DISTRICT MATHEMATICS PROGRAM

Instructional Guides
Secondary

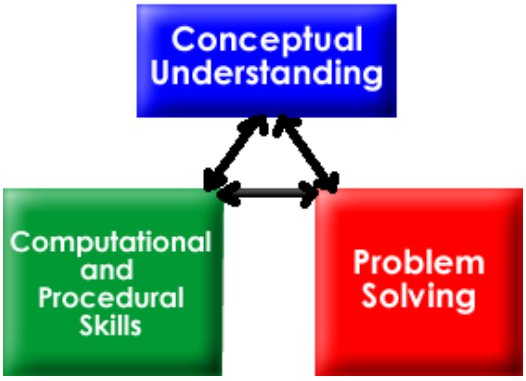
Los Angeles Unified School District
2009 - 2010

Vision, Coherence and Balance

The LAUSD Mathematics Instructional Guide (MIG) helps promote a balanced and designed mathematics curriculum for students as part of a coherent educational system. The Los Angeles Unified School District's vision is to provide its students with:

- **A designed curriculum** based on the Mathematics Content Standards for California Public Schools and the Mathematics Framework for California Public Schools.

- **A balanced curriculum** that teaches computational and procedural skills; conceptual understanding of mathematics; and problem solving.



- **A coherent educational system** in which the standards, the assessments, the curriculum, and the teacher professional development are closely aligned to one another.

Designed Curriculum: A designed curriculum is one that follows a deliberate design in which its elements act synergistically to provide all students access to content and reasoning standards. It is more than any single textbook. If taught completely and satisfactorily, this curriculum provides students with the experiences they need to become mathematically literate.

Balanced Curriculum: According to the Mathematics Framework for California Public Schools, mathematics education must provide students with a balanced instructional program. in such a program, students become proficient in basic computational and procedural skills, develop conceptual understanding, and become adept at problem solving. All three components are important; none is to be neglected or under emphasized. Balance, however, does not imply allocating equal amounts of time for each of the three components. At some times students might be concentrating on lessons or tasks that focus on one component; at other times the focus may be on two or all three. Basic computational and procedural skills, conceptual understanding, and problem solving form a web of mutually reinforcing elements in the curriculum.

Coherent Education: The California mathematics standards provide the basis of such an educational system. A close examination of the standards reveals certain big ideas, concepts and skills that students need to learn and use. An appropriate curriculum is designed to allow all students access to the concepts and skills. Proper use of the California Standards Test (CST) blueprints and the data from periodic assessments allow teachers to adapt the curriculum to the needs of their students. Appropriate teacher support in the form of professional development and resources provides additional avenues to reach students. Each of these components is crucial to form a coherent educational system.

Vision, Coherence and Balance

Conceptual Understanding

Understanding concepts means that students can use them to solve simple and complex problems, represent solutions in multiple ways, and explain procedures to someone else. Mathematics makes sense to students who have a conceptual understanding of the domain. Students know not only how to apply skills but also when to apply them as well as why they are being applied. Through this process students are able to see the structure and logic of mathematics and to use it flexibly, effectively, and appropriately. In seeing the larger picture and in understanding the underlying concepts, students are in a stronger position to apply their knowledge to new situations and problems and to recognize when they have made procedural errors. Work on conceptual understanding involves the opportunity to use; represent; explain.

Problem Solving

This is a goal-related activity that involves applying skills, understandings, and experiences to resolve new, challenging, or perplexing mathematical situations. The first phase in solving problems includes analyzing the problem (e.g. looking for patterns and making connections to known mathematical structures), making or formulating conjectures, and translating or expressing the problem into student language. The second phase involves integrating or putting together all the different pieces of information and representing the problem in mathematical language (e.g. an equation). Finally, the problem is solved using a wide variety of basic and technical skills with reasons or justifications made for each step in the solving process. Students might further identify relevant mathematical generalizations and seek connections to similar problems. Problem solving involves the opportunity to formulate, analyze, and translate; integrate and represent; solve and justify.

Computational and Procedural Skills

For each level of mathematics, a specific set of basic computational and procedural skills must be learned. For example, students need to memorize the number facts of addition and multiplication of one-digit numbers and their corresponding subtraction and division facts. The ability to retrieve these facts accurately and automatically from long-term memory, in turn, makes the solving of more complex problems, such as multi-step problems that involve basic arithmetic, quicker and less likely to result in errors (Geary and Widaman 1992). Computational and procedural skills are those that all students should learn to use routinely and automatically. Students should practice basic computational and procedural skills and use them frequently enough to commit them to memory. Work on skills involves the opportunity to practice; use accurately and automatically; memorize.

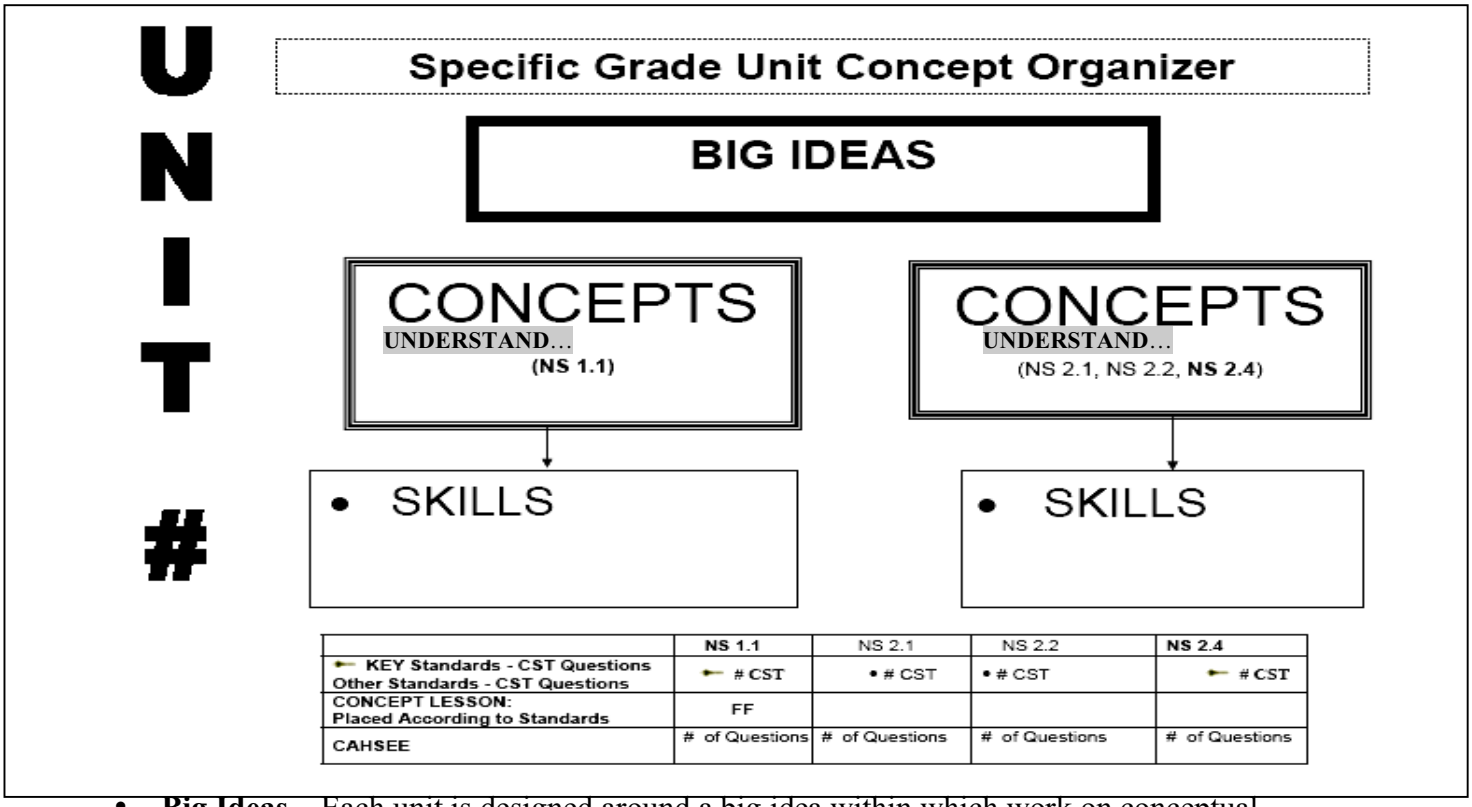
HOW TO USE THE MATH INSTRUCTIONAL GUIDE

This guide graphically organizes and clusters the California content standards to:

- promote the connections between and among mathematics skills, concepts, and problem solving strategies within and across different areas of mathematics content areas
- provide opportunities for students to develop a deep conceptual understanding as a foundation for their learning
- continue the use of strong teaching strategies
- provide students with a coherent learning experience that includes access to the necessary skills, concepts and problem solving

Organization of the Guide

Instructional Units – The content standards are grouped into instructional units. Some units may take less time than others to complete based on students' prior knowledge and the depth and complexity of the skills and concepts presented. A Unit Concept Organizer (see sample below) is found at the beginning of each instructional unit in order to facilitate instructional planning and student learning.



- **Big Ideas** – Each unit is designed around a big idea within which work on conceptual understanding, specific skills, and problem solving is balanced.
- **Concept Box** – **"UNDERSTAND"** in the concept box refers to a balanced approach which includes conceptual understanding, specific skill building, and problem solving.
- **Skills Box** – This box contains a list of all the skills that are connected to the concept described.
- **Content Standards** – Each instructional unit will contain the content standards for the unit.

- Assessment Tools – Blueprints aligned with the periodic assessment program are provided in this MIG. Teachers are encouraged to use them when planning a coherent standards-based program. The assessment items for 2006-2007 may be found on line at
- Instructional Resource Table –Sample Instructional Resources specific to each textbook will be provided to each teacher according to the courses taught by the teacher.
- Concept Lessons – Each unit may contain one or more mathematically rigorous task lesson. This multi-standard lesson is an essential part of the unit.
- Periodic Assessments – Assessment blueprints will be written for each unit assessment. All assessments will be available online to review prior to the assessment window.

Using the Guide to Plan Lessons

Before using the guide to plan instruction, teachers should be familiar with the mathematics content standards for California public schools and the *Mathematics Framework for California Public Schools*. In particular, teachers should be familiar with the standards for the grade level/course they are teaching.

In order for this Mathematics Instructional Guide (MIG) to be of greatest benefit to students, teachers may want to follow these steps:

- Become acquainted with the Mathematics Instructional Guide (MIG) and its components by answering he following questions:
  - How is this MIG different than others we have used?
  - What are the different elements of the MIG?
  - What does a balanced curriculum look like?
  - What do I teach in each unit?
  - What are the key standards in each unit?
  - What parts of my textbook should I use?
- **Focus on one unit at a time.** Use the Concept Unit Organizer for that unit to assist in guiding instruction by answering the following questions:
  - What are the key concepts and skills my students will learn in this unit to increase these mathematical understanding and prepare them for success on the CST?
  - What concepts should my students learn well for this unit?
  - What skills should my students practice for this unit?
  - What problems should my students be able to solve for this unit?
- **Examine the instructional resources document for the unit.** Examine the lessons from the textbook. Determine how to design classroom lessons which provide a balanced understanding of the concepts, conceptual and procedural skills, and problem solving for each student by answering the following questions:
  - Does every page of the textbook have to be used?
  - What other support materials could be used to teach students the concepts they need to learn?
- **Study the concept lesson for the unit.** This will help to answer the questions:
  - Which standards should I emphasize?
  - What scaffolding should I provide for my students to be successful?
  - What vocabulary should my students be familiar with?
  - What skills do my students need to successfully complete the lesson?
  - What questions may need to be addressed during the lesson?
  - How will students share their results/products?

ROAD TO ALGEBRA

	Number Sense	Number Sense	Algebra and Functions	Algebra and Functions
1ST GRADE	**1.1** Count, read, and write whole numbers to 100.	**2.1** Know the addition facts (sums to 20) and the corresponding subtraction facts and commit them to memory.	**1.1** Write and solve number sentences from problem situations that express relationships involving addition and subtraction.	**1.2** Understand the meaning of the symbols +, –, =.
	1.2 Compare and order whole numbers to 100 by using the symbols for less than, equal to, or greater than (<, =, >).	**2.5** Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference).		
	1.3 Represent equivalent forms of the same number through the use of physical models, diagrams, and number expressions (to 20) (e.g., 8 may be represented as 4 + 4, 5 + 3, 2 + 2 + 2 + 2, 10 – 2, 11 – 3).	**2.6** Solve addition and subtraction problems with one- and two-digit numbers (e.g., 5 + 58 = _).		
	1.4 Count and group objects in ones and tens (e.g., three groups of 10 and 4 equals 34, or 30 + 4).	**2.7** Find the sum of three one-digit numbers.		
2ND GRADE	**1.1** Count, read, and write whole numbers to 1,000 and identify the place value for each digit.	**3.3** Know the multiplication tables 2s, 5s, and 10s (to “times 10”) and commit them to memory.	**1.1** Use the commutative and associative rules to simplify mental calculations and to check results.	
	1.2 Use words, models, and expanded forms (e.g., 45 = 4 tens + 5) to represent numbers (to 1,000).	**4.1** Recognize, name, and compare unit fractions from 1/12 to ½.		
	1.3 Order and compare whole numbers to 1,000 by using the symbols <, =, >.	**4.3** Know that when all fractional parts are included, such as four-fourths, the result is equal to the whole and to one.		
	2.2 Find the sum or difference of two whole numbers up to three digits long.	**5.1** Solve problems using combinations of coins and bills.		
	2.3 Use mental arithmetic to find the sum or difference of two two-digit numbers.	**5.2** Know and use the decimal notation and the dollar and cent symbols for money.		
	3.1 Use repeated addition, arrays, and counting by multiples to do multiplication.			

	Number Sense	Number Sense	Algebra and Functions	Algebra and Functions
3rd GRADE	**1.3** Identify the place value for each digit in numbers to 10,000.	**2.6** Understand the special properties of 0 and 1 in multiplication and division	**1.0** Students select appropriate symbols, operations, and properties to represent, describe, simplify, and solve simple number relationships.	**1.5** Recognize and use the commutative and associative properties of multiplication (e.g., if 5 × 7 = 35, then what is 7 × 5? And if 5 × 7 × 3 = 105, then what is 7 × 3 × 5?).
	1.5 Use expanded notation to represent numbers (e.g., 3,206 = 3,000 + 200 + 6).	**2.7** Determine the unit cost when given the total cost and number of units.	**1.4** Express simple unit conversions in symbolic form (e.g., _ inches = _ feet × 12).	**2.1** Solve simple problems involving a functional relationship between two quantities (e.g., find the total cost of multiple items given the cost per unit).
	2.1 Find the sum or difference of two whole numbers between 0 and 10,000.	**3.1** Compare fractions represented by drawings or concrete materials to show equivalency and to add and subtract simple fractions in context (e.g., ½ of a pizza is the same amount as 2/4 of another pizza that is the same size; show that 3/8 is larger than ¼).		**2.2** Extend and recognize a linear pattern by its rules (e.g., the number of legs on a given number of horses may be calculated by counting 4s or by multiplying the number of horses by 4).
	2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.	**3.2** Add and subtract simple fractions (e.g., determine that 1/8 + 3/8 is the same as ½).		
	2.4 Solve simple problems involving multiplication of multidigit numbers by one-digit numbers.	**3.4** Know and understand that fractions and decimals are two different representations of the same concept (e.g., 50 cents is ½ of a dollar, 75 cents is ¾ of a dollar.		

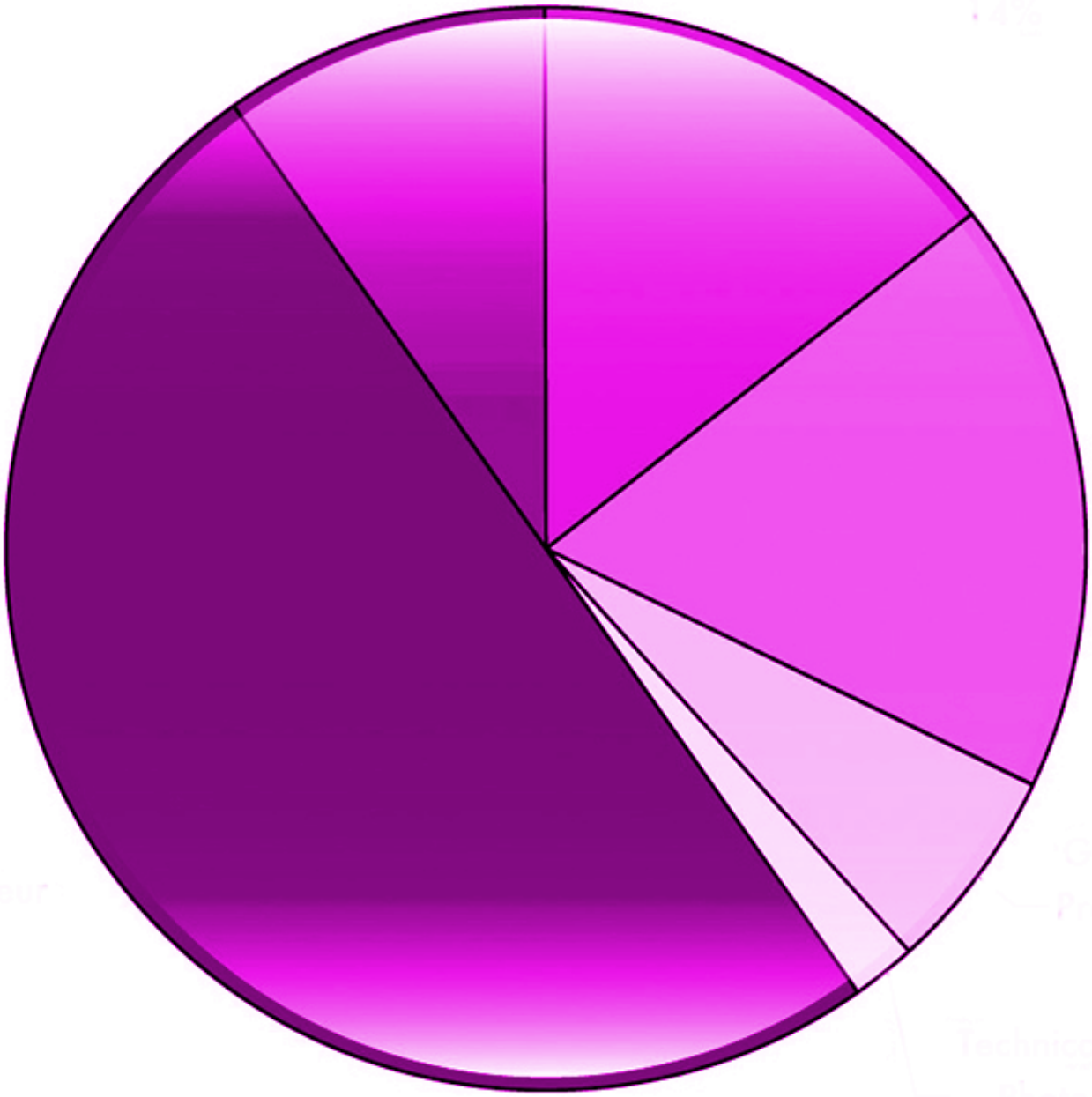
	Number Sense	Number Sense	Algebra and Functions	Algebra and Functions
4th GRADE	**1.1** Read and write whole numbers in the millions.	**1.7** Write the fraction represented by a drawing of parts of a figure; represent a given fraction by using drawings; and relate a fraction to a simple decimal on a number line.	**1.1** Use letters, boxes, or other symbols to stand for any number in simple expressions or equations (e.g., demonstrate an understanding and the use of the concept of a variable.	**2.1** Know and understand that equals added to equals are equal.
	1.2 Read, write, order and compare whole numbers in the millions and decimals to two places.	**2.0** Students extend their use and understanding of whole numbers to the addition and subtraction of simple decimals.	**1.2** Interpret and evaluate mathematical expressions that use parentheses.	**2.2** Know and understand that equals multiplied by equals and equal.
	1.3 Round whole numbers through the millions to the nearest ten, hundred, thousand, ten thousand, or hundred thousand.	**3.1** Demonstrate an understanding of, and the ability to use, standard algorithms for the addition and subtraction of multidigit numbers.	**1.3** Use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations.	
	1.5 Explain different interpretations of fractions, for example, parts of a whole, parts of a set, and division of whole numbers; explain equivalence of fractions (see Standard 4.0).	**3.2** Demonstrate an understanding of, and the ability to use, standard algorithms for multiplying a multidigit number by a two-digit number and for dividing a multidigit number by a one-digit number; use relationships between them to simplify computations and to check results.	**1.5** Understand that an equation such as $y = 3x + 5$ is a prescription for determining a second number when a first number is given.	
	1.6 Write tenths and hundredths in decimal and fraction notations and know the fraction and decimal equivalents for halves and fourths (e.g., ½ = 0.5 or 0.50; 7/4 = 1 ¾ = 1.75).	**4.1** Understand that many whole numbers break down in different ways (e.g., 12 = 4 × 3 = 2 × 6 = 2 × 2 × 3).	**2.0** Know and understand that equals added to equals are equal and that equals multiplied by equals are equal.	

5th GRADE	**1.2** Interpret percents as a part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number.	**2.0** Students perform calculations and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.	**1.0** Students use variables in simple expressions, compute the value of the expression for specific values of the variable, and plot and interpret the results.	**1.4** Identify an graph ordered pairs in four quadrants of the coordinate plane.
	1.4 Determine the prime factors of all numbers through 50 and write the numbers as the product of their prime factors by using exponents to show multiples of a factor (e.g., $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$).	**2.1** Add, subtract, multiply, and divide with decimals; add with negative integers; subtract positive integers from negative integers; and verify the reasonableness of the results.	**1.2** Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitution.	**1.5** Solve problems involving linear functions with integer values; write the equation; and graph the resulting ordered pairs of integers on a grid.
	1.5 Identify and represent on a number line decimals, fractions, mixed numbers, and positive and negative integers.	**2.5** Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems.	**1.3** Know and use the distributive property in equations expressions with variables.	

	Number Sense	Number Sense	Algebra and Functions	Algebra and Functions
6th GRADE	**1.1** Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.	**2.1** Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.	**1.2** Write and evaluate an algebraic expression for a given situation, using up to three variables.	
	1.2 Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (*a/b, a* to *b, a:b*).	**2.3** Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.	**2.1** Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches.	
	1.3 Use proportions to solve problems (e.g., determine the value of *N* if 4/7 = N/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.		**2.2** Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity.	
	1.4 Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.		**2.3** Solve problems involving rates, average speed, distance, and time.	

	Number Sense	Number Sense	Algebra and Functions	Algebra and Functions
7th GRADE	**1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	**1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest	**1.1** Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations of inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).	**3.3** Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.
	1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.		**1.2** Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.	**3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of a line equals the ration of the quantities.
	1.6 Calculate the percentage of increases and decreases of a quantity.		**1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	**4.0** Students solve simple linear equations and inequalities over the rational numbers.
			3.0 Students graph and interpret linear and some nonlinear functions.	**4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation.
			3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.	

Grade 6



Secondary Mathematics Instructional Guide 2009-2010

Mathematics 6AB
(Annual Course – Grade 6)
Prerequisite: Mathematics 5AB

310101 Mathematics 6A
310102 Mathematics 6B

Course Description
The major purpose of this course is to serve as a vehicle by which students will master the four arithmetic operations with whole numbers, positive fractions, positive decimals, and positive and negative integers; and will accurately compute and solve problems. They will apply this knowledge to statistics and probability, and geometry.

In this course, students will understand the concept of mean, median, and mode of data sets and how to calculate the range. They will analyze data and sampling processes for possible bias and misleading conclusions; they will use addition and multiplication of fractions routinely to calculate probabilities. Students will work with ratios and proportions.

Students will continue their study of geometry, including complementary and supplementary angles, the sum of the angles in a triangle, the concept of the constant pi and its applications to the formulas for area and circumference of the circle.

COURSE SYLLABUS

Unit 1

Recommended Focus Standards

6 NS 1.1 Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.

6 NS 2.4 Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions(e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction)

Scope and Sequence

As one of the most critical units, the number sense strand requires that students understand the position of the negative numbers and the geometric effect on the numbers on the number line when a number is subtracted from them. Interpreting and using ratios in different contexts will be essential for showing the relative size of two quantities.

Unit 2

Recommended Focus Standards

6 NS 1.2 Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b, a to b, a:b).

6 NS 1.3 Use proportions to solve problems (e.g., determine the value of N if $\frac{4}{7} = \frac{N}{21}$; find the length of a side of a polygon similar to a known polygon). Use cross multiplication as a method to solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

6 NS 1.4 Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.

6 NS 2.3 Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.

6 AF 1.1 Write and solve one-step linear equations in one variable.

6 AF 2.2 Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity.

Scope and Sequence

In this unit, the students will learn how to use, write and solve ratios and proportions. Equally important, students will develop an understanding of how to solve simple one-variable equations.

Unit 3

Recommended Focus Standards

6 SDAP 2.2 Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a Population.

6 SDAP 2.3 Analyze data displays and explain why the way in which the question was asked might have influenced the results obtained and why the way in which the results were displayed might have influenced the conclusions reached.

6 SDAP 2.4 Identify data that represent sampling errors and explain why the sample (and the display) might be biased.

6 SDAP 2.5 Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.

6 SDAP 3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.

6 SDAP 3.3 Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if P is the probability of an event, 1- P is the probability of an event not occurring.

6 SDAP 3.5 Understand the difference between independent and dependent events.

Scope and Sequence

Students will learn the concept of mean, median, and mode of data and how to calculate the range. In this unit, students will focus their attention on how to analyze data and sampling processes for possible bias and misleading conclusions.

Unit 4

Recommended Focus Standards

6 MG 1.1 Understand the concept of a constant such as π ; know the formulas for the circumference and area of a circle.

6 MG 2.2 Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle.

Scope and Sequence

In the final unit, students will learn how to use a constant such as π in formulas to calculate the circumference and area of a circle. Students will learn that the lengths of the sides of a polygon or the diameter of a circle are used to find the distance around the figure. Students will learn that the volumes of three-dimensional figures can often be found by dividing and combining them into figures whose volume are already known.

Representative Performance Outcomes and Skills

In this course, students will know and be able to:

- Master the four arithmetic operations with whole numbers, positive fractions, positive decimals, and positive and negative integers
- Understand the concept of mean, median, and mode of data sets and how to calculate the range
- Analyze data and sampling processes
- Use addition and multiplication to calculate probabilities
- Interpret and use ratios in different context
- Understand how to solve simple one-variable equations
- Understand how to use a constant such as π

Assessments will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments
- Periodic Assessments

Texts/Materials

- LAUSD *Secondary Mathematics Instructional Guide*
- Textbook: District approved materials
- Supplemental materials and resources

Sixth Grade: *Unit Concept Organizer*

Rational numbers: How to Connect Properties and Applications

UNIT 1

Understand the relationships between different representations of rational numbers

NS 1.1, NS 2.4

- Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line
- Determine the least common multiple and the greatest common divisor of whole numbers
- Use LCM and GCD to solve problems with fractions

Understand applications and operations on rational numbers

NS 2.1, NS 2.2

- Solve problems involving addition, subtraction, multiplication, and division of positive fractions
- Explain why a particular operation was used for a given situation involving operations on fractions
- Explain the meaning of multiplication and division of positive fractions and perform the calculations

Understand variables and expressions as symbolic representations of numerical values

AF 1.2, AF 1.3, AF 1.4

- Write and evaluate an algebraic expression for a given situation, using up to three variables
- Apply order of operations and the commutative, associative, and distributive properties to evaluate expressions
- Justify each step when evaluating expressions

	NS 1.1	NS 2.1	NS 2.2	**NS 2.4**	AF 1.2	AF1.3	AF1.4
KEY Standards - CST Questions **Other Standards - CST Questions** *** 1 / 2 : 1 question every 2 years**	3	1/2*	1/2*	3	1	1	1
CONCEPT LESSON: FF - Fraction of a Fraction LF - Linking Fractions BT - Banquet Tables	FF	LF			BT	BT	BT

Concept Task

Fraction of a Fraction: Discounting Brownies

Your task: Read the situation below and use pictures, diagrams, words, numbers, and/or symbols to determine and show how much brownies Mr. Vargas will buy and how much he will pay.

Paulo and Paula are tending the brownie booth at the school fair. The brownies are baked in square pans, and they are sold as fractional parts of a pan. A whole pan of brownies costs $24.00. The cost any fractional part of a pan is that fraction of $24.00. The school fair was almost over. Paulo and Paula wanted to sell all the remaining brownies in a hurry, so they decided to offer discount of 20% on all sales. They had $2\frac{1}{4}$ pans of brownies left. Remember they originally sold a pan of brownies for $24.00.

Part A. Mr. Vargas offered to buy half of all that they had left.

1. How much will Mr. Vargas purchase?

2. How much should Paulo and Paula charge Mr. Vargas?

Part B. When Mr. Vargas got his bill, he realized he had only $20.00 in his wallet, so he said, "I guess I'll only buy $\frac{1}{3}$ of what you have left."

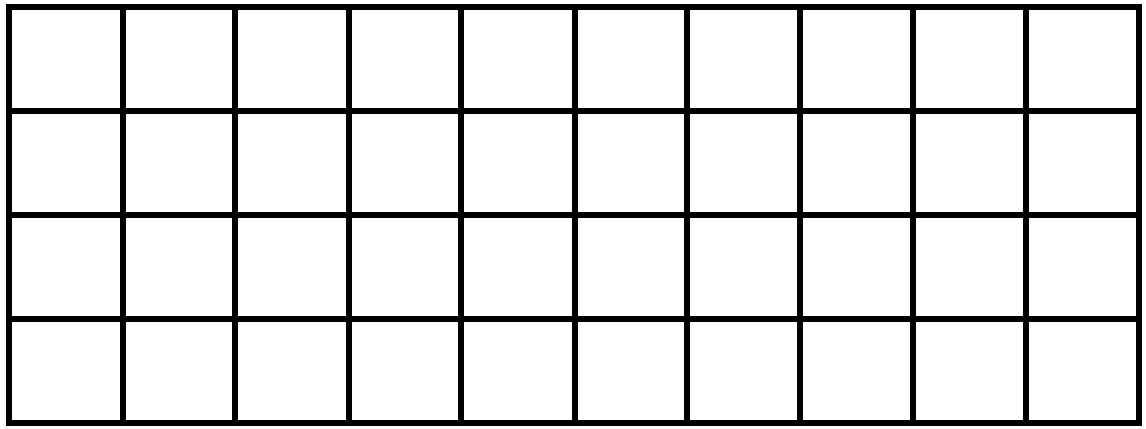
1. Now how much will Mr. Vargas buy?

2. Can he afford this much? Explain your reasoning.

Concept Task

Linking Fractions, Decimals, and Percents

Your task: Shade 6 of the small squares in the rectangle shown below.
Then determine the percent, the decimal, and the fraction represented by the shaded squares.

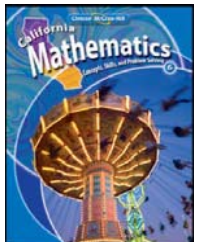


Using the diagram, explain how to determine each of the following:

a) The percent of area that is shaded.
b) The decimal part of the area that is shaded.
c) The fractional part of the area that is shaded.

Stein, M.K., Smith, M.S., Henningsen, M.A., and Silver, E.A. (2000). *Implementing Standards-Based Mathematics Instruction: A Casebook for Professional Development.* p. 47.

Grade 6: Textbook Connections



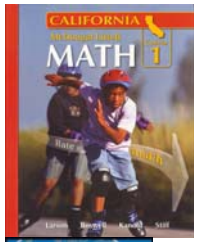
California Mathematics: Concept, Skills, and Problem Solving

UNIT 1

Topic	Standards	Textbook Sections
Understand the relationships between representations of rational numbers	**NS1.1** Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line NS2.1 Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation NS2.2 Explain the meaning of multiplication and division of positive fractions and perform the calculations (e.g., 5/8 divided by 15/16 = 5/8 × 16/15 = 2/3)	**4.1** Prime Factorization **4.2** Greatest Common Factor **4.3** Problem Solving Investigation **4.4** Simplifying Fractions **4.5** Fractions and Decimals **4.6** Fractions and Percents **4.7** Percents and Decimals **4.8** Least Common Multiple **4.9** Comparing and Ordering rational Numbers **6.8** Fractions, Decimals, and Percent
Understand applications and operations on rational numbers	**NS 2.4** Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction) AF1.2 Write and evaluate an algebraic expression for a given situation, using up to three variables	**5.1** Estimating with Fractions **5.2** Adding and Subtracting Fractions **5.3** Adding and Subtracting Mixed Numbers **5.4** Problem Solving Investigation **5.5** Multiplying Fractions **5.7** Dividing Fractions and Mixed Numbers
Understand variables and expressions as symbolic representations of numerical values	AF1.3 Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process AF1.4 Solve problems manually by using the correct order of operations or by using a scientific calculator	**1.4** Order of Operations **1.5** Problem Solving Investigation **1.6** Algebra: Variables and Expressions

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6: Textbook Connections



Course 1 McDougal Littell MATH

UNIT 1

Topic	Standards	Textbook Sections
Understand the relationships between representations of rational numbers	**NS1.1** Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line NS2.1 Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation NS2.2 Explain the meaning of multiplication and division of positive fractions and perform the calculations (e.g., 5/8 divided by 15/16 = 5/8 × 16/15 = 2/3)	**1.1** Prime Factorization **1.2** Greatest Common Factor **1.3** Equivalent Fractions **1.4** Least Common Multiple **1.5** Comparing and Ordering Fractions **1.6** Comparing Fractions and Mixed Numbers **1.7** Ordering Fractions and Decimals
Understand applications and operations on rational numbers	**NS 2.4** Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction)	**2.1** Adding and Subtracting Fractions **2.2** Using a Common Denominator **2.3** Adding and Subtracting Mixed Numbers **2.4** Multiplying Fractions and Mixed Numbers **2.5** Dividing Fractions and Mixed Numbers **2.6** Adding and Subtracting Decimals **2.7** Multiplying and Dividing Decimals
Understand variables and expressions as symbolic representations of numerical values	AF1.2 Write and evaluate an algebraic expression for a given situation, using up to three variables AF1.3 Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process AF1.4 Solve problems manually by using the correct order of operations or by using a scientific calculator	**4.1** Evaluating Expressions **4.2** Writing Expressions **4.3** Simplifying Expressions

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6
Assessment 1
Periodic Assessment Blueprint
Secondary Mathematics, 2009 – 2010

6th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
NS1.1 🔑	Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.	3	**5**	**1**
NS2.1	Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.	1/2	**2**	
NS2.2	Explain the meaning of multiplication and division of positive fractions and perform the calculations (e.g., 5/8 divided by 15/16 = 5/8 × 16/15 = 2/3).	1/2	**2**	
NS2.4 🔑	Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).	3	**5**	
AF1.2	Write and evaluate an algebraic expression for a given situation, using up to three variables.	1	**2**	
AF1.3	Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process.	1	**2**	
AF1.4	Solve problems manually by using the correct order of operations or by using a scientific calculator.	1	**2**	

🔑 *Denotes key standards as defined by the Mathematics Framework for California Public Schools*

Sixth Grade: *Unit Concept Organizer*

Integers, Algebraic Thinking and Proportional Reasoning

UNIT 2

Understand operations on integers

NS 2.3

- Solve addition, subtraction, multiplication, and division problems that use positive and negative integers
- Solve integer problems that arise in concrete situations
- Solve problems that use a combination of integer operations
- Write verbal expressions using symbolic representations, and vice versa
- Translate between verbal expressions and symbolic representations

Understand and Solve Equations

AF 1.1

- Use inverse operation to solve algebraic equations
- Translate verbal equations to algebraic equations
- Write and solve one-step linear equations in one variable

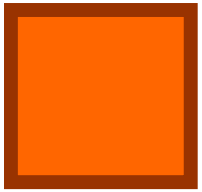
Understand and use ratios, rates, and proportions,

NS 1.2, **NS 1.3**, AF 2.1, **AF 2.2**, AF2.3

- Interpret ratios in different contexts to show the relative sizes of two quantities
- Use appropriate notations to denote ratios (e.g., *a*/*b*, *a* to *b*, *a*:*b*)
- Use proportions to solve problems
- Use cross multiplication as a method for solving proportion problems
- Understand that cross multiplication is the multiplication of both sides of an equation by a multiplicative inverse
- Convert one unit of measurement to another
- Understand that *rate* is a measure of one quantity per unit value of another quantity
- Solve problems involving rates, average speed, and time

	NS1.2	**NS1.3**	**NS2.3**	**AF1.1**	AF2.1	**AF2.2**	AF2.3
KEY Standards - CST Questions Other Standards - CST Questions	1	6	6	6	1	6	1
CONCEPT LESSON: VS-Victor and Sharon's Road Trip CJ-The Candy Jar	VS CJ	CJ	CJ			VS	

Grade 6: The Banquet Tables



Concept Task: *Unit 2*

You are helping to plan a big reception for your sister's wedding. The reception hall has square-shaped tables and four people can sit around a table. Unfortunately, you have just found out there is not enough room to spread the tables out.

Your brother has an idea, "What if we push two tables together so that one of the sides from the first table is touching a side from the second table?"
What happens to the number of people when you push two tables together?

Guiding Question: How would you find how many people can sit around *any* number of tables?

Investigation 1: Use the pattern blocks to explore what happens when you place square tables end-to-end. Draw a picture, using colors to show how you count the number of people that can sit down at *any* number of square tables.

1. Share your picture with a partner.

2. Are they the alike? If they are alike, can you think of another way to determine the number of seats?

3. Are they different? If they are different, do you understand your partner's diagram?

Now complete the t-table, describe your diagram in words, develop an algebraic expression and draw a graph.

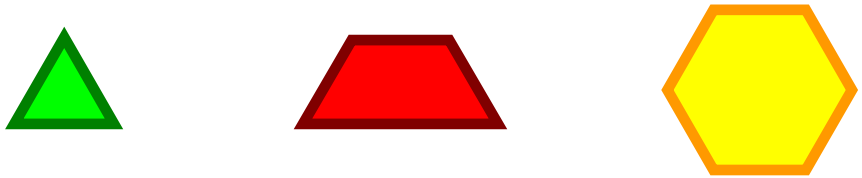
4. What patterns do you notice in your graph?

5. Can you see these patterns in your other representations?
(The table, the picture, the explanation, and the algebraic expression)

Grade 6: The Banquet Tables

Concept Task: *Unit 2*

Investigation 2: Investigate what happens when you use different shapes for the tables.



1. What are the similarities between the graphs when you use different shaped tables?

2. What are the differences?

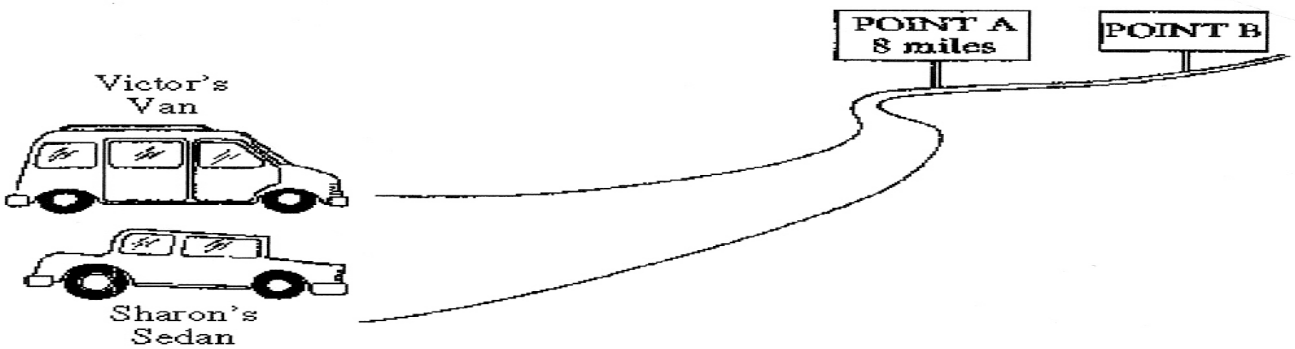
3. Can you see these similarities and differences in your other representations?
(The table, the picture, the explanation, and the algebraic expression)

4. Can you determine the number of people seated at 25 tables from your graph? How?

Extension: Develop an algebraic expression to give the total number of seats depending on the number of tables placed end-to-end and the number of people able to sit around a table of given size.

Concept Task

VICTOR AND SHARON'S ROAD TRIP



8. Victor's van travels at a rate of 8 miles every 10 minutes. Sharon's sedan travels at a rate of 20 miles every 25 minutes.

   If both cars start at the same time, will Sharon's sedan reach point A, 8 miles away, before, at the same time, or after Victor's van?

   Explain your reasoning.

   _____

   _____

   _____

   If both cars start at the same time, will Sharon's sedan reach point B (at a distance further down the road) before, at the same time, or after Victor's van?

   Explain your reasoning.

   _____

   _____

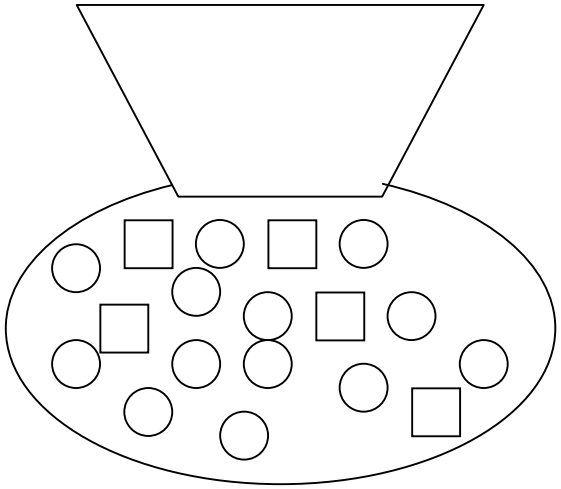
   _____

From NAEP, 8th Grade, NCES – National Center for Education Statistics

Concept Task

THE CANDY JAR TASK

The Candy Jar shown below contains Jolly Ranchers (the rectangles) and Jawbreakers (the circles). Solve each of the following problems:



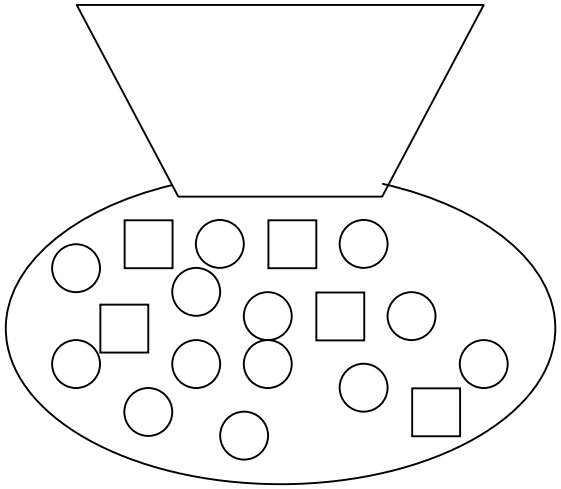
1. **What is the ratio of the Jolly Ranchers to Jawbreakers in the candy jar?**

2. **Write as many ratios as you can that are equivalent to the first ratio that you wrote down.**

Concept Task

THE CANDY JAR TASK

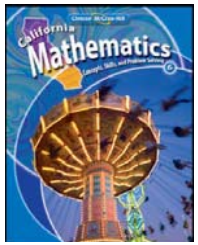
The Candy Jar shown below contains Jolly Ranchers (the rectangles) and Jawbreakers (the circles). Solve each of the following problems:



3. **Suppose you had a new candy jar with the same ratio of Jolly Ranchers to Jawbreakers as shown above, but it contained 100 jolly Ranchers. How many Jawbreakers would you have?**

4. **Suppose you had a candy jar with the same ratio of Jolly Ranchers to Jawbreakers as shown above, but it contained 720 candies. How many of each kind of candy would you have?**

Grade 6: Textbook Connections



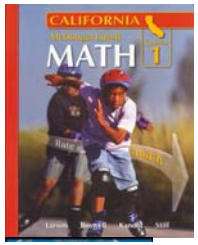
California Mathematics: Concept, Skills, and Problem Solving

UNIT 2

Topic	Standards	Textbook Sections
Understand operations on integers	**NS1.2** Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (*a/b*, *a* to *b*, *a:b*) **NS1.3** Use proportions to solve problems (e.g., determine the value of *N* if 4/7 = *N*/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse	**2.1** Integers and Absolute Value **2.2** Comparing and Ordering Fractions **2.3** The Coordinate Plane **2.4** Adding Integers **2.5** Subtracting Integers **2.6** Multiplying Integers **2.7** Problem Solving Investigation **2.8** Dividing Integers
Understand and solve *equations*	**NS2.3** Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations **AF1.1** Write and solve one-step linear equations in one variable AF2.1 Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches)	**1.7** Algebra: Equations **1.8** Properties **3.1** Writing Expressions and Equations **3.2** Solving Addition and Subtraction Equation **3.3** Solving Multiplication Equations **3.4** Problem Solving Investigation **3.5** Solving Two-Step Equations **3.6** Measurement: Perimeter and Area
Understand and use ratios, rates, and proportions	**AF2.2** Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity AF2.3 Solve problems involving rates, average speed, distance, and time	**6.1** Ratios **6.2** Rates **6.3** Measurement: Changing Customary Units **6.4** Measurement: Changing Metric Units **6.5** Solving Proportions **6.6** Problem Solving Investigation **6.7** Scale Drawing **6.8** Fractions, Decimals, and Percents **6.9** Percents Greater Than 100% and Percents Less Than 1%

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6: Textbook Connections



Course 1 McDougal Littell MATH

UNIT 2

Topic	Standards	Textbook Sections
Understand operations on integers	**NS1.2** Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (*a/b*, *a* to *b*, *a:b*) **NS1.3** Use proportions to solve problems (e.g., determine the value of *N* if 4/7 = *N*/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse	**3.1** Ordering Integers on a Number Line **3.2** Adding Integers **3.3** Subtracting Integers **3.4** Multiplying Integers **3.5** Dividing Integers **3.6** Order of Operations **3.7** Rational Numbers and their Properties **3.8** The Distributive Properties
Understand and solve *equations*	**NS2.3** Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations **AF1.1** Write and solve one-step linear equations in one variable	**4.5** Equations and Mental Math **4.6** Solving Addition and Subtraction Equations **4.7** Solving Multiplication and Division Equations
Understand and use ratios, rates, and proportions	AF2.1 Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches) **AF2.2** Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity AF2.3 Solve problems involving rates, average speed, distance, and time	**5.1** Ratios **5.2** Rates **5.3** Writing and Solving Proportions **5.4** Solving Proportions Using Cross Products **5.5** Scale Drawings and Models **10.1** Converting Metric Units **10.2** Converting Customary Units **10.3** Converting Between Systems

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6
Assessment 2
Periodic Assessment Blueprint
Secondary Mathematics, 2009 – 2010

6th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
NS1.2 🔑	Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (*a/b*, *a* to *b*, *a:b*).	1	**1**	
NS1.3 🔑	Use proportions to solve problems (e.g., determine the value of *N* if 4/7 = *N*/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.	6	**5**	**1**
AF1.1 🔑	Write and solve one-step linear equations in one variable.	6	**4**	
NS2.3 🔑	Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations that use positive and negative integers and combinations of these operations.	6	**3**	
AF2.1	Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).	1	**1**	
AF2.2 🔑	Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity.	6	**5**	
AF2.3	Solve problems involving rates, average speed, distance, and time.	1	**1**	

🔑 *Denotes key standards as defined by the Mathematics Framework for California Public Schools*

Sixth Grade: *Unit Concept Organizer*

Percentages, Statistics, Data Analysis and Probability

UNIT 3

Understand applications of percentages

NS 1.4

- Calculate given percentages of quantities
- Solve problems involving discounts at sales, interest earned, and tips

Understand data analysis and population sampling

SDAP 1.1, SDAP 1.2, SDAP 1.3, **SDAP2.2**, **SDAP2.5**

- Compute the range, mean, median, and mode of data sets
- Recognize outliers and their effect on measures of central tendency
- Identify different ways of selecting a sample, and which method makes a sample more representative for a population
- Analyze and evaluate the validity of claims based on statistical data

Understand theoretical and experimental probabilities

SDAP 3.1, SDAP 3.2, **SDAP3.3**, SDAP 3.4, **SDAP3.5**

- Represent all possible outcomes for compound events in an organized way, and express the theoretical probability of each outcome
- Represent probabilities as ratios, proportions, decimals and percentages and verify that the probabilities computed are reasonable
- Know that if P is the probability of an event, $1-P$ is the probability of an event not occurring
- Understand the difference between independent and dependent events
- Understand that the probability of two disjoint (mutually exclusive) events occurring can be expressed as $P(A \text{ or } B) = P(A) + P(B)$
- Understand that the probability of one event following another, in independent trials, can be expressed as $P(A \text{ and } B) = P(A) \cdot P(B)$

	NS1.4	SDAP 1.1	SDAP 1.2	SDAP 1.3	**SDAP 2.2**	**SDAP 2.5**	**SDAP 3.1**	**SDAP 3.3**	SDAP 3.4	**SDAP 3.5**
KEY Standards - CST Questions Other Standards - CST Questions * 1 / 3 : means 1 question every 3 years	5	1/3*	1/3*	1/3*	3	1/3*	3	3	1/3*	1/3*
CONCEPT LESSON: CW – Conserving Water WS – Winning Spinners		CW	CW		CW		WS	WS		WS

Spinner Investigation 1: When is a game fair?

Grade 6 Concept Task: Unit 3

In pairs, play a game with the spinner that has three colors, blue, yellow and red. One person will spin the spinner, and the other will put a check mark in the table below every time the spinner lands on the color of each row; either blue, yellow or red. When one color has been landed on 10 times, the game stops and that color "wins".

Once your group has finished the game, add up the total number of times the spinner landed on each color.

Start **Finish**

	1	2	3	4	5	6	7	8	9	10

Total number of times the spinner landed on each color

Now turn to page 2 and use your data and observations to answer questions 1 through 4.

Spinner Investigation 1: When is a game fair?

Grade 6 Concept Task: Unit 3

1. Based on your experiment, what is the probability of the spinner landing on red? Explain.

2. Based on your experiment, what is the probability of the spinner landing on blue? Explain.

3. If you had not actually played the game, and had to guess, what do you think is the probability of the spinner landing on red? Explain how you got this answer.

4. Is your answer to question 3 different from your answer to question 1? Why might this be?

Now add your group's data to the overall class data recording sheet.

5. Based upon the whole groups' data, what is the probability of the spinner landing on red?

6. Is your answer to question 5 different from your answers to questions 1 and 3? If so, explain why this might be the case.

Spinner Investigation 1: When is a game fair?

Grade 6 Concept Task: Unit 3

Answer questions 7, 8 and 9 using the theoretical probability of the spinner landing on blue, red or yellow.

7. How many times would you expect to have to spin the spinner for it to land on red 12 times? Explain.

8. If this is a game in which each player is assigned a color, will it be a fair game? Discuss why or why not?

9. If not fair, how could you change the game to make it fair?

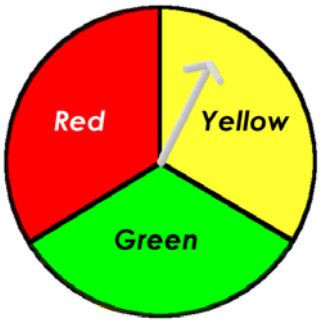
Group Recording Sheet
Fair Game

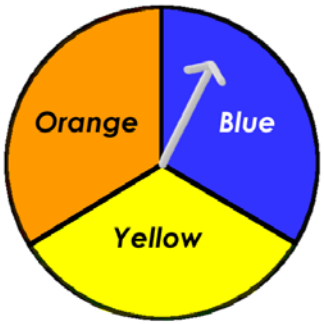
Groups	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Group Total
Blue																
Yellow																
Red																
															Overall Total	

Spinner Investigation 2: Making Purple

Grade 6 Concept Task: Unit 3

A science club hosts a carnival to raise money. A game called *Making Purple* at the carnival involves using both spinners shown. If the player gets red on spinner A and blue on spinner B, the player wins because mixing red and blue makes purple.





Make a chart of your answers to questions 1, 2, and 3, making sure that you clearly show how your answers to questions 2 and 3 are related to your answer to question 1

1. List the outcomes that are possible when you spin both pointers. Are these outcomes equally likely? Explain your reasoning.

2. What is the theoretical probability that a player "makes purple"? Explain.

3. What is the theoretical probability of a player getting only one yellow? Explain.

Spinner Investigation 2: Making Purple

Grade 6 Concept Task: Unit 3

Complete questions 4, 5, and 6 on the sheet below, making sure you provide clear explanations for each answer.

4. If 100 people play the *Making Purple* game, how many people do you expect to win? Explain your reasoning.

5. If 100 people play the *Making Purple* game, how many people will get only one yellow? Explain.

6. The club charges $1 per turn. A player who makes purple wins $5. Suppose 100 people play. How much money do you expect the club to make?

Concept Task

Conserving Water: Which Community Will Win the Water Conservation Challenge?

The Mayor of the town of Crystal Springs wants to encourage families to conserve water. In April, he found that households in the communities of Oak Park and Fern Woods used a lot of water – the typical household in each community used 6,300 gallons of water per month. On May 1st the mayor made a challenge – the community that uses less water over the summer will be able to host the fall carnival.

The newspaper stated that Oak Park cut their monthly household water consumption to 5,900 gallons of water during the month of May. Miguel, Sam, Mary and Tamara live in Fern Woods and their school asked them each to poll households in their community to find out how they are doing. Unfortunately, they don't have enough time or money to visit every home to gather their data. How could they collect information from a sample of homes in Fern Woods to find out whether they are on the way to winning the challenge, or whether they have to work harder to catch up with Oak Park?

Miguel decided to use systematic sampling, Sam decided to use convenience sampling, and Tamara decided to use random sampling to gather their data, but they need your help. With your team, select a task card to find out whom you will help. Work together to decide how you will use their method to collect your data to decide whether families in Fern Woods used less water than families in Oak Park during the month of May. Once you have selected the homes that will be in your sample, consult the "Home Visit" sheet to collect your data. Calculate the range, mean, median, and mode of your sample.

- Which of these results best represents the "typical" household water consumption in your sample?
- Do you think this result represents the "typical" water consumption in Fern Woods?
- Which community do you think uses less water, Fern Woods or Oak Park?
- Produce a poster that describes your methods and shows your results and conclusions.
- Explain your reasoning.

COMPARISON:

Mary collected her data using a self-selected sample. She placed a notice on Broad Street, but only five families responded. Her data was: 4,800, 5,300, 4,300, 6,400, and 4,300 gallons. She performed her calculations and put her findings in the summary chart. Add your team's results and conclusions to the summary chart.

- Compare your findings to those of the other teams.
- What do you think is the best way to determine w***hich community conserved more water?***
- Be prepared to explain your recommendations.

Extension Questions, if students need additional challenge:

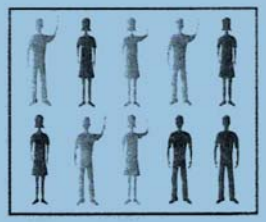
- Would it be important to find out whether Oak Park reported their median or mean water consumption? Explain.
- Will it always be true that mean water consumption is higher than median water consumption? Explain.
- Why do you think some households use a lot more water than others?
- What can you do to make sure you are not wasting water at home?

<u>Homework:</u> Prepare a letter to send to the Mayor of Crystal Springs to recommend the best sampling procedure to use to collect water consumption data from Fern Woods. Be sure to mention the suggested sample size, sampling method, possible bias, and the measure you should use to determine the "typical" household water consumption. Justify your recommendations.

<u>Project:</u> Find out how much your utility company charges for water. Figure out how much money your family would save over a month, and over a year, if your family can use 1000 less gallons of water per month.

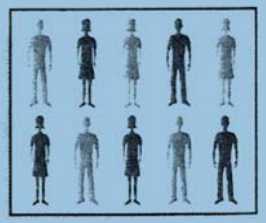
TASK CARDS

With *self-selected sampling*, you let people volunteer to be part of the sample.



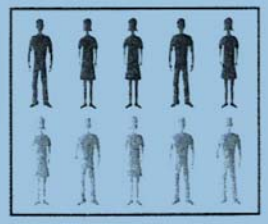
MARY
(Mary has already used self-selected sampling to collect her data so you won't need to help her.)

With *systematic sampling*, you use a pattern to select people, such as choosing every other person.



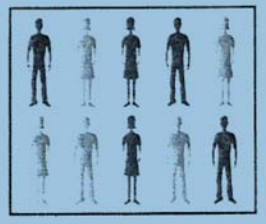
MIGUEL
(Systematic Sampling)

With *convenience sampling*, you choose easy-to-reach people, such as those in the first row.



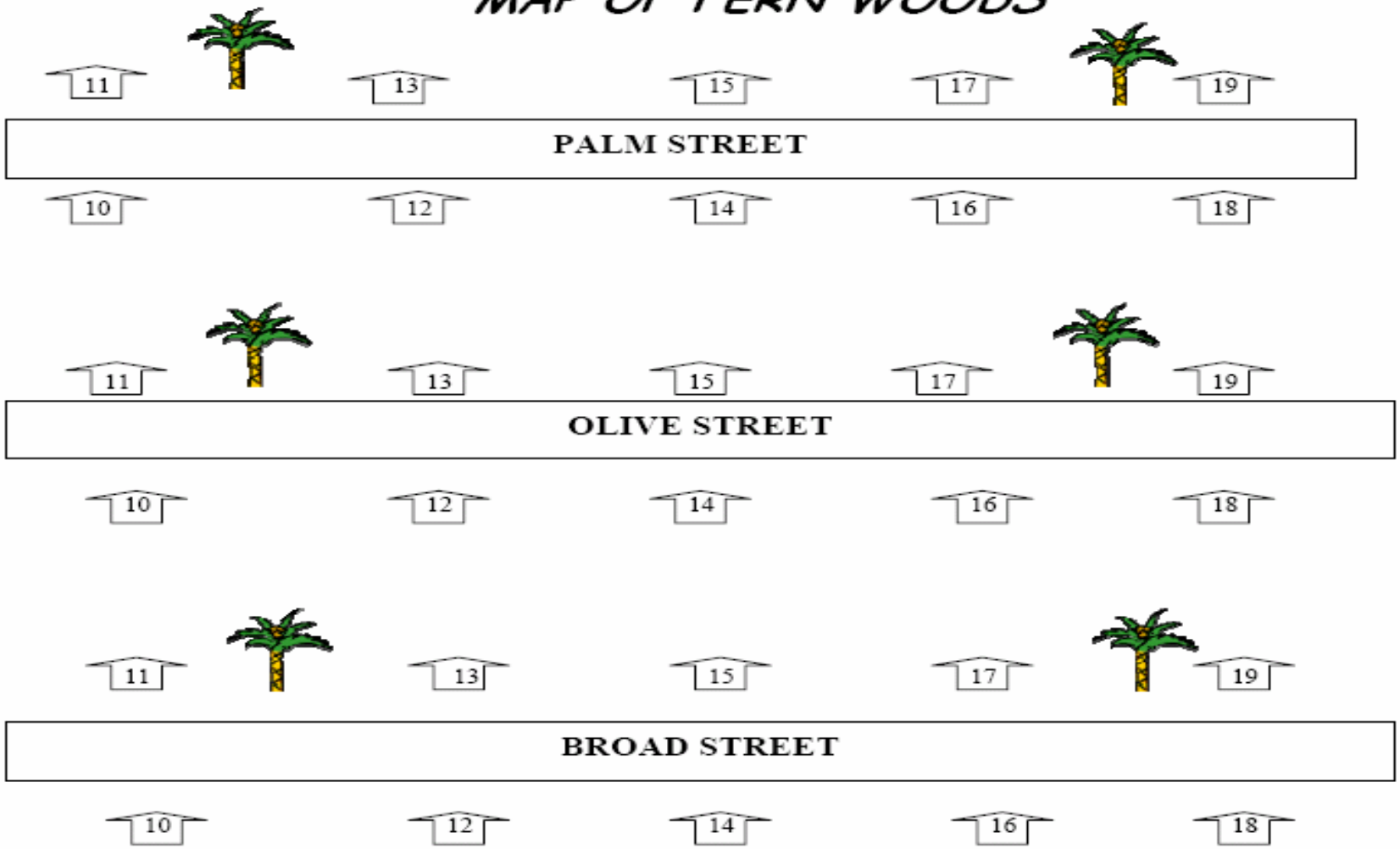
SAM
(Convenience Sampling)

With *random sampling*, each person has an equally likely chance of being chosen.



TAMARA
(Random Sampling)

MAP OF FERN WOODS



HOME VISIT SHEET FOR FERN WOODS*

WATER CONSUMPTION FOR MAY

BROAD STREET			OLIVE STREET			PALM STREET	
House #	Water consumption (gallons per month)		House #	Water consumption (gallons per month)		House #	Water consumption (gallons per month)
10	4,300		10	5,300		10	5,900
11	4,900		11	8,300		11	5,800
12	4,800		12	4,700		12	6,200
13	6,900		13	9,300		13	13,000
14	4,300		14	5,300		14	5,600
15	8,300		15	6,800		15	10,400
16	5,300		16	5,100		16	6,300
17	6,400		17	7,600		17	10,400
18	5,100		18	5,100		18	5,700
19	7,100		19	5,200		19	11,400

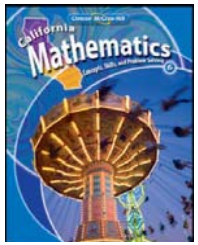
*(**to be consulted by teams ONLY AFTER they have decided which homes are in their sample**)

CLASS SUMMARY DATA

WHICH COMMUNITY USES LESS WATER?

Team	Sample Size	Sampling Method	Range	Median	Mean	Mode	Oak Park or Fern Woods?
MARY	5	Self-Selected	2,100 gallons	4,800 gallons	5,020 gallons	4,300 gallons	Fern Woods

Grade 6: Textbook Connections



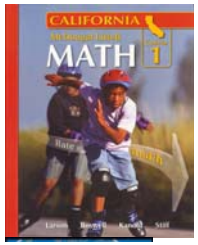
California Mathematics: Concept, Skills, and Problem Solving

UNIT 3

Topic	Standards	Textbook Sections
Understand applications of percentages	**NS1.4** Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips SDAP1.1 Compute the range, mean, median, and mode of data sets SDAP1.2 Understand how additional data added to data sets may affect these computations of measures of central tendency SDAP1.3 Understand how the inclusion or exclusion of outliers affect measures of central tendency	**7.1** Percent of a Number **7.2** The Percent Proportion **7.3** Percent and Estimation **7.4** The Percent Equation **7.5** Problem Solving Investigation **7.6** Percent of Change **7.7** Sales Tax Discount **7.8** Simple Interest
Understand data analysis and population sampling	**SDAP2.2** Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population **SDAP2.5** Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims **SDAP3.1** Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome **SDAP3.3** Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if *P* is the probability of an event, 1 - *P* is the probability of an event not occurring	**8.1** Line Plots **8.2** Measures of Central Tendency and Range **8.3** Stem-and-Leaf Plots **8.4** Bar Graphs and Histograms **8.5** Problem Solving Investigation **8.6** Using Graph to Predict **8.7** Using Data to Predict **8.8** Using Sampling to Predict **8.9** Misleading Statistics
Understand theoretical and experimental probability	SDAP3.4 Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities **SDAP3.5** Understand the difference between independent and dependent events	**9.1** Simple Events **9.2** Sample Spaces **9.3** The fundamental Counting Principle **9.4** Permutations **9.5** Combinations **9.6** Problem Solving Investigation **9.7** Theoretical and Experimental Probability **9.8** Compound Events

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6: Textbook Connections



Course 1 McDougal Littell MATH

UNIT 3

Topic	Standards	Textbook Sections
Understand applications of percentages	**NS1.4** Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips SDAP1.1 Compute the range, mean, median, and mode of data sets SDAP1.2 Understand how additional data added to data sets may affect these computations of measures of central tendency	**6.1** Percents and Fractions **6.2** Percents and Proportions **6.3** Percents and Decimals **6.4** The Percent Equations **6.5** Discount, Markups, Tips, and Sales Tax **6.6** Simple Interest
Understand data analysis and population sampling	SDAP1.3 Understand how the inclusion or exclusion of outliers affect measures of central tendency **SDAP2.2** Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population **SDAP2.5** Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims	**7.1** Sampling Methods **7.2** Sampling Errors **7.3** Mean, Median, and Mode **7.4** Range and Outliers **7.5** Histograms **7.6** Circle Graphs **7.7** Choosing and Analyzing Data Displays
Understand theoretical and experimental probability	**SDAP3.1** Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome **SDAP3.3** Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if *P* is the probability of an event, 1 - *P* is the probability of an event not occurring SDAP3.4 Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities **SDAP3.5** Understand the difference between independent and dependent events	**8.1** Introduction to Probability **8.2** Experimental Probability **8.3** Disjointed Events **8.4** Compound Events **8.5** Independent and Dependent Events

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6
Assessment 3
Periodic Assessment Blueprint
Secondary Mathematics, 2009 – 2010

6th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
NS1.4 🔑	Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.	5	**5**	
SDAP1.1	Compute the range, mean, median, and mode of data sets.	1/3	**1**	
SDAP1.2	Understand how additional data added to data sets may affect these computations of measures of central tendency.	1/3	**0**	
SDAP1.3	Understand how the inclusion or exclusion of outliers affect measures of central tendency.	1/3	**0**	
SDAP2.2 🔑	Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population.	3	**4**	**1**
SDAP2.5 🔑	Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.	1/3	**1**	
SDAP3.1 🔑	Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.	3	**4**	
SDAP3.3 🔑	Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if *P* is the probability of an event, 1 - *P* is the probability of an event not occurring.	3	**4**	
SDAP3.5 🔑	Understand the difference between independent and dependent events.	1/3	**1**	

🔑 *Denotes key standards as defined by the Mathematics Framework for California Public Schools*

Sixth Grade: *Unit Concept Organizer*

Plane and Solid Figures

UNIT 4

Understand angles and geometric figures

MG 2.1, **MG 2.2,** MG 2.3

- Identify angles as vertical, adjacent, complementary, or supplementary, and describe these terms
- Use the properties of complementary and supplementary angles and the sum of the angles in a triangle to solve problems involving an unknown angle
- Draw quadrilaterals and triangles from given information about them

Understand measurement and area

MG1.1, MG 1.2

- Understand the concept of a constant such as π
- Know the formulas for the circumference and area of a circle
- Know common estimates of π (3.14, 22/7)
- Use common estimates of π to estimate and calculate the circumference and the area of circles
- Compare calculations with actual measurements of circumference and area

CST

Understand the properties of three-dimensional figures

MG 1.3, AF 3.1, AF 3.2

- Know and use the formulas for the volume of triangular prisms and cylinders
- Compare the formulas for triangular prisms and cylinders with the formula for the volume of a rectangular solid
- Explain the similarities between the volume formulas for triangular prisms, cylinders and rectangular solids
- Use variables in expressions describing geometric quantities
- Express simple geometric relationships using symbols

	MG 1.3	MG 2.1	**MG2.2**	MG2.3	AF 3.1	AF 3.2	**MG1.1**	MG1.2
KEY Standards - CST Questions Other Standards - CST Questions * 1/ 2 means 1 question every 2 years	1/2*	1	4	1	1	1	3	1/2*
CONCEPT LESSON: MR – Magic Rectangle SP – Surround the Pool IP – Investigating Pi		MR	MR		SP	SP	IP	IP

Concept Task

Investigating π

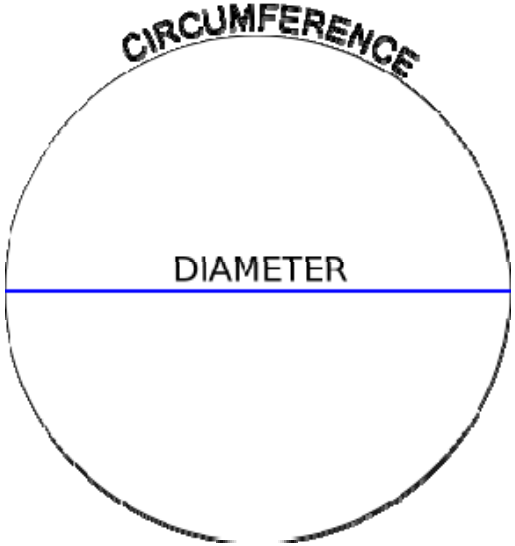
Your task is to explore the relationship between the circumference of a circle and the diameter.

1. Form a group with a partner. You will need several different-sized circular objects.

- Use a tape measure to find the distance around each circular object (the circumference).
- Then measure the distance across the objects through the center (the diameter).
- Record your measurements in the table.

Complete the table and discuss with your partner any patterns that you see.

Now answer questions 2, 3, and 4 using complete sentences:



2. Describe in words the relationship you see between the circumference of a circle and the diameter.

3. What do you notice about the ratio in the last column?

4. Write a formula that describes the relationship between the circumference and the diameter of a circle.

Use the formula you found in question 4 to answer questions 5 and 6.

5. What is the circumference of a tire that has a diameter of 18 inches?

6. If a soccer ball has a circumference of 44 inches, how big is the diameter?

Investigating π

Use this table to record your measurements of different-sized circular objects

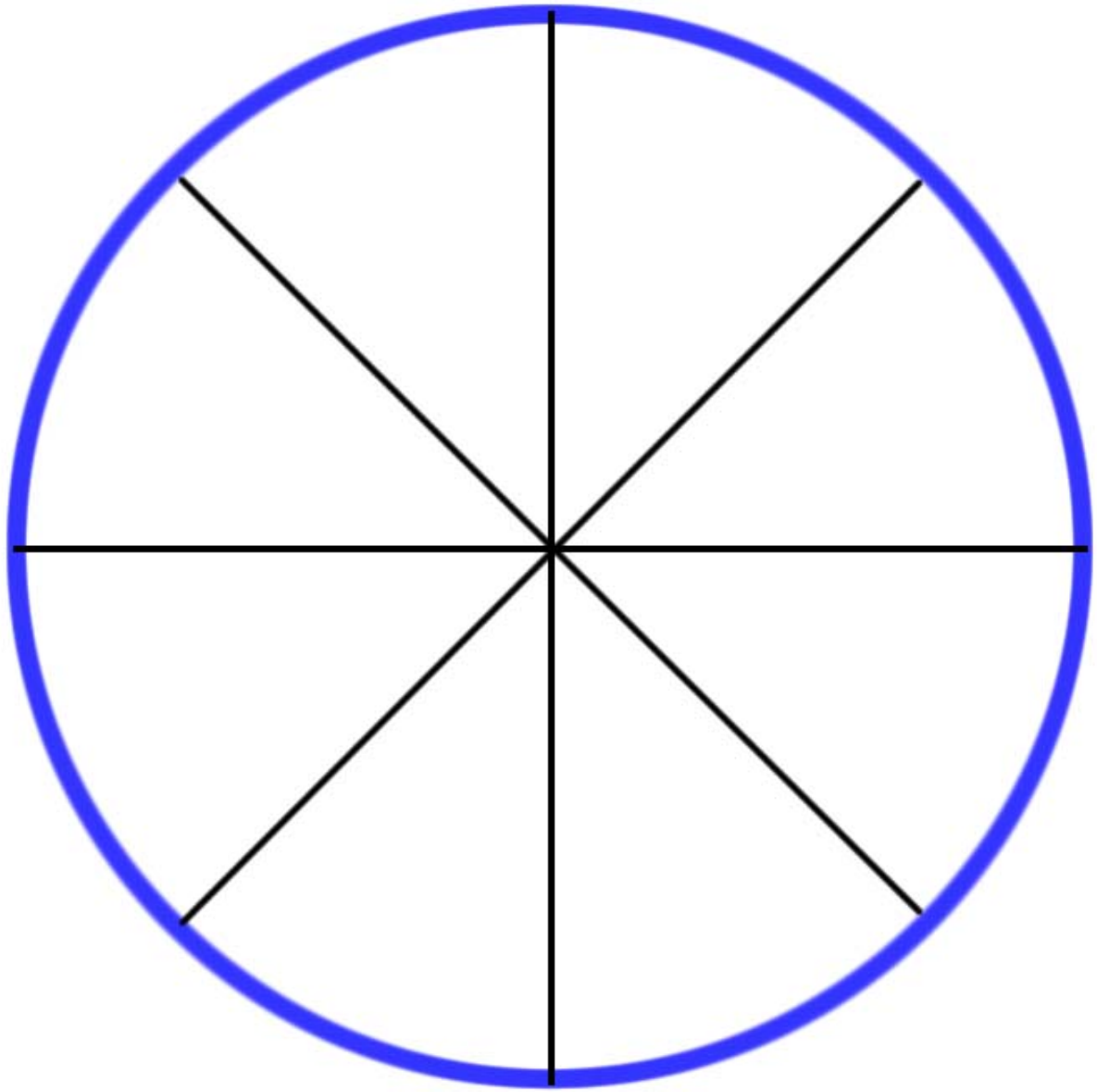
Object Name	Circumference C	Diameter d	Ratio of Circumference to Diameter C/d

CA 6MG 1.0 Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems:
1.1 Understand the concept of a constant such as π; know the formulas for the circumference and area of a circle.

Area of a Circle Investigation

Carefully cut out the circle. Cut the circle into the 8 separate segments. Rearrange these segments into any other shape you choose. Use your knowledge of area formulas for other shapes to approximate the area of the circle.

Explain your reasoning:



Concept Task

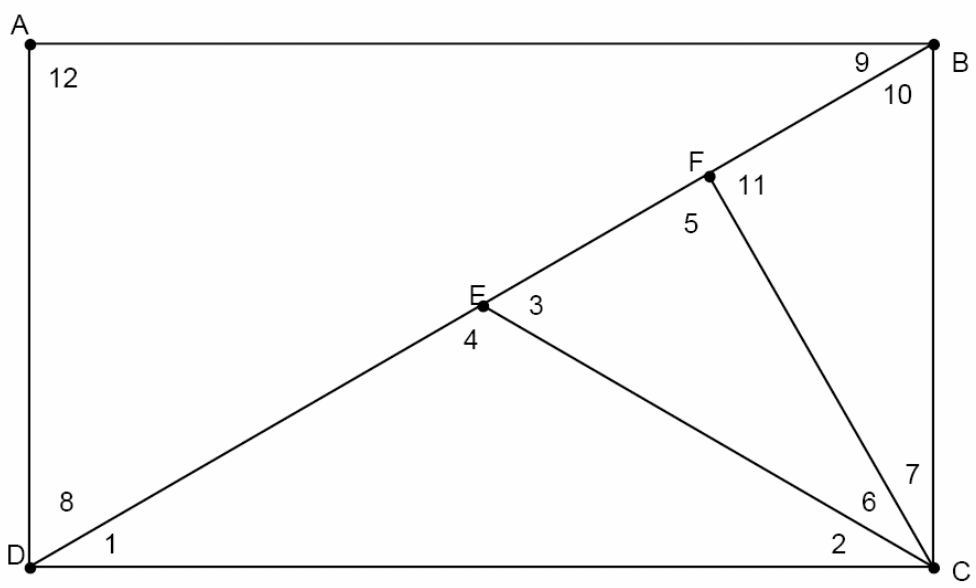
The "Magic Rectangle

Mr. Wizard claims that he can perform "magic" with the rectangle shown below. He says that by measuring just one angle in the diagram that is not a right angle, he can use the magic to figure out all of the remaining angles. Your task is to:

1. find out if it is possible to figure out the measures of all of the angles in the diagram by just measuring one angle that is not a right angle.
2. explain to Mr. Wizard why his "magic trick" works. Be certain to use correct mathematical properties and vocabulary in your explanation.

Explore:

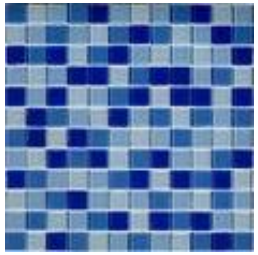
3. determine if this trick will work for all other "magic rectangles" that Mr. Wizard could draw (remember, a "magic rectangle" has to meet the special conditions).



Special conditions for Mr. Wizard's "Magic Rectangles"

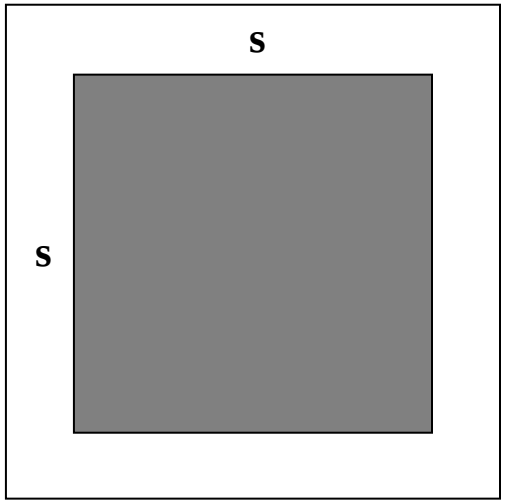
- ABCD is a rectangle
- E is the midpoint of segment BD
- ∠1 and ∠2 have the same measure
- segment CF is perpendicular to segment BD

Concept Task



Surround the Pool

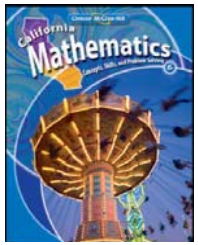
Hot tubs and in-ground swimming pools are sometimes surrounded by borders of tiles. This drawing shows a square swimming pool surrounded by a border of square tiles. Each tile measures 1 foot on each side.



1. Write an expression describing the total number of 1-foot square tiles needed for the border of the pool. Show how your expression can be seen in the drawing.

2. Solve the problem again using a different expression and explain how the second expression can be seen in the drawing.

Grade 6: Textbook Connections



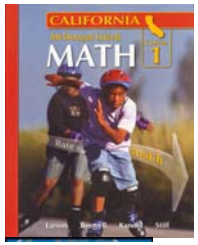
California Mathematics: Concept, Skills, and Problem Solving

UNIT 4

Topic	Standards	Textbook Sections
Understand angles and geometric figures Understand measurement and area AND Understand the properties of three-*dimensional* figures	**MG1.1** Understand the concept of a constant such as π; know the formulas for the circumference and area of a circle MG1.2 Know common estimates of π (3.14; 22/7) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements MG1.3 Know and use the formulas for the volume of triangular prisms and cylinders (area of base ×height; compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid MG2.1 Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms **MG2.2** Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle MG2.3 Draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle) AF3.1 Use variables in expressions describing geometric quantities (e.g., $P = 2w + 2l$, $A = ½\ bh$, $C = \pi d$ – the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively) AF3.2 Express in symbolic form simple relationships arising from geometry	**10.1** Angle Relationships **10.2** Complementary and Supplementary Angles **10.3** Statistics: Display Data in a Circle Graph **10.4** Triangles **10.5** Problem Solving Investigation **10.6** Quadrilaterals **10.7** Similar Figures **11.1** Area Parallelograms **11.2** Triangles and Trapezoids **11.3** Circles and Circumference **11.4** Area of Circles **11.5** Problem Solving Investigation **11.6** Area of Complex Figures **11.7** Three- Dimensional Figures **11.8** Drawing Three-Dimensional Figures **11.9** Volume of Prisms **11.10** Volumes of Cylinders

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 6: Textbook Connections



Course 1 McDougal Littell MATH

UNIT 4

Topic	Standards	Textbook Sections
Understand angles and geometric figures	**MG1.1** Understand the concept of a constant such as π; know the formulas for the circumference and area of a circle MG1.2 Know common estimates of π (3.14; 22/7) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements	**9.1** Angles **9.2** Special Pairs of Angles **9.3** Triangles **9.4** Quadrilaterals and Other Polygons **9.5** Similar and Congruent Polygons **9.6** Using Proportions with Similar Polygons
Understand measurement and area AND Understand the properties of three-*dimensional* figures	MG1.3 Know and use the formulas for the volume of triangular prisms and cylinders (area of base ×height; compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid MG2.1 Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms **MG2.2** Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle MG2.3 Draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle) AF3.1 Use variables in expressions describing geometric quantities (e.g., $P = 2w + 2l$, $A = ½\, bh$, $C = \pi d$ – the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively) AF3.2 Express in symbolic form simple relationships arising from geometry	**10.4** Area of Parallelogram **10.5** Areas of Triangles and Trapezoids **10.6** Circumference of a Circle **10.7** Area of a Circle **4.4** Using Familiar Formulas **11.1** Visualizing Area of Prisms **11.2** Surface Area of Prisms **11.3** Surface Area of Cylinders **11.4** Volume of Prisms **11.5** Volume of Cylinders

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7

Secondary Mathematics Instructional Guide 2009-2010

Mathematics 7AB
(Annual Course – Grade 7)
Prerequisite: Mathematics 6AB

310103 Mathematics 7A
310104 Mathematics 7B

COURSE DESCRIPTION

By the end of grade seven, students will be adept at manipulating numbers and equations and understand the general principles at work. Students will gain a deeper understanding of rational numbers and their various forms of representation. They will increase their understanding of ratio and proportion and apply this knowledge to topics such as slopes of lines and the change in volume and surface area of basic three-dimensional figures when the scale is changed. Students will make conversions between different units of measurement and compute percents of change and simple and compound interest. In addition, students will know the Pythagorean Theorem and solve problems involving computing a missing side.

Since the seventh grade standards constitute the core content for the mathematics portion of the California High School Exit Exam (CAHSEE), it is essential that students become proficient in the key standards.

COURSE SYLLABUS

Unit 1

Recommended Focus Standards

7 AF 1.3 Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.

Scope and Sequence

In this unit, students will have an opportunity to transition from prior mathematics through a review of topics from prior grade level standards. Students will then study algebraic expressions, equations and linear relationships.

Unit 2

Recommended Focus Standards

7 NS 1.2 Add, Subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

7 NS 1.5 Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.

7 NS 1.7 Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

7 NS 2.3 Multiply, divide, and simplify rational numbers by using exponent rules.

7 NS 2.5 Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

Scope and Sequence

The focus of this unit is the in-depth study of the connections among properties, operations, and representation of rational numbers.

Unit 3

Recommended Focus Standards

7NS 1.4 Differentiate between rational and irrational numbers.

7 AF 4.1 Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.

7 AF 4.2 Solve multistep problems involving rate, average speed, distance, and time or a direct variation.

7 MG 3.3 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.

7 MG 3.4 Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.

Scope and Sequence

Students will use the knowledge developed in the second unit to study linear relationships including graphical representations and algebraic representations. Students will gain an understanding of congruency and the relationship of units of measurement and the use of ratios for conversions between measurement systems. Number sense skills will be further utilized and developed through the study of the Pythagorean Theorem.

Unit 4

Recommended Focus Standards

7 AF 3.3 Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.

7 AF 3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the ratio of the quantities.

7 AF 4.2 Solve multistep problems involving rate, average speed, distance, and time or a direct variation.

7 MG 1.3 Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

7 MG 3.6 Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).

7 SDAP 1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Scope and Sequence

The foci of this unit are: the representation and interpretation of data sets including quartiles; properties of three dimensional figures including surface area, volume and the effect of scale factors; and proportional relationships and their representations including relating the slope of a line to a rate.

REPRESENTATIVE PERFORMANCE OUTCOMES AND SKILLS

In this course, students will know and be able to:

- Simplify numerical and variable expressions by applying properties
- Use the correct order of operations to evaluate expressions
- Solve one step linear equations and inequalities in one variable and represent solutions graphically
- Use algebraic terminology correctly
- Add, subtract, multiply, divide and simplify rational numbers
- Calculate the absolute value of a sum or of a difference
- Read, write, and compare rational numbers in scientific notation
- Convert fractions, decimals, and percents from one form to another
- Interpret absolute value as the distance of a number from zero on the number line
- Know that every rational number is either a terminating or a repeating decimal
- Solve problems involving discounts, mark-ups, commission, and profit
- Compute simple and compound interest and calculate percentage of increase or of decrease
- Solve one and two step linear equations and inequalities in one variable
- Use multiple representations for linear relationships including tables and graphs
- Solve problems involving rate, average speed, distance, and time
- Identify congruent and similar figures and their corresponding parts
- Determine scale factor, express it as a ratio, and determine how the scale factor affects area and volume
- Determine whether a triangle is right and calculate the missing side of a right triangle
- Find area of squares and right triangles
- Interpret a box and whisker plot, stem leaf plot, and scatter plot
- Calculate volumes and surface areas
- Graph linear functions by plotting points
- Interpret a graph and its parts
- Recognize that slope is a rate of change that is constant in a linear relationship
- Use measures expressed as rates or products to solve problems

Assessments will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments
- Periodic Assessments

Texts/Materials

LAUSD *Secondary Mathematics Instructional Guide*

- Textbook: District approved materials
- Supplemental materials and resources

Seventh Grade: *Unit Concept Organizer*

Number Sets: Properties, Operations, and Representations

UNIT 1

Understand integer operations

NS1.1, **NS 1.2**, **NS 2.5**, AF 1.2, **AF 1.3**

- Use the correct order of operations
- Integers and number line
- Interpret absolute value as the distance of a number from zero on the number line
- Add, subtract, subtract and divide integers
- Read, write, and compare rational numbers including scientific notation

Understand rational number operations

NS1.1, **NS 1.2, NS2.2, AF 1.3**

- Compare and order rational numbers
- Add, subtract, multiply and divide rational numbers (fractions and terminating decimals)
- Simplify numerical expressions by applying arithmetic properties

Understand real number operations and exponents

NS1.1, **NS1.4, NS 1.5**, NS2.1, NS2.4, AF2.1

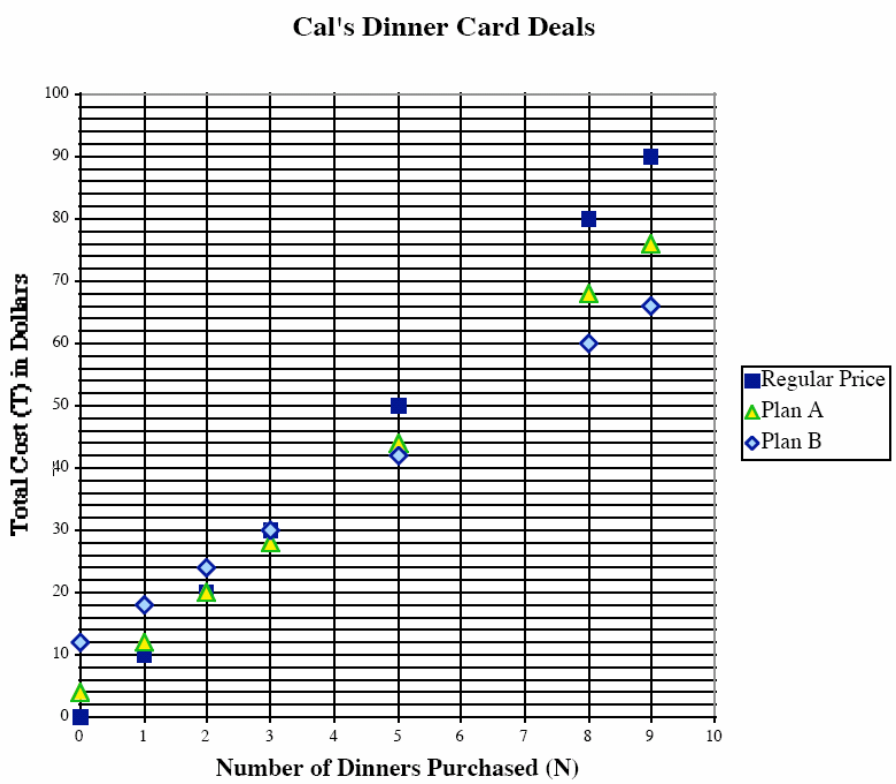
- Understand, simplify, and evaluate expressions involving exponents
- Read, write and compare numbers in Scientific Notation
- Find square roots of perfect square integers, and estimate square roots of non-perfect square integers.
- Know that every rational number is either a terminating or a repeating decimal
- Differentiate between rational and irrational numbers

	NS1.1	**NS1.2**	**NS1.4**	**NS1.5**	NS2.1	**NS2.2**	NS2.4	**NS2.5**	AF1.2	**AF1.3**	AF2.1
🗝 **KEY Standards - CST Questions** Other Standards - CST Questions	1	🗝 4	🗝 1	🗝 1	1	🗝 1	1	🗝 2	1	🗝 5	1
CONCEPT LESSON:											

Concept Task

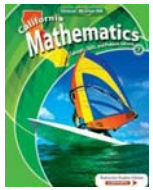
CAL's DINNER CARD DEALS

The graph below shows data for three dinner plans. Make observations about each of the graphs. What is the formula for determining the cost of each dinner plan? Decide which plan is the best and explain your reasoning.



With permission from Smith, Silver and Stein (2005) Using cases to transform mathematics teaching and learning, Vol. 2: Algebra. New York: Teachers College Press. The COMET Project is funded by the National Science Foundation (ESI-9731428). The project is co-directed by Margaret Smith, Edward Silver, and Mary Kay Stein and is housed at the Learning Research and Development Center at the University of Pittsburgh.

Grade 7: Textbook Connections



California Mathematics: Concepts Skills and Problem Solving, Glencoe McGraw-Hill

UNIT 1

Topic	Standards	Textbook Sections
Understand integer operations Understand rational number operations Understand real number operations and exponents	NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) and compare rational numbers in general **NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole number powers **NS1.4** Differentiate between rational and irrational numbers **NS1.5** Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions NS2.1 Understand negative whole number exponents. Multiply and divide expressions involving exponents with a common base **NS2.2** Add and subtract fractions by using factoring to find common denominators NS2.4 Understand the inverse relationship between raising to a power and extracting a root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why **NS2.5** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers. AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$ **AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used AF2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base	**1.1** A Plan for Problem Solving **1.2** Variables, Expressions, and Properties **1.3** Integers and Absolute Value **1.4** Adding Integers **1.5** Subtracting Integers **1.6** Multiplying and Dividing Integers **1.7** Writing Equations **1.8** Problem Solving Investigation **1.9** Solving Addition and Subtraction Equations **1.10** Solving Multiplication and Division Equations **2.1** Rational Numbers **2.2** Comparing and Ordering Rational Numbers **2.3** Multiplying Positive and Negative Fractions **2.4** Dividing Positive and Negative Fractions **2.5** Adding and Subtracting Like Fractions **2.6** Adding and Subtracting Unlike Fractions **2.7** Solving Equations with Rational Numbers **2.8** Problem Solving Investigation **2.9** Powers and Exponents **2.10** Scientific Notation **3.1** Square Roots **3.2** Estimating Square Roots **3.3** Problem Solving Investigation **3.4** The Real Number System

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: Textbook Connections

California Math: Course 2 - McDougal Littell

UNIT 1

Topic	Standards	Textbook Sections
Understand integer operations	NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) and compare rational numbers in general **NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole number powers **NS1.4** Differentiate between rational and irrational numbers **NS1.5** Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions	**1.1** Expressions and Order of Operations **1.2** Integers and the Number Line **1.3** Adding Integers **1.4** Subtracting Integers **1.5** Multiplying integers **1.6** Dividing Integers **1.7** Number Properties **1.8** The Distributive Property **1.9** A problem Solving Plan
Understand rational number operations	NS2.1 Understand negative whole number exponents. Multiply and divide expressions involving exponents with a common base **NS2.2** Add and subtract fractions by using factoring to find common denominators NS2.4 Understand the inverse relationship between raising to a power and extracting a root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why **NS2.5** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.	**2.1** Simplifying Fractions **2.2** Comparing Fractions and Mixed Numbers **2.3** Adding and Subtracting Fractions **2.4** Using a Common Denominator **2.5** Multiplying Fractions **2.6** Dividing Fractions **2.7** Rational Numbers in Decimal Form
Understand real number operations and exponents	AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$ **AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used AF2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base	**4.1** Integer Powers of Ten **4.2** Scientific Notation **4.3** Zero and Negative Exponents **4.4** Finding and Approximating Square Roots **4.5** Simplifying Square Roots **4.6** Rational and Irrational Numbers

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: *Assessment 1 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
NS1.1	Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) and compare rational numbers in general	1	1	
NS1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole number powers	4	4	
NS1.4	Differentiate between rational and irrational numbers	1	1	
NS1.5	Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions	1	1	
NS2.1	Understand negative whole number exponents. Multiply and divide expressions involving exponents with a common base	1	1	
NS2.2	Add and subtract fractions by using factoring to find common denominators	1	2	
NS2.4	Understand the inverse relationship between raising to a power and extracting a root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why	1	1	
NS2.5	Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.	2	2	
AF1.2	Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$	1	1	
AF1.3	Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used	5	5	CR
AF2.1	Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents	1	1	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Seventh Grade: *Unit Concept Organizer*

Percentages, Linear Equations and Linear Inequalities

UNIT 2

Understand percentages

NS 1.3, NS 1.6, **NS 1.7**

- Simplify numerical and variable expressions by applying properties of rational numbers
- Convert fractions to decimals and percents
- Solve problems involving discounts, mark-ups, commission, and profit
- Calculate percentage of change
- Compute simple and compound interest

Understand solving equations and inequalities

AF1.1, AF1.4, **AF4.1, AF 4.2**

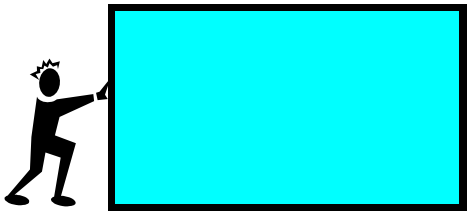
- Simplifying algebraic expressions
- Use algebraic terminology correctly
- Writing and solving two-step linear equations
- Writing and solving two-step linear inequalities
- Solve problems involving rate, average speed, distance, and time

	NS1.3	NS1.6	**NS1.7**	AF1.1	AF1.4	**AF4.1**	**AF4.2**
🗝 **KEY Standards - CST Questions** Other Standards - CST Questions *1 / 3 : means 1 question every 3 years	1	1	🗝 5	1	1/3*	🗝 5	🗝 5
CONCEPT LESSON: PP – Problems with Percents RP – Ratios and Percents GG – Gauging Gas Mileage			PP RP				GG

Concept Task

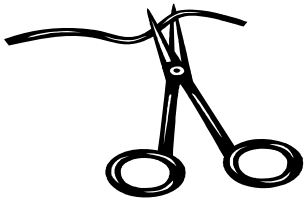
Ratios and Percents

Your task: Read the three problems below and use pictures, diagrams, words, numbers, and/or symbols to show how you solve each of them. ***Make sure to explain how and why your method for solving each problem works.***



1. The ratio of the length of a certain rectangle to its width is 4 to 3. Its area is 300 square inches. What are its length and width?

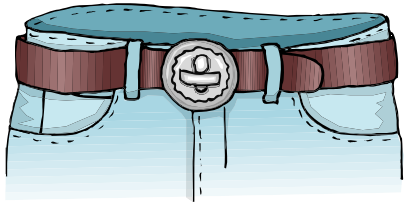
2. A length of string that is 180 cm long is cut into 3 pieces. The second piece is 25% longer than the first, and the third piece is 25% shorter than the first. How long is each piece?



3. If 50 gallons of cream with 20% butterfat are mixed with 150 gallons of milk with 4% butterfat, what percent butterfat is the resulting mixture?

Smith, M.S., Silver, E.A., and Stein, M.K. (2005). *Improving Instruction in Rational Numbers and Proportionality: Using Cases to Transform Mathematics Teaching and Learning.* P. 58.

Concept Task



Problems with Percents

Julie and her mother are shopping for some new jeans for school. They notice a rack of jeans with this sign on top of it:

40% discount on ticketed price of already reduced merchandise

Julie finds a pair of jeans on the rack, but unfortunately part of the price tag has been torn off. The tag looks like this:

Julie's mom claims that they can take 65% off the original price to determine the cost of the jeans. Julie claims that her mother is incorrect. Who is right – Julie or her mom?

Explain your reasoning. What price will they pay for the jeans?

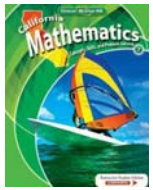
Consider:

- What would happen to the final price if the 40% discount was taken first and the 25% discount was taken second? Explain your thinking.

- What percent of the original price is the final price? Can you find a general rule for finding the sale price of an item that is discounted several times based on its previous price?

(Adapted from "Making Sense of Percents", *Mathematics Teaching in the Middle School*, September, 2003.)

Grade 7: Textbook Connections



California Mathematics: Concepts Skills and Problem Solving, Glencoe McGraw-Hill

UNIT 2

Topic	Standards	Textbook Sections
Understand percentages	NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. NS1.6 Calculate the percentage of increases and decreases of a quantity. **NS1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest. AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A). AF1.4 Use correct algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly. **AF4.1** Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results. **AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	**4.1** Ratios and Rates **4.2** Proportional and Non-proportional Relationships **4.3** Solving Proportions **5.1** Ratios and Percents **5.2** Comparing Fractions, Decimals, and Percents **5.3** Algebra: The Percent Proportion **5.4** Finding Percents Mentally **5.5** Problem Solving Investigation **5.6** Percent and Estimation **5.7** Algebra: The Percent Equation **5.8** Percent Change **5.9** Simple Interest
Understand solving equations and inequalities		**8.1** Simplifying Algebraic Expressions **8.2** Solving Two-Step Equations **8.3** Writing Two-Step Equations **8.4** Solving Equations with Variables on Each Side **8.5** Problem Solving Investigation **8.6** Inequalities **8.7** Solving Inequalities by Adding or Subtracting **8.8** Solving Inequalities by Multiplying or Dividing

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: Textbook Connections

California Math: Course 2 - McDougal Littell

UNIT 2

Topic	Standards	Textbook Sections
Understand percentages	NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. NS1.6 Calculate the percentage of increases and decreases of a quantity. **NS1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest. AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A). AF1.4 Use correct algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly.	**3.1** Comparing Decimals **3.2** Adding and Subtracting Decimals **3.3** Multiplying and Dividing Decimals **3.4** Percents as Decimals and Fractions **3.5** Decimals and Fractions as Percents **3.6** Discounts, Markups, Commissions, and Profit **3.7** Percent of Change **3.8** Simple and Compound Interest
Understand solving equations and inequalities	**AF4.1** Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results. **AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	**5.1** Writing and Evaluating Expressions **5.2** Simplifying Expressions **5.3** Solving Equations Using Addition or Subtraction **5.4** Solving Equations Using Multiplication or Division **5.5** Solving Two-Step Equations **5.6** Writing and Solving Proportions **5.7** Solving Inequalities Using Addition or Subtraction **5.8** Solving Inequalities Using Multiplication or Division **5.9** Solving Two-Step Inequalities

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: *Assessment 2 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
NS1.3	Convert fractions to decimals and percents and use these representations in estimations, computations, and applications	1	1	
NS1.6	Calculate the percentage of increases and decreases of a quantity	1	1	
NS1.7	Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest	5	5	
AF1.1	Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represent a verbal description (e.g., three less than a number, half as large as area A)	1	1	
AF1.4	Use correct algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly	1/3	1	
AF4.1	Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results	5	6	
AF4.2	Solve multistep problems involving rate, average speed, distance, and time or a direct variation	5	5	CR

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Seventh Grade: *Unit Concept Organizer*

Linear Relationships, Exponents, and Special Geometric Relationships

UNIT 3

Understand linear relationships and their graphs

AF 3.3, AF 3.4

- Use variables and appropriate operations to write expressions, equations, inequalities, and systems of inequalities
- Graph a linear function by plotting points
- Express relationships between quantities as tables, graphs, and equations
- Interpret a graph and its parts
- Recognize that slope is a rate of change that is constant in a linear relationship

Understand the rules of exponents and manipulate monomials

NS2.3, AF2.2

- Multiply, divide and simplify rational numbers by using exponents rules
- Multiply and divide monomials
- Raise a monomial to a power
- Find the root of a monomials if this results in a monomial with an integer exponent

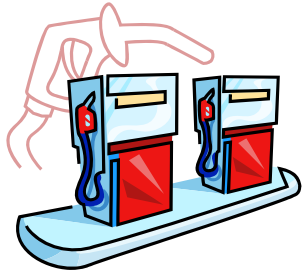
Understand and apply the Pythagorean Theorem and determine the congruence of geometric figures

MG1.1, MG1.2, **MG1.3, MG 3.3, MG 3.4**

- Know the Pythagorean theorem and use it to calculate the missing side of a right triangle
- Know the converse of the Pythagorean theorem and use it to determine whether or not a triangle is right
- Identify congruent figures and their corresponding parts
- Use congruence to determine the relationships between the sides and angles of figures
- Compare different measurement systems
- Construct and read scale drawings
- Use measures expressed as rates and products to solve problems; check the units and reasonableness of an answer

	NS2.3	AF2.2	**AF3.3**	**AF3.4**	MG1.1	MG1.2	**MG1.3**	**MG3.3**	**MG3.4**
KEY Standards - CST Questions Other Standards - CST Questions * 1/ 3 : means 1 question every 3 years	3	2	2	2	2/3*	1/3*	3	4	2
CONCEPT LESSON: SE – Shrinking and Enlarging PB – Planning a Bowling Party CP – Calling Plans			PB CP	PB					SE

Concept Task



Gauging Gas Mileage

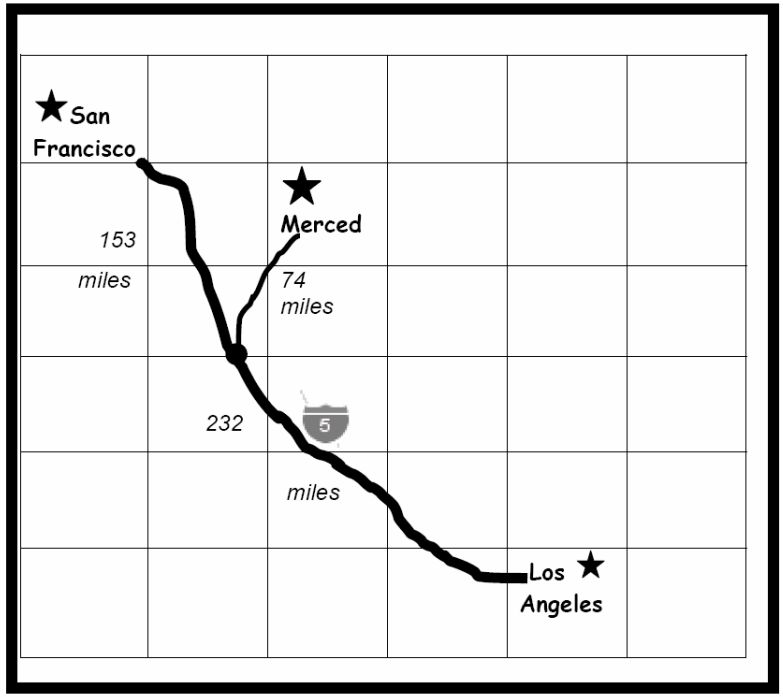
After graduating from UCLA, Luis and Keira both got teaching jobs in Los Angeles. They each bought a new car for commuting to work and one afternoon they had a friendly argument about whose car was better. Luis claimed his car was more fuel-efficient. Keira challenged him to prove his claim. Since they would both be traveling home for Thanksgiving, Luis suggested they use the trip to test their gas mileage.

Luis and Keira are from different cities in northern California, Merced and San Francisco. But they both traveled the first part of their trips on Interstate 5 to get to their homes. Luis then travels on to Merced while Keira travels to San Francisco. After Thanksgiving, they compared their fuel economy. Luis made the trip to Merced and back using 27.8 gallons of gasoline. Keira used 32.2 gallons of gasoline on her trip to San Francisco and back. Luis claimed his car was more fuel-efficient but Keira disagreed.

1. Whose car was more fuel-efficient? Explain how you know and why you think your answer is correct.

2. Would it make sense to use percents to settle the argument between Luis and Keira? Explain your reasoning.

Consider: Many people travel 10,000 miles or more in their cars in one year. Describe how being fuel-efficient would impact Luis and Keira if they both traveled that many miles in one year.



Adapted from "Comparing Fuel Economy", pp. 38-39, *Comparing and Scaling*, **Connected Mathematics**, Prentice Hall, 2002

Concept Task

Shrinking and Enlarging: Making Copies

***Your task**: Read the situation below and use pictures, diagrams, words, numbers, and/or symbols to show how to determine the scale factors you would need to **enlarge or shrink** an $8\frac{1}{2}$" by 11" advertisement.*

1. Raphael is closing his bookstore. He wants to place a full-page advertisement in the newspaper to announce his going-out-of-business sale. A full-page ad is 13" by 22", which allows for a white border around the ad. Raphael used his computer to make an $8\frac{1}{2}$" by 11" model of the advertisement, but he wants the newspaper ad department to enlarge it to full-page size. Is this possible? Explain your reasoning.

2. Raphael wants to make sale posters by enlarging his $8\frac{1}{2}$" by 11" advertisement. He thinks big posters will get more attention, so he wants to enlarge his ad as much as possible. The copy machines at the copy shop have cartridges for three paper sizes: $8\frac{1}{2}$" by 11", 11" by 14", and 11" by 17". The machines allow users to enlarge or reduce documents by specifying a percent between 50% and 200%. For example, to enlarge a document by a scale factor of 1.5, a user would enter 150% of its current size.

   a. Can Raphael make a poster that is similar to his original advertisement on any of the three paper sizes—without having to trim off part of the paper? Why or why not?

   b. If you were Raphael, what paper size would you use to make a larger, similar poster on the copy machine? What scale factor would you use? How would you enter it into the copy machine?

   c. How would you use the copier described above to reduce a drawing to $\frac{1}{4}$ of its original size? Remember, the copy machines only accept values between 50% and 200%?

   d. How would you use the copy machine to reduce a drawing to $12\frac{1}{2}$% of its original size?

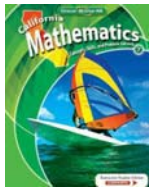
   e. How would you use the copy machine to reduce a drawing to 36% of its original size?

Grade 7: *Assessment 3 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
NS2.3	Multiply, divide, and simplify rational numbers by using exponent rules	3	3	
AF2.2	Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent	1	2	
AF3.3	Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ('rise over run") is called the slope of a graph	2	2	
AF3.4	Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities	2	2	CR
MG1.1	Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters)	2/3	1	
MG1.2	Construct and read drawing s and models made to scale	1/3	1	
MG1.3	Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the unit of the solutions; and use dimensional analysis to check the reasonableness of the answer	3	3	
MG3.3	Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and in some situations, empirically verify the Pythagorean theorem by direct measurement	4	4	
MG3.4	Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures	2	2	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Grade 7: Textbook Connections



California Mathematics: Concepts Skills and Problem Solving, Glencoe McGraw-Hill

UNIT 3

Topic	Standards	Textbook Sections
Understand linear relationships and their graphs	**NS2.3** Multiply, divide, and simplify rational numbers by using exponent rules. AF2.2 Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent. **AF3.3** Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **AF3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	**9.1** Functions **9.2** Representing Linear Functions **9.3** Slope **9.4** Direct Variation **9.5** Slope-Intercept Form **9.6** Writing Systems of Equations and Inequalities **9.7** Problem Solving Investigation **9.8** Scatter Plots
Understand the rules of exponents and manipulate monomials	MG1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters). MG1.2 Construct and read drawings and models made to scale. **MG1.3** Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the unit of the solutions; and use dimensional analysis to check the reasonableness of the answer	**10.5** Multiplying Monomials **10.6** Dividing Monomials **10.7** Powers of Monomials **10.8** Roots of Monomials
Understand the Pythagorean Theorem and determine the congruence of geometric figures	**MG3.3** Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement. **MG3.4** Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.	**3.5** The Pythagorean Theorem **3.6** Using the Pythagorean Theorem **3.7** Geometry: Distance on the Coordinate Plane **4.5** Similar Polygons **4.6** Measurement: Converting Length, Weight/Mass, Capacity, and Time **4.7** Measurement: Converting Square Units and Cubic Units **4.8** Scale Drawings and Models **4.9** Rate of Change **4.10** Constant rate of Change **6.1** Line and Angle Relationships **6.2** Problem Solving Investigation **6.3** Polygons and Angles **6.4** Congruent Polygons

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: Textbook Connections

California Math: Course 2 - McDougal Littell

UNIT 3

Topic	Standards	Textbook Sections
Understand linear relationships and their graphs	**NS2.3** Multiply, divide, and simplify rational numbers by using exponent rules. AF2.2 Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent. **AF3.3** Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **AF3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	**6.1** Equations in Two Variables **6.2** Graphs of Linear Equations **6.3** Using Intercepts **6.4** Slope **6.5** Slope-Intercept Form **6.6** Direct Variation **6.7** Graphs of Linear Inequalities **6.8** Systems of Equations and Inequalities
Understand the rules of exponents and manipulate monomials	MG1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters). MG1.2 Construct and read drawings and models made to scale. **MG1.3** Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the unit of the solutions; and use dimensional analysis to check the reasonableness of the answer	**7.1** Exponent Properties Involving Products **7.2** Exponent Properties Involving Quotients **7.3** Products, Quotients, and Roots of Monomials
Understand the Pythagorean Theorem and determine the congruence of geometric figures	**MG3.3** Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement. **MG3.4** Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.	**8.1** Comparing and Converting Measurements **8.2** Measures Involving Products and Quotients **8.3** Multi-Step Conversions **8.6** The Pythagorean Theorem and Its Converse **9.1** Congruent and Similar Figures **9.5** Scale Drawings and Models

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Seventh Grade: *Unit Concept Organizer*

Handling Data, Plane and Solid Geometry, and Non-Linear Functions

UNIT 4

CST

Understand, represent, and interpret data sets

SDAP 1.1, SDAP 1.2, **SDAP 1.3**

- Know various forms of display for data sets
- Interpret a box and whisker plot, stem and leaf plot, and scatter plot
- Use data displays to compare two data sets
- Represent two numerical variables on a scatterplot and interpret the results
- Compute lower quartile, median, and upper quartile of a data set
- Identify the maximum and minimum values of a data set

Understand features of plane and solid geometry

MG2.1, MG2.2, MG 2.3, MG2.4, MG3.1, MG3.2, MG3.5, **MG 3.6**

- Calculate perimeter, area, surface area, and volume of common geometric objects
- Determine how scale factor affects perimeter, area, and volume
- Identify and construct basic elements of geometric figures by using a compass and straightedge
- Use coordinate graphs to plot simple figures, determine lengths and areas
- Determine the images of shapes under translations and rotations
- Construct 2-dimensional nets for three-dimensional models
- Identify elements of three-dimensional objects

Understand non-linear functions and their graphs

AF1.5, AF3.1, AF3.2

- Represent quantitative relationships graphically
- Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems
- Plot the values derived from the volumes of various three-dimensional shapes for various values of edge lengths

	AF1.5	AF3.1	AF3.2	MG2.1	MG2.2	MG2.3	MG2.4	MG3.1	MG3.2	MG3.5	**MG3.6**	SDAP1.1	SDAP1.2	**SDAP1.3**
🗝 **KEY Standards - CST Questions** Other Standards - CST Questions * 1/ 3 means 1 question every 3 years	2/3*	2/3*	1/3*	1/3*	1/3*	1/3*	1/3*	1/3*	1/3*	0	🗝 1	1	1	🗝 3
CONCEPT LESSON: CD – Cal's Dinner Card Deals	CD													

Concept Task

Calling Plans

Long-distance Company A charges a base rate of $5 per month, plus 4 cents per minute that you are on the phone. Long-distance Company B charges a base rate of only $2 per month, but they charge you 10 cents per minute used.

How much time per month you would have to talk on the phone before subscribing to Company A would save you money?

Concept Task

Planning a Bowling Party

The 7th grade is planning a bowling party to celebrate the end of the school year. Juan and Camilla decided to call different companies to find their group rates for an afternoon of unlimited bowling.

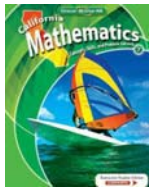
→ Bowling Bonanza charges $100 for the afternoon, plus a charge of $1.00 per person for the bowling shoes.
→ Ten Pin Haven charges $3.00 per person which includes both bowling and shoes.
→ Lucky Lanes charges a flat rate of $200 which includes both bowling and shoes for everyone.

Which company should you choose if you want to keep the cost to a minimum? Explain how you made your choice.

Follow-Up:

1. For each company, write an equation for the relationship between the number of people and the total cost.
2, Graph the equations for the three companies on a single graph. Does it make sense to connect the points on the graphs? Why or why not?
3. What range of values did you use for the number of people? What range of values did you use for the total cost? How did you select these ranges?
4. Find the points of intersection of the graphs. What do these points mean in terms of the total cost for bowling? What do they mean in terms of the number of people?
5. Are there any additional questions you might like to ask each bowling company that might influence your choice?

Grade 7: Textbook Connections



California Mathematics: Concepts Skills and Problem Solving, Glencoe McGraw-Hill

UNIT 4

Topic	Standards	Textbook Sections
Understand, represent, and interpret data sets	SDAP1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data. SDAP1.2 Represent two numerical variables on a scatter plot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level). **SDAP1.3** Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.	**11.1** Problem Solving Investigation **11.2** Histograms **11.3** Circle Graphs **11.4** Measures of Central Tendency and Range **11.5** Measures of Variation **11.6** Box-and-Whisker Plots **11.7** Stem-and-Leaf Plots **11.8** Select an Appropriate Display
Understand features of plane and solid geometry	MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders. MG2.2 Estimate and compute the area of more complex or irregular two-and three-dimensional figures by breaking the figures down into more basic geometric objects. MG2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor. MG2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft^2] = [144 in^2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in^3] = [16.38 cm^3]). MG3.1 Identify and construct basic elements of geometric figures (e.g., altitudes, mid-points, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge. MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections. MG3.5 Construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms, and cones. **MG3.6** Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).	**6.5** Symmetry **6.6** Reflections **6.7** Translations **7.1** Circumference and Area of Circles **7.2** Problem Solving Investigation **7.3** Area of Complex Figures **7.4** Three-Dimensional Figures **7.5** Volume of Prisms and Cylinders **7.6** Volume of Pyramids and Cones **7.7** Surface Area of Prisms and Cylinders **7.8** Surface Area of Pyramids **7.9** Similar Solids
Understand non-linear functions and their graphs	AF1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph. AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. AF3.2 Plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying lengths).	**10.1** Linear and Nonlinear Functions **10.2** Graphing Quadratic Functions **10.3** Problem Solving Investigation **10.4** Graphing Cubic Functions

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Grade 7: Textbook Connections

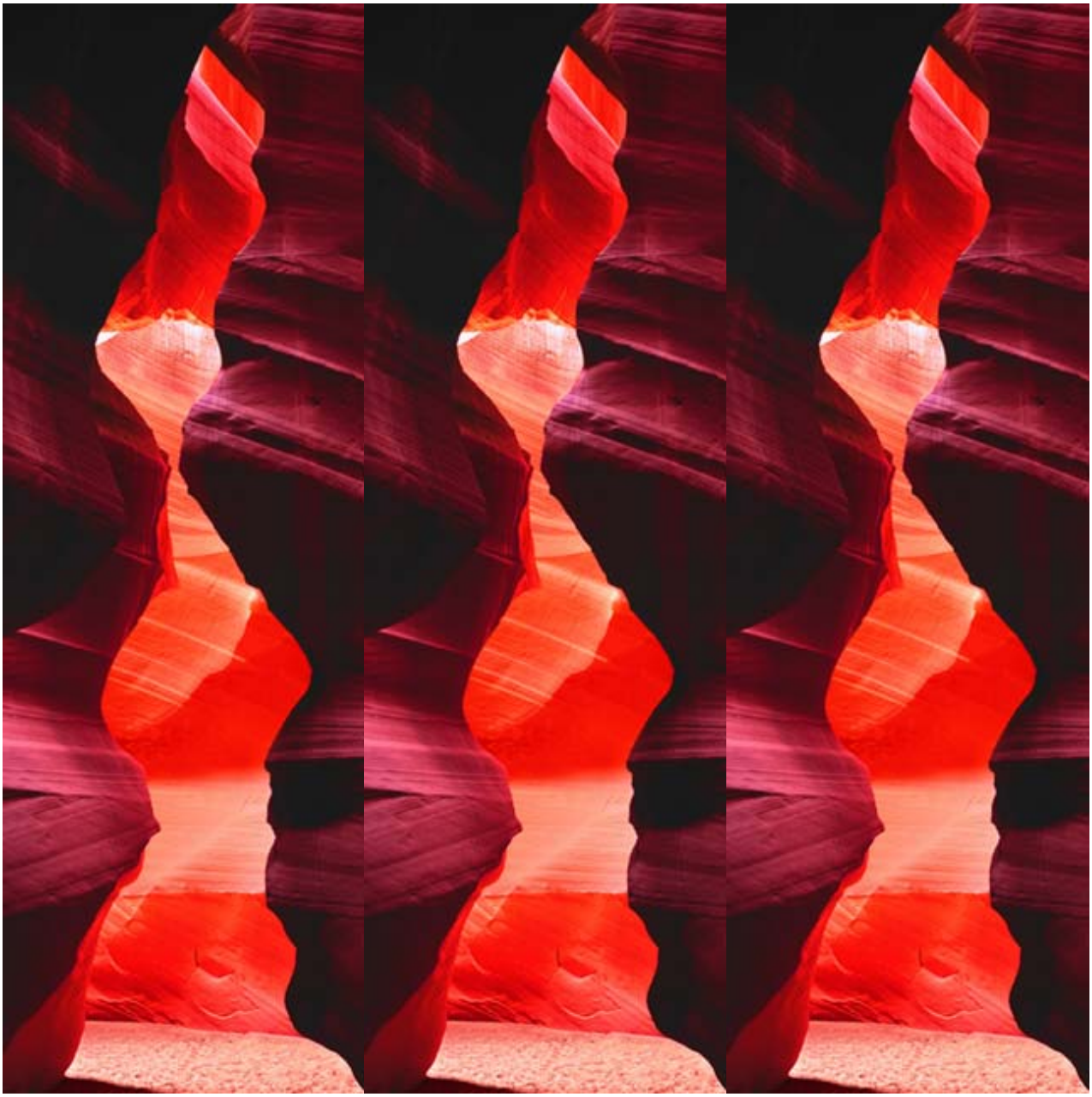
California Math: Course 2 - McDougal Littell

UNIT 4

Topic	Standards	Textbook Sections
Understand, represent, and interpret data sets	SDAP1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data. SDAP1.2 Represent two numerical variables on a scatter plot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level). **SDAP1.3** Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.	**11.1** Mean, Median, Mode, and Range **11.2** Bar Graphs and Circle Graphs **11.3** Frequency Tables and Histograms **11.4** Stem-and-Leaf Plots **11.5** Box-and-Whisker Plots **11.6** Scatter Plots and Line Graphs
Understand features of plane and solid geometry	MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders. MG2.2 Estimate and compute the area of more complex or irregular two-and three-dimensional figures by breaking the figures down into more basic geometric objects. MG2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor. MG2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft^2] = [144 in^2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in^3] = [16.38 cm^3]). MG3.1 Identify and construct basic elements of geometric figures (e.g., altitudes, mid-points, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge. MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections. MG3.5 Construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms, and cones. **MG3.6** Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).	**8.4** Segment and Angles Bisectors **8.5** Triangles and Their Areas **8.7** Quadrilaterals and Their Areas **8.8** Circumferences and Areas of Circles **9.2**Translations in the Coordinate Plane **9.3** Reflections in the Coordinate Plane **9.4** Dilations in the Coordinate Plane **10.1** Lines and planes **10.2** Three-Dimensional Figures **10.3** Surface Areas of Prisms and Cylinders **10.4** Surface Areas of Pyramids and Cones **10.5** Volumes of Prisms and Cylinders **10.6** Volumes of Pyramids and Cones **10.7** Similar Solids
Understand non-linear functions and their graphs	AF1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph. AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. AF3.2 Plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying lengths).	**7.4** Relations and Functions **7.5** Nonlinear Functions

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

Algebra Readiness



Secondary Mathematics
Instructional Guide
2009-2010

ALGEBRA READINESS AB
(Intervention Course – Grade 8)
Prerequisite: Mathematics 7AB

310317 Algebra Readiness A
310318 Algebra Readiness B

COURSE DESCRIPTION

Algebra Readiness is a one-year course designed to adequately prepare 8th grade students for Algebra. According to the *Mathematics Framework for California Public Schools (2006 Revised Edition)*, it is imperative that students master pre-algebraic skills and concepts before they enroll in a course that meets or exceeds the rigor of the content standards for Algebra I adopted by the State board of Education

The sixteen targeted standards for Algebra Readiness (thirteen from grade 7 and three from Algebra I) are grouped into the following topics: Operations on Rational Numbers, Equations and Functions, The Coordinate Plane, Graphing Proportional Relationships and Algebra (Introductory Examples). They are purposely limited in number to provide teachers the flexibility and time to rebuild the following foundational skills and concepts that may be missing from earlier grades: Whole Numbers, Operations on Whole Numbers, Rational Numbers, Operations on Rational Numbers, Symbolic Notation, Equations and Functions, and the Coordinate Plane.

COURSE SYLLABUS

Unit 1

Recommended Focus Standards

7 NS 1.2 Add, subtract, multiply and divide rational numbers (integers, fractions and terminating decimals) and take positive rational numbers to whole number powers.

7 NS 2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.

7 AF 1.3 Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative and commutative) and justify the process used.

7 AF 2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.

Scope and Sequence

Number Sense, Integers, Fractions, and Algebraic Thinking. Students work with whole numbers, integers and their operations. Next they study the properties of fractions.

Unit 2

Recommended Focus Standards

7 NS 1.2 Add, subtract, multiply and divide rational numbers (integers, fractions and terminating decimals) and take positive rational numbers to whole number powers.

7 NS 1.3 Convert fractions to decimals and percents and use these representations in estimations, computations and applications.

7 NS 1.5 Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.

7 AF 4.2 Solve multistep problems involving rate, average speed, distance and time or a direct variation.

7 MG 1.3 Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solution; and use dimensional analysis to check the reasonableness of the answer.

Algebra I 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents. [*excluding fractional powers*]

Scope and Sequence

Fractions, Decimals, Ratios and Proportions. Students transition to operations on fractions and mixed numbers and then move to work on decimals and operations with them then study ratios, rates and proportions.

Unit 3

Recommended Focus Standards

7 NS 1.3 Convert fractions to decimals and percents and use these representations in estimations, computations and applications.

7 NS 2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.

7 AF 1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).

7 AF 1.3 Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative and commutative) and justify the process used.

7 AF 4.1 Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.

7 AF 4.2 Solve multistep problems involving rate, average speed, distance and time or a direct variation.

Algebra I 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents. [*excluding fractional powers*]

Scope and Sequence

Percents and Algebraic Problem Solving. The unit opens with the study of percents, including percent increase and decrease. Students make the transition to algebraic problem solving including word problems including those involving average speed, distance, and time. They solve simple (one and two step) equations and inequalities.

Unit 4

Recommended Focus Standards

7 AF 3.3 Graph linear functions, noting that the vertical change (change in *y*- value) per unit of horizontal change (change in *x*- value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.

7 AF 3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

7 MG 3.3 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.

Algebra I 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents. [*excluding fractional powers*]

Algebra I 4.0 Students simplify expressions before solving linear equations and inequalities in one variable, such as 3(2x-5) + 4(x-2) = 12. [*excluding inequalities*]

Algebra I 5.0 Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step. [*excluding inequalities*]

Scope and Sequence

Linear Functions and their Graphs, Linear Equations, and the Pythagorean Theorem. Students use the Cartesian coordinate system to graph points and lines and work with proportional relationships and linear functions using the slope to graph linear functions. Additionally students continue algebraic problem solving including multi-step problems.

Note: As students in this course will take the General Mathematics CST examination, in Unit 4 they study additional topics in Statistics, Data Analysis and Probability, Measurement and Geometry and the Real Number System.

REPRESENTATIVE PERFORMANCE OUTCOMES AND SKILLS

In this course, students will know and be able to:

- Demonstrate the concept of place value in whole numbers.
- Demonstrate fluency with operations on whole numbers.
- Demonstrate fluency with representing fractions, mixed numbers, decimals and percentage.
- Demonstrate fluency with operations on positive fractions
- Demonstrate fluency with the use of symbols to express verbal information.
- Demonstrate fluency in writing and solving simple linear equations.
- Demonstrate fluency in plotting points, interpreting ordered pairs from a graph, and interpreting lengths of horizontal and vertical line segments on a coordinate plane.
- Demonstrate fluency in graphing and interpreting relationships of the form $y = mx$
- Use operations such as taking the opposite, finding the reciprocal, taking a root and the rules of exponents
- Simplify expressions before solving linear equations in one variable.
- Solve multi-step problems, including word problems, involving linear equations in one variable and provide justification for each step

ASSESSMENTS will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments
- Periodic Assessments

TEXTS/MATERIALS

- LAUSD *Secondary Mathematics Instructional Guide*
- Textbook: District approved materials
- Supplemental materials and resources

Algebra Readiness: *Unit Concept Organizer*

UNIT 1

Number Sense, Integers, Fractions, and Algebraic Thinking

Understand the composition of whole numbers

7NS 1.2, 7AF 1.2, **7AF1.3, 7AF2.1**

- Take positive rational numbers to whole number powers
- Interpret positive whole number power as repeated multiplication
- Simplify expressions that include exponents
- Use the order of operations including exponents
- Recognize and apply properties of rational numbers (e.g. inverse,

Understand integers and operations on integers

7NS1.2, 7NS2.1, 7NS2.5
7AF 2.1

- Write integers to represent real-life situations
- Graph integers on a number line
- Compare integers
- Understand, interpret, and determine the absolute value of integers
- Add, subtract, multiply, and divide integers

Understand the composition of fractions

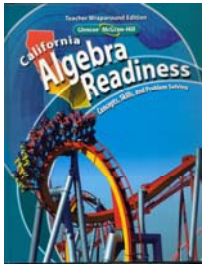
Selected Referenced Standards from Foundational Skills and Concepts (*CA Math Framework, Appendix E, p. 365*)

- Find the LCM, GCD, and know divisibility rules
- Identify numbers as prime and composite
- Use fractions to represent parts of a whole
- Use fractions to divide more than one whole into equally sized parts
- Write equivalent fractions
- Write fractions in simplest form
- Compare and order fractions

	7NS 1.2	7AF 1.2	**7AF 1.3**	**7NS 2.1**	7NS2.5	**7AF 2.1**
KEY Standards - Number of CST Items	4	3	2	1	2	1
CONCEPT LESSON:						
CAHSEE	3	1		1	1	1

Note: Standards in **BOLD** are targeted standards for Algebra Readiness

Algebra Readiness: Textbook Connections

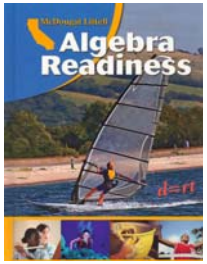


California Algebra Readiness, Concepts, Skills, and Problem Solving

UNIT 1

Topic	Standards	Textbook Sections
Transitional Standards		Prerequisite Skills: Pg. 2-41 *Important*: Exponents, Prime Factorization, Fractions, Decimals, LCM
Number Sense and Whole Numbers	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base. **7NS2.5** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers. 7AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$. **7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used. 7AF2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	1-1 A Plan for Problem Solving 1-2 Expressions and Equations 1-3 Order of Operations 1-4 Commutative and Associative Properties 1-5 Distributive Property 1-6 Problem-Solving Strategy: Guess and Check 1-7 Other Properties 1-8 Simplifying Expressions
Integers		2-2 Integers 2-3 Adding and Subtracting Integers [Explore 2-3: Model Integers Operations using Cubes] 2-4 Multiply Integers 2-5 Divide Integers 2-6 Problem-Solving Strategy: Look for a Pattern
Composition of Fractions		3-1 Fractions 3-2 Fractions and Mixed Numbers 3-3 Factors and Simplifying Fractions 3-4 Problem-Solving Strategies: Draw a Diagram 5-6 Comparing and Ordering Rational Numbers

Algebra Readiness: Textbook Connections

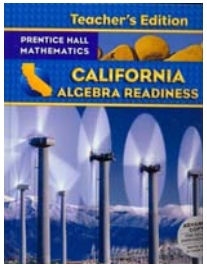


McDougal Littell: Algebra Readiness

UNIT 1

Topic	Standards	Textbook Sections
Transitional Standards		Skills Review Handbook, pg. 476 - 485
Number Sense and Whole Numbers	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.	1-1 Write and Evaluate Powers 1-2 Use Order of Operations 1-3 Use Formulas 1-5 Write and Evaluate Algebraic Expressions 1-6 Use a Problem Solving Plan
Integers	**7NS2.5** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers. 7AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.	4-1 Compare and Order Integers 4-2 Add Integers 4-3 Subtract Integers 4-4 Multiply Integers 4-5 Divide Integers
Composition of Fractions	**7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used. 7AF2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	2-1 Simplify Fractions 2-1 Activity 2-2 Activity Use the Tables on Pgs. 216 and 230 as well as ancillary material to address Properties of Rational Numbers Prerequisite Skills (p. 159) Skills Review Handbook (pg. 484 – 485) Prerequisite Skills (p. 51)

Algebra Readiness: Textbook Connections



Prentice Hall Mathematics: California Algebra Readiness

Topic	Standards	Textbook Sections

UNIT 1

Transitional Standards		
Number Sense and Whole Numbers	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base. **7NS2.5** Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers. 7AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$. **7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used. 7AF2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	1-1 Numerical Expressions 1-2 Algebraic Expressions 1-3 Writing Expressions 1-3a Modeling Expressions 1-5 Properties of Numbers 1-6 Distributive Property
Integers		2-1 Integers and Absolute Value 2-2a Modeling Addition of Integers 2-2 Adding Integers 2-3a Modeling Subtraction of Integers 2-3 Subtracting Integers 2-4 Multiplying Integers 2-5 Dividing Integers 2-6 Positive Exponents
Composition of Fractions		4-1 Prime Factorization 4-2 Greatest Common Divisor 4-3a Exploring Fractions 4-3 Equivalent Fractions 4-4 Equivalent Forms of Rational Numbers 4-5a Mixed Numbers 4-5 Comparing and Ordering Rational Numbers

Algebra Readiness
Assessment 1
Periodic Assessment Blueprint
Secondary Mathematics, 2008 – 2009

7th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
NS1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	4	**4**	**1**
AF1.2	Use the correct order of operations to evaluate algebraic expressions such as $3(2x+5)^2$	3	**4**	
AF1.3	Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	2	**3**	
AF2.1	Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	1	**1**	
NS2.5	Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.	2	**3**	
NS2.1	Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.			

Transitional Standards		No. of Multiple Choice Items on the Assessment
6NS2.4	Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g. to find a common denominator, to add two fractions or to find the reduced form for a fraction).	**2**
4NS1.7	Write the fraction represented by a drawing of parts of a figure; represent a given fraction by using drawings; and relate a fraction to a simple decimal on a number line.	**1**
6NS2.3	Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations that use positive and negative integers and combinations of these operations	**1**
6AF1.3	Apply algebraic order of operations and the communicative, associative, and distributive properties to evaluate expressions; and justify each step in the process.	**1**

Algebra Readiness: *Unit Concept Organizer*

UNIT 2

Fractions, Decimals, Ratios and Proportion

Understand the operations on fractions and mixed numbers

7NS 1.2, 7NS 2.2
Algebra 2.0

- Add and subtract like and unlike fractions
- Add and subtract fractions by using factoring to find common denominator (e.g. $\frac{2}{28}+\frac{1}{49}=\frac{2}{2\bullet2\bullet7}\bullet\frac{7}{7}+\frac{1}{7\bullet7}\bullet\frac{2\bullet2}{2\bullet2}$)
- Convert between improper fractions and mixed numbers
- Multiply and divide fractions
- Add, subtract, multiply, and divide mixed numbers
- Find the reciprocal of numbers

Understand the composition of decimals and operations on decimals

7NS 1.2, 7NS1.3, 7NS1.5

- Write fractions as decimals and use these representations in estimation, computations, and applications.
- Add, subtract, multiply, and divide decimals
- Know that rational number is either repeating or terminating decimal
- Convert terminating decimals into reduced fraction

Understand ratios and proportions

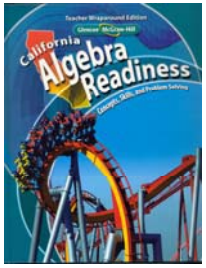
7 AF 4.2
7MG 1.2**, 7MG 1.3**

- Write ratios as fractions
- Compare ratios
- Find unit rates
- Write and solve proportions
- Read scale drawings and models
- Solve problems using proportions
- Solve problems involving average speed, distance, and time

	7NS 1.2	7NS 2.2	**Algebra 2.0**	**7NS1.3**	**7AF 4.2**	**7NS 1.5**	7MG 1.2	**7MG 1.3**
KEY Standards – Number of CST Items	4	4		2	2	2	1	2
CONCEPT LESSON:								
CAHSEE	3	1	1	2	2		1	2

Note: Standards in **BOLD** are targeted standards for Algebra Readiness

Algebra Readiness: Textbook Connections

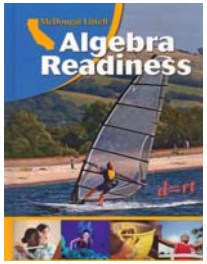


California Algebra Readiness, Concepts, Skills, and Problem Solving

UNIT 2

Operations of Fractions **Composition of and Operations on Fractions** **Ratios and Proportions**	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. **7NS1.5** Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions. **7NS2.2** Add and subtract fractions by using factoring to find common denominators. **7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. 7MG1.2 Construct and read drawings and models made to scale. **7MG1.3** Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	3-5 Multiplying Fractions 3-6 Dividing Fractions 3-7 Adding Fractions and Subtracting Fractions with Like Denominators 3-8 Adding Fractions with Unlike Denominators 3-9 Subtracting Fractions with Unlike Denominators 4-1 Fractions and Decimals 4-2 Adding and Subtracting Decimals 4-2 Extend: The Whole Thing 4-3 Multiplying Decimals 4-4 Dividing Decimals 4-5 Problem-Solving Strategy: Work Backward 6-1 Ratios and Rates 6-3 Proportions and Proportional Reasoning 6-3 Extend: Capture and Recapture

Algebra Readiness: Textbook Connections

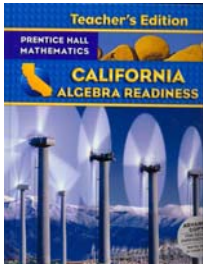


McDougal Littell: Algebra Readiness

UNIT 2

Operations of Fractions	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. **7NS1.5** Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions. **7NS2.2** Add and subtract fractions by using factoring to find common denominators. **7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. 7MG1.2 Construct and read drawings and models made to scale. **7MG1.3** Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.	2-2 Write Mixed Numbers and Improper Fractions 2-3 Add and Subtract Fractions with the Same Denominator 2-4 Add and Subtract Fractions with Different Denominators 2-5 Multiply Fractions 2-6 Find Reciprocals 2-7 Divide Fractions 3-1 Add and Subtract Decimals 3-2 Multiply Decimals 3-3 Divide Decimals 3-4 Convert Between Fractions and Decimals 5-2 Add and Subtract Rational Numbers 5-3 Use the Properties of Addition 5-4 Multiply and Divide Rational Numbers 5-5 Use the Properties of Multiplication 5-6 Use the Distributive Property
Composition of and Operations on Fractions	**1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	5-1 Compare and Order Rational Numbers
Ratios and Proportions		3-5 Write Percents as Fractions and Decimals p. 483 Skills Review Handbook Note: Proportions are not covered in this text

Algebra Readiness: Textbook Connections



Prentice Hall Mathematics: California Algebra Readiness

UNIT 2

Composition of and Operations on Fractions	**7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. 7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. **7NS1.5** Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions. **7NS2.2** Add and subtract fractions by using factoring to find common denominators.	4-4 Equivalent Forms of Rational Numbers 4-5 Comparing and Ordering Rational Numbers 5-1 Adding Rational Numbers 5-2 Subtracting Rational Numbers 5-3 Multiplying Rational Numbers 5-3a Modeling Fraction Multiplication 5-4 Dividing Rational Numbers
Ratios and Proportions	**7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. 7MG1.2 Construct and read drawings and models made to scale. **7MG1.3** Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	6-1 Ratios 6-2 Rates 6-2b Simplifying Rates 6-3 Dimensional Analysis 6-4 Applications of Rates 6-5 Proportions

Algebra Readiness
Assessment 2
Periodic Assessment Blueprint
Secondary Mathematics, 2008 – 2009

7th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
NS 1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	4	**5**	
NS2.2	Add and subtract fractions by using factoring to find common denominators.	4	**4**	
AF4.2	Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	2	**3**	**1**
NS1.5	Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.	2	**2**	
MG1.2	Construct and read drawings and models made to scale.	1	**1**	
MG1.3	Use measures expressed as rates (e.g. speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.	2	**2**	
NS1.3	Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.	4	**2**	

Transitional Standard		No. of Multiple Choice Items on the Assessment
6NS1.2	Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b, a to b, a:b).	**1**

Algebra Readiness: *Unit Concept Organizer*

UNIT 3

Percents and Algebraic Problem Solving

Understand percents

7NS 1.3, 7NS 1.6, 7NS 1.7

- Write percents as decimals and fractions
- Write decimals and fractions as percents
- Use benchmark percents (1% and 10%) to find the percent of a number
- Use a proportion to find the percent of a number and to find a number that corresponds to 100%
- Use a proportion to find percent, given two numbers
- Find the percent increase or decrease of a quantity
- Solve problems involving discounts, markup, commission, and profit
- Compute simple and compound interest

Understand how to solve linear equations including simplifying expressions

7AF 1.1, 7AF 1.3, 7AF 4.1, 7AF4.2, 7NS 2.1, 7NS 2.3, **Algebra 2.0**

- Use variables and appropriate operations to write an expression and equation that represents a verbal description
- Simplify and evaluate expressions that include exponents
- Understand and use the rules of exponents
- Evaluate expressions
- Solve one-step and two-step equations
- Simplify expressions
- Solve problems involving average speed, distance, and time

Understand Inequalities

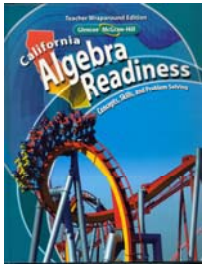
7AF 1.1, **7AF 4.1**

- Write an inequality that represents a verbal description
- Solve problems involving inequalities

	7AF 1.1	**7AF 1.3**	**7AF 4.1**	**7AF 4.2**	**7NS 1.3**	7NS 1.6	**7NS2.1**	7NS2.3	**Algebra 2.0**	7NS 1.7
KEY Standards Number of CST Items	3	2	4	2	4	1	1	2		2
CONCEPT LESSON:										
CAHSEE	2		3	2	2	1	1	1	1	2

Note: Standards in **BOLD** are targeted standards for Algebra Readiness

Algebra Readiness: Textbook Connections

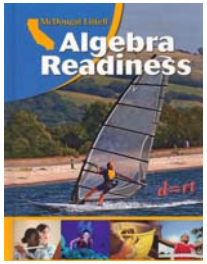


California Algebra Readiness, Concepts, Skills, and Problem Solving

UNIT 3

Linear Equations	7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. 7NS1.6 Calculate the percentage of increases and decreases of a quantity. **7NS1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base. **7NS2.3** Multiply, divide, and simplify rational numbers by using exponent rules.	2-1 Equations 2-7 Solving Equations 3-10 Fractions in Expressions and Equations 4-6 Decimals in Expressions and Equations 5-1 Exponents 5-2 Integers Exponents 5-3 Problem-Solving Strategies: Solve a Simpler Problem 5-5 Simplifying and Evaluating Expressions
Percents	7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A). **7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	6-2 Fractions, Decimals, and Percents 6-4 The Percent Proportion 6-5 Problems Involving Percents 6-6 Direct Variation 6-7 Problem-Solving Strategy: Make a Table Note: Compound Interest is not covered in this text. Use Ancillary Materials
Linear Inequalities	**7AF4.1** Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results. **7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	Note: Inequalities are not covered in this text. Use Ancillary Materials

Algebra Readiness: Textbook Connections

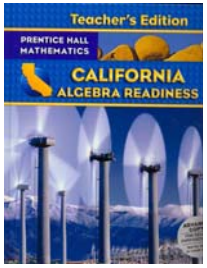


McDougal Littell: Algebra Readiness

UNIT 3

Linear Equations	7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. 7NS1.6 Calculate the percentage of increases and decreases of a quantity. **7NS1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base. **7NS2.3** Multiply, divide, and simplify rational numbers by using exponent rules. 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A). **7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used. **7AF4.1** Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results. **7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	6-1 Multiply Powers with the Same Base 6-2 Divide Powers with the Same Base 6-3 Use Zero and Negative Exponents 6-4 Simplify Expressions Involving Exponents 8-1 Solve Equations Involving Addition or Subtraction 8-2 Solve Equations Involving Multiplication or Division 8-3 Solve Two-Step Equations 8-4 Solve Equations with Fractions and Decimals
Percents		3-5 Write Percents as Fractions and Decimals 3-6 Write Decimals and Fractions as Percents 3-7 Find a Percent of a Number
Linear Inequalities		9-1 Write and Graph Simple Inequalities 9-2 Solve Inequalities Involving Addition or Subtraction 9-3 Solve Inequalities Involving Multiplication or Division 9-4 Solve Two-Step Inequalities

Algebra Readiness: Textbook Connections



Prentice Hall Mathematics: California Algebra Readiness

UNIT 3

Linear Equations	7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. 7NS1.6 Calculate the percentage of increases and decreases of a quantity. **7NS1.7** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest. 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base. **7NS2.3** Multiply, divide, and simplify rational numbers by using exponent rules. 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A). **7AF1.3** Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used. **7AF4.1** Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results. **7AF4.2** Solve multistep problems involving rate, average speed, distance, and time or a direct variation. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents.	1-2 Algebraic Expressions 3-1 Solving Addition Equations 3-2a Modeling Equations 3-2 Solving Subtraction Equations 3-3 Solving Multiplication and Division Equations 3-4a Modeling Two-Step Equations 3-4 Solving Two-Step Equations 5-5 Solving Equations by Adding or Subtracting 5-6 Solving Equations by Multiplying 5-7 Zero and Negative Exponents
Percents		7-1 Fractions, Decimals, and Percents 7-2 Finding a Percent of a Number 7-3 Percents and Proportions 7-4 Percent of Change 7-5b Simple Interest 7-5 Applications of Percent
Linear Inequalities		9-1 Writing Inequalities 9-2 Solving Inequalities by Addition or Subtracting 9-3 Solving Inequalities by Dividing 9-4 Solving Inequalities by Multiplying 9-5b Systems of Inequalities 9-5 Solving Two-Step Inequalities 10-1 Properties of Exponents 10-2 Power Rules

Algebra Readiness
Assessment 3
Periodic Assessment Blueprint
Secondary Mathematics, 2008 – 2009

7th Grade Standards		No. of Items on the CST	No. of Multiple Choice Items on the Assessment	No. of Constructed Response Items on the Assessment
AF1.1	Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).	3	**2**	**1**
AF 1.3	Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	2	**2**	
AF2.1	Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	1	**1**	
AF4.1	Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.	4	**5**	
AF4.2	Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	2	**1**	
NS1.3	Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.	4	**3**	
NS 2.3	Multiply, divide, and simplify rational numbers by using exponent rules.	2	**2**	
NS1.6	Calculate the percentage of increases and decreases of a quantity.	1	**1**	
NS1.7	Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.	2	**2**	
NS2.1	Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.	1	**1**	

Algebra Readiness: *Unit Concept Organizer*

UNIT 4

Linear Functions and their Graphs, Linear Equations, and Pythagorean Theorem

Understand linear functions and graph lines
7AF 1.5, 7**AF 3.1, 7AF 3.3, 7AF 3.4**
Understand Pythagorean Theorem
7MG 3.3

- Identify and graph points in the coordinate plane
- Use tables and graphs to represent function
- Find the slope of a line as a ratio and as a rate of change
- Use equations, tables, and graphs to solve problems
- Find squares of numbers and find and estimate the square roots of numbers
- Use the Pythagorean Theorem to solve problems
- Use the converse of the Pythagorean Theorem
- Find Pythagorean triples

CST Preparation

Review all prior standards for CST including these:

7SDAP 1.1, 7SDAP 1.3**,** 7SDAP 1.2
6SDAP 1.1, 3.1, 3.3, 3.5, 3.3

7MG 2.3**, 7**MG 2.4, 7MG 3.2,
7MG 2.1, 7MG 2.2, 7NS 1.1

Understand algebraic problem solving (linear applications) involving multistep problems

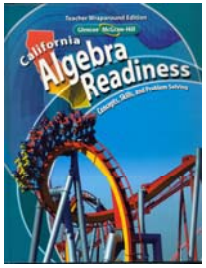
Algebra 2.0, Algebra 4.0
Algebra 5.0

- Take the root
- Simplify expressions before solving linear equations
- Solve multistep problems involving linear equations in one variable

	7AF 3.1	7AF 3.3	7AF 3.4	7MG 3.3	Algebra 4.0	Algebra 5.0	Algebra 2.0
KEY Standards - Number of CST Items	1	2	1	3			
CONCEPT LESSON:							
CAHSEE	1	2	1	2	3	2	2

Note: Standards in **BOLD** are targeted standards for Algebra Readiness

Algebra Readiness: Textbook Connections

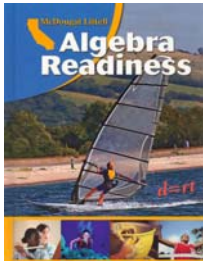


California Algebra Readiness, Concepts, Skills, and Problem Solving

UNIT 4

Linear Functions and their Graphs **Pythagorean Theorem** **Multistep Algebraic Problem Solving** **Area and Volume** **Probability and Statistics**	7AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. **7AF3.3** Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **7AF3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities. **7MG3.3** Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement. **1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents. **1A4.0** Students simplify expressions prior to solving linear equations in one variable, such as $3(2x-5) + 4(x-2) = 12$. **1A5.0** Students solve multistep problems, including word problems, involving linear equations in one variable and provide justification for each step.	7-1 The Coordinate Plane 7-2 Problem-Solving Strategy: Draw a Graph 7-3 Relationships Involving Equal Ratios 7-5 Slope 7-6 Linear Functions 7-7 The Pythagorean Theorem 5-4 Roots 5-5 Simplifying and Evaluating Expressions 8-3 Coordinate Geometry 8-4 Perimeter 8-5 Area 8-6 Problem-Solving 8-7 Explore: Find Volume and Surface Area 8-7 Solid Figures and Volume 8-8 Surface Area The standards: MG 2.1, 2.2, 2.3, 2.4, and 3.2 are to be additionally addressed for General Math CST Note: Use Ancillary Materials to Review Applicable Probability and Statistics Standards for CST

Algebra Readiness: Textbook Connections

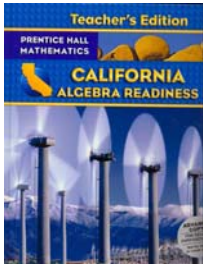


McDougal Littell: Algebra Readiness

UNIT 4

Linear Functions and their Graphs	7AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. **7AF3.3** Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **7AF3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	10-1 Graph in the Coordinate Plane 10-2 Graph Linear Equations in Standard Form 10-3 Graph Horizontal and Vertical Lines 10-4 Graph Linear Equations Using Intercepts 10-5 Find Slopes of Lines 10-6 Graph Equations in Slope-Intercept Form 10-7 Solve Direct Variation Problems Using Algebra
Pythagorean Theorem	**7MG3.3** Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.	7-1 Find Square Roots of Perfect Squares 7-2 Approximate Square Roots 7-3 Use the Pythagorean Theorem 7-4 Use the Converse of the Pythagorean
Multistep Algebraic Problem Solving	**1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents. **1A4.0** Students simplify expressions prior to solving linear equations in one variable, such as $3(2x-5) + 4(x-2) = 12$. **1A5.0** Students solve multistep problems, including word problems, involving linear equations in one variable and provide justification for each step.	8-5 Solve Equations Using the Distributive Property 8-6 Solve Rate Problems
Area and Volume		Use Ancillary Materials to Review these Standards: MG 2.1, 2.2, 2.3, 2.4, and 3.2 for CST
Probability and Statistics		Use Ancillary Materials to Review Applicable Probability and Statistics Standards for CST

Algebra Readiness: Textbook Connections

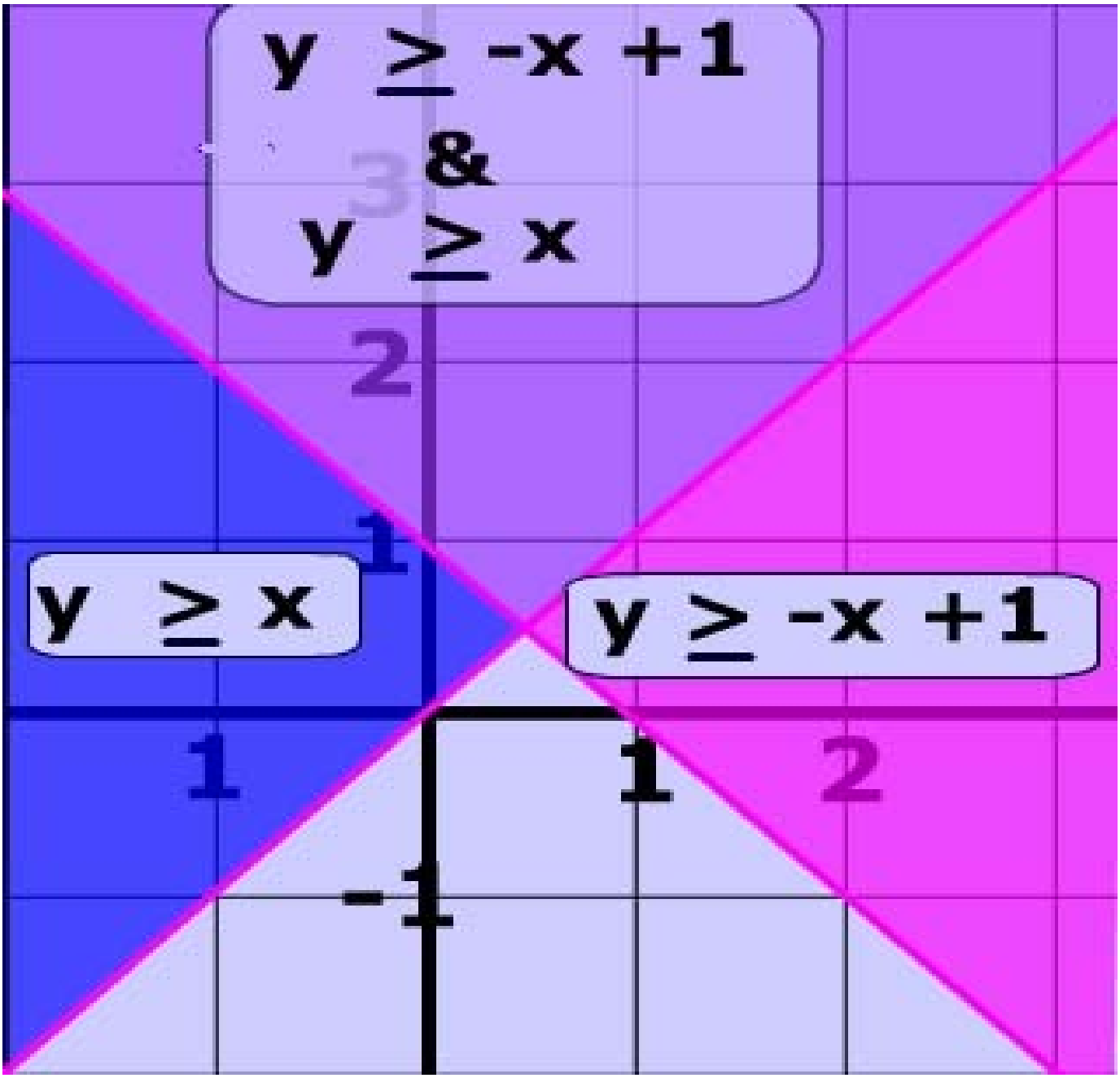


Prentice Hall Mathematics: California Algebra Readiness

UNIT 4

Linear Functions and their Graphs	7AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. **7AF3.3** Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **7AF3.4** Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	8-1 Graphing in the Coordinate Plane 8-2 Length in the Coordinate Plane 8-2b Graphs of Right Triangles 8-3a Tables and Equations 8-3 Functions 8-4 Graphing Linear Functions 8-5 Slope 8-6 Slope and Direct Variation
Pythagorean Theorem	**7MG3.3** Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.	3-5 Square Roots 3-6 The Pythagorean Theorem 3-7 Using the Pythagorean Theorem 3-7b Verifying Right Triangles
Multistep Algebraic Problem Solving	**1A2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root. They understand and use the rules of exponents. **1A4.0** Students simplify expressions prior to solving linear equations in one variable, such as $3(2x-5) + 4(x-2) = 12$. **1A5.0** Students solve multistep problems, including word problems, involving linear equations in one variable and provide justification for each step.	10-3 Exploring Roots 10-4a: Modeling Expressions 10-4 Simplifying Algebraic Expressions 10-5a: Modeling Multi-Step Equations 10-5 Solving Multi-Step Equations 10-6 Solving Equations With Variables on Both Sides
Area and Volume		Use Ancillary Materials to Review these Standards: MG 2.1, 2.2, 2.3, 2.4, and 3.2 for CST
Probability and Statistics		Use Ancillary Materials to Review Applicable Probability and Statistics Standards for CST

Algebra 1



Secondary Mathematics
Instructional Guide
2008-2009

ALGEBRA 1 AB
(Annual Course – Grade 8 or 9)
Prerequisite: Mathematics 7AB

310301 Algebra 1A
310302 Algebra 1B

COURSE DESCRIPTION

The purpose of this course is to serve as the vehicle by which students make the transition from arithmetic to symbolic mathematical reasoning. It is an opportunity for students to extend and practice logical reasoning in the context of understanding, writing, solving, and graphing problems involving linear and quadratic equations (including systems of two linear equations in two unknowns).

In this course, students are expected to demonstrate their ability to extend specific problems and conditions to general assertions about mathematical situations. Additionally, they are expected to justify steps in an algebraic procedure and check algebraic arguments for validity.

COURSE SYLLABUS

The following are recurring standards in the course:

Algebra I 24.0 Students use and know simple aspects of a logical argument.
Algebra I 25.0 Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements.

Unit 1

Recommended Focus Standards

Algebra I 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
Algebra I 4.0 Students simplify expressions before solving linear equations and inequalities in one variable.
Algebra I 5.0 Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

Scope and Sequence

This unit sets the stage for success in Algebra by providing time to review arithmetic (whole numbers, fractions, decimals, and percents) and proceeds on to cover foundational algebra skills necessary to solve equations. Subsequent to this review, students will proceed to solving equations in one variable (including equations with absolute value).

Unit 2

Recommended Focus Standards

Algebra I 6.0 Students graph a linear equation and compute the x- and y- intercepts. (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequalities (e.g., they sketch the region defined by $2x + 6y < 4$).

Algebra I 7.0 Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.

Scope and Sequence

The focus of this unit is graphing and deriving linear equations using a variety of techniques. The unit also addresses solving inequalities (including absolute value) in one variable.

Unit 3

Recommended Focus Standards

Algebra I 9.0 Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.

Algebra I 15.0 Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Algebra I 19.0 Students know the quadratic formula and are familiar with its proof by completing the square.

Algebra I 20.0 Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.

Algebra I 21.0 Students graph quadratic functions and know that their roots are the x-intercepts.

Algebra I 23.0 Students apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.

Scope and Sequence

This unit includes two main foci. Linear relationships are concluded with solving systems of linear equations and inequalities. The students will then learn how to solve quadratic equations and how to interpret the graphs of quadratic functions.

Unit 4

Recommended Focus Standards

Algebra I 10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.

Algebra I 12.0 Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

Algebra I 13.0 Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.

Algebra I 14.0 Students solve a quadratic equation by factoring or completing the square.

Scope and Sequence

It is important that students learn how to perform polynomial arithmetic (including factoring) and apply factoring as a technique to solve simple quadratics prior to the CST. After the CST, students will learn the arithmetic of rational expressions and will solve rational equations in one variable.

REPRESENTATIVE PERFORMANCE OUTCOMES AND SKILLS

In this course, students will know and be able to:

- Interpret the meaning of variables and variable expressions
- Solve linear equations (including proportions) in one variable
- Apply the concept of absolute value to simple equations
- Graph a linear function by plotting points, using intercepts, and using the slope and y-intercept
- Sketch the region defined by a linear inequality
- Derive the equation of a line when given a variety of parameters for that line
- Solve inequalities in one variable (including those with absolute value)
- Solve systems of linear equations by graphing, using substitution, and using elimination
- Solve systems of linear inequalities by graphing
- Solve quadratic equations by graphing, finding square roots, using the quadratic formula, and factoring
- Simplify and perform arithmetic operations on and with rational expressions
- Solve rational equations
- Solve application problems using the above techniques

ASSESSMENTS will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments
- Periodic Assessments

TEXTS/MATERIALS

- LAUSD *Secondary Mathematics Instructional Guide*
- Textbook: District approved materials
- Supplemental materials and resources

Algebra 1: *Unit Concept Organizer*

Linear Equations and Functions

UNIT 1

Understand the language of algebra

1.0, 1.1, **2.0**, 16.0, 17.0, 24.0, 25.1

- Understand the meaning of variables and variable expressions
- Evaluate variable expressions
- Simplify numerical and variable expressions using the properties of real numbers including the distributive property
- Use properties of numbers to demonstrate whether assertions are true or false
- Use properties to formulate counterexamples to claimed assertions
- Use operations such as taking the opposite, finding the reciprocal and taking a root

Understand and solve linear equations

4.0, 5.0

- Translate between verbal sentences and equations
- Solve multi-step linear equations in one variable (involving addition, subtraction, multiplication and division)
- Solve equations for a given variable
- Solve problems using proportions
- Solve application problems using all of these techniques

Understand and graph linear equations, functions and patterns

6.0, 7.0, 16.0, 17.0, 18.0

- Identify the domain and range of functions and relations
- Determine whether a relation is a function
- Graph linear equations
- Compute the x and y-intercepts of a linear equation
- Verify that a point lies on a line

	1.0	1.1	**2.0**	**4.0**	**5.0**	**6.0**	**7.0**	16.0	17.0	18.0	24.0	25.0
KEY Standards - #CST Questions **Other Standards - #CST Questions** *** 1 / 2 : 1 question every 2 years**	NA	1/2*	4	3	6	4	4	½*	1	½*	1	1 ½*
CONCEPT LESSON: TT-Tommy's T-Shirts SP-Surround the Pool SC-Stack of Cups				TT	SP SC		SC					

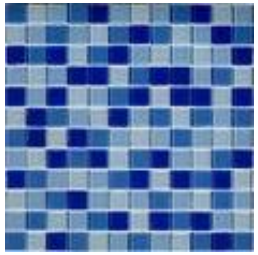
Tommy's T - Shirts

This past summer you were hired to work as a consultant for Tommy's T-Shirts, a company that produces custom t-shirts using their customer's own designs. They want you to help them decide how much they should charge for their shirts. Their major competitor is Custom T-Shirts. When a customer places an order for a special design, Custom T-Shirts charges a one-time fee of $15 to set up the design plus $8 for each t-shirt printed.

1. Create a plan for Tommy's T-Shirts that has a lower base fee than Custom T-Shirts but will charge the same for an order of 8 shirts. Explain how you arrived at your plan.

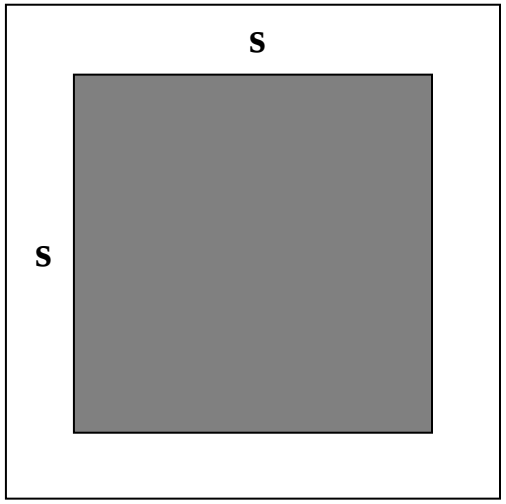
2. Create a new plan that will always cost a customer less than either of the other two plans. Explain your reasoning.

Concept Task



Surround the Pool

Hot tubs and in-ground swimming pools are sometimes surrounded by borders of tiles. This drawing shows a square swimming pool surrounded by a border of square tiles. Each tile measures 1 foot on each side.



1. Write an expression describing the total number of 1-foot square tiles needed for the border of the pool. Show how your expression can be seen in the drawing.

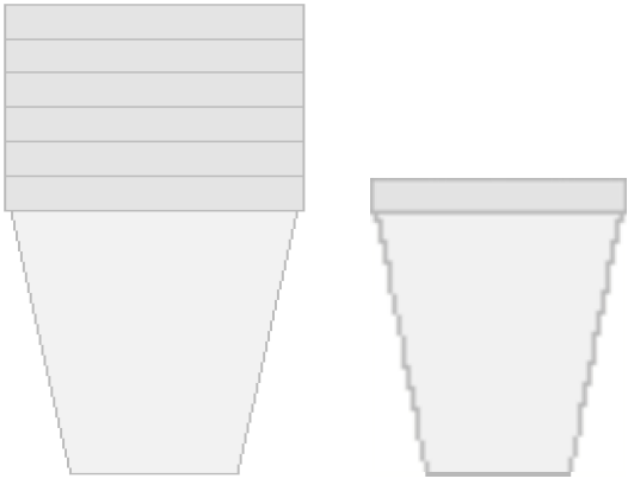
2. Solve the problem again using a different expression and explain how the second expression can be seen in the drawing.

Concept Task

A Stack of Cups

Your task is to represent the relationship between the size of the cups and the height of the stack of cups using a formula and a graph. Then answer the questions below about the stack of cups.

The paper cups shown below are identical and drawn full size:



a) By making measurements, represent the relationship between the number of cups and the height of the stack using a formula and a graph.

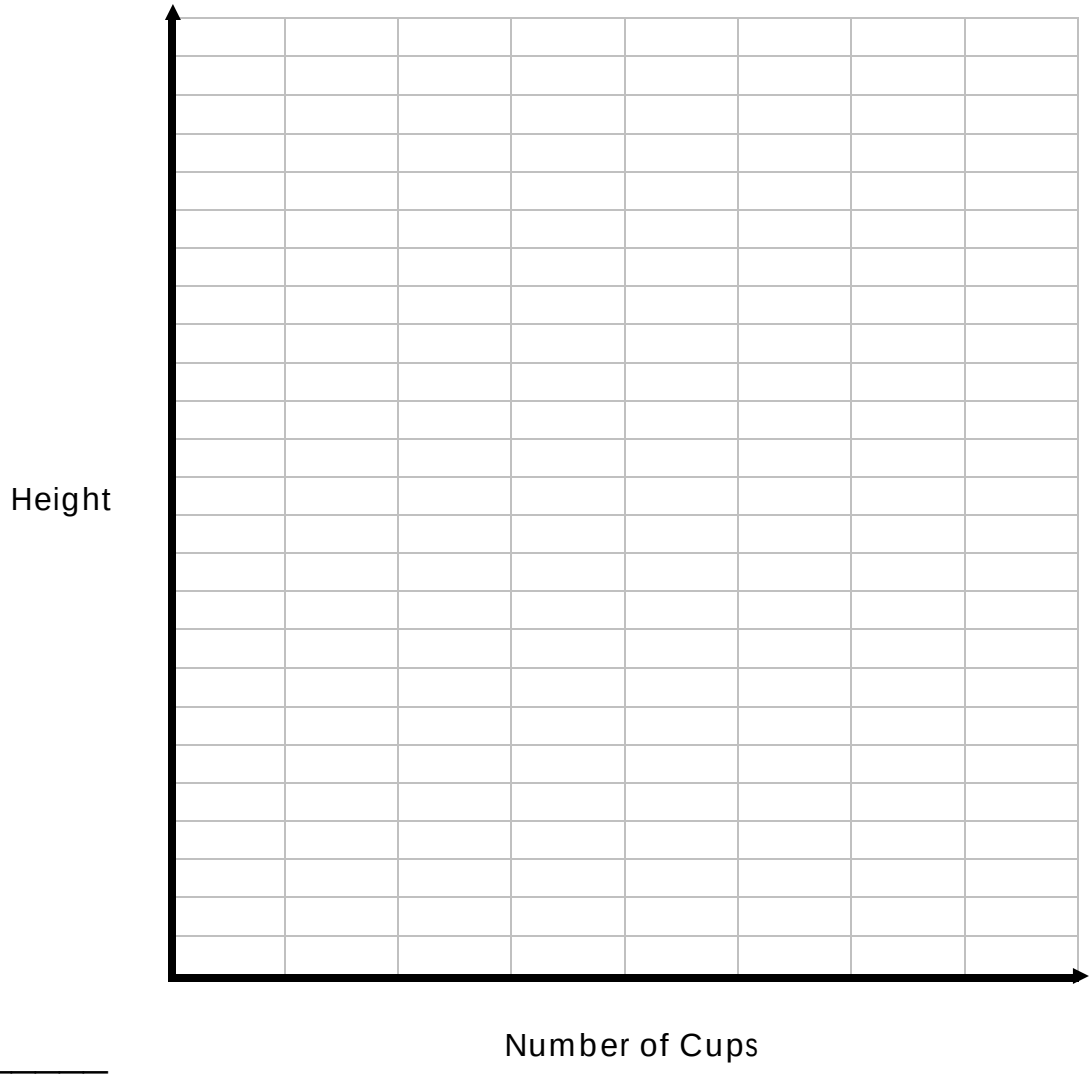
b) The graph can be drawn as a set of discrete points on a coordinate system. These points *lie along a line* and can be connected by a straight line.

- Why is the line straight?
- What are the slope and intercept of this line?
- Interpret the meaning of the slope and intercept with regard to the number and size of the cups, or parts of the cups.

Adapted from "Paper Cups," in The New Standards Mathematics Reference Examination Practice Test High School (p. 20), Harcourt Brace Educational Measurement, University of Pittsburgh and the National Center on Education and the Economy,

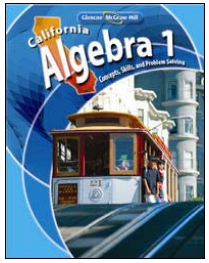
Secondary Mathematics: Stack of Cups Concept Task **Worksheet**

# Cups	Height



Formula: _____

Algebra 1: Textbook Connections



Glencoe McGraw-Hill: *Algebra 1 Concepts, Skills, and Problem Solving*

UNIT 1

Topic	Standards	Textbook Sections
Analyze and Graph Linear Equations	1.1 Students use properties of numbers to demonstrate whether assertions are true or false. **2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents. **4.0** Students simplify expressions prior to solving linear equations and inequalities in one variable, such as 3(2x-5) + 4(x-2) = 12. **5.0** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable, and provide justification for each step. **6.0** Students graph a linear equation and compute the x and y-intercepts (e.g., graph 2x + 6y = 4). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by 2x + 6y < 4). **7.0** Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations using the point slope formula. 16.0 Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions. 17.0 Students determine the domain of independent variables defined by a graph, a set of ordered pairs, or a symbolic expression. 18.0 Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion 24.0 Students know and use simple aspects of a logical argument 25.0 Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements	**1.1** Variables and Expressions **1.2** Order of Operations **1.3** Open Sentences **1.4** Identity and Equality Properties **1.5** The Distributive Property **1.6** Commutative and Associative Properties **1.7** Logical Reasoning and Counterexamples **1.8** Number Systems **1.9** Functions and Graphs
Solve Systems of Linear Equations		**2.1** Writing Equations **2.2** Solving Equations by Using Addition and Subtraction **2.3** Solving Equations by Using Multiplication and Division **2.4** Solving Multi-Step Equations **2.5** Solving Equations with the Variable on Each Side **2.6** Ratios and Proportions **2.7** Percent of Change **2.8** Solving for a Specific Variable
Solve and Graph Linear Inequalities		**3.1** Representing Relations **3.2** Representing Functions **3.3** Linear Functions **3.4** Arithmetic Sequences **3.5** Proportional and Non-proportional Relationships

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools

**To be covered as time permits. While this material is not necessary for CA Algebra 1, it may be very useful in preparing students for the CAHSEE examination, and/or previewing topics in to be covered in Geometry and Algebra 2*

Algebra 1: *Assessment 1 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
1.1	Students use properties of numbers to demonstrate whether assertions are true or false.	½*	1	
2.0	Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.	4	2	
4.0	Students simplify expressions prior to solving linear equations and inequalities in one variable, such as 3(2x-5) + 4(x-2) = 12.	3	3	
5.0	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable, and provide justification for each step.	6	6	CR
6.0	Students graph a linear equation and compute the x and y-intercepts (e.g., graph 2x + 6y = 4). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by 2x + 6y < 4).	4	2	
7.0	Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations using the point slope formula.	4	1	
16.0	Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions.	½*	1	
17.0	Students determine the domain of independent variables defined by a graph, a set of ordered pairs, or a symbolic expression.	1	1	
18.0	Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion	½*	1	
24.0	Students know and use simple aspects of a logical argument	1	1	
25.0	Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements	1 ½*	1	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Algebra 1: *Unit Concept Organizer*

Systems of Linear Equations and Inequalities

UNIT 2

Understand, Analyze, and Graph Linear Equations

6.0, 7.0, 8.0

- Evaluate the slope of a line
- Use rate of change to solve problems
- Write and graph different forms of linear functions
- Identify characteristics of parallel and perpendicular lines
- Derive the equation of a line:
  - Given the slope and a point on a line
  - Given 2 points on the line
  - Parallel or perpendicular to a given line through a given point

Understand and Solve Systems of Linear Equations

9.0, 15.0

- Solve systems of equations by graphing
- Solve systems of linear inequalities by graphing
- Solve systems of two linear equations using substitution and elimination
- Solve application problems using the above techniques

Understand, Solve, and Graph linear inequalities

3.0, **4.0, 5.0, 9.0**

- Sketch the region defined by a linear inequality
- Solve inequalities in one and two variables
- Solve linear absolute value inequalities
- Graph inequality solutions (including absolute value)

	3.0	**4.0**	**5.0**	**6.0**	**7.0**	8.0	**9.0**	**15.0**
KEY Standards - #CST Questions Other Standards - #CST Questions	1	3	6	4	4	1	5	4
CONCEPT LESSON: MF - Making the Final ST - Storage Tanks CP - Calling Plans TK-Tying the Knot				MF CP TK	ST CP	TK	ST CP	

Making the Final (Part I)

To qualify for the finals of the X-Games Skateboarding competition, skateboarders must complete one 45 second run. They earn points in two ways:

- **A score out of 100 for the Skill of the tricks performed**
- **A score out of 100 for the Amplitude (air) the skateboarder gets**

40% of the Skill score and 60% of the Amplitude score are added together to produce the Weighted Score. To make the final, the skater's Weighted Score must be at least 60. (All Weighted Scores are rounded to the nearest tenth.)

1. You score 80 points for Skill and 50 points for Amplitude. What is your Weighted Score?

2. Make a table that shows some possible performance scores for Skill and Amplitude and the Corresponding Weighted Score. Be sure to choose a range of high and low scores for both programs in your table.

***Note:** The table is drawn for you on the next page*

Materials adapted from the PRISMA project, developed by the IFL and LAUSD

Note: *The first skateboarder's scores are given to you. You need to decide what the other skateboarders scored for both Skill and Amplitude and then calculate their Weighted Scores.*

Skill Score	Amplitude Score	Weighted Score
80	50	

3. Make a group graph (four tables per graph) to represent the situation.

   The x-axis represents the Skill score (S).

   The y-axis represents the Amplitude score (A).

   a. Use a **BLACK** MARKER to plot the points in the tables you and your group members created.

   b. Use a **GREEN** MARKER to circle the points that represent a Weighted Score that qualifies for the team.

   c. Now add a **BLUE** STAR to those points where the Weighted score is EXACTLY 60.

What patterns do you notice in your group graph?

Materials adapted from the PRISMA project, developed by the IFL and LAUSD

Making the Final (Part II)

A new rule has been introduced to the qualifying process. It states that if a skater scores less than 50 points for either Skill or Amplitude then that skateboarder cannot make the X-Games final.

1. On your group graph from Part I, use a **RED** MARKER to circle *all* the points that represent a score that will not make the final because of the new rule.

What new patterns do you notice in your group graph?

2. Develop a System of Inequalities to algebraically describe the situation. Only use the variables S (Skill score) and A (Amplitude score).

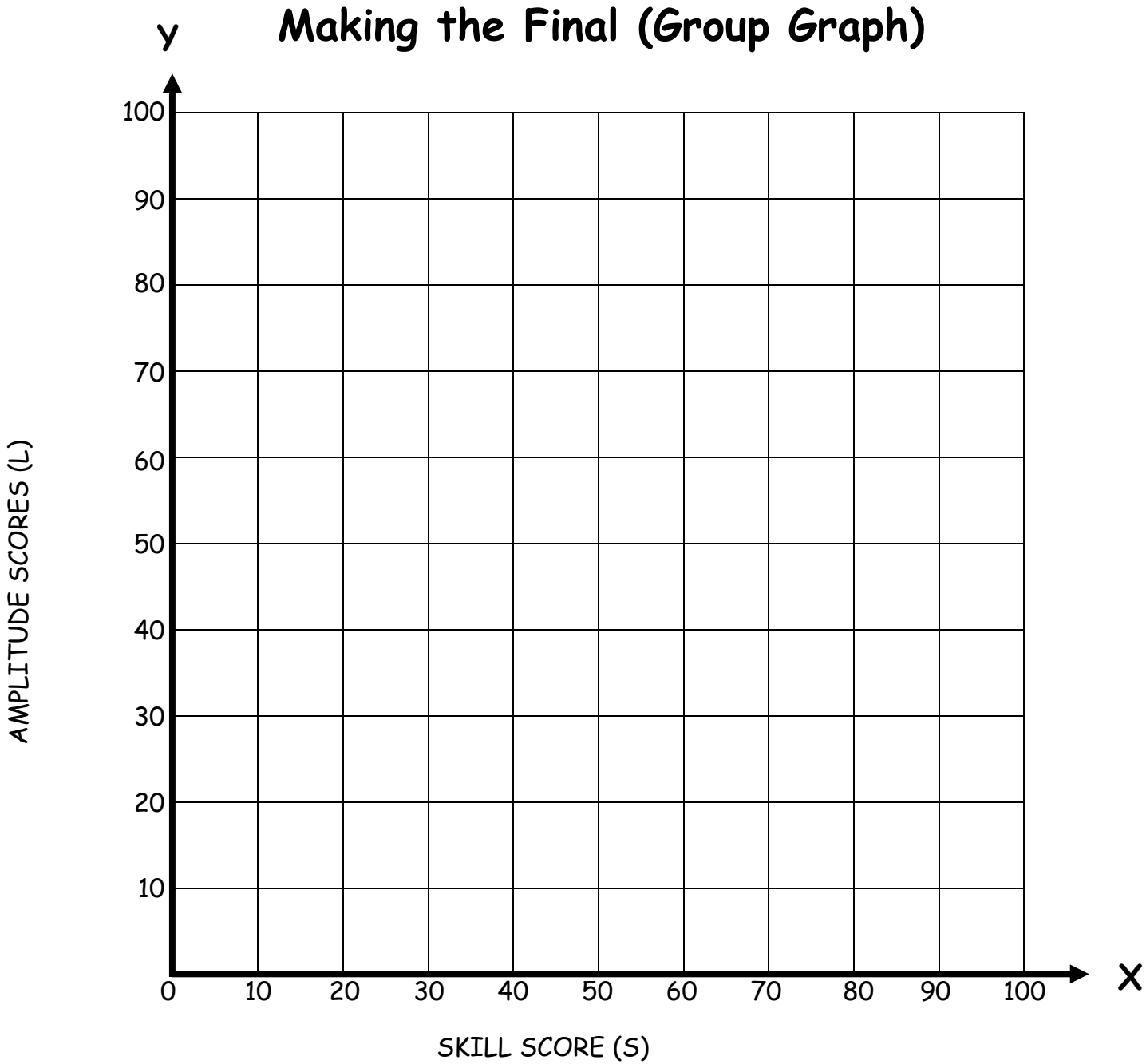
3. Shade the region of the graph that contains the points that make the X-Games skateboarding final.

Extension Questions

4. What is the minimum Skill score a skateboarder can receive and still make the final?
5. What score is required for Amplitude to make the final with the minimum Skill score?
6. A skater has a particular Skill score. How can she/he figure out the minimum Amplitude score needed to make the team?

Materials adapted from the PRISMA project, developed by the IFL and LAUSD

Making the Final (Group Graph)

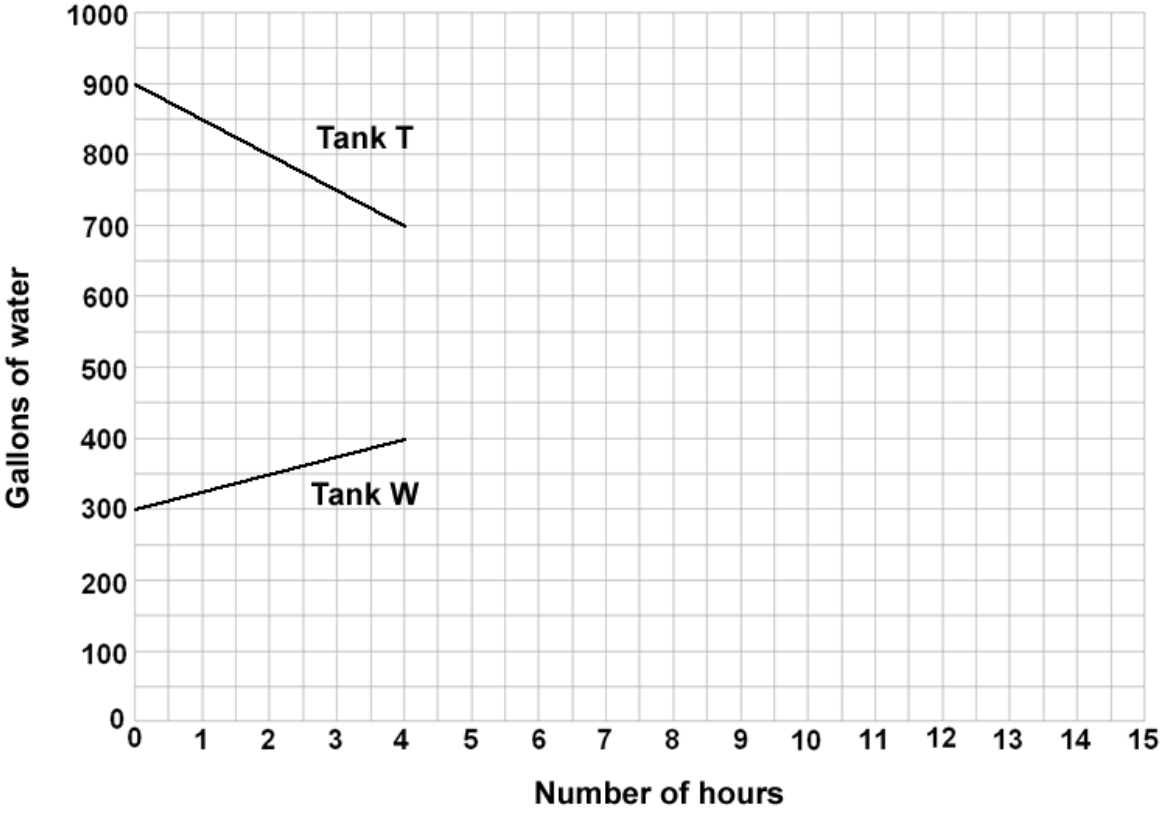


Materials adapted from the PRISMA project, developed by the IFL and LAUSD

Concept Task

Two Storage Tanks

Two large storage tanks, T and W, contain water. T starts losing water at the same time additional water starts flowing into W. The graph below shows the amount of water in each tank over a period of time.



1. Assume that the rates of water loss and water gain continue as shown. When will the two tanks contain the same amount of water? Explain how you found your answer and interpret your solution in terms of the problem.

2. Write an equation for each storage tank that can be used to determine the amount of water in the tank at any given number of hours. How many different coordinate pairs (x and y pairs) will satisfy both equations? Explain.

3. How are the two equations the same and how are they different? Interpret each equation in terms of its corresponding graph.

4. Suppose Tank Z contains 550 gallons of water and is not gaining or losing water. When will Tank Z contain the same amount of water as Tank T? as Tank W? Will all 3 tanks ever contain the same amount of water at the same time? Explain.

Concept Task

Calling Plans

Long-distance Company A charges a base rate of $5 per month, plus 4 cents per minute that you are on the phone. Long-distance Company B charges a base rate of only $2 per month, but they charge you 10 cents per minute used.

How much time per month you would have to talk on the phone before subscribing to Company A would save you money?

Concept Task

Tying the knot

Your task is to explore the relationship between the length of a rope and the number of knots tied in the rope.

a) *By measuring the length of the rope after you tie each knot, investigate the relationship between the number of knots and the length of the rope.*

b) *Express this relationship in a table, a graph, a written description, and an algebraic formula.*

c) *The graph can be drawn as a set of discrete points on a coordinate system. These points lie along a line of best fit and can be connected by a straight line.*

- *What are the slope and intercept of this line?*
- *Interpret the meaning of the slope and intercept with regard to the rope and the knots.*
- *Predict the length of a rope with 10 knots*
- *What is the maximum number of knots that you can tie with your piece of rope?*

2008 LAUSD Secondary Mathematics
Adapted from Discovering Algebra An investigative Approach p 57
Key Curriculum Press, Murdoch, Kamischke & Kamischke

Algebra 1 Unit 2: Tying the knot

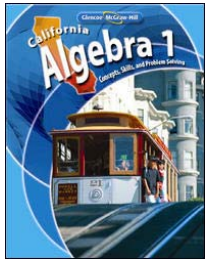
Number of knots tied	Length of rope (cm)
0	
1	
2	
3	
4	
5	
6	

Graph your relationship and draw the line of best fit

Describe in words the approximate relationship between the number of knots tied in the rope and the length of the rope

Write an algebraic formula that describes your line of best fit

Algebra 1: Textbook Connections



Glencoe McGraw-Hill: *Algebra 1 Concepts, Skills, and Problem Solving*

UNIT 2

Topic	Standards	Textbook Sections
Analyze and Graph Linear Equations	3.0 Students solve equations and inequalities involving absolute values **4.0** Students simplify expressions prior to solving linear equations and inequalities in one variable, such as 3(2x-5) + 4(x-2) = 12. **5.0** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable, and provide justification for each step. **6.0** Students graph a linear equation and compute the x and y-intercepts (e.g., graph 2x + 6y = 4). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by 2x + 6y < 4). **7.0** Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations using the point slope formula. 8.0 Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions. **9.0** Students determine the domain of independent variables defined by a graph, a set of ordered pairs, or a symbolic expression. **15.0** Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion	**4.1** Rate of Change and Slope **4.2** Slope and Direct Variation **4.3** Graphing Equations in Slope-Intercept Form **4.4** Writing Equations in Slope-Intercept Form **4.5** Writing Equations in Point-Slope Form ***4.6** Scatter Plots and Lines of Best Fit **4.7** Parallel and Perpendicular Lines
Solve Systems of Linear Equations		**5.1** Graphing Systems of Equations **5.2** Substitution **5.3** Elimination Using Addition and Subtraction **5.4** Elimination Using Multiplication **5.5** Applying Systems of Linear Equations **2.9** Weighted Averages
Solve and Graph Linear Inequalities		**6.1** Solving Inequalities by Addition and Subtraction **6.2** Solving Inequalities by Multiplication and Division **6.3** Solving Multi-Step inequalities **6.4** Solving Compound Inequalities **6.5** Solving Open Sentences Involving Absolute Value **6.6** Solving Inequalities involving Absolute value **6.7** Graphing Inequalities in Two Variables **6.8** Graphing Systems of Inequalities

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools
**To be covered as time permits. While this material is not necessary for CA Algebra 1, it may be very useful in preparing students for the CAHSEE examination, and/or previewing topics in to be covered in Geometry and Algebra 2*

Algebra 1: *Assessment 2 Blueprint*

			Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
	3.0	Students solve equations and inequalities involving absolute values	1	2	
	4.0	Students simplify expressions prior to solving linear equations and inequalities in one variable, such as 3(2x-5) + 4(x-2) = 12.	3	1	
	5.0	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable, and provide justification for each step.	6	3	
	6.0	Students graph a linear equation and compute the x and y-intercepts (e.g., graph 2x + 6y = 4). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by 2x + 6y < 4).	4	2	CR
	7.0	Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations using the point slope formula.	4	3	
	8.0	Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.	1	2	
	9.0	Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.	5	5	
	15.0	Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.	4	2	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Algebra 1: *Unit Concept Organizer*

Polynomials and Quadratic Functions

UNIT 3

Understand Operations on Polynomials

2.0, 10.0

- Perform operations on monomials and polynomials

Understand factoring of Polynomials

11.0, **14.0**

- Factor 2nd degree polynomials over the integers
- Use the zero-product rule and factoring as well as completing the square to solve simple quadratics

Understand and use quadratic functions

14.0, 19.0, 20.0, 21.0, 22.0, **23.0**

- Solve quadratic equations by:
  - Graphing (x-intercepts)
  - Finding square roots
  - Using the quadratic formula
- Relate the graph of a quadratic function to its related quadratic equation
- Solve application problems using the above techniques

	2.0	**10.0**	11.0	**14.0**	**19.0**	**20.0**	**21.0**	22.0	**23.0**
KEY Standards - #CST Questions Other Standards - #CST Questions * 1 / 3 : means 1 question every 3 years	4	4	2	3	2	3	3	1	3
CONCEPT LESSON: BB-Bend it Like Beckham MM-Martian Math SP-S Pattern QQ-Quadratic Quandry TL-Trading Land		MM TL	MM TL				BB QQ		BB SP

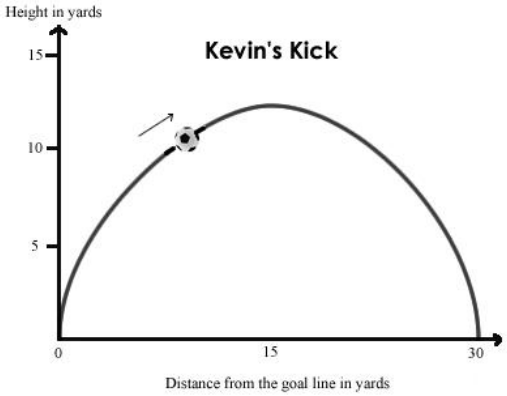
Bend it like Beckham

Andre, Juana, Kevin and Emiko go to a soccer day at the L.A. Galaxy's training field at the Home Depot Center. The coach has a computer and video system that can track the height and distance of their kicks. All four soccer players are practicing up-field kicks, away from the goal.

Andre goes first and takes a kick starting 12 yards out from goal. His kick reaches a maximum height of 17 yards and lands 48 yards from the goal.

Juana goes next and the computer gives the equation of the path of her kick as $y = -x^2 + 14x - 24$, where y is the height of the ball in yards and x is the horizontal distance of the ball from the goal line in yards.

After Kevin takes his kick, the coach gives him a printout of the path of the ball:



Finally Emiko takes her kick but the computer has a problem and can only give her a partial table of data points of the ball's trajectory.

Emiko's table

Distance from the goal line in yards	10	11	12	13	14	15	16	17	18	19	20
Height in yards	0	4.7	8.75	12.2	15	17.2	18.75	19.7	20	19.7	18.75

The computer is still not working but Andre, Juana, Kevin and Emiko want to know who made the best kick.

Help them decide by using what you know to find: (a) Whose kick went the highest? (b) Whose kick went the longest? Be prepared to explain your answer and support your reasoning.

Martian Math: Distributing

Part A: *Zeb is a Martian visiting Earth.*
Scientists have deciphered some of the Martian symbols and we know that:

Martian Number	Earth Meaning
	One
	Ten
	One hundred

You and your team must figure out how the Martians use their number system to do multiplication.

1. *Explore the multiplication*  *times* 

****Note: You must use the Martian symbols for <u>every part</u> of your process, including your answer.***

Exploration: (Use extra paper if necessary)

2. *Write up a detailed* ***<u>step-by-step</u>*** *explanation of the multiplication process you developed with your team in part 1.*

Explanation: (Use extra paper if necessary)

CA 10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
CA 11.0 Students apply basic factoring techniques to second-and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.

Martian Math: Distributing

3. *Now* ***only*** *using the step-by-step process you described in question* ***2*** *do the multiplication* **12** *times* **13** *using our earth numbers.*

4. *Does your process work in this case? Why, or why not?*

5. *Now using the same step-by-step process, multiply* $x + 2$ *times* $x + 3$

CA 10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
CA 11.0 Students apply basic factoring techniques to second-and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.

Martian Math: Generalizing

Part B: *Zeb is trying to figure out how we do math. He needs your help to discover how we multiply binomials like the one below.*

1. *Multiply* $x + a$ *times* $x + b$ *and explain each step of the process you use.*

Your Math: **Your Explanation:**

Answer: $x^2 + (\_\_\_\_\_)x + \_\_\_\_\_$

2. *Without performing the full multiplication, complete the equation below.*

$$(x+4)\bullet(x+3) = x^2 + (\_\_\_\_\_)x + \_\_\_\_\_$$

3. *In your own words, write a general rule for multiplying binomials like* $(x+a)\bullet(x+b)$

General Rule:

CA 10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
CA 11.0 Students apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.

Martian Math: Grouping

Part C: *Zeb is a little confused. He has been trying to understand factoring but he needs your help.*

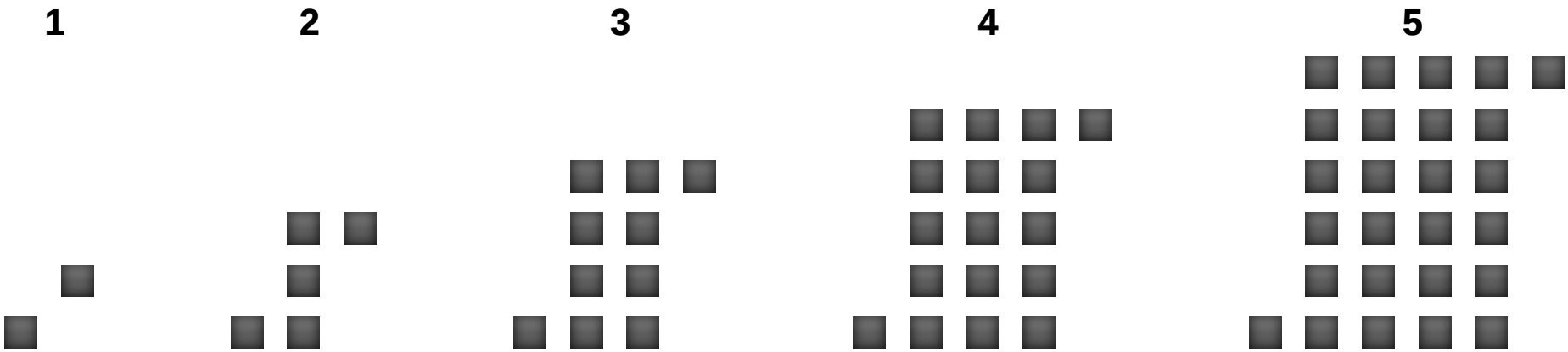
You and your team need to clearly explain each step of the following factorization:

Mathematics	**Your Explanation**
1. $x^2+7x+10$	*Describe how the 7 and the 10 are related to each other*
2. $x^2+5x+2x+10$	*Explain how to get from Step 1 to Step 2*
3. $x(x+5)+2(x+5)$	*Explain how to get from Step2 to Step 3*
4. $(x+5)(x+2)$	*Explain how to get from Step 3 to Step 4*

CA 10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
CA 11.0 Students apply basic factoring techniques to second-and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.

Concept Task

The “S” Pattern

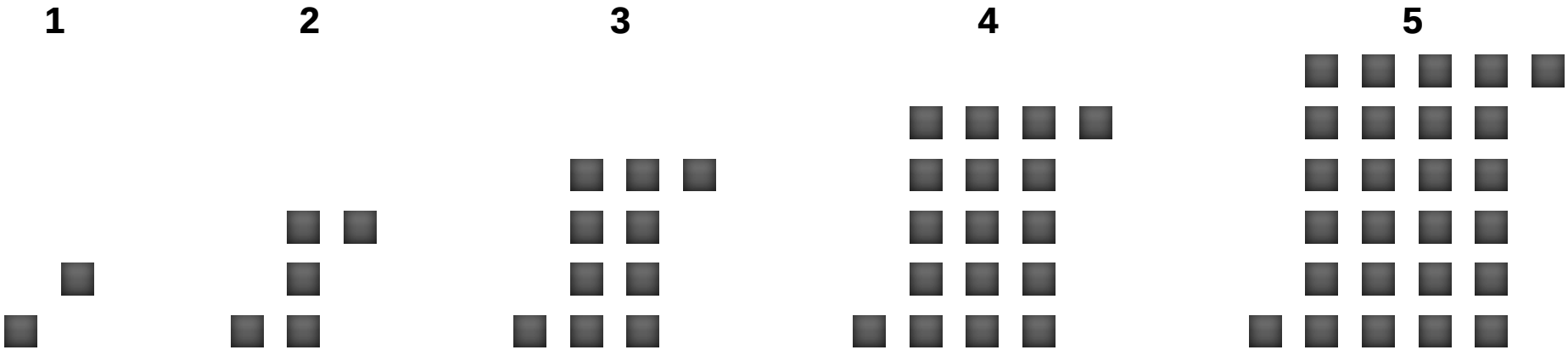


1. Describe the development of this pattern?

2. How many square tiles are in step 7? Write a description that could be used to determine the shape of and total number of square tiles in step 7. Your description should be clear enough so that another person could read it and use it to think about another figure.

3. Determine an expression for the total number of squares in any figure. Explain your rule and show how it relates to the visual diagram shown above.

Also with permission from Smith, Silver and Stein (2005) Using cases to transform mathematics teaching and learning, Vol. 2: Algebra. New York: Teachers College Press. The COMET Project is funded by the National Science Foundation (ESI-9731428). The project is co-directed by Margaret Smith, Edward Silver, and Mary Kay Stein and is housed at the Learning Research and Development Center at the University of Pittsburgh.
Task: “S-Pattern Task” Source: Adapted from Visual Mathematics Course II, Lessons 1-10, published by The Math Learning Center, © 1996 The Math Learning Center



Follow-up

- Find another way to describe the development of the pattern and write the expression that matches that description. Compare the two expressions and show algebraically how one expression is equivalent to the other.

- A figure has 9802 squares tiles in it. Show how you can determine the step number of this figure.

- Does the pattern describe a linear relationship between the step number and the total number of squares? Why or why not?

Also with permission from Smith, Silver and Stein (2005) Using cases to transform mathematics teaching and learning, Vol. 2: Algebra. New York: Teachers College Press. The COMET Project is funded by the National Science Foundation (ESI-9731428). The project is co-directed by Margaret Smith, Edward Silver, and Mary Kay Stein and is housed at the Learning Research and Development Center at the University of Pittsburgh.
Task: "S-Pattern Task" Source: Adapted from Visual Mathematics Course II, Lessons 1-10, published by The Math Learning Center, © 1996 The Math Learning Center

Concept Task

Quadratic Quandary

Two friends, Adam and Alyssa, are members of model rocket clubs at their schools. Each of their schools is having a competition to see whose model rocket can stay in the air the longest. The science teachers in each school have helped the students construct equations that describe the height of the rocket from the ground when it has been launched from the roof of the school.

Following are Adam's and Alyssa's equations:

Adam: $h = -16t^2 + 40t + 56$ where t is measured in seconds and h is measured in feet.

Alyssa: $h = -5t^2 + 15t + 18$ where t is measured in seconds and h is measured in meters.

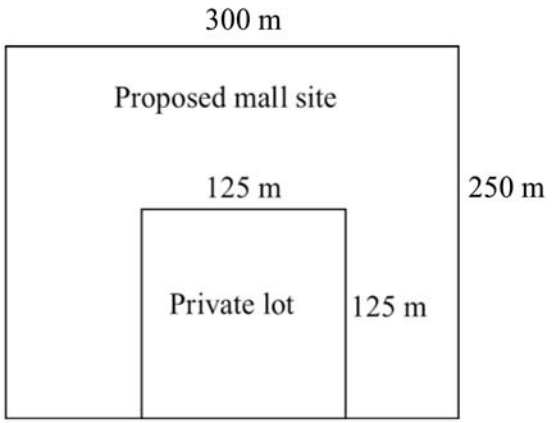
- Use a graph to determine whose rocket stays in the air the longest. Explain how you used the graph to answer the question.
- Explain how to find the x-intercepts of any quadratic function by graphing. In general, what do the x-intercepts of a quadratic function mean? How many x-intercepts can a quadratic function have?

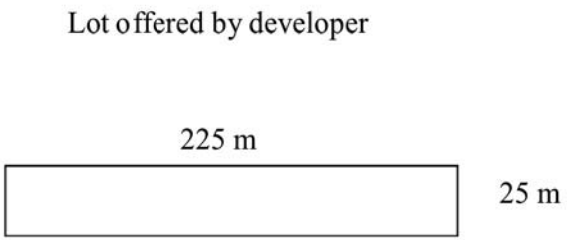
Quadratic Expressions: Trading Land

Your task: In this problem you will explore whether the trade offered will always be fair, sometimes be fair, or never be fair. Read the situation and develop a way to evaluate whether the proposed trade is a fair trade for any side length.

If you gave a friend two $1 dollar bills, and your friend gave you eight quarters, you would consider it a fair trade. If you left you job an hour early one day and worked an hour later the next day, your boss would probably consider it a fair trade. Sometimes, it is not easy to determine whether a trade is fair.

Think about this!
U.S. Mall, Incorporated, wants to build a new shopping center. The mall developer has bought all the land on the proposed site except for one square lot that measures 125 meters on each side. The family that owns the lot is reluctant to sell it. In exchange for the lot, the developer has offered to give the family a rectangular lot that is 100 meters longer on one side and 100 meters shorter on another side than the square lot. Do you think this is a fair trade? Why or why not?

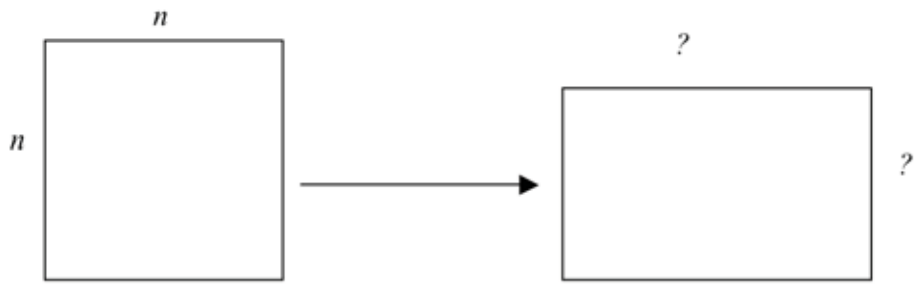




Adapted from Connected Mathematics: Grade 8. Frogs, Fleas, and Painted Cubes; 2.1 Trading Land

Concept Task

Suppose you own a square piece of land with sides *n* meters long. You trade your land for a rectangular lot. The length of you new lot is 2 meters longer than the side length of your original lot, and the width of your new lot is 2 meters shorter than the side length of the original lot.



A. For which side lengths, if any, is this a fair trade? Use pictures, tables, graphs, symbols, and/or words to show how you know whether this is a fair trade for any side length.

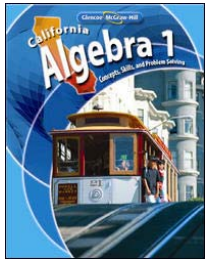
B. Copy and complete the table below.

Original square		New rectangle			Difference in areas (m^2)
Side length (m)	Area (m2	Length (m)	Width (m)	Area (m^2)	
3	9	5	1	5	4
4					
5					
6					
7					

C. For each side length in the table, tell how the area of your new lot compares with the area of the original lot.

D. The side length of the original square lot was *n* meters. For each column in the table, write an expression for the values in the column in terms of *n*. For example, the expression for the area of the original square is n^2.

Algebra 1: Textbook Connections



Glencoe McGraw-Hill: *Algebra 1 Concepts, Skills, and Problem Solving*

UNIT 3

Topic	Standards	Textbook Sections
Operations on Polynomials	**2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents **10.0** Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques. 11.0 Students apply basic factoring techniques to second-and-third degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials. **14.0** Students solve a quadratic equation by factoring or completing the square **19.0** Students know the quadratic formula and are familiar with its proof by completing the square **20.0** Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations. **21.0** Students graph quadratic functions and know that their roots are the x-intercepts 22.0 Students use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points **23.0** Students apply quadratic equations to physical problems such as the motion of an object under the force of gravity.	**7.1** Multiplying Monomials **7.2** Dividing Monomials **7.3** Polynomials **7.4** Adding and Subtracting Polynomials **7.5** Multiplying a Polynomial by a Monomial **7.6** Multiplying Polynomials **7.7** Special Products
Factoring of Polynomials		**8.1** Monomials and Factoring **8.2** Factoring Using the Distributive Property **8.3** Factoring Trinomials: x^2+bx+c **8.4** Factoring Trinomials: ax^2+bx+c **8.5** Factoring Differences of Squares **8.6** Perfect Squares and Factoring
Quadratic Functions		**9.1** Graphing Quadratic Functions **9.2** Solving Quadratic Equations by Graphing **9.3** Solving Quadratic Equations by Completing the Square **9.4** Solving Quadratic Equations by Using the Quadratic Formula ***9.5** Exponential Functions ***9.6** Growth and Decay

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools
**To be covered as time permits. While this material is not necessary for CA Algebra 1, it may be very useful in preparing students for the CAHSEE examination, and/or previewing topics in to be covered in Geometry and Algebra 2*

Algebra 1: *Assessment 3 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
2.0	Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents	4	2	
10.0	Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.	4	3	
11.0	Students apply basic factoring techniques to second-and-third degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.	2	2	
14.0	Students solve a quadratic equation by factoring or completing the square	3	2	
19.0	Students know the quadratic formula and are familiar with its proof by completing the square	2	2	
20.0	Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.	3	3	
21.0	Students graph quadratic functions and know that their roots are the x-intercepts	3	3	
22.0	Students use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points	1	1	
23.0	Students apply quadratic equations to physical problems such as the motion of an object under the force of gravity.	3	2	CR

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Algebra 1: *Unit Concept Organizer*

Rational Expressions and Equations

UNIT 4

Understand Rational Expressions and Equations

2.0, 10.0, 12.0, 13.0, 15.0

- Simplify rational expressions
- Perform arithmetic operations on and with rational expressions
- Solve rational equations
- Solve applications problems using the above techniques

CST

Understand Radical Expressions

2.0, 17.0, **19.0**

- Simplify radical expressions
- Use the rules of exponents to simplify expressions

	2.0	**10.0**	**12.0**	**13.0**	**15.0**	17.0	**19.0**
KEY Standards - #CST Questions Other Standards - #CST Questions * 1/ 2 means 1 question every 2 years	4	4	3	4	4	1	2
CONCEPT LESSON:							

Concept Task

Music Mania

Maria, Ben, and Patrice all received MP3 players as gifts and want to download music from the Internet. They want to find the best possible deal available.

Following are two of the plans they found:

1. Super Songs charges 20 cents per minute for the first 100 minutes of downloaded music and then 10 cents per minute for any additional minutes. (You can download fractional parts of a minute.)

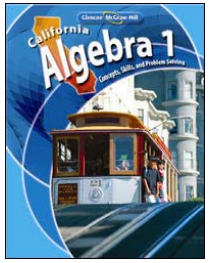
2. Terrific Tunes charges by the number of songs downloaded. The first song costs $10 and each successive song is ¾ of the cost of the previous song.

Represent each of the plans using a table and a graph.

- Do either of the music plans represent a function? Explain why or why not.
- For each plan, what information would you need to know if you wanted to determine the cost?
- For each plan, what are the possible values for the cost?
- Choose the plan that you think is the best deal and justify to Maria, Ben, and Patrice why you chose that plan.

EXTENSION: Represent each plan by writing an equation. Use the equation to determine the domain and range of each.

Algebra 1: Textbook Connections



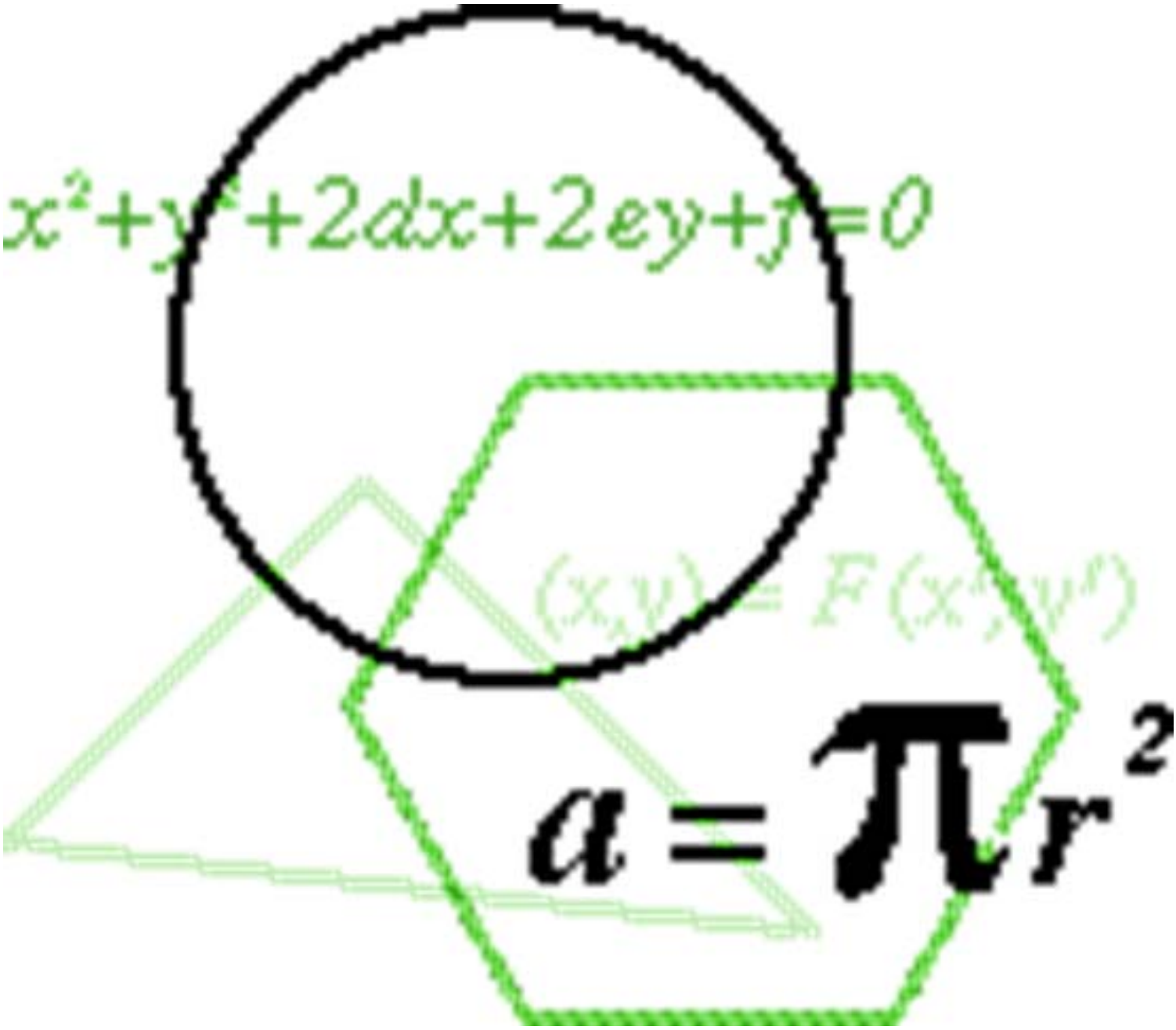
Glencoe McGraw-Hill: *Algebra 1 Concepts, Skills, and Problem Solving*

UNIT 4

Topic	Standards	Textbook Sections
Rational Expressions and Equations	**2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents **10.0** Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques. **12.0** Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.	**11.1** Inverse Variation **11.2** Rational Expressions **11.3** Multiply Rational Expressions **11.4** Dividing Rational Expressions **11.5** Dividing Polynomials **11.6** Rational Expressions with Like Denominators **11.7** Rational Expressions with Unlike Denominators **11.8** Mixed Expressions and Complex Fractions **11.9** Rational Equations and Functions
Radical Expressions	**13.0** Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques. **15.0** Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion	**10.1** Simplifying Radical Expressions **10.2** Operations with Radical Expressions ***10.3** Radical Equations ***10.4** The Pythagorean Theorem ***10.5** The Distance Formula ***10.6** Similar Triangles
Statistics and Probability	17.0 Students determine the domain of independent variables defined by a graph, a set of ordered pairs, or a symbolic expression. **19.0** Students know the quadratic formula and are familiar with its proof by completing the square	***12.1** Sampling Bias ***12.2** Counting Outcomes ***12.3** Permutations and Combinations ***12.4** Probability of Compound Events ***12.5** Probability Distributions ***12.6** Probability Simulations

Standards in bold are key standards as defined by the Mathematics Framework for California Public Schools
**To be covered as time permits. While this material is not necessary for CA Algebra 1, it may be very useful in preparing students for the CAHSEE examination, and/or previewing topics in to be covered in Geometry and Algebra 2*

Geometry



Secondary Mathematics
Instructional Guide
2009-2010

GEOMETRY AB
(Grade 8, 9 or 10)
Prerequisite: Algebra 1AB

310401 Geometry A
310402 Geometry B

COURSE DESCRIPTION
The Geometry skills and concepts developed in this discipline are useful to all students. Aside from learning these skills and concepts, students will develop their ability to construct formal, logical arguments and proofs in geometric settings and problems. Although the curriculum is weighted heavily in favor of plane (synthetic) Euclidean geometry, there is room for placing special emphasis on coordinate geometry and its transformations.

An important point to make to students concerning proofs is that while the written proofs presented in class should serve as models for exposition, *they should in no way be a model of how proofs are discovered.* The perfection of the finished product can easily mislead students into thinking that they must likewise arrive at their proofs with the same apparent ease. Teachers need to make clear to their students that the actual thought process is usually full of false starts and that there are many zigzags between promising leads and dead ends. Only trial and error can lead to a correct proof.
This awareness of the nature of solving mathematical problems might lead to a de-emphasis of the rigid requirements on the writing of two-column proofs.

Development of geometric intuition. The following geometric constructions are recommended to develop students' geometric intuition. (In this context *construction* means "construction with straightedge and compass.") It is understood that all of them will be proved at some time during the course of study. The constructions that students should be able to do are:

Bisecting an angle
Constructing the perpendicular bisector of a line segment
Constructing the perpendicular to a line from a point on the line and from a point not on the line
Duplicating a given angle
Constructing the parallel to a line through a point not on the line
Constructing the circumcircle of a triangle
Dividing a line segment into n equal parts
Constructing the tangent to a circle from a point on the circle
Constructing the tangents to a circle from a point not on the circle
Locating the center of a given circle
Constructing a regular n-gon on a given circle for $n = 3, 4, 5, 6$

Use of technology. The availability of good computer software makes the accurate drawing of geometric figures far easier. Such software can enhance the experience of creating the constructions described previously. In addition, the ease of making accurate drawings encourages the formulation and exploration of geometric conjectures. If students do have access to such software, the potential for a more intense mathematical encounter is certainly there.

COURSE SYLLABUS

The following are recurring standards in each unit of the course:

Geometry 1.0 Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.
Geometry 2.0 Students write geometric proofs, including proofs by contradiction.
Geometry 3.0 Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.
Geometry 16.0 Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.
Geometry 17.0 Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.

Unit 1

Recommended Focus Standards

Geometry 1.0 Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.
Geometry 2.0 Students write geometric proofs, including proofs by contradiction.
Geometry 3.0 Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.
Geometry 7.0 Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.
Geometry 12.0 Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.

Scope and Sequence
This introductory unit helps students develop geometric sense by working through the foundations of geometric reasoning and developing geometric ideas connected to the study of polygons, angles and parallel lines. Students are provided with opportunities to perform constructions relating to these topics such as constructing the line parallel to a given line through a point off the line. Students are given opportunities to use reasoning (inductive and deductive), write proofs and disprove statements using logical arguments.

Unit 2

Recommended Focus Standards:

Geometry 4.0 Students prove basic theorems involving congruence and similarity.
Geometry 7.0 Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.
Geometry 14.0 Students prove the Pythagorean theorem.

Scope and Sequence

The unit begins with the concepts of triangle congruence and similarity. Students then progress to study the properties of quadrilaterals. The unit concludes with the study of the Pythagorean Theorem, specifically its proof. Relevant constructions can be included throughout the unit, such as constructing the circumcircle of a triangle, and students should be given every opportunity to develop logical reasoning skills and mathematical proofs as they apply to each new topic of study. For example, using proof by contradiction to prove conjectures based on the triangle inequality theorem and using coordinate geometry to prove conjectures about triangle congruence or quadrilaterals.

Unit 3

Recommended Focus Standards:

Geometry 8.0 Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.

Geometry 9.0 Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders.

Geometry 10.0 Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.

Geometry 18.0 Students know the definitions of the basic trigonometric functions defined by the angles of a right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x) = \frac{\sin(x)}{\cos(x)}$, and $\sin^2(x) + \cos^2(x) = 1$

Geometry 19.0 Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.

Scope and Sequence

Students study special right triangles and trigonometric ratios. They then progress to a study of area, volume and surface area and investigate how changes in dimension affect perimeter, area and volume. Relevant constructions can be included throughout the unit. Students should be given every opportunity to develop logical reasoning skills and mathematical proofs as they apply to each new topic of study.

Unit 4

Recommended Focus Standards

Geometry 7.0 Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.

Geometry 21.0 Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.

Geometry 22.0 Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translations, and reflections.

Scope and Sequence

Students study the properties of circles and their relationships with lines and polygons. Students also study Transformations, i.e., Rigid motion in the coordinate plane. Relevant constructions can be included throughout the unit; for example, constructing the tangent to a circle from a point not on the circle, and students should be given every opportunity to develop logical reasoning skills and mathematical proofs as they apply to each new topic of study.

REPRESENTATIVE PERFORMANCE OUTCOMES AND SKILLS

In this course, students will know and be able to:

- Identify and give examples of undefined terms, axioms, theorems, inductive and deductive reasoning
- Construct and judge the validity of a logical argument and give counterexamples to disprove a statement
- Write geometric proofs, including proofs by contradiction
- Prove basic theorems involving congruence and similarity
- Prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals and the properties of circles
- Find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems
- Prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles and inscribed and circumscribed polygons of circles
- Prove the Pythagorean Theorem
- Derive and solve problems involving perimeter, circumference, area, volume, lateral area and surface area of common geometric figures
- Computer areas of polygons
- Know the definitions of the basic trigonometric functions defined by the angles of a right triangle, and the elementary relationships between them
- Use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side
- Prove theorems involving coordinate geometry
- Know the effect of rigid motions on figures in the coordinate plane and space

ASSESSMENTS will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments
- Periodic Assessments

TEXTS/MATERIALS

- LAUSD *Secondary Mathematics Instructional Guide*
- Textbook: District approved materials
- Supplemental materials and resources

Developing Geometric Sense

UNIT 1

GEOMETRY

Transitions from previous grades: **C**oordinate Plane. **E**quations of lines parallel and perpendicular to each other and a given line. **S**upplementary, complementary, vertical, and adjacent angles. **N**umber patterns and inductive reasoning. **D**isproving statements using counter examples. **M**idpoints, angle bisectors, and the bisector of a segment. **C**onstruction of the perpendicular bisector of a line segment **U**se of the Pythagorean theorem

Understand the foundations of Geometry

1.0, 16.0, 17.0

- Understand and use basic geometric definitions
- Perform basic constructions
- Solve problems in the coordinate plane using the Distance and Midpoint formulas

Understand parallel lines cut by transversals

7.0, 16.0, 17.0

- Construct the parallel to a line through a point not on the line
- Prove and use properties of parallel lines cut by a transversal
- Construct the perpendicular to a line from a point on the line and from a point not on the line
- Use slope to identify parallel and perpendicular lines in the coordinate plane

Understand polygons and angles

12.0, 13.0**, 16.0**

- Construct the bisector of an angle
- Construct an angle congruent to a given angle
- Solve problems using angle and side measures for triangles and polygons
- Prove relationships between angles in polygons

<u>Logic, Reasoning and Proof</u>: Standards 1.0, 2.0, 3.0

Using axioms, theorems, definitions and examples

Using inductive and deductive reasoning

Proof by contradiction

Constructing geometric proofs, logical arguments and counterexamples

Amazing Amanda

Amanda claims to have an amazing talent.

"Draw any polygon. Don't show it to me. Just tell me the number of sides it has and I can tell you the sum of its interior angles!"

Is Amanda's claim legitimate? Does she really have an amazing gift? Or is it possible for anyone to do the same thing? In this lesson, you will investigate what predictions are possible.

Getting Started: Triangles

1) Is the sum of the interior angles of a triangle the same for every triangle, or is the sum different for different types of triangles (e.g., equilateral, isosceles, scalene?)

2) Complete the table:

Polygon name	# of sides	Sketch	Sum of interior angles
Triangle	3		

Next Step: Investigating Polygons

In your groups investigate the sum of the interior angles of polygons with 4, 5, 6 and 7 sides:

- Divide the workload among group members. Each group member should find the sum of the interior angles of one of the new polygons.
- Use a straight-edge to draw your polygons. *(Hint: Subdivide each polygon into non-overlapping triangles so you can use what you know about the sum of the angle measures of triangles to compute the sum of the interior angles of your polygon.)*

Record your individual result in the table below:

Polygon name	# of sides	Sketch of polygon	# of triangles inside	Sum of interior angles

Now as a group, combine your results on the "group recording sheet" and answer questions 3, 4 and 5 and 6

Group Recording Sheet

Polygon name	Sketch of polygon	# of sides	# of triangles inside	Sum of interior angles
Triangle		3		
		4		
		5		
		6		
		7		

Questions:

3) What patterns do you notice in the table? Use complete sentences in your answer.

4) Is there a relationship between the number of sides of the polygon and the number of triangles inside the polygon? Explain using a complete sentence.

5) Is there a relationship between the number of sides of the polygon and the sum of the interior angles? Explain using a complete sentence

6) If so, **write an algebraic formula** to describe this relationship.

Sum of the interior angles of a polygon with n sides = $\boxed{}$

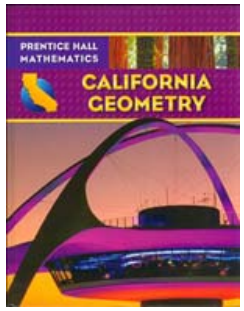
Extension Questions: (Answer in full sentences and explain your reasoning for each question)

7) How many sides does a polygon have if the sum of its interior angles is $1980°$?

8) Is it possible for the sum of the interior angles of a polygon to be $3000°$? If so, how many sides would the polygon have?

9) What is the sum of the interior angles of a polygon with 100 sides?

Geometry: Textbook Connections

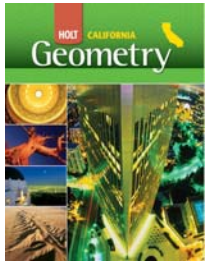


Prentice Hall Mathematics California Geometry

UNIT 1

Topic	Standards	Book Sections
Foundations of Geometry	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**1.3** Points Lines and Planes **1.4** Segments, Rays, Parallel Lines and Planes **1.5** Measuring Segments **1.6** Measuring Angles **1.7** Basic Constructions **1.8** The Coordinate Plane **1.9** Perimeter, Circumference, and Area
Logic, Reasoning and Proof	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning **2.0** Students write geometric proofs, including proofs by contradiction. **3.0** Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	**1.1** Patterns and Inductive Reasoning **2.1** Conditional Statements **2.2** Bi-conditionals and Definitions **2.3** Deductive Reasoning **2.4** Reasoning in Algebra **2.5** Proving Angles Congruent
Parallel Lines cut by a Transversal	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**3.1** Properties of Parallel lines **3.2** Proving Lines Parallel **3.3** Parallel and Perpendicular Lines **3.6** Lines in the Coordinate Plane **3.7** Slopes of parallel and Perpendicular Lines **3.8** Constructing Parallel and Perpendicular Lines
Polygons and Angles	**12.0** Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems. **13.0** Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical. And exterior angles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	**3.4** Parallel lines and the Triangle Sum Theorem **3.5** The Polygon Angle Sum Theorem

Geometry: Textbook Connections

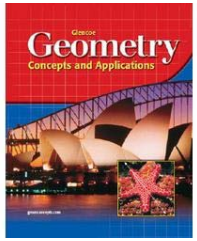


Holt California Geometry

UNIT 1

Topic	Standards	Book Sections
Foundations of Geometry	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**1.1** Points, lines and planes **1.2** Measuring and Constructing Segments **1.3** Measuring and Constructing Angles **1.5** Using Formulas in Geometry **1.6** Midpoints and Distance in the Coordinate Plane
Logic, Reasoning and Proof	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning **2.0** Students write geometric proofs, including proofs by contradiction. **3.0** Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	**2.1** Using inductive reasoning to make conjectures **2.2** Conditional Statements **2.3** Using Deductive Reasoning to Verify Conjectures **2.4** Bi-conditional Statements and Definitions **2.5** Algebraic Proof **2.6** Geometric Proofs **2.7** Flowchart and Paragraph Proofs
Parallel Lines cut by a Transversal	**7.**0 Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**3.1** Lines and Angles **3.2** Angles Formed by Parallel Lines and Transversals **3.3** Proving lines Parallel **3.4** Perpendicular Lines **3.5** Slopes of Lines **3.6** Lines in the Coordinate Plane
Polygons and Angles	**12.0** Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems. **13.0** Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical. And exterior angles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	**1.4** Pairs of Angles **4.1** Classifying Triangles **4.2** Angle Relationships in Triangles **6.1** Properties and Attributes of Polygons

Geometry: Textbook Connections

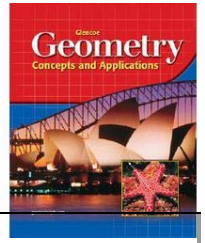


Glencoe Geometry Concepts and Applications (California Edition)

UNIT 1

Topic	Standards	Book Sections
Foundations of Geometry	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**1.1** Patterns and Inductive Reasoning **1.2** Points Lines and Planes **1.3** Postulates **1.4** Conditional Statements and their Converses **1.5** Tools of the trade **1.6** A Plan for Problem Solving **2.1** Real Numbers and Number Lines **2.2** Segments and Properties of Real Numbers **2.3** Congruent Segments **2.4** The Coordinate Plane **2.5** Midpoints **6.7** Distance on the Coordinate Plane **3.1** Angles **3.2** Angle Measure **3.3** The Angle Addition Postulate **3.4** Adjacent Angles and Linear pairs of Angles **3.5** Complementary and Supplementary Angles **3.6** Congruent Angles **3.7** Perpendicular lines **4.1** Parallel Lines and Planes **4.2** Parallel Lines and Transversals **4.3** Transversals and Corresponding Angles **4.4** Proving Lines Parallel (Must Include Q24 on page 167 to cover the Parallel Postulate) **4.5** Slope
Logic, Reasoning and Proof	**1.0** Students demonstrate understanding by identifying and giving examples of undefined terms, axioms and theorems, and inductive and deductive reasoning **2.0** Students write geometric proofs, including proofs by contradiction. **3.0** Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	
Parallel Lines cut by a Transversal	**7.**0 Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	

Geometry: Textbook Connections



Glencoe Geometry Concepts and Applications (California Edition)

Polygons and Angles	**12.0** Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems. **13.0** Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical. And exterior angles. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	**4.6** Equations of Lines **7.2** Exterior Angle Theorem **10.1** Naming Polygons **10.2** Diagonals and Angle Measure **15.1** Logic and Truth Tables **15.2** Deductive Reasoning **15.3** Paragraph Proofs (Example 2 on p645 and Q3, 4 and 5 on page 646) **15.4** Preparing for Two-Column Proofs **CH 15** Investigation, Indirect Proofs (Investigate Parts a, b and c on page 666) *(Note: The construction of a line perpendicular to a given line through a point not on the line is not covered by this text)*

Geometry: *Assessment 1 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
1.0	Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.	2	2	
2.0	Students write geometric proofs, including proofs by contradiction.	3	3	
3.0	Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	4	2	
7.0	Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.	5 2/3*	3	
12.0	Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.	5	5	1
13.0	Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical, and exterior angles.	2	2	
16.0	Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	4	2	
17.0	Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.	3	1	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Triangles and Quadrilaterals

UNIT 2

GEOMETRY

Transitions from previous grades: **S**imilarity and congruence of common geometric figures using the coordinate system **U**se of the Pythagorean Theorem and its converse to find the length of the missing side of a right triangle **R**atios and proportions **R**oots and radicals **S**imple properties of common quadrilaterals and triangles **C**onstruction of congruent triangles

Understand triangle congruency and similarity

4.0, 5.0, 6.0, **16.0**, **17.0**

Understand the properties of quadrilaterals

7.0, 17.0

Understand the proof and use of the Pythagorean Theorem

14.0, 15.0

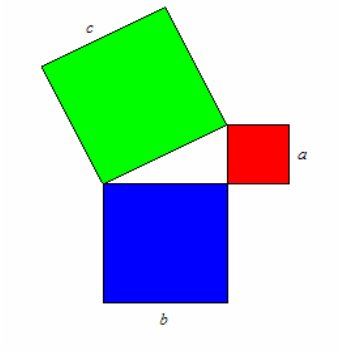
Standards 1.0, 2.0, 3.0
Using axioms, theorems, definitions and examples
Using inductive and deductive reasoning
Proof by contradiction
Constructing geometric proofs, logical arguments and counterexamples

- Prove congruence and similarity of triangles
- Coordinate proofs involving triangles
- Properties of segments of triangles
- Apply ratios and proportions to solving problems
- Use the triangle inequality theorem
- Construct the circumcircle of a triangle

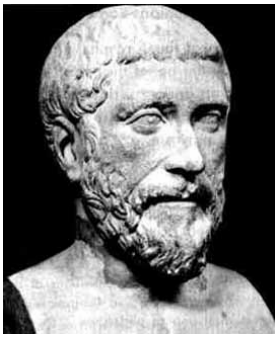
- Prove and use properties of quadrilaterals (including proofs and problems using coordinates)
- Categorize quadrilaterals based on properties

- Prove the Pythagorean Theorem
- Use the Pythagorean Theorem to find missing sides and distance

Squaring Triangles



The picture on the right illustrates a famous mathematical relationship between the areas of the squares on the sides of a right triangle, the **Pythagorean Theorem**.



Although it is named after Pythagoras, a Greek mathematician who lived in the 6th century B.C., there is evidence that other ancient cultures, including the Chinese, Egyptians, Babylonians, and African societies, also knew about and used this relationship.

There are more than 300 different proofs of this theorem. In this lesson, you will reconstruct one of the best known proofs.

Group Activity:

Getting Started: the Pythagorean Theorem

- Individually, write down everything you know about the Pythagorean Theorem.
- Create a combined group list.
- Select one person to be the recorder.
- Group members take turns telling one thing they wrote down and how they know it is true.
- The recorder writes down only the statements that all the group members agree are true.
- Continue until all group members' ideas have been discussed.

Record what you know about the Pythagorean Theorem in this box:

Investigation 1: Proving the Pythagorean Theorem

Consider the right triangle with legs **a** and **b**, and hypotenuse **c** in *figure 1*. You may assume that all of the triangles in figures 1, 2 and 3 are congruent.

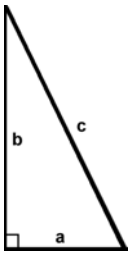


figure 1

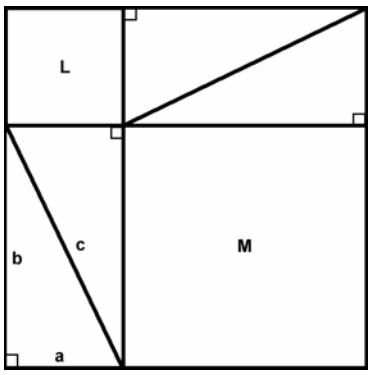


figure 2

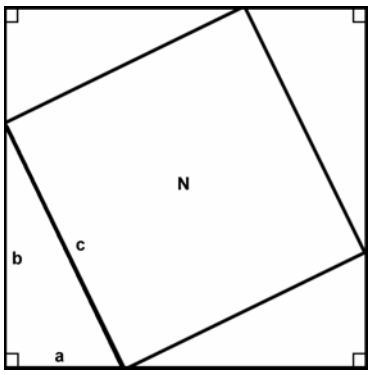


figure 3

It is your job to explain how these figures can be used to construct a geometric proof of the Pythagorean Theorem. Work **in pairs** to answer the questions below.

1) Look closely at *figure 2:*
   - What type of shape is shape L?
     - Explain why you know this is true.
     - What is the area of L?
   - What type of shape is shape M?
     - Explain why you know this is true.
     - What is the area of M?

2) Look closely at *figure 3:*
   - What type of shape is shape N?
     - Explain why you know this is true.
     - What is the area of N?

3) i. How many triangles are in *figure 2?*

   ii. How many triangles are in *figure 3?*

4) Compare your results for parts 1, 2 and 3. What conclusions can you make?

Group Activity

Writing a Proof: The Pythagorean Theorem

Compare your answers to questions 1 through 4 with everybody in your group.
Together, use the information you've gathered to explain why the Pythagorean Theorem is true.
(Note: you do **not** need to use a 2-column proof)

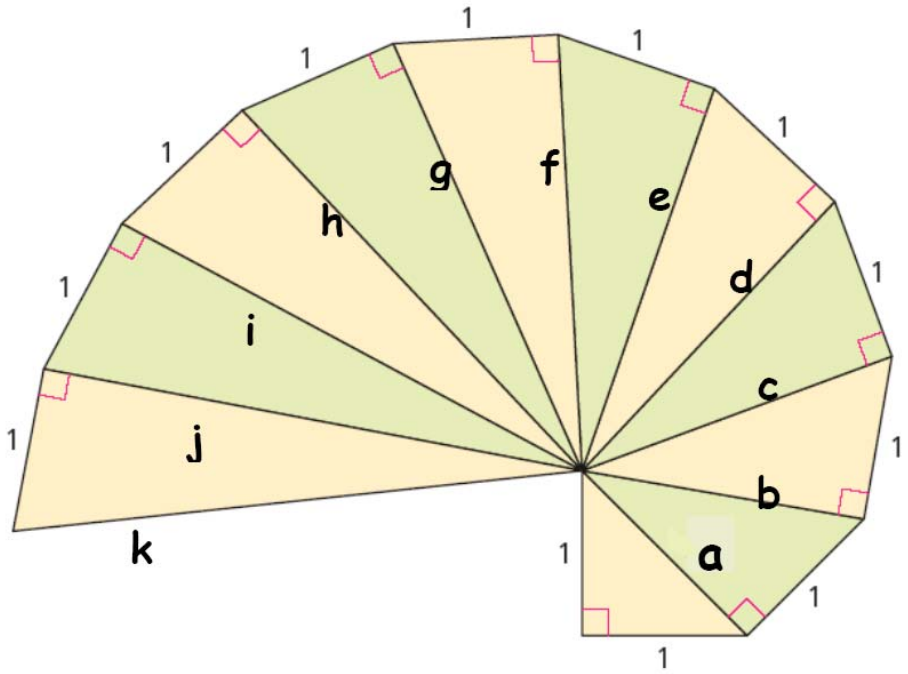
Extension Activity: Homework

Using the Pythagorean Theorem

You know from your prior work that it is not possible to represent irrational numbers precisely as either terminating or repeating decimals.

Surprisingly, however, it is possible to construct line segments that have lengths that are irrational numbers.

1. Find the lengths of segments **a** through **k** and write them on the diagram.



2. What pattern do you notice in the lengths of the hypotenuses of the right triangles?

- What is the length of the hypotenuse of the 20th triangle?
- The 100th triangle?
- The nth triangle?

3. How could you use this method to locate √2 on a number line?

- √3?
- √5?
- The square root of any number that is not a perfect square?

Geometry: The Bermuda Triangle

Concept Task: *Coordinate Geometry*

*The **Bermuda Triangle** is a region of the northwestern Atlantic Ocean in which a number of aircraft and ships have disappeared. Some people have claimed that these disappearances are due to the paranormal, a suspension of the laws of physics, or activity by extraterrestrial beings. However, most official agencies state that this area is just as safe as any other. The triangle stretches from Miami (80° W, 24° N) to Bermuda (64° W, 32° N) and Puerto Rico (66° W, 18° N).*

Jamal is going with his family on a ship from Miami to Bermuda, while at the same time Carla is traveling with her family from Miami to Puerto Rico. Jamal and Carla talk on their cell phones after two days and find that they are both halfway to their destinations.

a) With your group, use the grid provided to draw a map of the Bermuda Triangle, clearly labeling Miami, Bermuda and Puerto Rico and their coordinates.

b) What are the coordinates of each ship when Jamal talks to Carla? Explain how you found your answer.

Coordinates of Jamal's Ship: (,) **Coordinates of Carla's ship: (,)**
Explanation:

c) How far has each ship traveled? Explain how you found your answer.

Distance Jamal's Ship has traveled: _____ **Distance Carla's ship has traveled: _____**
Explanation:

d) The distance you calculated above is measured in "degrees". If each degree is equal to 60 miles, how many miles has Carla's ship traveled?

e) How far apart are the two ships when Jamal talks to Carla?
f) How far apart will the two ships be at the end of their journeys?
g) What do you notice about your answers to part e) and f)? Provide an explanation.

Explanation:

CA Standard Geometry 17.0 Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.

Geometry: The Bermuda Triangle

Concept Task: *Coordinate Geometry*

At the same time that Jamal talks to Carla, an Unidentified Flying Object is spotted hovering just above the sea at a point exactly halfway between Bermuda and Puerto Rico.

a) What are the coordinates of the UFO? **Coordinates: (,)**

On your group's graph, label Jamal's ship (when he talks to Carla) as point **A**, Carla's ship (when she talks to Jamal) as point **B**, Puerto Rico as point **C**, and the UFO as point **D**.

b) What is the shape defined by the points **ABCD**?

Shape ABCD:

c) Using coordinates, algebraically prove your conjecture from part b).

Algebraic proof of part (b):

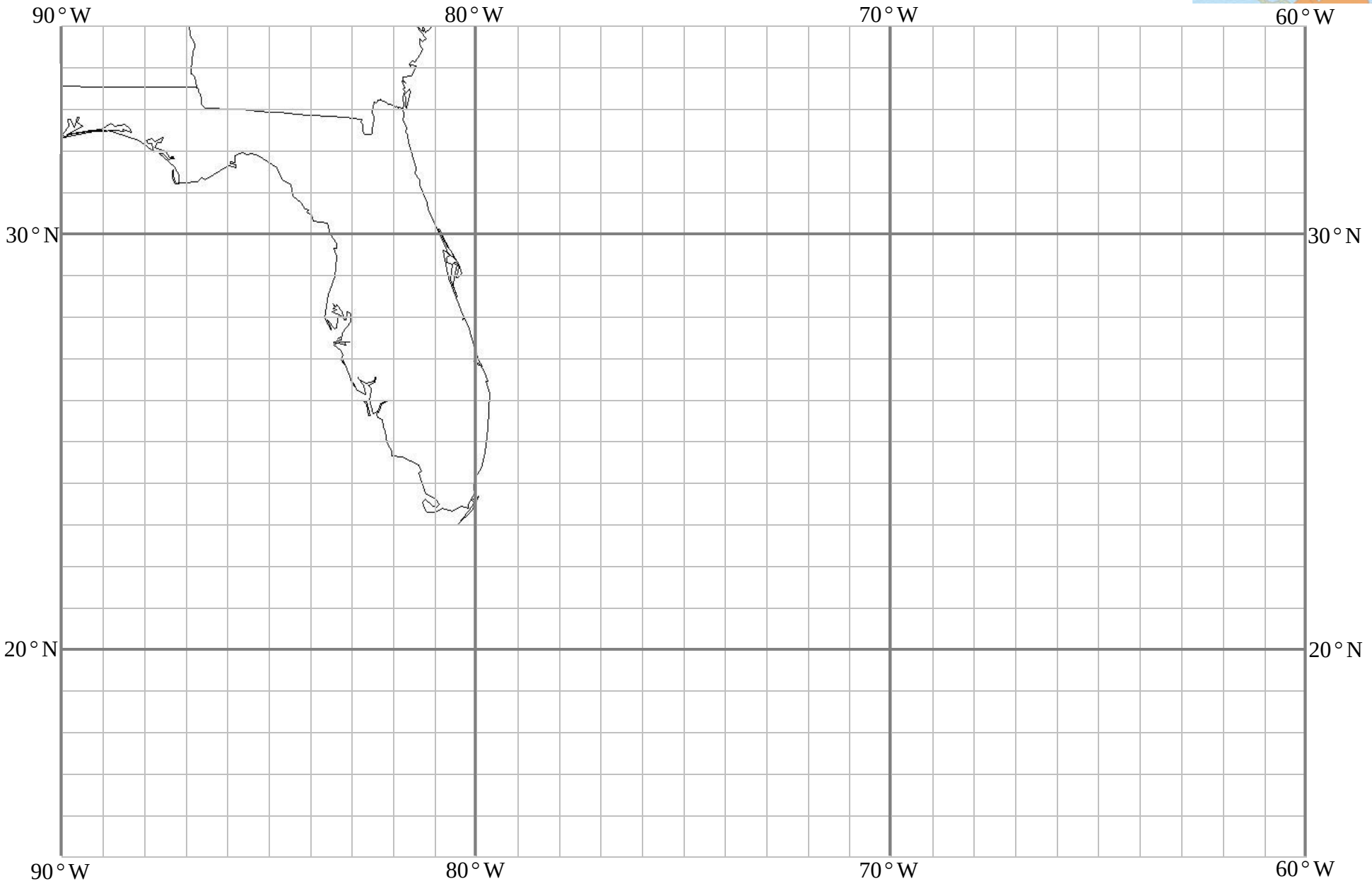
d) Provide a geometric justification for part b)

Geometric justification:

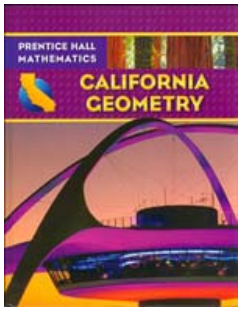
CA Standard Geometry 17.0 Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.

Geometry: The Bermuda Triangle

Concept Task: *Coordinate Geometry*



Geometry: Textbook Connections

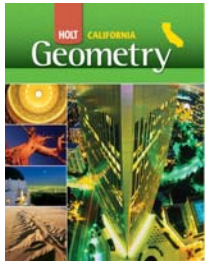


Prentice Hall Mathematics California Geometry

UNIT 2

Topic	Standards	Book Sections
Triangle Congruency and Similarity	**2.0** Students write geometric proofs, including proofs by contradiction. **4.0** Students prove basic theorems involving congruence and similarity **5.0** Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles. **6.0** Students know and are able to use the triangle inequality theorem. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**4.1** Congruent Figures **4.2** Triangle Congruence by SSS and SAS **4.3** Triangle Congruence by ASA and AAS **4.4** Using CPCTC **4.5** Isosceles and Equilateral Triangles **4.6** Congruence in Right Triangles **4.7** Using CPCTC **5.1** Midsegments of a Triangle **5.2** Bisectors in Triangles **5.3** Concurrent Lines, Medians and Altitudes **5.4** Inverses, Contrapositives and Indirect Reasoning **5.5** Inequalities in Triangles **7.1** Ratios and Proportions **7.2** Similar Polygons **7.3** Proving Triangles Similar **7.4** Similarity in Right Triangles **7.5** Proportions in Triangles *(Note: The construction of a circumcircle is not covered by this text)*
Properties of Quadrilaterals	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**6.1** Classifying in Quadrilaterals **6.2** Properties of Parallelograms **6.3** Proving that a Quadrilateral is a parallelogram **6.4** Special Parallelograms **6.5** Trapezoids and Kites **6.6** Placing Figures on the Coordinate Plane **6.7** Proofs Using Coordinate Geometry
Proof and Use of the Pythagorean theorem	**14.0** Students prove the Pythagorean Theorem **15.0** Students use the Pythagorean Theorem to determine distance and find missing lengths of sides of right triangles.	**8.1** The Pythagorean Theorem (Including page 416 on proof of the Pythagorean Theorem and page 431 Activity #1)

Geometry: Textbook Connections

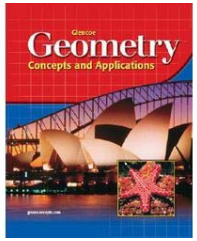


Holt California Geometry

UNIT 2

Topic	Standards	Book Sections
Triangle Congruency and Similarity	**2.0** Students write geometric proofs, including proofs by contradiction. **4.0** Students prove basic theorems involving congruence and similarity **5.0** Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles. **6.0** Students know and are able to use the triangle inequality theorem. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**4.3** Congruent Triangles **4.4** Triangle Congruence: SSS and SAS **4.5** Triangle Congruence: ASA, AAS and HL **4.6** Triangle Congruence: CPCTC **4.7** Introduction to Coordinate Proof **4.8** Isosceles and Equilateral Triangles **5.1** Perpendicular and Angle Bisectors **5.2** Bisectors of Triangles **5.3** Medians and Altitudes of triangles **5.4** The Triangle Mid-segment Theorem **5.5** Indirect Proof and Inequalities in One Triangle **7.1** Ratio and Proportion **7.2** Ratios in Similar Polygons **7.3** Triangle Similarity: AA, SSS, SAS **7.4** Applying Properties of Similar Triangles **7.5** Using Proportional Relationships
Properties of Quadrilaterals	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**6.2** Properties of Parallelograms **6.3** Conditions for Parallelograms **6.4** Properties for Special Parallelograms **6.5** Conditions for Special Parallelograms **6.6** Properties of Kites and Trapezoids
Proof and Use of the Pythagorean theorem	**14.0** Students prove the Pythagorean Theorem **15.0** Students use the Pythagorean Theorem to determine distance and find missing lengths of sides of right triangles.	**LAB** Hands on Proof of the Pythagorean Theorem (Page 348) **5.7** The Pythagorean Theorem

Geometry: Textbook Connections

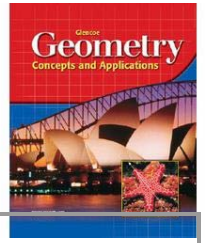


Glencoe Geometry Concepts and Applications (California Edition)

UNIT 2

Topic	Standards	Book Sections
Triangle Congruency and Similarity	**2.0** Students write geometric proofs, including proofs by contradiction. **4.0** Students prove basic theorems involving congruence and similarity **5.0** Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles. **6.0** Students know and are able to use the triangle inequality theorem. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**5.4** Congruent Triangles **5.5** SSS and SAS **5.6** ASA and AAS **6.1** Medians **6.2** Altitudes and Perpendicular bisectors **6.3** Angle Bisectors of Triangles **6.4** Isosceles Triangles **6.5** Right Triangles **7.1** Segments, Angles and Inequalities **7.3** Inequalities Within a Triangle **7.4** Triangle Inequality Theorem **9.1** Using Ratios and Proportions **9.2** Similar Polygons **9.3** Similar Triangles **9.4** Proportional Parts and Triangles **9.5** Triangles and Parallel Lines **9.6** Proportional Parts and Parallel Lines **15.3** Paragraph Proofs (Example 1 on page 645 and Q6, 7, 8, 9, 10, 11 on page 646 and 647) **15.4** Preparing for Two-Column Proofs (Q11 on page 653) **15.5** Two-Column Proofs (Exercises 1, 3, 4, 6, 7, 10 on page 656, 657 and 658) **15.6** Coordinate Proofs (Exercises 12, 13, 14, 17, 19 on page 664) **CH 15** Investigation, Indirect Proofs (Investigate Part h and Q2 on page 667)

Geometry: Textbook Connections



Glencoe Geometry Concepts and Applications (California Edition)

Properties of Quadrilaterals	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles	**8.1** Quadrilaterals **8.2** Parallelograms **8.3** Tests for Parallelograms **8.4** Rectangles, Rhombi and Squares **8.5** Trapezoids **15.3** Paragraphs Proofs (Q12 on page 647) **15.5** Two-Column Proofs (Example 2 on page 656, Q4, 8 on page 657, Q13, 15, 16 on page 658) **15.6** Coordinate Proofs (Q6, 7, 8, 9 page 663, Q10, 11 15, 16, 18, 21, 22 page 664)
Proof and Use of the Pythagorean theorem	**14.0** Students prove the Pythagorean Theorem **15.0** Students use the Pythagorean Theorem to determine distance and find missing lengths of sides of right triangles.	**6.6** The Pythagorean theorem *(Note: The Proof of the Pythagorean Theorem – CA Standard 14.0 – is not covered by this text)*

Geometry: *Assessment 2 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
1.0	Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.	2	embedded	
2.0	Students write geometric proofs, including proofs by contradiction.	3	embedded	
3.0	Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	4	1	
4.0	Students prove basic theorems involving congruence and similarity.	5	5	
5.0	Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles.	2	3	
6.0	Students know and are able to use the triangle inequality theorem.	1	1	
7.0	Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.	5 2/3*	3	
14.0	Students prove the Pythagorean theorem.	1/3*	0	1
15.0	Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.	2	2	
16.0	Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	4	2	
17.0	Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.	3	3	

**Fractional Values indicate rotated standards (e.g., 1/3 = rotated every three years)*

Trigonometry, Area and Volume

UNIT 3

GEOMETRY

- **Transitions from previous grades:** **A**rea and volume of common geometric figures **U**se of coordinate graphs to plot simple figures, determine related lengths and areas, and determine their image under translations and reflections **R**atios and proportions **A**rea of common geometric figures using the coordinate system **C**ircumference, radius, diameter, and pi

Understand the properties of right triangles and trigonometry

16.0, 17.0, 18.0, 19.0, 20.0

Understand, derive and apply area formulas

8.0, 10.0, 11.0, **17.0**

Understand volume and surface area

9.0, 11.0

Standards 1.0, 2.0, 3.0
Using axioms, theorems, definitions and examples
Using inductive and deductive reasoning
Proof by contradiction
Constructing geometric proofs, logical arguments and counterexamples

- Use special right triangle properties. ($45°, 45°, 90°$ and $30°, 60°, 90°$)
- Know and use trigonometric ratios to solve problems involving right triangles (including right triangles on the coordinate plane)

- Compute area of triangles and quadrilaterals (including figures on the coordinate plane)
- Solve problems involving perimeter and area
- Derive and solve problems involving circumference and area
- Investigate how dimension changes affect perimeter and area

- Solve problems involving surface area
- Solve problems involving volume
- Investigate how dimension changes affect volume and surface area

Geometry: Unit 3 Concept Task

The Chocolate Factory

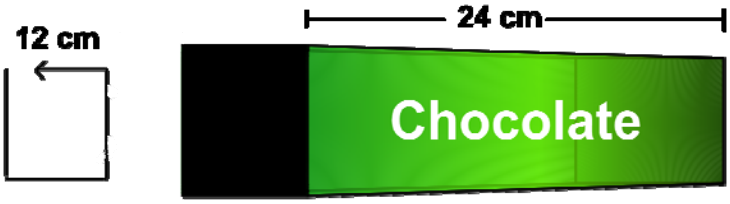
Part A: You and your team are designing a new chocolate bar.

The wrapper for the chocolate bar, not including the ends, is a rectangle measuring 24cm by 12cm like the one in the diagram.

You need to decide between the following three designs:

- A cylinder

- A square prism



- A triangular prism with an equilateral triangle for a base

Question 1: Which design uses the least amount of chocolate? Provide a full mathematical explanation of your answer.

Note: *You can assume that whatever shape you choose will be completely full of chocolate.*

Question 2: Based on your work in Part A, what conclusions can you draw?

CA Geometry Standards: **8.0** Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. **9.0** Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders. **11.0** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

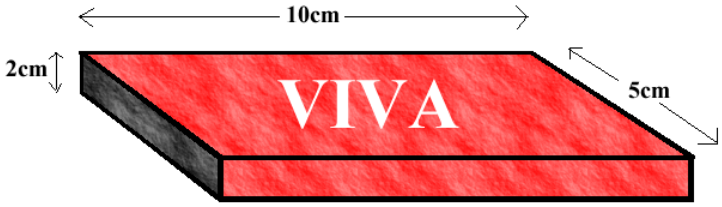
Geometry: Unit 3 Concept Task

The Chocolate Factory

Provide a full mathematical explanation for each question listed below:

Part B: SUPER-SIZE me!

Your chocolate company also sells a chocolate bar called "Viva" that is 10cm long, 5cm wide and 2cm thick.



You have decided to make a **super-size** version of this bar. The Supersize bar will be twice as long, twice as wide, and twice as thick as the viva chocolate bar.

Question 3: How many viva chocolate bars contain the same amount of chocolate as one super-size bar?

Question 4: How many viva chocolate bar wrappers cover the same area as the wrapper of one super-size bar?

Now imagine that a new **super-super-size** bar is going to be three times as long, three times as wide and three times as thick.

Question 5: How many Viva chocolate bars contain the same amount of chocolate as one new super-super-size bar?

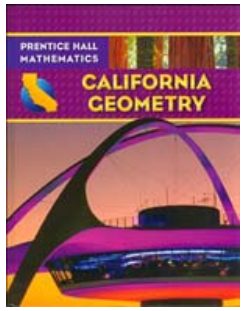
Question 6: How many viva chocolate bar wrappers cover the same area as the wrapper of one super-super-size bar?

Question 7: Based on your work on questions 3, 4, 5, and 6 what conclusions can you draw?

Extension: Using your conclusion from question 7, and without making any volume calculations, predict how many **micro-bars** (half the length, half the width, and half the height) could be made from one Viva chocolate bar.

CA Geometry Standards: **8.0** Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. **9.0** Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders. **11.0** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

Geometry: Textbook Connections

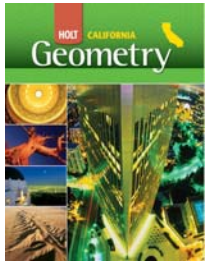


Prentice Hall Mathematics California Geometry

UNIT 3

Topic	Standards	Book Sections
Properties of Right Triangles and Trigonometry	**16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles **18.0** Students know the definitions of the basic trigonometric functions defined by the angles of the right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x)=\sin(x)/\cos(x)$, and $\sin^2 x+\cos^2 x = 1$ **19.0** Students use Trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side. **20.0** Students know and are able to use angle and side relationships in problems with special right triangles, such as 30°, 60°,and 90° triangles and 45°,45°, and 90° triangles.	**8.2** Special Right Triangles **8.3** The Tangent Ratio **8.4** Sine and Cosine Ratio **8.5** Angles of Elevation and Depression
Derive and Apply Area Formulas	**8.0** Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. **10.0** Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangle, rhombi, parallelograms, and trapezoids. **11.0** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	**10.1** Area of Parallelograms and Triangles **10.2** Area of Trapezoids, Rhombi and Kites **10.3** Area of Regular Polygons **10.4** Perimeters and Areas of Similar Figures **10.5** Trigonometry and Area **10.6** Circles and Arcs **10.7** Areas of Circles and Sectors
Volume and Surface Area	**9.0** Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students to memory the formulas for prisms, pyramids and cylinders. **11.0** Students determine how changes in dimensions affect the perimeter ,area, and volume of common geometric figures and solids	**11.1** Space Figures and cross Sections **11.2** Surface Area of Prisms and Cylinders **11.3** Surface Area of Pyramids and Cones **11.4** Volume of Prisms and Cylinders **11.5** Volume of Pyramids and Cones **11.6** Surface Area of Volumes and Spheres **11.7** Areas and Volumes of Similar Solids

Geometry: Textbook Connections

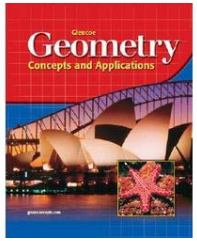


Holt California Geometry

UNIT 3

Topic	Standards	Book Sections
Properties of Right Triangles and Trigonometry	**16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles **18.0** Students know the definitions of the basic trigonometric functions defined by the angles of the right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x)=\sin(x)/\cos(x)$, and $\sin^2 x + \cos^2 x = 1$ **19.0** Students use Trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side. **20.0** Students know and are able to use angle and side relationships in problems with special right triangles, such as 30°, 60°,and 90° triangles and 45°,45°, and 90° triangles.	**5.8** Applying Special Right Triangles **8.1** Explore Trigonometric Ratios **8.2** Trigonometric Ratios **8.3** Solving Right Triangles **8.4** Angles of Elevation and Depression
Derive and Apply Area Formulas	**8.0** Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. **10.0** Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangle, rhombi, parallelograms, and trapezoids. **11.0** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	**9.1** Developing Formulas for Triangles and Quadrilaterals **9.2** Developing Formulas for Circles and Regular Polygons **9.3** Composite Figures **9.4** Perimeter and Area in the Coordinate Plane **9.5** Effects of Changing Dimensions Proportionally
Volume and Surface Area	**9.0** Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students to memory the formulas for prisms, pyramids and cylinders. **11.0** Students determine how changes in dimensions affect the perimeter ,area, and volume of common geometric figures and solids	**10.1** Solid Geometry **10.2** Representations of Three –Dimensional Figures **10.3** Formulas in Three Dimensions **10.4** Surface Area of Prisms and Cylinders **10.5** Surface Area of Pyramids and Cones **10.6** Volume of Prisms and Cylinders **10.7** Volume of Pyramids and Cones **10.8** Spheres

Geometry: Textbook Connections



Glencoe Geometry Concepts and Applications (California Edition)

UNIT 3

Topic	Standards	Book Sections
Properties of Right Triangles and Trigonometry	**16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles **18.0** Students know the definitions of the basic trigonometric functions defined by the angles of the right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x)=\sin(x)/\cos(x)$, and $\sin^2 x+\cos^2 x = 1$ **19.0** Students use Trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side. **20.0** Students know and are able to use angle and side relationships in problems with special right triangles, such as 30°, 60°,and 90° triangles and 45°,45°, and 90° triangles.	**13.1** Simplifying Square Roots **13.2** 45-45-90 Triangles **13.3** 30-60-90 Triangles **13.4** Tangent Ratio **13.5** Sine and Cosine Ratios **15.6** Coordinate Proofs (Q13,17, 20 on page 664)
Derive and Apply Area Formulas	**8.0** Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. **10.0** Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangle, rhombi, parallelograms, and trapezoids. **11.0** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	**9.7** Perimeters and Similarity **10.3** Areas of Polygons **10.4** Area of Triangles and trapezoids **10.5** Areas of Regular Polygons **CH 10** Investigation: How About That Pythagoras! **11.1** Parts of a Circle **11.5** Circumference of a Circle **11.6** Area of a Circle
Volume and Surface Area	**9.0** Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students to memory the formulas for prisms, pyramids and cylinders. **11.0** Students determine how changes in dimensions affect the perimeter ,area, and volume of common geometric figures and solids	**12.1** Solid Figures **12.2** Surface Area of Prisms and Cylinders **12.3** Volume of Prisms and Cylinders **12.4** Surface Area of Pyramids and Cones **12.5** Volume of Pyramids and Cones **12.6** Spheres **12.7** Similarity of Solid Figures

Geometry: *Assessment 3 Blueprint*

		Number of items on the CST	Number of Multiple Choice questions on the Assessment	Number of Constructed Response questions on the Assessment
1.0	Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.	2	Embedded	
2.0	Students write geometric proofs, including proofs by contradiction.	3	Embedded	
3.0	Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	4	1	
8.0	Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.	4	4	
9.0	Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders.	2	2	
10.0	Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.	4	4	
11.0	Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	1	1	1
16.0	Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	4	Embedded	
18.0	Students know the definitions of the basic trigonometric functions defined by the angles of a right triangle. They also know and are able to use elementary relationships between them. For example, $\tan x = \sin x / \cos x$, $\sin^2 x + \cos^2 x = 1$	3	3	
19.0	Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.	3	3	
20.0	Students know and are able to use angle and side relationships in problems with special right triangles, such as 30°, 60°, and 90° triangles and 45°, 45°, and 90° triangles.	1	2	

Circles and Transformations

UNIT 4

GEOMETRY

- **Transitions from previous grades:** **C**ircumference, radius, diameter, and pi **C**oordinate system **U**se of coordinate graphs to plot simple figures, determine related lengths and areas, and determine their image under translations and reflections

Understand the properties of circles

7.0, 16.0, 17.0, 21.0

CST

Understand transformations

22.0

Standards 1.0, 2.0, 3.0
Using axioms, theorems, definitions and examples
Using inductive and deductive reasoning
Proof by contradiction
Constructing geometric proofs, logical arguments and counterexamples

- Prove and solve problems about inscribed angles, chords, secants, tangents, inscribed and circumscribed polygons
- Construct the tangent to a circle from a point on the circle
- Construct the tangents to a circle from a point not on the circle
- Use construction to locate the center of a circle
- Solve problems using the equations and graphs of circles in the coordinate plane

- Rotate, translate, reflect, and stretch figures and objects

LAUSD Geometry Unit 4

AWESOME Amanda

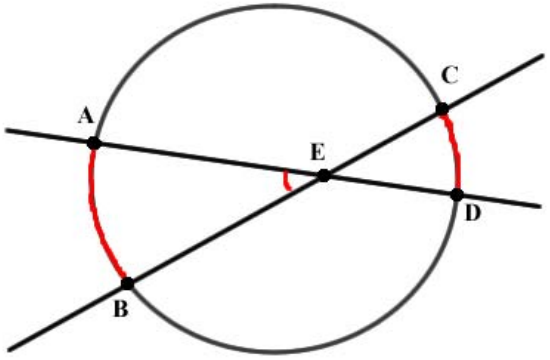
We first met Amanda in Unit 1 where she said "Draw any polygon. Don't show it to me. Just tell me the number of sides it has and I can tell you the sum of its interior angles!" This time Amanda has another awesome talent!

"Given any two lines that intersect inside a circle, I can tell you the sum of the measures of the intercepted arcs, knowing only the angle between the lines"

Investigate Amanda's claim, and find out how she's able to make this prediction.

You will need:

1. Investigation Sheet and Angle Sheet (30°, 45°, 60° or 90°)
2. A paper cup (or Styrofoam cup)
3. A tape measure
4. A marker pen
5. A calculator

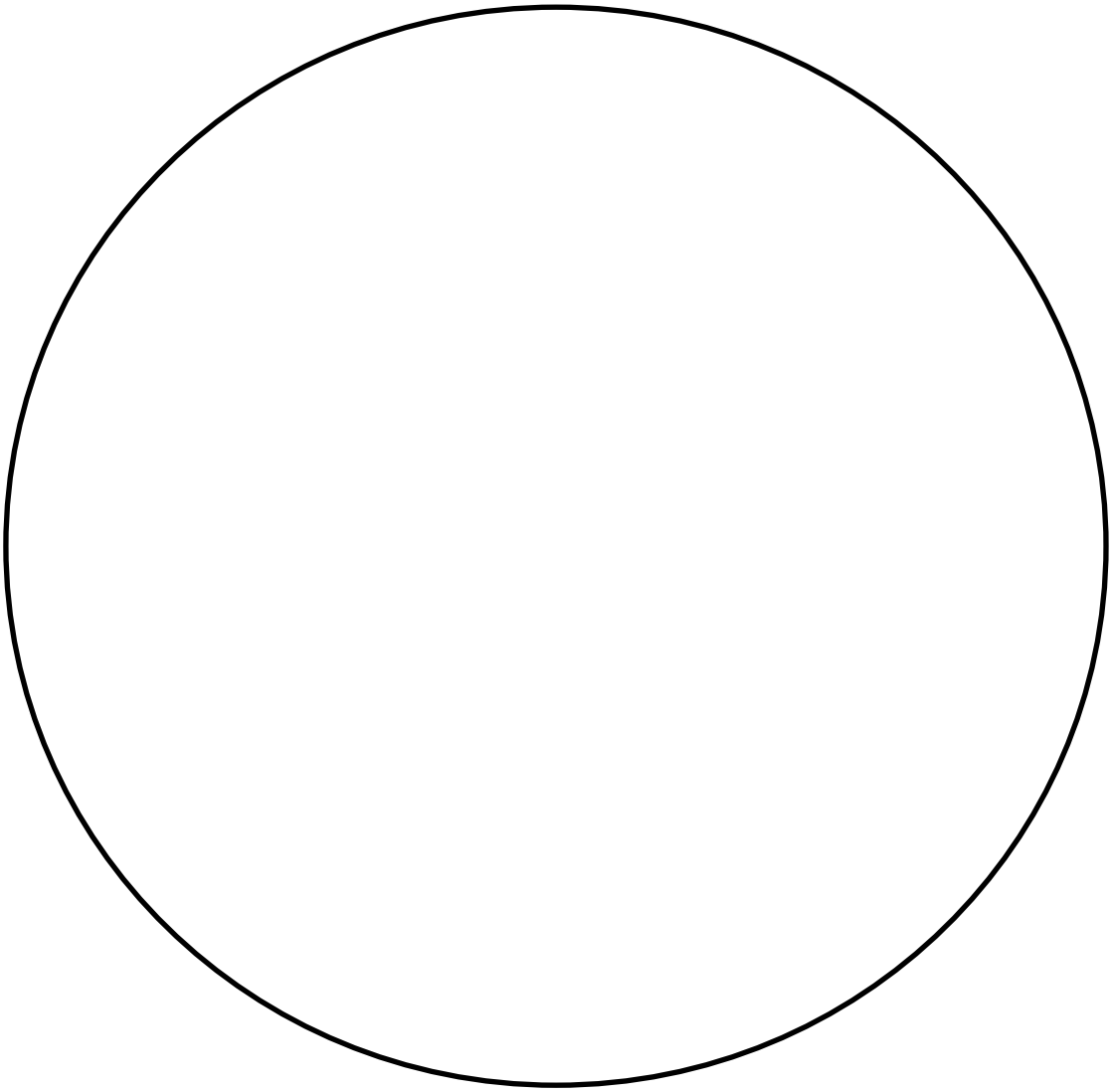


CA STANDARD: 21.0 Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.

Geometry Unit 4: Awesome Amanda

Amanda has another awesome talent:

"Given any two lines that intersect inside a circle, I can tell you the sum of the measures of the intercepted arcs, knowing only the angle between the lines"



Using the circle above draw a diagram that represents Amanda's new claim.

Investigation Sheet

Instructions:

1. Measure the circumference of your cup (in cm) with the tape measure.
2. Place your cup over the intersecting lines, making sure that point *E* is **inside or on** the circle.
3. Using a marker pen or pencil, mark off both of the arcs intercepted by the angle.
4. Measure the lengths of the arcs (in cm) with the tape measure and record the measurement in the table.
5. Convert the arc length (in cm) into arc measure (in degrees) using the formula given below and calculate the sum of the arc measures.
6. Repeat the process 3 more times, each time placing the cup in a **different** position.
7. Once you have completed the table calculate the average value of the Arc Sum (column 5)

Arc 1 Length (cm)	Arc 2 Length (cm)	Arc 1 measure (degrees)	Arc 2 measure (degrees)	Sum of Arc measures (degrees)
		+	=	
		+	=	
		+	=	
		+	=	

The circumference of the cup is _____ cm

Formula: $\text{Arc Measure}° = \dfrac{\text{Arc Length (cm)}}{\text{Circumference (cm)}} \times 360°$

Average **Arc Sum** (Average of column 5) =

AWESOME Amanda (Reflection Sheet)

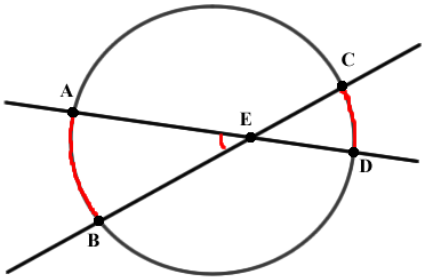
After you and your partner have completed your investigation sheet, record your average value on the class chart. Examine the class data before answering the following questions.

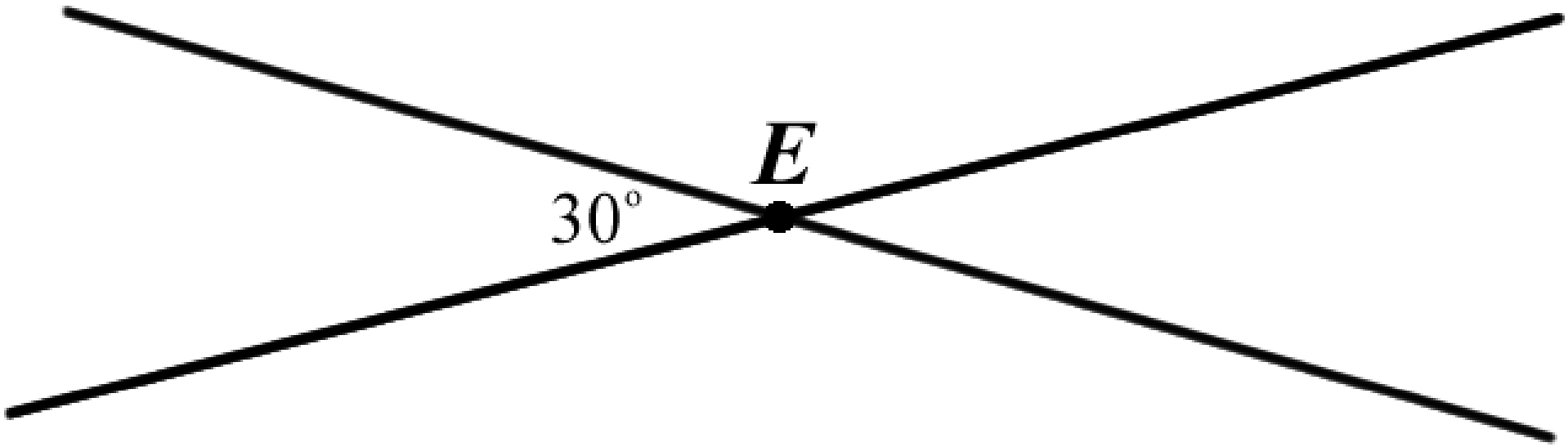
1. With your partner discuss any patterns you notice on the class chart.

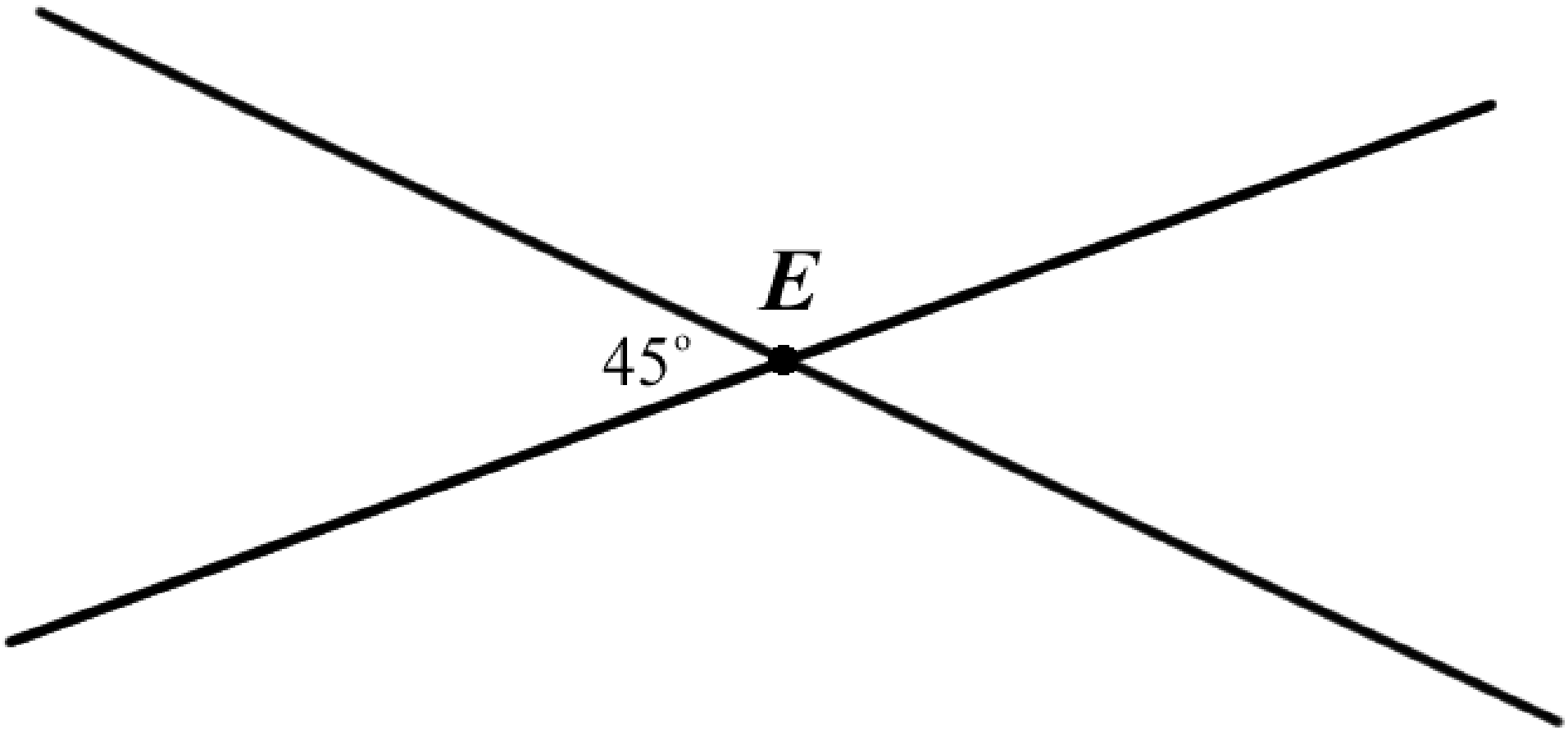
2. In your own words write a rule that summarizes your observations.

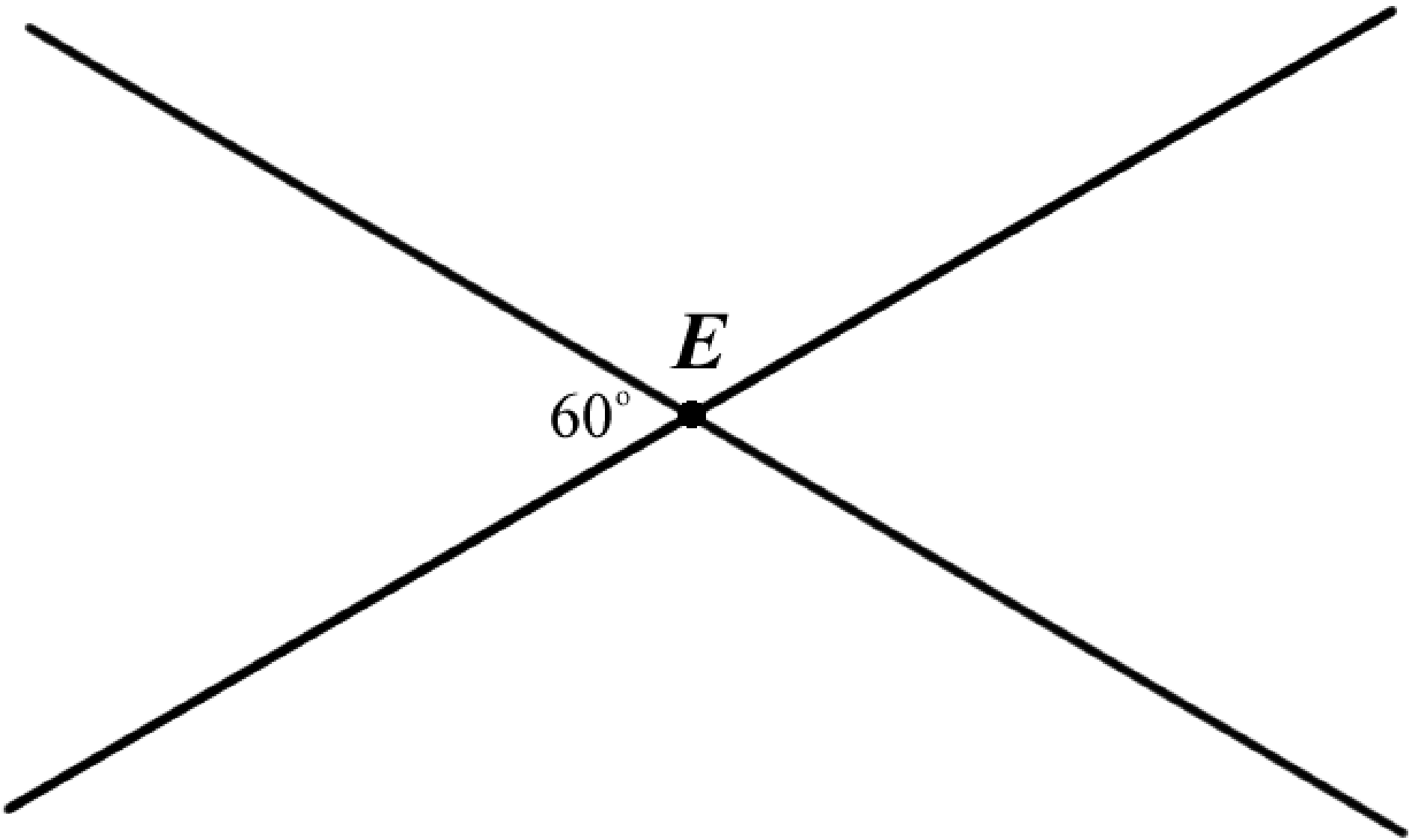
3. Re-write your rule from part 2 using the appropriate mathematical vocabulary.

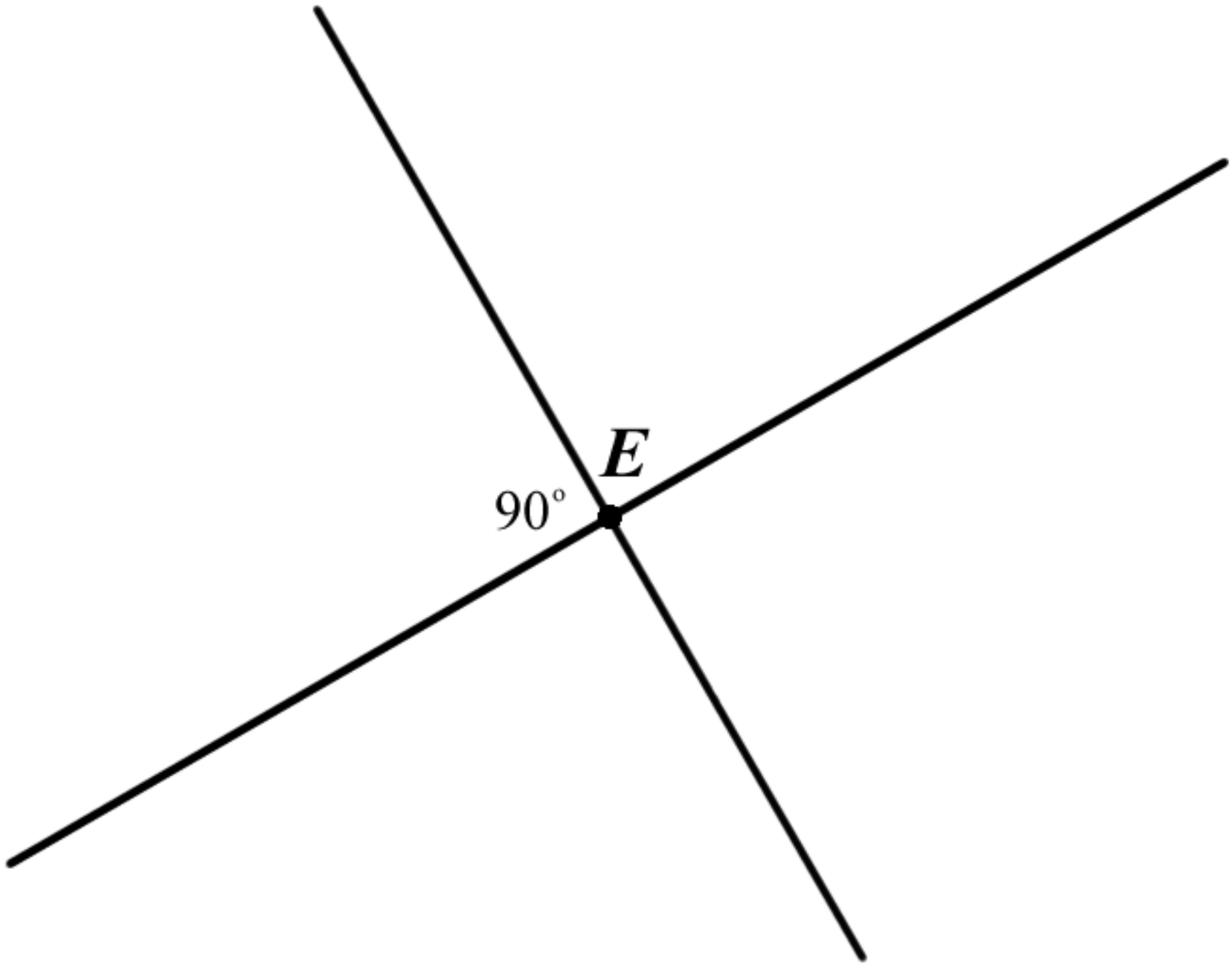
4. Re-write your rule from part 3 as a formula using mathematical symbols.



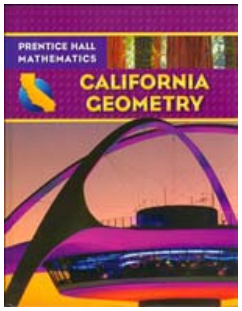

E
30°


E
45°


E
60°


E
90°

Geometry: Textbook Connections

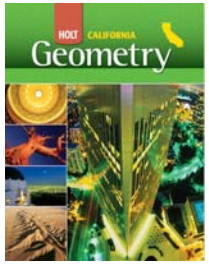


Prentice Hall Mathematics California Geometry

UNIT 4

Topic	Standards	Book Sections
The Properties of Circles	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles. **21.0** Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.	**12.1** Tangent Lines **12.2** Chords and Arcs **12.3** Inscribed Angles **12.4** Angle Measures and Segment Length **12.5** Circles in the Coordinate Plane *(Note: The construction of a tangent to a circle from a given point is not covered by this text)*
Transformations	**22.0** Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translation, and reflections.	**9.1** Translations **9.2** Reflections **9.3** Rotations **9.4** Symmetry **9.5** Dilations **9.6** Composition of Reflections

Geometry: Textbook Connections

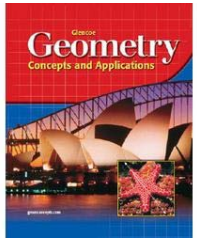


Holt California Geometry

UNIT 4

Topic	Standards	Book Sections
The Properties of Circles	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles. **21.0** Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.	**11.1** Lines that Intersect Circles **11.2** Arcs and Chords **11.3** Sector Area and Arc Length **11.4** Inscribed Angles **11.5** Angle Relationships in Circles **11.6** Segment Relationships in Circles **11.7** Circles in the Coordinate Plane
Transformations	**22.0** Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translation, and reflections.	**1.7** Transformations in the Coordinate Plane **12.1** Reflections **12.2** Translation **12.3** Rotations **12.4** Composition of Transformations **12.5** Symmetry **7.6** Dilations and Similarity in the Coordinate Plane **12.7** Dilations

Geometry: Textbook Connections



Glencoe Geometry Concepts and Applications (California Edition)

UNIT 4

Topic	Standards	Book Sections
The Properties of Circles	**7.0** Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of a circle. **16.0** Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line. **17.0** Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles. **21.0** Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.	**11.2** Arcs and Central Angles **11.3** Arcs and Chords **11.4** Inscribed polygons **14.1** Inscribed Angles **14.2** Tangents to a Circle **14.3** Secant Angles **14.4** Secant-Tangent Angles **14.5** Segment Measures **14.6** Equations of Circles **15.5** Two-Column Proofs (Q11, p658) *(Note: The construction of a tangent to a given circle, and using construction to find the center of a circle are not covered by this text)*
Transformations	**22.0** Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translation, and reflections.	**16.3** Translations **16.4** Reflections **16.5** Rotations **16.6** Dilations

Periodic Assessment Blueprint comparison to CST Blueprint

The table below shows the number of questions per standard on each of the LAUSD Geometry Periodic Assessments and compares this to the number of questions per standard listed on the CST blueprint. Rationales are listed below for each case (except standard 7.0) where there is a discrepancy between the figures)

Standard	Periodic Assessment #1	Periodic Assessment #2	Periodic Assessment #3	Constructed Response	Periodic Assessment Total	CST	Comparison PA to CST
1.0	2	-	-		2	2	=
2.0	3	-	-		3	3	=
3.0	2	1	1		4	4	=
4.0		5			5	5	=
5.0		3			3	2	+1*
6.0		1			1	1	=
7.0	3	3			6	5 2/3	+ 1/3
8.0			4		4	4	=
9.0			2		2	2	=
10.0			4		4	4	=
11.0			1	*****CR3	1	1	=
12.0	5			CR1	5	5	=
13.0	2				2	2	=
14.0		0		*****CR2	0	1/3	- 1/3**
15.0		2			2	2	=
16.0	2	2	-		4	4	=
17.0	1	3			4	3	+1***
18.0			3		3	3	=
19.0			3		3	3	=
20.0			2		2	1	+1****
21.0						5	Unit 4
22.0						3	Unit 4

***Note:** There is an extra question on standard 5.0 to fully cover all three aspects of the standard, triangle congruence, triangle similarity and the concept of corresponding parts of congruent triangles.

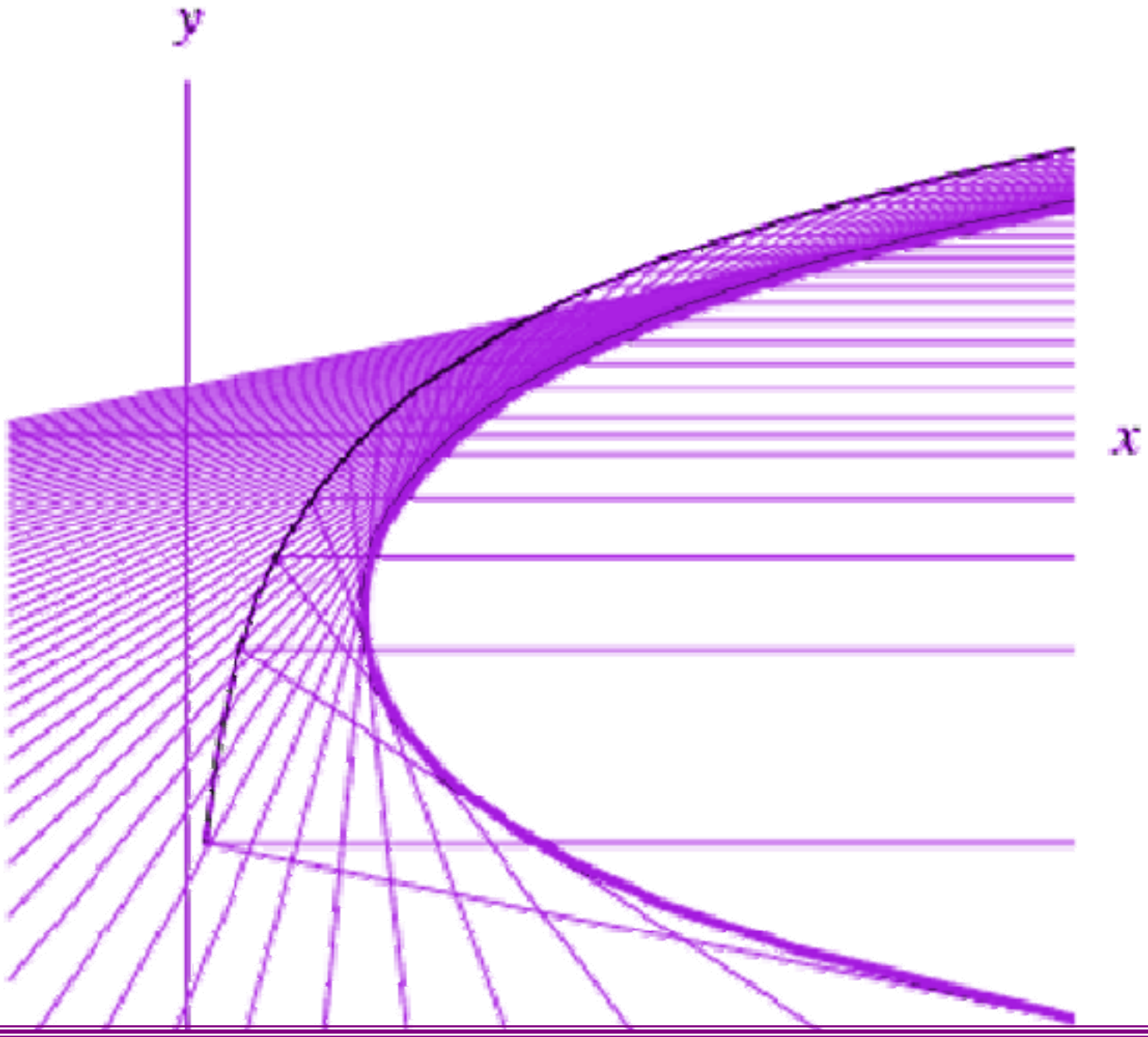
****Note:** Even though there are no multiple choice Periodic Assessment questions covering standard 14.0 (Proof of the Pythagorean Theorem), it is covered by the constructed response on PA 2.

*****Note:** There is an extra question on standard 17.0 (Coordinate Geometry) to cover the foundational concepts of the midpoint/distance formula.

******Note:** There is an extra question on standard 20.0 (Special Right Triangles) in order to cover both cases 30-60-90 and 45-45-90

*******Note:** While the constructed response questions on assessments 2 and 3 nominally address standards that are lightly tested on the CST, they in actuality test a combination of standards but only one of these is listed for data collection purposes.

Algebra 2



Secondary Mathematics
Instructional Guide
2009-2010

ALGEBRA 2AB
(Grade 9, 10 or 11)
Prerequisite: Algebra 1AB or Geometry AB

310303 Algebra 2A
310304 Algebra 2B

COURSE DESCRIPTION

Algebra II expands on the mathematical content of Algebra I and Geometry. There is no single unifying theme. Instead, many new concepts and techniques are introduced that will be basic to more advanced courses in mathematics and the sciences and useful in the workplace. In general terms the emphasis is on abstract thinking skills, the function concept, and the algebraic solution of problems in various content areas. Students who master Algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.

COURSE SYLLABUS

Unit 1

Recommended Focus Standards

Algebra II 1.0 Students solve equations and inequalities involving absolute value.
Algebra II 2.0 Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.
Algebra II 3.0 Students are adept at operations on polynomials, including long division.
Algebra II 4.0 Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.

Scope and Sequence

This introductory unit sets the stage for success in Algebra II by providing a connection with the Algebra I concepts of graphing equations, solving systems of equations and inequalities, and working with polynomials. These concepts are expanded to include work with absolute value problems, work with three variables, specialized factoring and Polynomial long division. Concrete applications of simultaneous linear equations and linear programming to problems in daily life should be bought out, though there is no need to emphasize linear programming at this stage. While it would be inadvisable to advocate the use of graphing calculators all the time, such calculators are helpful for graphing regions in connection with linear programming once students are past the initial stage of learning.

Unit 2

Recommended Focus Standards

Algebra II 5.0 Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane.

Algebra II 6.0 Students add, subtract, multiply, and divide complex numbers.

Algebra II 7.0 Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.

Algebra II 8.0 Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.

Algebra II 9.0 Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as *a, b,* and *c* vary in the equation $y = a(x - b)^2 + c$.

Algebra II 10.0 Students graph quadratic functions and determine the maxima, minima, and zeros of the function.

Scope and Sequence

This unit begins with previously learned concepts; rational expressions and parabolas. However these concepts are expanded upon to include quadratic (and other polynomial) denominators in the case of rational expressions and complex numbers in the case of quadratic equations (i.e. parabolas). From the beginning of the study of complex numbers, it is important to stress the geometric aspect; for example, the addition of two complex numbers can be shown in terms of a parallelogram. And the key difference between real and complex numbers should be pointed out: The complex numbers cannot be linearly ordered in the same way as real numbers are (the real *line*).

Unit 3

Recommended Focus Standards

Algebra II 11.0 Students prove simple laws of logarithms.

11.1 Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

11.2 Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.

Algebra II 12.0 Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.

Algebra II 18.0 Students use fundamental counting principles to compute combinations and permutations.

Algebra II 19.0 Students use combinations and permutations to compute probabilities.

Algebra II 20.0 Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.

Scope and Sequence

The "big ideas" in this unit are exponential and logarithmic functions, combinations and permutations and probability and statistics. While the probability and statistics standards are not listed as Algebra II standards they comprise 8% of the questions on the Algebra II CST examination.

Unit 4

Recommended Focus Standards

Algebra II 15.0 Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true.

Algebra II 23.0 Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.

Scope and Sequence

Standard 15.0 allows teachers to review several topics; rational expressions, radical expressions and logarithmic and exponential functions through the lens of logical reasoning; i.e., is a given statement sometimes true, always true or never true. Other topics covered include; arithmetic and geometric series, conic sections, functional concepts and mathematical induction.

REPRESENTATIVE PERFORMANCE OUTCOMES AND SKILLS

In this course, students will know and be able to:

- Solve equations and inequalities involving absolute value
- Solve systems of linear equations and inequalities in two and three variables
- Demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically
- Add, subtract, multiply and divide complex numbers
- Be adept at operations on polynomials, including long division
- Factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes
- Add, subtract, multiply, divide, reduce and evaluate rational expressions with monomial and polynomial denominators
- Solve and graph quadratic equations
- Demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions
- Graph quadratic functions and determine the maxima, minima, and zeros of the function
- Prove simple laws of logarithms
- Know the laws of fractional exponents and understand exponential functions
- Determine the truth of specific algebraic statements involving rational expressions, radical expressions, or logarithmic or exponential functions
- Derive summation formulae for arithmetic series and for both finite and infinite geometric series.
- Know the binomial theorem and use it to expand binomial expressions
- Use fundamental counting principles to compute combinations and permutations
- Use combinations and permutations to compute probabilities

ASSESSMENTS will include:

- Teacher designed standards-based quizzes and tests
- Projects and group tasks
- Teacher designed formative assessments

TEXTS/MATERIALS

- LAUSD *Secondary Mathematics Instructional Guide*
- Textbook: District approved materials
- Supplemental materials and resources

Algebra 2 Unit 1 *Concept Organizer*

UNIT 1

Linear Functions and Polynomials

Understand absolute value and inequalities

1.0, 2.0

- Solve absolute value equations, inequalities and systems
- Solve systems of linear equations in two or three variables
- Solve and graph systems of linear inequalities

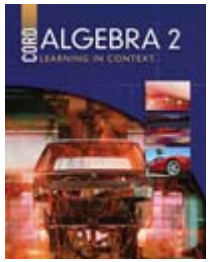
Understand polynomial operations

3.0, 4.0

- Be adept at basic polynomial operations
- Factor polynomials (difference of squares, sum and difference of cubes, perfect square trinomials)
- Perform polynomial long division

Standards	**1.0**	**2.0**	**3.0**	**4.0**
CST	1	5	4	3

Algebra 2: Textbook Connections



***Cord Communications**, Learning in Context*

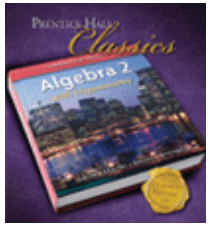
UNIT 1

Topic	Standards	Book Sections
Review from Algebra 1	*Teachers should utilize appropriate review material at the beginning of the course. However, it is **not** anticipated that teachers will necessarily need to cover ALL of the material listed in this review section.*	**1.1** Real Numbers and Properties **1.2** Solving Equations and Inequalities **1.4** Rate of Change and Linear Equations **1.5** Graphing Linear Equations and Inequalities
Absolute Value and Inequalities	***1.0** Students solve equations and inequalities involving absolute value ***2.0** Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.	**1.3** Absolute Value Equations and Inequalities **2.1** Solving Systems of Equations by Graphing **2.2** Solving Systems of Equations Algebraically **2.3** Solving Systems of Linear Inequalities **2.5** Solving Systems of Equations in Three Variables
Polynomial Operations	***3.0** Students are adept at operations on polynomials, including long division. ***4.0** Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.	**9.1** Operations with Polynomials **9.2** Factoring Polynomials **9.3** Division of Polynomials [**NOT** INCLUDING "Synthetic Division"] **9.4** The Factor and Remainder Theorem [**ONLY** INCLUDING "The Factor Theorem"]

It is strongly recommended that teachers utilize the "Math Applications" sections in each chapter of this textbook

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



Prentice Hall Classics: *Algebra 2 with Trigonometry*

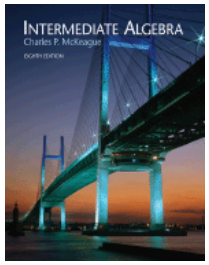
UNIT 1

Topic	Standards	Textbook Sections
Review from Algebra 1	*Teachers should utilize appropriate review material at the beginning of the course. However, it is **not** anticipated that teachers will necessarily need to cover ALL of the material listed in this review section.*	**Chapter 2.1 – 2.6** **Chapter 3.1 – 3.7**
Absolute Value and Inequalities	***1.0** Students solve equations and inequalities involving absolute value ***2.0** Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.	**2.7** Absolute Value **4.1** Systems of Equations in Two Variables **4.2** Solving Systems of Equations **4.3** Using a System of Two Equations **4.4** Systems of Equations in Three Variables **4.5** Using a System of Three Equations **4.6** Consistent and Dependent Systems **4.7** Systems of Inequalities
Polynomial Operations	***3.0** Students are adept at operations on polynomials, including long division. ***4.0** Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.	**5.1** Polynomials and Functions **5.2** Addition and Subtraction of Polynomials **5.3** Multiplication of Polynomials **5.4** Factoring **5.5** More Factoring **5.6** Factoring: A General Strategy **6.4** Division of Polynomials

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections

***Charles P. McKeague**, Intermediate Algebra 8th Edition*



UNIT 1

Topic	Standards	Book Sections
Review from Algebra 1	*Teachers should utilize appropriate review material at the beginning of the course. However, it is **not** anticipated that teachers will necessarily need to cover ALL of the material listed in this review section.*	**Chapter 2.1 – 2.4** **Chapter 3.1 – 3.3**
Absolute Value and Inequalities	***1.0** Students solve equations and inequalities involving absolute value ***2.0** Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.	**2.5** Equations with Absolute Value **2.6** Inequalities Involving Absolute value **3.4** Linear Inequalities in Two Variables **4.1** Systems of Linear Equations in Two Variables **4.2** Systems of Linear Equations in Three Variables **4.5** Applications **4.6** Systems of Linear Inequalities
Polynomial Operations	***3.0** Students are adept at operations on polynomials, including long division. ***4.0** Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.	**5.1** Properties of Exponents **5.2** Polynomials, Sums, and Differences **5.3** Multiplication of Polynomials **5.4** The Greatest Common Factor and Factoring by Grouping **5.5** Factoring Trinomials **5.6** Special Factoring **5.7** Factoring: A General Review **6.2** Division of Polynomials and Difference Quotients

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2 Unit 2 *Concept Organizer*

UNIT 2

Rational Functions, Quadratic Functions and Complex Numbers

Understand rational expressions

7.0

- Perform operations on rational expressions
- Simplify and evaluate complicated rational expressions, including those with negative exponents

Understand and graph quadratic functions and parabolas

8.0, 9.0, 10.0

- Solve quadratic equations by:
  1) factoring
  2) completing the square
  3) using the quadratic formula
- Determine the maxima, minima, and zeros of quadratic functions
- Solve related word problems
- Explain the change the coefficients have on the graphs of parabolas

Understand and solve problems involving complex numbers

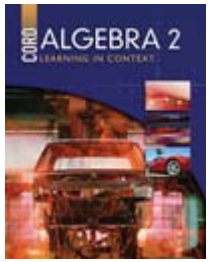
5.0, 6.0, 8.0

- Solve quadratic equations with complex roots
- Perform basic operations with complex numbers
- Understand the graphical representation of complex numbers in the plane

Standards	**5.0**	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**
CST	2	3	6	4	2	4

Algebra 2: Textbook Connections

***Cord Communications**, Learning in Context*



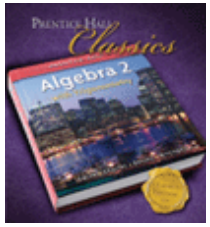
UNIT 2

Topic	Standards	Book Sections
Rational Expressions	***7.0** Students add, subtract, multiply divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.	**10.2** Multiplying and Dividing Rational Expressions **10.3** Adding and Subtracting Rational Expressions **5.1** Properties of Exponents **Note:** *Negative exponents are additionally covered on pages 11 – 14 of the CORD LAUSD Supplement.*
Quadratic Functions	***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system. ***9.0** Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as *a*, *b*, and *c* vary in the equation $y = a(x-b)^2 + c$ ***10.0** Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	**6.1** Solving Quadratic Equations by Graphing **6.2** Solving Quadratic Equations Using Square Roots **6.3** Solving Quadratic Equations by Completing the Square **6.4** Solving Quadratic Equations by Factoring **6.5** Solving Quadratic Equations Using the Quadratic Formula **4.5** Transformation of Functions *(Use this section to cover the changing coefficients of quadratic functions)*
Complex Numbers	***5.0** Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane. ***6.0** Students add, subtract, multiply, and divide complex numbers. ***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.	**6.6** Solving Quadratic Equations using Any Method **5.5** Complex Numbers (Graphing see p226) **Note:** *Graphing of and Division of complex numbers are additionally covered on pages 3 through 10 of the CORD Algebra 2 LAUSD Supplement.*

It is strongly recommended that teachers utilize the "Math Applications" sections in each chapter of this textbook

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



Prentice Hall Classics: *Algebra 2 with Trigonometry*

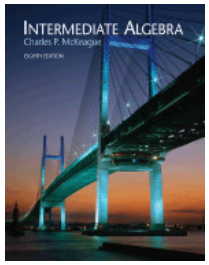
UNIT 2

Topic	Standards	Textbook Sections
Rational Expressions	***7.0** Students add, subtract, multiply divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.	**6.1** Multiplying and Simplifying **6.2** Addition and Subtraction **6.3** Complex Rational Expressions
**Complex Numbers	***5.0** Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane. ***6.0** Students add, subtract, multiply, and divide complex numbers. ***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.	**7.7** Imaginary and Complex Numbers **7.8** Complex Numbers and Graphing **7.9** More About Complex Numbers **7.10** Solutions of Equations
**Quadratic Functions	***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system. ***9.0** Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as *a*, *b*, and *c* vary in the equation $y = a(x-b)^2 + c$ ***10.0** Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	**5.7** Solving Equations by Factoring **8.1** Introduction to Quadratic Equations **8.2** Using Quadratic Equations **8.3** The Quadratic Formula **8.4** Solutions of Quadratic Equations **8.5** Equations Reducible to Quadratic Form **8.6** Formulas and Problem Solving **9.4** Graphs of Quadratic Functions **9.5** Graphs of $f(x) = a(x-h)^2 + k$ **9.6** Standard Form for Quadratic Functions **9.7** Graphs and x-intercepts

***Complex Numbers are taught before Quadratic Functions using this text because complex roots appear in chapter 8*

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



***Charles P. McKeague**, Intermediate Algebra 8th Edition*

UNIT 2

Topic	Standards	Book Sections
Rational Expressions	***7.0** Students add, subtract, multiply divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.	**6.1** Basic Properties and Reducing to Lowest Terms **6.3** Multiplying and Dividing Rational Expressions **6.4** Adding and Subtracting Rational Expressions **6.5** Complex Fractions
****Complex Numbers**	***5.0** Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane. ***6.0** Students add, subtract, multiply, and divide complex numbers. ***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.	**7.7** Complex Numbers **NOTE:** *Graphing of complex numbers is not covered by this text.*
****Quadratic Functions**	***8.0** Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system. ***9.0** Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as *a*, *b*, and *c* vary in the equation $y = a(x-b)^2 + c$ ***10.0** Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	**5.8** Solving Equations by Factoring **8.1** Completing the Square **8.2** The Quadratic Formula **8.3** Additional Items Involving Solutions to Equations **8.4** Equations in Quadratic Form **8.5** Graphing Parabolas

***Complex Numbers are taught before Quadratic Functions using this text because complex roots appear in chapter 8*
**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2 Unit *Concept Organizer*

UNIT 3

Exploring Logarithms and Counting Principles

Understand exponential and logarithmic functions and solve their equations

11.0 (11.1, 11.2), 12.0, 13.0, 14.0

- Solve problems involving logarithms and exponents
- Apply the laws of logarithms to simplify expressions
- Translate between logarithms of any base
- Solve logarithmic and exponential equations
- Solve growth and decay problems
- Understand fractional exponents
- Simplify logarithmic numeric expressions

Understand and solve problems using combinatorics, probability and statistics

18.0, 19.0, 20.0, ♦PS1.0, ♦PS2.0, ♦PS7.0

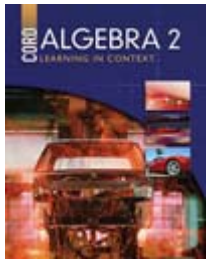
- Use fundamental counting principles to compute combinations and permutations
- Use combinations and permutations to compute probabilities
- Know the Binomial Theorem and use it to expand binomial expressions raised to positive integer powers
- Solve probability problems in finite sample spaces
- Solve problems involving conditional probability
- Compute the variance and standard deviation of a distribution of data

Standards	**11.0**	**12.0**	13.0	14.0	**18.0**	**19.0**	**20.0**	PS1.0	PS2.0	PS7.0
CST	*5 ½	3	1	2	2	2	2	1	2	2

♦ ***Note:*** *PS1.0 refers to Probability & Statistics standard 1.0. There are three Probability & Statistics standards tested on the Algebra 2 CST examination, PS1.0, PS2.0 and PS7.0*

* ***Note:*** *5½ questions for standard 11.0 means that there will be 5 questions every year and one additional question every other year.*

Algebra 2: Textbook Connections



***Cord Communications**, Learning in Context*

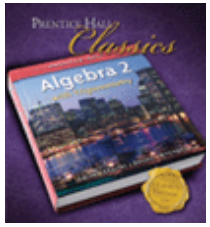
UNIT 3

Topic	Standards	Book Sections
Logarithms	***11.0** Students prove simple laws of logarithms. 11.1 Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. 11.2 Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. ***12.0** Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay. ***13.0** Students use the definition of logarithms to translate between logarithms in any base. **14.0** Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.	**5.3** Rational Exponents and nth Roots **8.1** Exponential Functions **8.2** Logarithmic Functions **8.3** Properties of Logarithms **8.4** Natural Logarithms **8.5** Solving Exponential and Logarithmic Equations **8.6** Compound Interest
Binomial Theorem, Probability & Statistics	***18.0** Students use fundamental counting principles to compute combinations and permutations. ***19.0** Students use combinations and permutations to compute probabilities. ***20.0** Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers. **PS 1.0** Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces. **PS 2.0** Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces. **PS 7.0** Students compute the variance and the standard deviation of a distribution of data	**14.1** Fundamental Theorem of Counting **14.2** Compound Events **14.3** Permutations **14.4** Combinations **11.5** The Binomial Theorem **NOTE:** *Mean, Standard Deviation and other related Statistics topics are covered on pages 19 through 62 of the CORD Algebra 2 LAUSD Supplement*

It is strongly recommended that teachers utilize the "Math Applications" sections in each chapter of this textbook

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



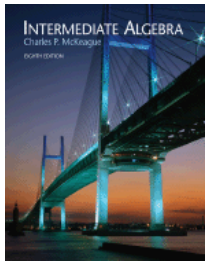
Prentice Hall Classics: *Algebra 2 with Trigonometry*

UNIT 3

Topic	Standards	Textbook Sections
Logarithms	***11.0** Students prove simple laws of logarithms. 11.1 Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. 11.2 Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. ***12.0** Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay. ***13.0** Students use the definition of logarithms to translate between logarithms in any base. **14.0** Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.	**7.5** Rational Numbers as Exponents **12.1** Inverse Functions and Relations **12.2** Exponential and Logarithmic Functions **12.3** Exponential and Logarithmic Relationships **12.4** Properties of Logarithmic Functions **12.5** Logarithmic Function Values **12.7** Exponential and Logarithmic Equations **12.8** Natural Logarithms and the Number *e*
Binomial Theorem, Probability & Statistics	***18.0** Students use fundamental counting principles to compute combinations and permutations. ***19.0** Students use combinations and permutations to compute probabilities. ***20.0** Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers. **PS 1.0** Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces. **PS 2.0** Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces. **PS 7.0** Students compute the variance and the standard deviation of a distribution of data	**15.1** Counting Problems and Permutations **15.2** Permutations for Special Counts **15.3** Combinations **15.4** The Binomial Theorem **15.5** Probability **15.6** Compound Probability **16.2** Using Measures of Central Tendency **16.3** Measures of Variation ***Note:*** *Conditional probability is not covered by this text*

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



***Charles P. McKeague**, Intermediate Algebra 8th Edition*

UNIT 3

Topic	Standards	Book Sections
Logarithms	***11.0** Students prove simple laws of logarithms. 11.1 Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. 11.2 Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. ***12.0** Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay. ***13.0** Students use the definition of logarithms to translate between logarithms in any base. **14.0** Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.	**7.1** Rational Exponents **7.2** More Expressions Involving Rational Exponents **9.1** Exponential Functions **9.2** The Inverse of a Function **9.3** Logarithms Are Exponents **9.4** Properties of Logarithms **9.5** Common Logarithms and Natural Logarithms **9.6** Exponential Equations and Change of Base
Binomial Theorem, Probability & Statistics	***18.0** Students use fundamental counting principles to compute combinations and permutations. ***19.0** Students use combinations and permutations to compute probabilities. ***20.0** Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers. **PS 1.0** Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces. **PS 2.0** Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces. **PS 7.0** Students compute the variance and the standard deviation of a distribution of data	**11.5** The Binomial Expansion **12.1** Statistics: Mean, Median, and Mode, Variance and Standard Deviations **12.2** Venn Diagrams, Permutations, and Combinations **12.3** Displaying Information **12.4** Introduction to Probability and Random Variables **12.5** Probabilities and Compound Events **12.6** Mutually Exclusive Events and Their Probabilities **12.7** Conditional Probabilities: Independent and Dependent Events **12.8** The Binomial Distribution **12.9** Normal Distributions

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2 Unit *Concept Organizer*

UNIT 4

Series, Conics, Functions and Induction

Understand logical statements involving rational expressions, radical expressions, logarithmic or exponential functions

15.0

- Determine whether statements are sometimes, always or never true

Understand how to solve problems involving arithmetic and geometric series

22.0**, 23.0**

- Find the general term of the sums of:
  1) arithmetic series
  2) finite geometric series
  3) infinite geometric series
- Derive the summation formulas (Not on CST)

CST

Understand Conic Sections, functional concepts and mathematical induction

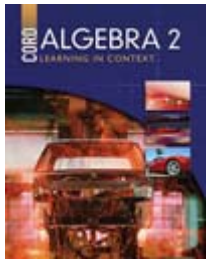
16.0, 17.0, 21.0, 24.0, 25.0

- Transform the general quadratic equation into standard form
- Identify the conic section from its equation
- Demonstrate the relationship between the geometry of conic sections and the coefficients of their equations
- Graph conic sections
- Prove general statements about the positive integers using mathematical induction
- Solve problems involving functional concepts such as composition and inverse
- Use properties from number systems to justify steps in combining and simplifying functions

Standards	**15.0**	16.0	17.0	21.0	22.0	**23.0**	24.0	25.0
CST	4	*1/3	1	*1/3	2	0	*½	*1/3

**** Note:*** *Fractional values indicate rotated standards (e.g., ½ = rotated every two years; 1/3 = rotated every three years)*

Algebra 2: Textbook Connections



***Cord Communications**, Learning in Context*

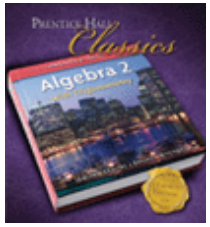
UNIT 4

Topic	Standards	Book Sections
Logic and Reasoning	***15.0** Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true or never true. *{Teachers should also reference the 2008 released Algebra 2 CST questions. #58 - #62}*	**NOTE:** *While these types of logical statements are not covered explicitly by this text, the following section addresses necessary material not previously covered.* **5.2** Simplifying Radical Expressions
Arithmetic and Geometric Series	**22.0** Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series. ***23.0** Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.	**11.1** Patterns **11.2** Arithmetic Sequences and Series **11.3** Geometric Sequences and Series **11.4** Infinite Geometric Series
Conic Sections, Functional Concepts and Mathematical Induction	**16.0** Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it. **17.0** Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation. **24.0** Students solve problems involving functional concepts such as composition, defining the inverse function and performing arithmetic operations on functions **25.0** Students use properties from number systems to justify steps in combining and simplifying functions **21.0** Students apply the method of mathematical induction to prove general statements about the positive integers.	**7.1** Distance and Midpoint Formulas **7.2** General Conics **7.3** Parabolas **7.4** Ellipses **7.5** Circles **7.6** Hyperbolas **4.1** Relations and Functions **4.2** Function Operations **4.3** Identity, Constant, and Inverse Functions **NOTE:** *Mathematical Induction is covered on pages 15 through 18 of the CORD Algebra 2 LAUSD Supplement.*

It is strongly recommended that teachers utilize the "Math Applications" sections in each chapter of this textbook

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

Algebra 2: Textbook Connections



Prentice Hall Classics: *Algebra 2 with Trigonometry*

UNIT 4

Topic	Standards	Textbook Sections
Logical Statements	***15.0** Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true or never true. *{Teachers should also reference the 2008 released Algebra 2 CST questions. #58 - #62}*	**NOTE:** *While these types of logical statements are not covered explicitly by this text, the following sections address necessary material not previously covered.* **7.1** Radical Expressions **7.2** Multiplying and Simplifying **7.3** Operations with Radical Expressions
Arithmetic and Geometric Series	**22.0** Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series. ***23.0** Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.	**14.1** Sequences and Series **14.2** Arithmetic Sequences and Series **14.3** Geometric Sequences and Series **14.4** Infinite Geometric Series
Conic Sections, Functional Concepts and Mathematical Induction	**16.0** Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it. **17.0** Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation. **21.0** Students apply the method of mathematical induction to prove general statements about the positive integers. **24.0** Students solve problems involving functional concepts such as composition, defining the inverse function and performing arithmetic operations on functions. **25.0** Students use properties from number systems to justify steps in combining and simplifying functions.	**10.2** Conic Sections: Circles **10.3** Ellipses **10.4** Hyperbolas **10.5** Parabolas **10.6** Second-Degree Equations and Systems ***Note:*** *From section 10.6, students need to be able to recognize the equations of circles, ellipses, hyperbolas, and parabolas. See exercises 1-10 p462* **3.3** Functions **3.9** More about Functions **[12.1** Inverse Relations and Functions *{Already covered in Unit 3: Logarithms}***]** **14.5** Mathematical Induction

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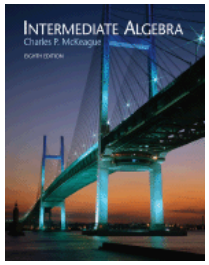
Algebra 2: Textbook Connections



***Charles P. McKeague**, Intermediate Algebra 8th Edition*

UNIT 4

Topic	Standards	Book Sections
Logic and Reasoning	***15.0** Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true or never true.	**NOTE:** *While these types of logical statements are not covered explicitly by this text, the following sections address necessary material not previously covered.* **7.3** Simplified Form for Radicals
Arithmetic and Geometric Series	**22.0** Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series. ***23.0** Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.	**11.1** Sequences **11.2** Series **11.3** Arithmetic Sequences **11.4** Geometric Sequences
Conic Sections, Functional Concepts and Mathematical Induction	**16.0** Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it. **17.0** Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation. **24.0** Students solve problems involving functional concepts such as composition, defining the inverse function and performing arithmetic operations on functions **25.0** Students use properties from number systems to justify steps in combining and simplifying functions **21.0** Students apply the method of mathematical induction to prove general statements about the positive integers.	**10.1** The Circle **10.2** Ellipses and Hyperbolas **3.5** Introduction to Functions **3.6** Function Notation **3.7** Algebra and Composition with Functions **[9.2** The Inverse of a Function *{already covered in Unit 3: Logarithms}***]** **NOTE:** *Mathematical Induction is not covered by this text.*

**Denotes Key Standard as defined by the Mathematics Framework for California Public School (2006)*

L.A.U.S.D. "CAHSEE PREP" WARM-UPS (25 WEEKLY MODULES)

	7AF	7NS	7MG	6SDAP	7SDAP	7MR	ALG	TOTAL
Number of questions on CAHSEE	**17**	**14**	**17**	**8**	**4**	**8**	**12**	**80 questions**
Number of *weekly* modules	**5**	**4**	**5**	**2**	**2**	**3**	**4**	**25 weeks**

Each of the following modules comprises one week of suggested "CAHSEE PREP" warm-up exercises.

Classroom teachers may choose to present an entire module in one day, or to divide it up to span several days.

The exercises are designed to serve several purposes as follows:

- Content review for students
- Diagnostic materials to assist the teachers in determining where deficiencies exist in student learning of CAHSEE standards from prior grade levels
- Start frequent conversations around the CAHSEE to increase knowledge and awareness of this critical assessment

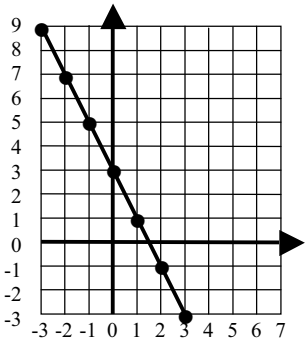
MODULE 1 – 7th Grade Algebra and Functions

1. Minh is thinking of a number. She says that if you divide the number by 4 and subtract 7 from the result, you will get 13. **Which equation below could be used to find Minh's number?** A. $\frac{x-7}{4}=13$ B. $-7=13+\frac{x}{4}$ C. $\frac{x}{4}-7=13$ D. $\frac{x}{4}=-7+13$ *Grade 7 AF 1.1*	*Divide number by 4*: $\frac{x}{4}$ *and subtract 7*: $\frac{x}{4}-7$ *you will get 13*: $\frac{x}{4}-7=13$ *Choose C.*
2. When the tennis team travels, the number of racquets, *r*, that the manager brings is always 3 times the number of players, *p*. **Which of the following equations agrees with the information above?** A. $3 \cdot p = r$ B. $3 \cdot r = 5 \cdot p$ C. $3 \cdot r = p$ D. $r \cdot p = 3$ *Grade 7 AF 1.1*	Circle the word "***is***" because it usually represents the equal sign. Before it you have "***r*** *racquets"*. After it, you have "$3 \cdot$ ***p"*** *players*. These are the two sides of the equation. (r = 3 · p) The answer A represents the same information, but reversed. *Choose A.*
3. Simplify $2(n-3)^2$. A. $2n-6$ B. $4n-12$ C. $2n^2-12n+18$ D. $4n^2-24n+36$ *Grade 7 AF 1.2*	**Long version**: $2(n-3)^2$ $2[(n-3)(n-3)]$ $2[n\cdot(n-3)-3\cdot(n-3)]$ $2[n^2-3n-3n+9]$ $2[n^2-6n+9]$ $2n^2-12n+18$ **Shorter version**: $2(n-3)^2$ $2[n^2-6n+9]$ $2n^2-12n+18$ **Shortest version**: The *n* will be squared and then you will multiply by 2, because powers are applied before multiplication. There is only one answer with as a term *Choose C.*

MODULE 1 – 7TH Grade Algebra and Functions

1. Minh is thinking of a number. She says that if you divide the number by 4 and subtract 7 from the result, you will get 13. **Which equation below could be used to find Minh's number?** A. $\frac{x-7}{4}=13$ B. $-7=13+\frac{x}{4}$ C. $\frac{x}{4}-7=13$ D. $\frac{x}{4}=-7+13$ *Grade 7 AF 1.1*	
2. When the tennis team travels, the number of racquets, *r*, that the manager brings is always 3 times the number of players, *p*. **Which of the following equations agrees with the information above?** A. $3 \cdot \boldsymbol{p} = \boldsymbol{r}$ B. $3 \cdot \boldsymbol{r} = 5 \cdot \boldsymbol{p}$ C. $3 \cdot \boldsymbol{r} = \boldsymbol{p}$ D. $\boldsymbol{r} \cdot \boldsymbol{p} = 3$ *Grade 7 AF 1.1*	
3. Simplify $2(n-3)^2$. A. $2n-6$ B. $4n-12$ C. $2n^2-12n+18$ D. $4n^2-24n+36$ *Grade 7 AF 1.2*	

4. The line graph below represents which of the following equations?



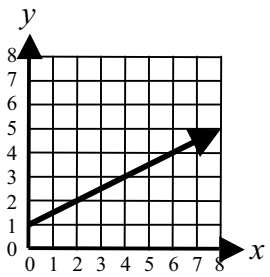
A. y = –2x – 3
B. y = –2x + 3
C. y = –2x – 9
D. y = –2x + 9

Grade 7 AF 1.5

This key understanding necessary to solve this problem is the fact that the "*b*" in an equation in the form *y= mx+b* is the *y-intercept*. That means this is where it crosses the *y-axis*. Since this line crosses the *y-axis* at 3 we need to find the + 3 as an answer choice.

Choose B.

5. Find the slope of the line shown on the graph below.



A. –2
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 2

Grade 7 AF 3.3

Choose any two points on the graph. The slope equals the change in y (up/down movement) divided by the change in x (left/right movement). Subtract the y coordinates of the points. Then subtract the x coordinates of the points. Now divide the first answer by the second answer.

Formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

where (x_1, y_1) and (x_2, y_2) are points on the graph.

Two points on the graph are (0, 1) and (4, 3).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-1}{4-0} = \frac{2}{4} = \frac{1}{2}$$

Another solution:.

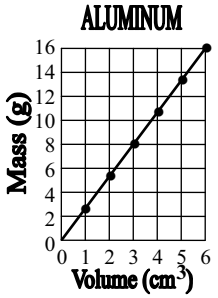
If students do not know the slope formula they can count up along the y from one point and then over the x to the other point. On this graph 1 up and 2 to the right takes you from point to point.

Remember: rise over run.

$$\frac{1.up}{2.right} = \frac{1}{2}$$

Choose C.

6. The density of a substance is equal to its mass divided by its volume $(D = \frac{M}{V})$. Julio measured the mass and volume of six aluminum samples. His data are plotted on the graph below.



According to Julio's data, what is the approximate density of aluminum?

A. 1.4 g/cm^3
B. 2.7 g/cm^3
C. 3.2 g/cm^3
D. 5.8 g/cm^3

Grade 7 AF 3.4

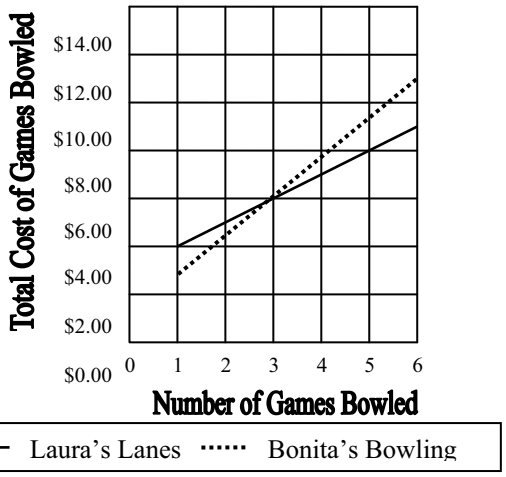
Pick any point on the line and divide the Mass from the left by the Volume from the bottom. Two points hit nicely on our graph: (3, 8) and (6, 16).

$$8 \div 3 = 2.66666...$$
$$16 \div 6 = 2.66666...$$

As we would expect in a linear relationship, both points yield the same answer.

Choose B.

7. The graph below illustrates the total cost of bowling for one person at each of two bowling alleys.



Choose the best answer to complete this sentence: *Bowling at Laura's Lanes costs less than Bonita's Bowling …*

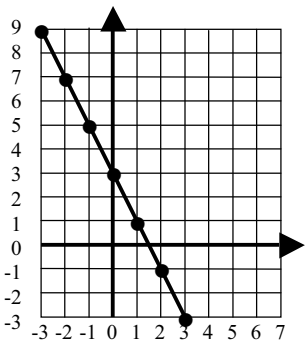
A. at all times.
B. if a person bowls less than 3 games.
C. if a person bowls 3 games.
D. if a person bowls more than 3 games.

Grade 7 AF 1.5

Laura's costs less when the solid line is below the dashed line. Laura's costs less when the number of games is more than 3.

Choose D.

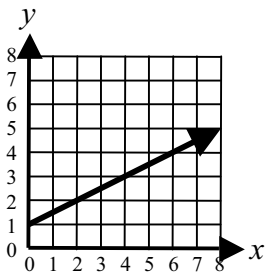
4. The line graph below represents which of the following equations?



A. $y = -2x - 3$
B. $y = -2x + 3$
C. $y = -2x - 9$
D. $y = -2x + 9$

Grade 7 AF 1.5

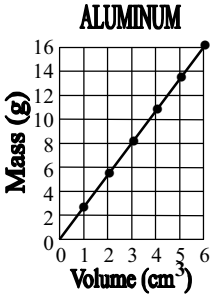
5. Find the slope of the line shown on the graph below.



A. -2
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 2

Grade 7 AF 3.3

6. The density of a substance is equal to its mass divided by its volume $(D = \frac{M}{V})$. Julio measured the mass and volume of six aluminum samples. His data are plotted on the graph below.



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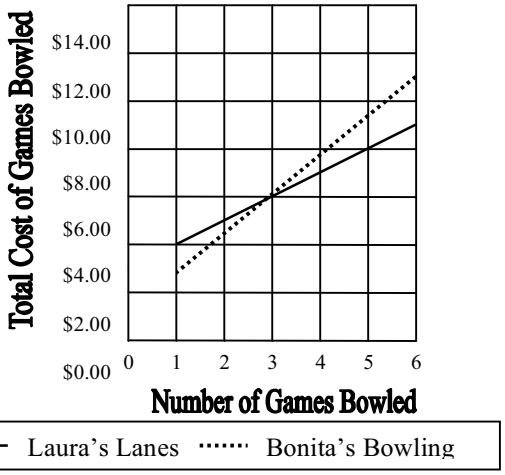
A. 1.4 g/cm^3
B. 2.7 g/cm^3
C. 3.2 g/cm^3
D. 5.8 g/cm^3

Grade 7 AF 3.4

7. The graph below illustrates the total cost of bowling for one person at each of two bowling alleys.



Choose the best answer to complete this sentence: *Bowling at Laura's Lanes costs less than Bonita's Bowling …*

A. at all times.
B. if a person bowls less than 3 games.
C. if a person bowls 3 games.
D. if a person bowls more than 3 games.

Grade 7 AF 1.5

8. Simplify $\frac{1}{3n^{-2}}$.

A. $\frac{n^2}{9}$

B. $\frac{n^2}{3}$

C. $3n^{-2}$

D. $3n^2$

Grade 7 AF 2.1

A negative in an exponent indicates a reciprocal of the base factor. The base of the exponent will simply shift from the numerator to the denominator or vice versa.

$$x^{-1} = \frac{1}{x} \text{ and } \frac{1}{x^{-1}} = x$$

In this problem the n^{-2} is simply moved from the denominator to the numerator and the exponent changes from negative to positive.

$$\frac{1}{3n^{-2}} = \frac{n^2}{3}$$

Choose D.

9. What is the result of $(4p^2t^5w)(4pt^4w^3)$ if you simplify it?

A. $8\ p^3t^5w^3$

B. $16\ p^2t^{20}w^{12}$

C. $16\ p^2t^9w^3$

D. $16\ p^3t^9w^4$

Grade 7 AF 2.2

The solution to this problem relies upon the ability to apply the following property of exponents:

$$(a^m)(a^n) = a^{m+n}$$

Multiply the numerical coefficients and add the exponents for other factors with common bases.

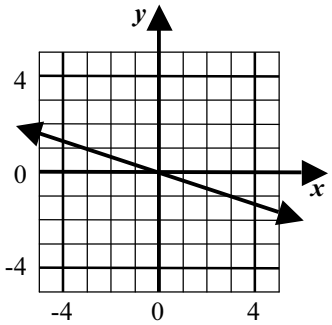
$$(4p^2t^5w)(4pt^4w^3)$$
$$4 \cdot 4p^{2+1}t^{5+4}w^{1+3}$$
$$16p^3t^9w^4$$

Choose D.

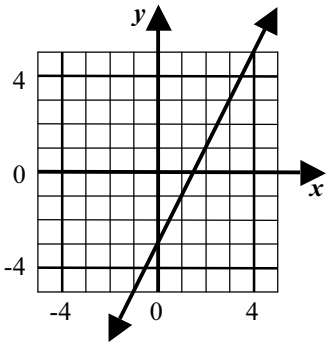
10. Which graph below represents the following equation?

$$-2x = y + 3$$

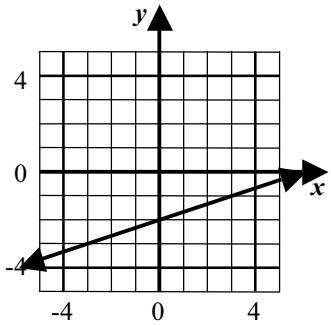
A.



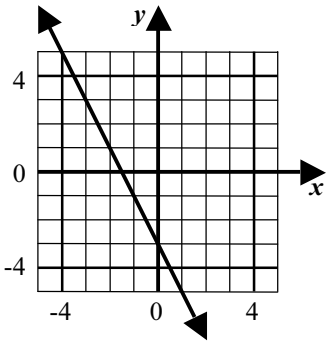
B.



C.



D.



Grade 7 AF 1.5

For the equation of a line expressed in *Slope-InterceptForm*

$$y = mx + b$$

the slope of the line it represents is the "m" and the y-intercept (sometimes referred to as vertical intercept is the "b".

Solve for y to get Slope-Intercept Form.

$$-2x = y + 3$$
$$y + 3 = -2x$$
$$y + 3 - 3 = -2x - 3$$
$$y = -2x - 3$$

The y-intercept is –3 so the graph crosses y-axis at –3. This means that the right answer is B or D.

The slope is –2. Negative slopes go down to the right. Only A and D go down.

So choice D is the only possibility that satisfies both conditions.

It is not necessary to actually graph the line.

<u>*Choose D.*</u>

8. Simplify $\frac{1}{3n^{-2}}$**.**

A. $\frac{n^2}{9}$

B. $\frac{n^2}{3}$

C. $3n^{-2}$

D. $3n^2$

Grade 7 AF 2.1

9. What is the result of $(4p^2t^5w)(4pt^4w^3)$ if you simplify it?

A. $8\ p^3t^5w^3$

B. $16\ p^2t^{20}w^{12}$

C. $16\ p^2t^9w^3$

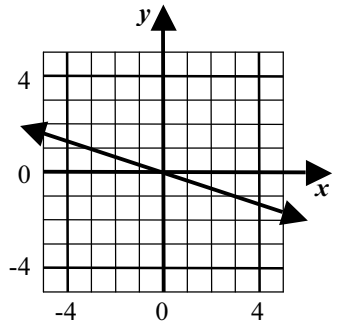
D. $16\ p^3t^9w^4$

Grade 7 AF 2.2

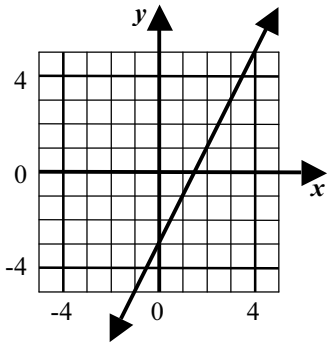
10. Which graph below represents the following equation?

$$-2x = y + 3$$

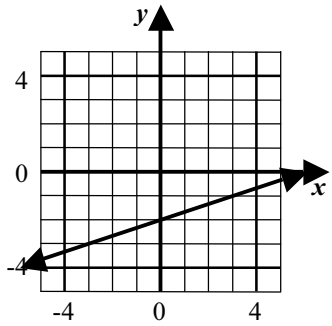
A.



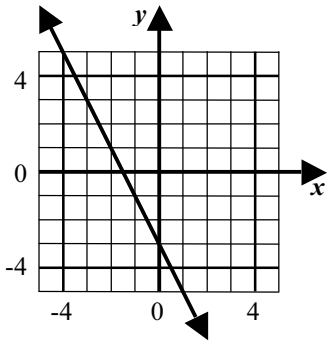
B.



C.

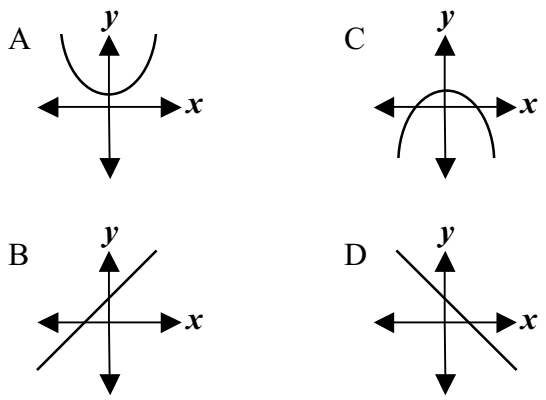


D.



Grade 7 AF 1.5

11. Which graph shown below could be the graph of the equation $y = 2 + x^2$?



Grade 7 AF 3.1

Positive solution:

The quantity x^2 is always positive.

Since $y = 2 + x^2$, y is always positive.

This means the only choice is A because graphs B, C, and D all go below the x axis where y is negative.

Alternate *solution*:

An equation with x^2 as the highest power (often referred to as quadratic) represents a parabola. If the sign of the x^2 is positive ($+ x^2$) then the graph opens up. Some people like to say if the quadratic term is positive then the graph smiles.

Choose A.

12. The coordinates of two points on a line are (0, -2) and (5, -8). What is the slope of this line?

A. $-\frac{6}{5}$

B. $-\frac{5}{6}$

C. $-\frac{5}{10}$

D. $\frac{5}{6}$

Grade 7 AF 3.3

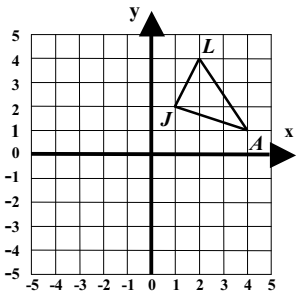
Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

where (x_1, y_1) and (x_2, y_2) are points on the graph.

Two points on the line are (0, -2) and (5, -8).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8-(-2)}{5-0} = \frac{-6}{5}$$

Choose A



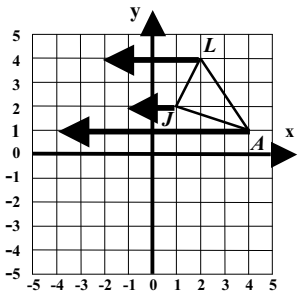
13. If triangle *JLA* is reflected across the y-axis, what are the coordinates of the image points of the vertices *J*, *L*, and *A*?

A. ***J*** (−1, 2), ***L*** (−2, 4), and ***A*** (−4, 1)
B. ***J*** (1, −2), ***L*** (2, −4), and ***A*** (4, −1)
C. ***J*** (−2, −1), ***L*** (−4, −2), and ***A*** (−1, −4)
D. ***J*** (−1, −2), ***L*** (−2, −4), and ***A*** (−4, −1)

Grade 7 MG 3.2

If you reflect across the y-axis, all the y coordinates stay the same and the x coordinates become their opposites.
J is at (1, 2) so the reflection of J across the y axis is at (-1, 2).

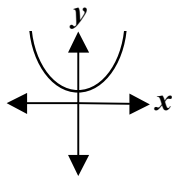
STOP. Answer A is the only answer with J at (-1, 2).
You can also do this by drawing the reflection across y as follows:

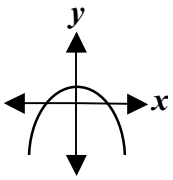


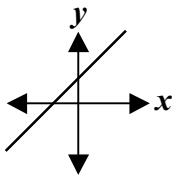
Again, if you look only at the reflection of point J you can find the solution.

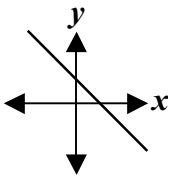
Choose A.

11. Which graph shown below could be the graph of the equation $y = 2 + x^2$?

A 

C 

B 

D 

Grade 7 AF 3.1

12. The coordinates of two points on a line are (0, -2) and (5, -8). What is the slope of this line?

A. $-\frac{6}{5}$

B. $-\frac{5}{6}$

C. $-\frac{5}{10}$

D. $\frac{5}{6}$

Grade 7 AF 3.3

13. The coordinates of two points on a line are (0, -2) and (5, -8). What is the slope of this line?

A. $-\frac{6}{5}$

B. $-\frac{5}{6}$

C. $-\frac{5}{10}$

D. $\frac{5}{6}$

Grade 7 AF 3.3

14. Solve the following inequality for m. $4m - 7 < 25$ A. $m < 6$ B. $m < 7$ C. $m < 8$ D. $m < 18$ *Grade 7 AF 4.1*	We can solve this exactly like an equation, since we will not have to multiply or divide by a negative number. (Multiplying or dividing by a negative when solving an inequality reverses the direction of, or flips, the inequality sign. $4m - 7 < 25$ $4m - 7 + 7 < 25 + 7$ $4m < 32$ $\frac{4m}{4} < \frac{32}{4}$ $m < 8$ *Choose C.*
15. If $p = 6$ and $q = 7$, then $\frac{pq - 10}{4} + 4 =$ A. 8 B. 12 C. 16 D. 32 *Grade 7 AF 4.1*	Substitute and simplify: $\frac{pq - 10}{4} + 4$ $\frac{6 \cdot 7 - 10}{4} + 4$ $\frac{42 - 10}{4} + 4$ $\frac{32}{4} + 4$ $8 + 4 = 12$ *Choose B.*
16. Robert is painting the walls of his living room at a rate of 12.5 square feet per minute. If the walls have a total surface area of 475 square feet, how long will it take to finish painting them if he continues at this rate? A. 38 minutes B. 45 minutes C. 462.5 minutes D. 487.5 minutes *Grade 7 AF 4.2*	**Work = Rate x Time** $475 = 12.5 \times time$ $\frac{475}{12.5} = \frac{12.5 \times time}{12.5}$ $38 = time$ *Choose A.*
17. The solution to the equation $4x + 14 = -2$ is A. $x = -4$ B. $x = -3$ C. $x = 3$ D. $x = 4$ *Grade 7 AF 4.1*	$4x + 14 = -2$ $4x + 14 - 14 = -2 - 14$ $4x = -16$ $\frac{4x}{4} = \frac{-16}{4}$ $x = -4$ *Choose A.* **Test-taking tip:** If a student does not know how to solve this equation, he/she can determine the correct answer by substituting each choice A-D.
18. Marisol has a 350-gallon tank in the van that she uses when detailing cars. The directions on the package of powdered detergent say to use 2 cups of detergent for every 100 gallons of water. How many cups of detergent should she use when she fills the tank? A. 5 B. 6 C. 7 D. 8 *Grade 7 AF 4.2*	Solve using proportions. $\frac{2}{100} = \frac{d}{350}$ $2(350) = 100 \cdot d$ $700 = 100d$ $7 = d$ *Choose C.*

14. Solve the following inequality for m. $4m - 7 < 25$ A. $m < 6$ B. $m < 7$ C. $m < 8$ D. $m < 18$ *Grade 7 AF4.1*	
15. If $p = 6$ and $q = 7$, then $\frac{pq - 10}{4} + 4 =$ A. 8 B. 12 C. 16 D. 32 *Grade 7 AF4.1*	
16. Robert is painting the walls of his living room at a rate of 12.5 square feet per minute. If the walls have a total surface area of 475 square feet, how long will it take to finish painting them if he continues at this rate? A. 38 minutes B. 45 minutes C. 462.5 minutes D. 487.5 minutes *Grade 7 AF4.2*	
17. The solution to the equation $4x + 14 = 2$ is D. $x = -4$ E. $x = -3$ F. $x = 3$ D. $x = 4$ *Grade 7 AF 4.1*	
18. Marisol has a 350-gallon tank in the van that she uses when detailing cars. The directions on the package of powdered detergent say to use 2 cups of detergent for every 100 gallons of water. How many cups of detergent should she use when she fills the tank? A. 5 B. 6 C. 7 D. 8 *Grade 7 AF 4.2*	

19. $1.8 \times 10^{-3} =$ A. 0.0018 B. 0.018 C. 180 **D.** 1800 *Grade 7 NS 1.1*	Each power of 10 moves the decimal point. When multiplying by positive powers of 10, the number gets bigger so the decimal point moves to the right. When multiplying by negative powers of 10, the number gets smaller, so the decimal point moves to the *left*. Since, in this case, the power of 10 is negative, move the decimal 3 places to the *left*. So, 1.8×10^{-3} is equal to 0.0018 *Choose A*.
20. Which sum below is equal to a negative number? A. (7) + (–8) + (6) B. (–7) + (–8) + (–3) C. (–7) + (8) **D.** (7) + (8) *Grade 7 NS 1.2*	A. 7 – 8 + 6 = 13 – 8 = 5 B. –7 – 8 – 3 = – 15 – 3 = –18 C. –7 + 8 = 1 D. 7 + 8 = 15 *Choose B*.
21. One million is divided by a number between 100 and 1,000. The resulting number must be A. less than 1,000 B. between 1,000 and 2,000 C. between 1,000 and 10,000 D. greater than 10,000 *Grade 7 NS 1.2*	Just divide: $\frac{1{,}000{,}000}{100} = 10{,}000$ $\frac{1{,}000{,}000}{1000} = 1{,}000$ Between 1000 and 10,000. *Choose C*.
22. Which of the following is equal to a negative number? A. (–5) · (–5) B. (–5) ÷ (–5) C. $(-5)^3$ D. $(-5)^4$ *Grade 7 NS 1.2* *1.2*	A and B equal positive numbers because pairs of (or *every two*) negatives multiply or divide to yield positive answers. Negatives raised to an odd power equal negatives. Negatives raised to even powers equal positives. C. equals a negative number because it is raised to an odd power (i.e. the 3rd power). It is not necessary to work this out, but here it is … $(-5)^3 = (-5)(-5)(-5) =$ $(25)(-5) = -125$ D. equals a positive because the negative is raise to an even power (i.e. the 4th power). $(-5)^4 = (-5)(-5)(-5)(-5)$ $= (25)(-5)(-5) = -125(-5)$ $= 625$ *Choose C.*

19. 1.8×10^{-3} =

A. 0.0018
B. 0.018
C. 180
D. 1800

Grade 7 NS 1.1

20. Which sum below is equal to a negative number?

A. (7) + (–8) + (6)
B. (–7) + (–8) + (–3)
C. (–7) + (8)
D. (7) + (8)

Grade 7 NS 1.2

21. One million is divided by a number between 100 and 1,000. The resulting number must be

A. less than 1,000
B. between 1,000 and 2,000
C. between 1,000 and 10,000
D. greater than 10,000

Grade 7 NS 1.2

22. Which of the following is equal to a negative number?

A. $(-5) \cdot (-5)$
B. $(-5) \div (-5)$
C. $(-5)^3$
D. $(-5)^4$

Grade 7 NS 1.2

MODULE 7 – 7th Grade Number Sense

23. Of the 833 students enrolled in Central Continuation High School, 210 are of Asian descent. Approximately what percentage of the student enrollment is of Asian descent? A. 21% B. 25% C. 50% D. 210% *Grade 7 NS 1.3*	Estimate: $\frac{210}{833} \approx \frac{200}{800} = \frac{1}{4} = 25\%$ Students should memorize percents for ¼, ½, and ¾. *Choose B*.
24. $2^3 \times 2^5 =$ A. 2^8 B. 2^{15} C. 4^8 D. 4^{15} *Grade 7 NS 2.1*	Two solutions: $2^3 \text{ x } 2^5 = (2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2) = 2^8$ or … $2^3 \text{ x } 2^5 = 2^{3+5} = 2^8$ *Choose A*.
25. Which of the following fractions is equivalent to 60%? A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{3}{5}$ D. $\frac{4}{5}$ *Grade 7 NS 1.3*	Percent means per 100. $60\% = \frac{60}{100}$ $\frac{60}{100} = \frac{6}{10} = \frac{3}{5}$ Or use Decimal Places. Percent to decimal moves the decimal two spaces ***left***. $60\% = 0.6$ $0.6 = \frac{6}{10} = \frac{3}{5}$ *Choose C.*
26. What is the prime factorization of the least common denominator of $\frac{5}{9}$ and $\frac{7}{12}$? A. $2 \times 2 \times 3$ B. $2 \times 3 \times 3$ C. $2 \times 2 \times 3 \times 3$ D. 9×12 *Grade 7 NS 2.2*	Students should know both the LCD and prime factoring. LCD: List multiples of each number and look for smallest common multiple. 9: 9 18 27 ***36*** 45 … 12: 12 24 ***36*** 48 60 … LCD(9, 12) = 36, since 36 is the smallest number that occurs in both lists. Prime factorization of 36 36 = 4 x 9 = (2 x 2) x (3 x 3) = 2 x 2 x 3 x 3 *Choose C*.

23. Of the 833 students enrolled in Central Continuation High School, 210 are of Asian descent. Approximately what percentage of the student enrollment is of Asian descent?

A. 21%
B. 25%
C. 50%
D. 210%

Grade 7 NS 1.3

24. $2^3 \times 2^5 =$

A. 2^8
B. 2^{15}
C. 4^8
D. 4^{15}

Grade 7 NS 2.1

25. Which of the following fractions is the equivalent of 60%?

A. $\frac{1}{6}$
B. $\frac{2}{3}$
C. $\frac{3}{5}$
D. $\frac{4}{5}$

Grade 7 NS 1.3

26. What is the prime factorization of the least common denominator of $\frac{5}{9}$ and $\frac{7}{12}$?

A. $2 \times 2 \times 3$
B. $2 \times 3 \times 3$
C. $2 \times 2 \times 3 \times 3$
D. 9×12

Grade 7 NS 2.2

27. An MP3 digital music player has a suggested retail price of $200. This weekend, it is on sale for 25% off. How much does the MP3 player cost during the sale?

A. $50
B. $150
C. $175
D. $225

Grade 7 NS 1.7

Two solutions:

1) To convert a percent to a decimal, the decimal point is moved two places to the left.

25% = 0.25

25% of 200 =
0.25 (200) = 50

$50 off the suggested retail price yields
$200 – $50 = 150

2) 25% off means 75% is left.

75% of 200 =
0.75 (200) = 50

Choose B.

28. The video game, Nano Bites, originally sold for $48.00 and now sells for $36.00. By what percent was the price reduced?

A. 16%
B. 20%
C. 25%
D. 75%

Grade 7 NS 1.7

Percent is ***number per 100*** or $\frac{p}{100}$.

To determine percent of change (either increase or decrease, you must know the old price and the new price, and determine the difference between them. Then find the percent that the difference is of the old price.

old price = $48.00
new price = $36.00
difference = $12.00

$$\frac{difference}{old.price} \rightarrow \frac{12}{48} = \frac{p}{100}$$

$$\frac{12}{48} = \frac{p}{100}$$

$$12 \cdot 100 = 48 \cdot p$$

$$1200 = 48p$$

$$\frac{1200}{48} = p$$

$$25 = p$$

So the price was reduced 25%

Note that reducing the fraction $\frac{12}{48}$ will make the proportion much easier to solve.

$$\frac{1}{4} = \frac{p}{100}$$

Note: If students know some common fractions and their equivalent percents, they do not need to perform the algebraic calculations in many cases.

Choose C

27. An MP3 digital music player has a suggested retail price of $200. This weekend, it is on sale for 25% off. How much does the MP3 player cost during the sale?

A. $50
B. $150
C. $175
D. $225

Grade 7 NS 1.7

28. The video game, Nano Bites, originally sold for $48.00 and now sells for $36.00. By what percent was the price reduced?

A. 16%
B. 20%
C. 25%
D. 75%

Grade 7 NS 1.7

29. $\frac{3^2 \times 2^9}{2^4} + \frac{3^4 \times 2^4}{3^2} =$ A. 77 B. 162 C. 252 D. 432 *Grade 7 NS 2.3*	You can stop working halfway through the problem if you are alert. $\frac{3^2 \times 2^9}{2^4} + \frac{3^4 \times 2^4}{3^2}$ $\frac{3\cdot3\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot2} + \frac{3^4 \times 2^4}{3^2}$ Note: here you could subtract exponents 9 – 4 = 5 giving 2^5. But if students don't know this rule, they can still solve it. This is not a timed test. $3\cdot3\cdot2\cdot2\cdot2\cdot2\cdot2 + \frac{3^4 \times 2^4}{3^2}$ $288 + \frac{3^4 \times 2^4}{3^2}$ At this point, students can stop working since there is only one answer larger than 288. *Choose D*.
30. Which number below shows the absolute value of –7? A. –7 B. $-\frac{1}{7}$ C. $\frac{1}{7}$ D. 7 *Grade 7 NS 2.5*	Absolute value is the distance from zero. Distance is ***always*** positive, so absolute value is always positive. Taking the absolute value does nothing to change the magnitude of a number. *Choose D*.
31. The square root of 371 is a number between A. 18 and 19 B. 19 and 20 C. 20 and 21 D. 21 and 22 *Grade 7 NS 2.4*	Students need not calculate the square root of 371. Instead, they can start by squaring the "most convenient" (easiest to work with), number in the answer choices. $20^2 = 400$ 371 is smaller than 400 so its square root is smaller than 20. Check the next number down, 19. $19^2 = 361$ 371 is larger than 361 so its square root is larger than 19. Therefore the square root is between 19 and 20. *Choose B.*

29. $\frac{3^2 \times 2^9}{2^4} + \frac{3^4 \times 2^4}{3^2} =$

A. 77
B. 162
C. 252
D. 432

Grade 7 NS 2.3

30. Which number below shows the absolute value of –7?

A. –7
B. $-\frac{1}{7}$
C. $\frac{1}{7}$
D. 7

Grade 7 NS 2.5

31. The square root of 371 is a number between

A. 18 and 19
B. 19 and 20
C. 20 and 21
D. 21 and 22

Grade 7 NS 2.4

32. Last year Los Angeles Publishers Inc. lost 484 person-hours of work to illnesses. If a normal day includes 8 hours of work, how many person-days of work did the company lose?

A. 60.5
B. 476
C. 492
D. 3872

Grade 7 MG 1.3

8-hours = 1 work day
484 hours = ? work days
Divide: 484 ÷ 8 = 60.5

Second option:

Proportions: $\frac{1}{8} = \frac{x}{484}$

$484 = 8x$
$484/8 = 8x/8$
$60.5 = x$

Choose A.

33. One quart is equal to approximately 0.945 liters. About how many liters are equal to 3 quarts?

A. 0.315
B. 0.645
C. 1.245
D. 2.835

Grade 7 MG 1.1

Approximation yields a quick and easy solution to this problem (especially since the answer choices are not close to each other in value).

Multiply. 0.9 · 3 = 2.7

Choose D.

34. A small airplane travels 96 miles in two-thirds of an hour. What is the airplane's average speed?

A. 64
B. 136
C. 144
D. 192

Grade 7 MG 1.1

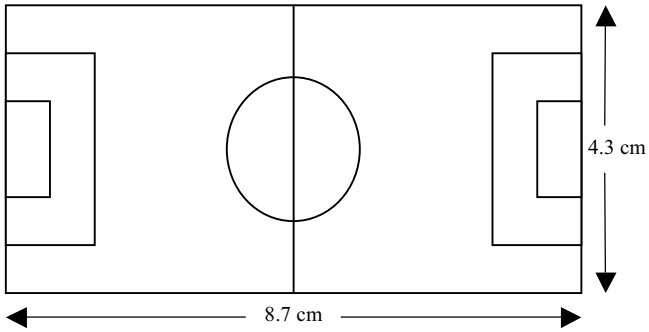
Distance = Rate x Time
Formula: D = rt

$96 = r\left(\frac{2}{3}\right)$
$96\left(\frac{3}{2}\right) = r\left(\frac{2}{3}\right)\left(\frac{3}{2}\right)$
$48(3) = r$
$144 = r$

Choose C.

35. The diagram below shows a scale drawing of a soccer field.

The scale for the drawing is
1 centimeter (cm) = 10 meters (m).



What is the length, in meters, of the soccer field?

A. 87.0 m
B. 124.4 m
C. 130.0 m
D. 374.1 m

Grade 7 MG 1.2

Short version:

$8.7 \times 10 = 87$

Long version:

$\frac{1}{10} = \frac{8.7}{x}$
$1(x) = 10(8.7)$
$x = 87$

Choose A.

32. Last year Los Angeles Publishers Inc. lost 484 person-hours of work to illnesses. If a normal day includes 8 hours of work, how many person-days of work did the company lose?

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B. 476
C. 492
D. 3872

Grade 7 MG 1.3

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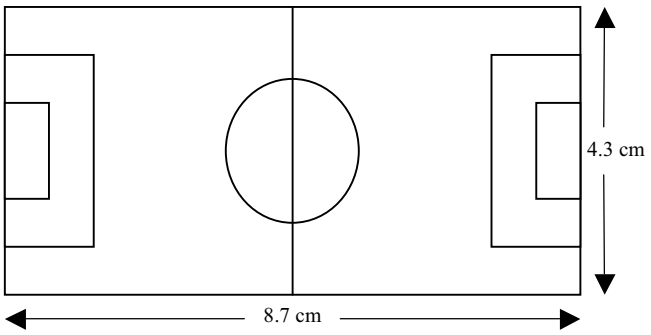

What is the length, in meters, of the soccer field?

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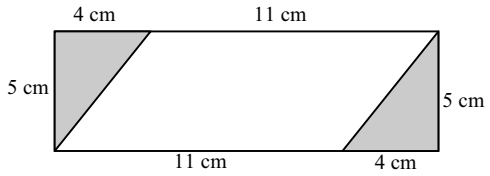
B. 124.4 m
C. 130.0 m
D. 374.1 m

Grade 7 MG 1.2

36. The figure below shows a parallelogram drawn inside a rectangle. What is the area of the shaded portion of the rectangle?

Area of a triangle = ½ bh

Area of a parallelogram = bh



A. 20 cm^2
B. 40 cm^2
C. 55 cm^2
D. 75 cm^2

Grade 7 MG 2.1

This problem has more information than is needed to solve the problem. We want the area of the 2 shaded triangles. They are the same size so we can calculate the area of one and double it.

$$\left(\tfrac{1}{2}\cdot b\cdot h\right)\cdot 2$$
$$\left(\tfrac{1}{2}\cdot 4\cdot 5\right)\cdot 2$$
$$(2\cdot 5)\cdot 2$$
$$(10)\cdot 2$$
$$20$$

ChooseA.

Notice that in the above calculation the ½ and the 2 would cancel and 4 times 5 is 20.

37. The manufacturing plant for *Hello Teddy!* can produce 2000 teddy bears in one hour and the plant receives $1.25 for every teddy bear made. The materials for each bear cost $0.50 and for every hour the plant is operating, 50 employees each receive $20 per hour. If the company extends the factory hours from 16 hours to 24 hours, how much more money will the plant make per day, considering the money received and the cost of materials and employees?

A. $500.00
B. $4000.00
C. $8000.00
D. $12,000.00

Grade 7 MG 1.3

Start by making calculations for the first hour.

Income: (2000)($1.25) = **$2500**

Expenses:
Materials: 2000 times $.50 = $1000
Labor: 50 times $20 = $1000
Total Expenses = $2000

Profit = Income minus Expenses
= 2500 – 2000 = 500

So, the plant makes $500 per hour.

Extending the factory hours from 16 to 24 means adding **(24 – 16)** or 8 additional hours per day.

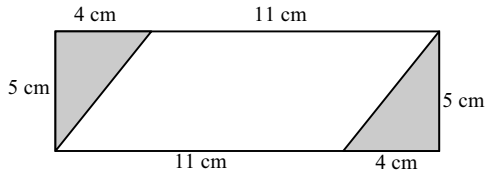
(8)($500) = **$4000 additional profit.**

Choose B.

36. The figure below shows a parallelogram drawn inside a rectangle. What is the area of the shaded portion of the rectangle?

Area of a triangle = ½ bh

Area of a parallelogram = bh



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Grade 7 MG 2.1

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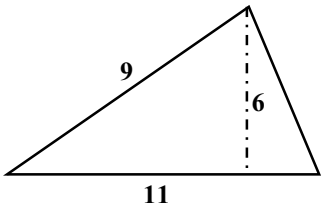
A. $500.00
B. $4000.00
C. $8000.00
D. $12,000.00

Grade 7 MG 1.3

38. Given the formula for the area of a triangle (A = ½ bh), what is the area of the triangle in the figure below.



A. 27 square units
B. 33 square units
C. 54 square units
D. 66 square units

Grade 7 MG 2.1

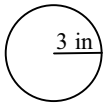
The base and height must be perpendicular so the 9 will not be used in our calculation

$$\tfrac{1}{2}\cdot b\cdot h$$
$$\tfrac{1}{2}\cdot 11\cdot 6$$
$$3\cdot 11$$
$$33$$

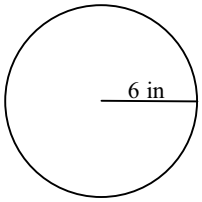
Note: Because multiplication is commutative, the calculation was simplified by multiplying $\frac{1}{2}$ times 6 first.

Choose B.

Circle A



Circle B



39. In the diagram shown above, Circle A has a radius of 3 in. and Circle B has a radius of 6 in.

What is the value of $\frac{\text{area of Circle A}}{\text{area of Circle B}}$?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{2}$

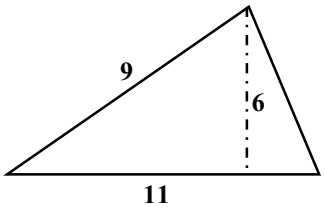
Grade 7 MG 2.1

Use πr^2.

$$\frac{\pi r_A^{\ 2}}{\pi r_B^{\ 2}} = \frac{\pi 3^2}{\pi 6^2} = \frac{9}{36} = \frac{1}{4}$$

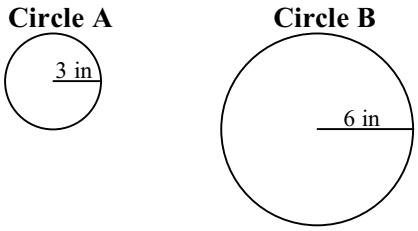
Choose A.

38. Given the formula for the area of a triangle (A = ½ bh), what is the area of the triangle in the figure below.



A. 27 square units
B. 33 square units
C. 54 square units
D. 66 square units

Grade 7 MG 2.1



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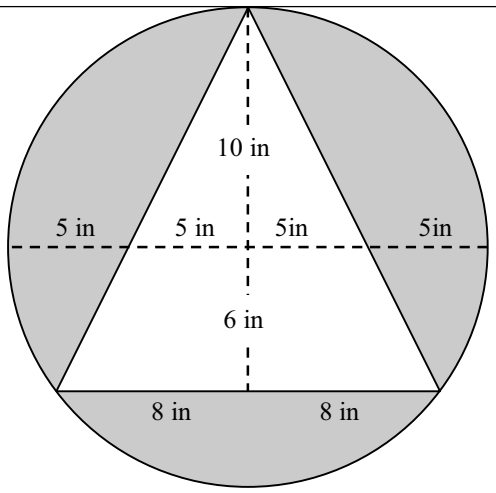
Grade 7 MG 2.1



40. April is cutting out a triangular stencil from a circular piece of gray paper that measures 20 inches in diameter. Approximately how many square inches is the area of the remaining paper (the shaded portion of the diagram)?

Area of a circle = πr^2; $\pi = 3.14$

Area of a triangle = ½ bh

A. 128
B. 186
C. 314
D. 442

Grade 7 MG 2.2

The radius of the circle is 10.

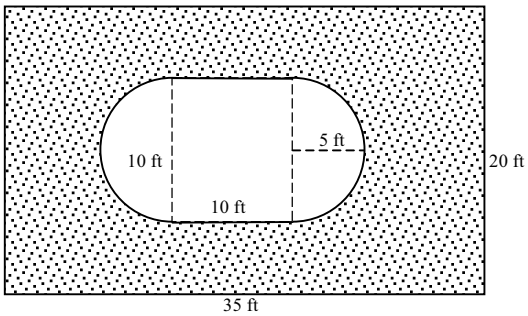
Area of a circle
$= \pi r^2 = 3.14(10)^2 = 3.14(100) = 314$

Area of a Triangle = ½ $b\ h$ =
$\frac{1}{2}(8+8)(6+10) = \frac{1}{2}(16)(16) =$
$8(16) = 128$

The area of the remaining paper (the shaded portion) is equal to

(area of the circle) − (area of triangle) =
314 − 128 = 186

Choose B.



41. Ms. Moya's backyard measures 20 ft by 35 ft and is covered with grass. She built a fish pond (that is actually two semicircles extending from two sides of a square) in the backyard as shown in the diagram above. What is the area of the backyard that is still covered by grass (the shaded area)?

Area of a semicircle = ½ πr^2; $\pi = 3.14$

A. 286.00 ft^2
B. 521.50 ft^2
C. 560.75 ft^2
D. 601.50 ft^2

Grade 7 MG 2.2

Area of a Rectangle = length x width
(entire backyard) = 35 x 20 = 700 ft^2

Area of a Square = side x side = 10 x 10 = 100 ft^2

Since the two semicircles together equal a whole circle, we calculate the area of the two semicircles extending from the square in the pond as follows:

Area of a circle = $\pi r^2 = 3.14(5)^2 = 3.14(25) = 78\ ft^2$

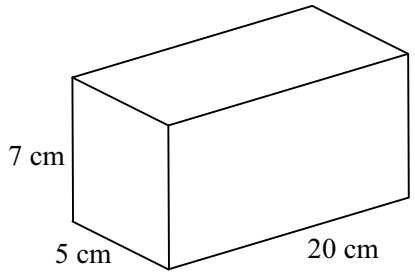
The **area of the pond** is 100 ft^2 + 78 ft^2 = 178 ft^2

The **area of the shaded area** is equal to the area of the entire backyard minus the area of the pond.

700ft^2 – 178ft^2 = **522 ft^2**

Choose B.

Module 13 (continued)



42. Find the volume, in cubic centimeters, of the box shown above.

A. 32
B. 100
C. 500
D. 700

Grade 7 MG 2.3

The *Volume* of a rectangular solid (i.e. a box) is *Length times width times height*.

Formula: $V = lwh$
$= 7(5)(20)$
$= 7(100)$
$= 700\ cm^3$

Choose D.

43. Judie's family room measures 9 feet by 15 feet. Ramirez Flooring Company sells carpet by the square yard. How many square yards of carpet does Judie need to cover her family room floor?

A. 8
B. 15
C. 45
D. 135

Grade7 MG 2.4

Solution 1:

3 feet = 1 yard, so the dimensions 9 feet by 15 feet can be expressed as 3 yards by 5 yards.

Area = Length x Width
= (9 feet) (15 feet)
= (3 yards) (5 yards)
= 15 square yards

Choose B.

Solution 2:

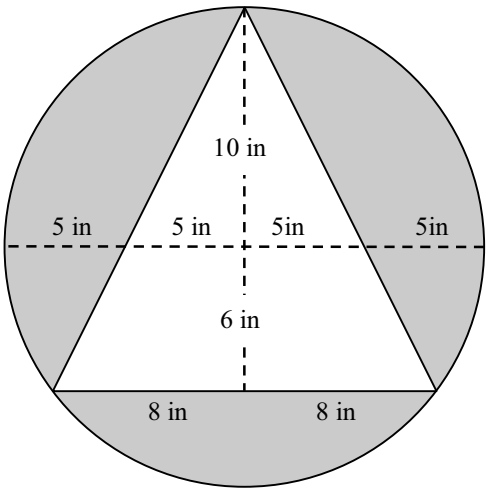
Area = Length x Width
= (9 feet)(15feet)
= 135 square feet

Since 1 square yard is 3 feet by 3 feet, the area of 1 square yard is (3feet)(3 feet) = 9 square feet.

To determine the number of square yards in 135 square feet we must divide by 9 (actually, multiply by 1square yard / 9 square feet)

(135 square feet)(1 square yard / 9 square feet)
= 15 square yards

Choose B.



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Area of a circle = πr^2; $\pi = 3.14$

Area of a triangle = ½ bh

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B. 186
C. 314
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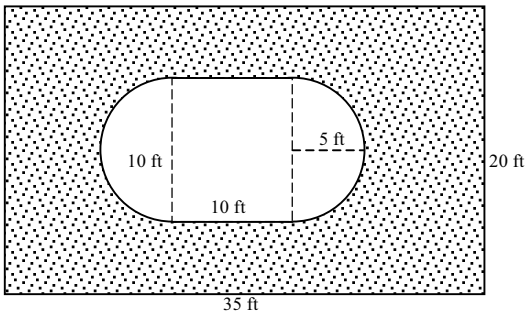
Grade 7 MG 2.2



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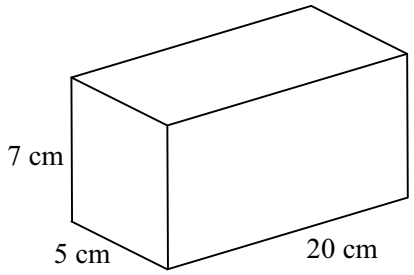
Grade 7 MG 2.2

Module 13 (continued)



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C. 500
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Grade 7 MG 2.3

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A. 8
B. 15
C. 45
D. 135

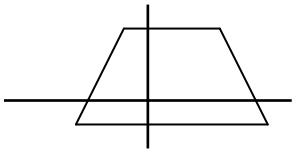
Grade7 MG 2.4

44. The vertices of a quadrilateral are represented by the points (-3, -1), (-1, 3), (3, 3), and (5, -1). What kind of quadrilateral is it?

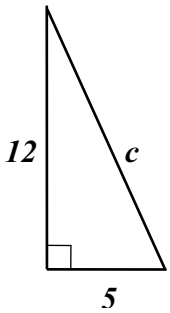
A. Parallelogram
B. Rectangle
C. Square
D. Trapezoid

Grade 7 MG 3.2

It's a trapezoid.



Choose D.



45. In the diagram above, find the value of *c*.

A. 11
B. 13
C. 17
D. 169

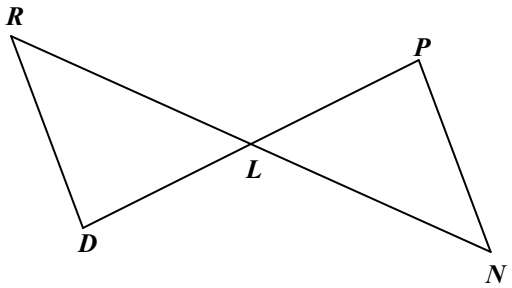
Grade MG 3.3

Pythagorean Theorem

$$a^2 + b^2 = c^2$$
$$5^2 + 12^2 = c^2$$
$$25 + 144 = c^2$$
$$169 = c^2$$
$$\pm\sqrt{169} = \sqrt{c^2}$$
$$\pm 13 = c$$

Discard the negative because length is a distance and therefore always positive.

Choose B.



46. In the diagram above L is the midpoint of $\overline{DP}$ and $\angle RLD \cong \angle NLP$. Which of the following bits of information is all that is needed to prove that $\Delta RLD \cong \Delta NLP$?

A. $\overline{RD} \cong \overline{DL}$
B. $\angle R \cong \angle D$
C. $\overline{RL} \cong \overline{LN}$
D. $\overline{LD} \cong \overline{LP}$

Grade 7 MG 3.4

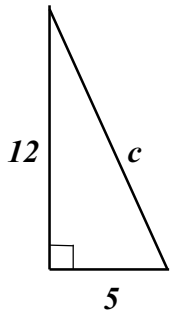
Using Side-Angle-Side (SAS) Theorem you have LD = LP because of the midpoint. You are given the angle. The other sides of the angles are RL and LN. That's what you need.

Choose C.

44. The vertices of a quadrilateral are represented by the points (-3, -1), (-1, 3), (3, 3), and (5, -1). What kind of quadrilateral is it?

A. Parallelogram
B. Rectangle
C. Square
D. Trapezoid

Grade 7 MG 3.2



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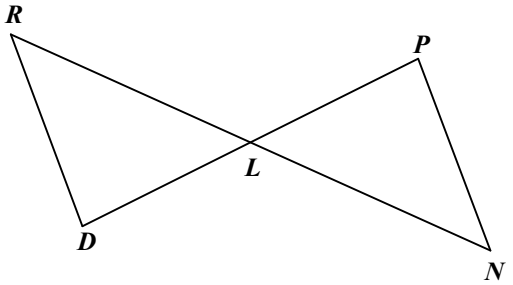
Grade MG 3.3



46. In the diagram above L is the midpoint of $\overline{DP}$ and $\angle RLD \cong \angle NLP$. Which of the following bits of information is all that is needed to prove that $\Delta RLD \cong \Delta NLP$?

A. $\overline{RD} \cong \overline{DL}$
B. $\angle R \cong \angle D$
C. $\overline{RL} \cong \overline{LN}$
D. $\overline{LD} \cong \overline{LP}$

Grade 7 MG 3.4

MODULE 15 – 6th Grade Statistics, Data Analysis, and Probability

47. The table below displays the number of hours that three students spent rehearsing for the school play.

Hours Spent Rehearsing

	Week 1	Week 2	Week 3	Week 4
Ignacio	10	7	11	12
Maria	9	6	7	10
Yolanda	8	5	12	8

What is the mean number of hours per week that Maria spent rehearsing for the play?

D. 7
E. 8
F. 9
G. 32

Grade 6 SDAP 1.1

The mean is what most people refer to as the average.

Maria's mean is
(9+6+7+10)÷4
32÷4 = 8

Choose B.

48. The table below displays the number of hours that three students spent rehearsing for the school play over a four-week period.

Hours Spent Rehearsing

	Week 1	Week 2	Week 3	Week 4
Cammie	12	10	11	10
Maria	9	6	7	10
Yolanda	8	5	6	8

What is the modal number of hours Yolanda spent rehearsing for the school play over the 4-week period?

A. 6.75
B. 8
C. 10
D. 27

Grade 6 SDAP 1.1

What is the Modal number is another of saying find the ***mode***. The mode is the number or item that occurs most often. (If there is a tie you must list more than one mode.)

On this list the mode of Yolanda's practice time is 8 hours because it is listed twice.

Choose B.

47. The table below displays the number of hours that three students spent rehearsing for the school play.

Hours Spent Rehearsing

	Week 1	Week 2	Week 3	Week 4
Ignacio	10	7	11	12
Maria	9	6	7	10
Yolanda	8	5	12	8

What is the mean number of hours per week that Maria spent rehearsing for the play?

E. 7
F. 8
G. 9
H. 32

Grade 6 SDAP 1.1

48. The table below displays the number of hours that three students spent rehearsing for the school play over a four-week period.

Hours Spent Rehearsing

	Week 1	Week 2	Week 3	Week 4
Cammie	12	10	11	10
Maria	9	6	7	10
Yolanda	8	5	6	8

What is the modal number of hours Yolanda spent rehearsing for the school play over the 4-week period?

A. 6.75
B. 8
C. 10
D. 27

Grade 6 SDAP 1.1

MODULE 16 – 6th Grade Statistics, Data Analysis, and Probability

Sports Injuries in 2005

Sport	Participants	Injuries
Baseball	37,500,000	475,000
Football	12,500,000	440,000

49. The local Board of Education considered dropping football as a varsity sport because too many players were injured. At a recent board meeting, a spokesperson for the parents of football players, referred to the data in the chart above and claimed, "Football has 7% fewer injuries per year than baseball." What is <u>deceptive</u> about the spokesperson's claim?

A. The average number of injuries <u>per 1,000 participants</u> is greater for baseball.

B. The spokesperson should have said, "one-third the number of injuries."

C. The spokesperson should have said, "thirty-five percent fewer injuries."

D. The average number of injuries <u>per 1,000 participants</u> is greater for football.

Grade 6 SDAP 2.5

Two approaches:

1) Compare rates of injuries:

$$\text{(Baseball)}\ \frac{475{,}000}{37{,}500{,}000} < \frac{440{,}000}{12{,}500{,}000}\ \text{(Football)}$$

$$.0126 < .0352$$

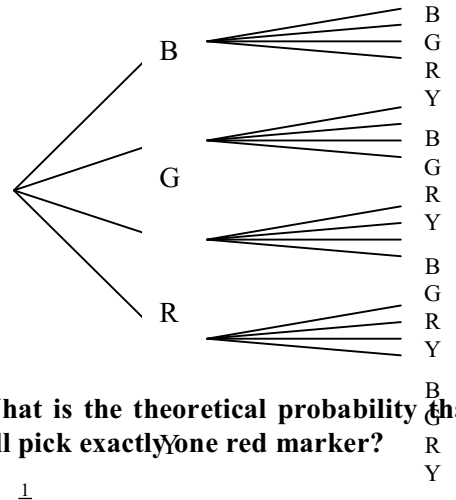
So, while the actual number of football injuries is less than the number of baseball injuries, the ***rate*** of football injuries is actually much greater than the **rate** of baseball injuries

<u>Choose D</u>

2) You can see that there are approximately the same number of injuries in each sport, but football has far fewer participants, so the ***rate*** of injuries for football will be much greater than the ***rate*** of injuries for baseball. The spokesperson is being deceptive because he/she is referring to number of injuries, but it is the rate of injuries in each sport that is a more valid indicator of the risk for student athletes.

<u>Choose D</u>

50. Four plastic game markers, a blue (B), a green (G), a red (R), and a yellow (Y) are placed in a bag. Without looking, Joaquin picks one of the markers, replaces it in the bag and then picks another. The tree diagram below represents all the possible outcomes.



What is the theoretical probability that Joaquin will pick exactly one red marker?

A. $\frac{1}{8}$

B. $\frac{3}{8}$

C. $\frac{5}{16}$

D. $\frac{7}{16}$

Grade 6 DAP 3.1

2 draws from 4 markers give 16 possible outcomes

BB	GB	RB	YB
BG	GG	RG	YG
BR	GR	RR	YR
BY	GY	RY	YY

There are 6 with "exactly one red marker."
(Don't count RR which has 2 reds.)

$$\frac{\#\text{"}winning\text{"}outcomes}{\#\ possible.outcomes} = \frac{6}{16} = \frac{3}{8}$$

<u>Choose B</u>.

51. Angela has rolled a 6-sided die with the faces numbered 1–6 several times. Every roll has come up 3. What is the probability that the next roll will be a 3?

A. $\frac{1}{6}$

B. $\frac{1}{5}$

C. $\frac{1}{2}$

D. $\frac{5}{6}$

Grade 6 SDAP

What has happened on previous rolls should not effect the next roll. Therefore

$$\frac{\text{\# of winning outcomes}}{\text{\# of possible outcomes}} = \frac{1}{6}$$

Choose A.

52. Which of the following pairs of events describes two dependent events?

A. Flipping a coin that comes up heads; rolling a cube with faces numbered 1– 6 and getting a 5.
B. Picking a spade from a standard deck of 52 cards without replacing it; picking another spade from the same deck of cards.
C. Drawing a vowel from a box of 26 different alphabet tiles; drawing a consonant from a box containing the same 26 alphabet tiles.
D. Picking a red jelly bean from a dish containing 20 each of eight assorted colors; picking a short straw from a hat containing 1 short straw and 9 long straws.

Grade 6 SDAP 3.5

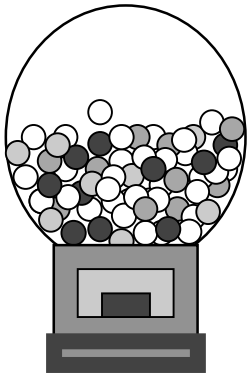
Dependent events means that what happens in the first event changes the odds of the second event.

In answer A flipping a coin will not change the odds of rolling a die afterwards, so these two events are independent.

In answer C, drawing a vowel from the box of 26 tiles and drawing a consonant from the same 26 tiles are independent events, since the implication is that the vowel is returned to the box. Answer choice C says 26 tiles both times.

In answer D, picking the jelly bean will not change the odds of picking the short straw.

The answer is B. When you pick the first spade out of the deck of 52 cards, your odds are 13 out of 52. Since you do not put it back (the choice says "*without replacing it"),* the events are dependent. The first event changes the odds of the second event to 12 out of 51 (instead of 12 out of 52).



53. A candy machine has an equal number of red, green, blue, yellow and orange candies. What is the probability that the first candy to come out will <u>not</u> be green?

A. $\frac{1}{5}$ B. $\frac{2}{5}$ C. $\frac{3}{5}$ D. $\frac{4}{5}$

Grade 6 SDAP 3.3

Note the "not."
There are four colors that are ***<u>not</u>*** green.

$$\frac{\#\text{"}winning\text{"}outcomes}{\#\,possible.outcomes} = \frac{4}{5}$$

<u>Choose D</u>.

Sports Injuries in 2005

Sport	Participants	Injuries
Baseball	37,500,000	475,000
Football	12,500,000	440,000

49. The local Board of Education considered dropping football as a varsity sport because too many players were injured. At a recent board meeting, a spokesperson for the parents of football players, referred to the data in the chart above and claimed, "Football has 7% fewer injuries per year than baseball." What is deceptive about the spokesperson's claim?

A. The average number of injuries per 1,000 participants is greater for baseball.

B. The spokesperson should have said, "one-third the number of injuries."

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Grade 6 SDAP 2.5

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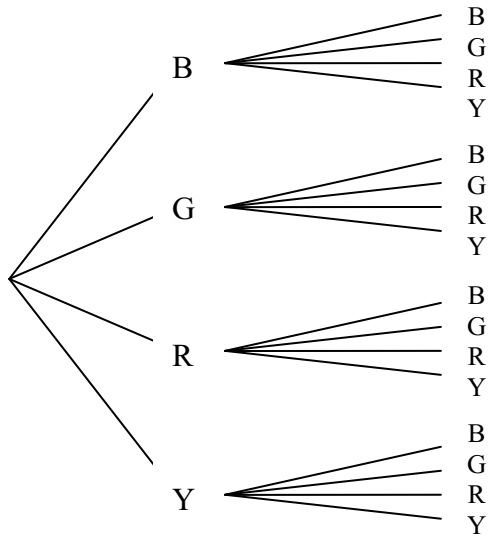

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A. $\frac{1}{8}$

B. $\frac{3}{8}$

C. $\frac{5}{16}$

D. $\frac{7}{16}$

Grade 6 SDAP 3.1

51. Angela has rolled a 6-sided die with the faces numbered 1–6 several times. Every roll has come up 3. What is the probability that the next roll will be a 3?

A. $\frac{1}{6}$

B. $\frac{1}{5}$

C. $\frac{1}{2}$

D. $\frac{5}{6}$

Grade 6 SDAP 3.3

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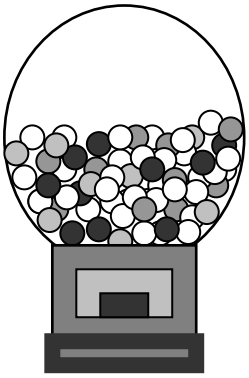
Grade 6 SDAP 3.5



53. A candy machine has an equal number of red, green, blue, yellow and orange candies. What is the probability that the first candy to come out will <u>not</u> be green?

A. $\frac{1}{5}$

B. $\frac{2}{5}$

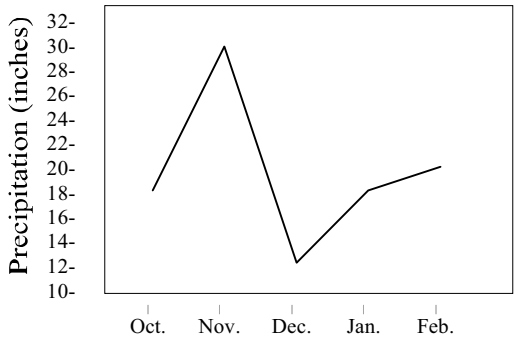
C. $\frac{3}{5}$

D. $\frac{4}{5}$

Grade 6 SDAP 3.3

MODULE 17 – 7th Grade Statistics, Data Analysis, and Probability

54. The monthly amounts of precipitation for Seattle over a five-month period are shown in the graph below.



Which month's precipitation increased the least compared to the previous month?

A. November
B. December
C. January
D. February

Grade 7 SDAP 1.1

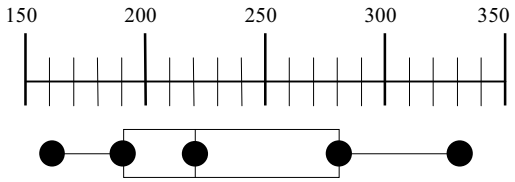
This question is actually a bit ambiguous. An argument could be made that December is the right choice, since a decrease could be represented as a negative increase. Do not choose B.

Typically, on problems stated like this one, increases and decreases are represented as positive numbers They are expressed as an increase of _____ or a decrease of _____, where the blanks are positive numbers.

For this problem, the answer is February, since February shows the smallest (positive) increase from the previous month.

Choose D.

Airfares (Dollars)



55. The diagram shown above is a box-and-whisker plot of the air fares (in dollars) for flights from Long Beach to Sacramento. What is the median price of the airfares?

A. $160.00
B. $190.00
C. $220.00
D. $280.00

Grade 7 SDAP 1.1

On a box-and-whisker plot such as this one, the dots from left to right represent the following:

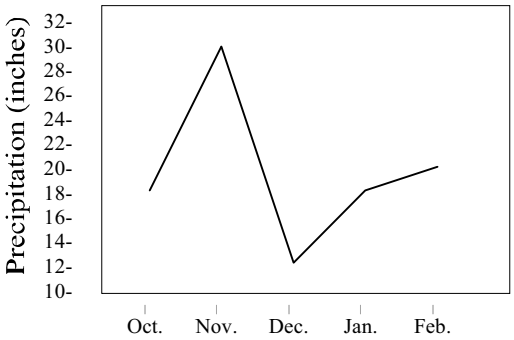
1st dot is the lower extreme
2nd dot is the lower quartile.
3rd dot is the median.
4th dot is the upper quartile.
5th dot is the upper extreme.

The median is the dot which is located inside the "box". It is the center dot of the five dots indicated.

On this particular plot, we locate the median point in the box and move straight up to the airfare scale, which identifies $220.00 as the corresponding airfare to our median price.

Choose C.

54. The monthly amounts of precipitation for Seattle over a five-month period are shown in the graph below.



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Grade 7 SDAP 1.1

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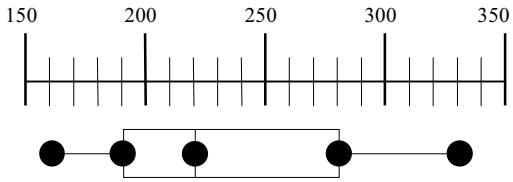

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Grade 7 SDAP 1.1

MODULE 18 – 7th Grade Statistics, Data Analysis, and Probability

56. The Algebra 2 class sizes at East Los Angeles Community College are 35, 37, 46, 48, 37, 55, 38 and 50. What is the upper quartile of these class sizes?

A. 37
B. 42
C. 47
D. 49

Grade 7 SDAP 1.3

The median is the middle number of a list of numbers in order. The upper quartile is the middle number of the top half of that list.

Put the numbers in order and find the top half.

35 37 37 38 *46 48 50 55*

The middle of the top half is between 48 and 50.

The upper quartile is 49.

Choose D.

57. The set of numbers below displays the number of boxes of cookies sold at the mall this weekend by each of the 10 members of the *Turtle Scouts*.

7, 17, 7, 8, 22, 7, 14, 5, 18, and 17

What is the median of this set?

A. 7
B. 8
C. 11
D. 14

Grade 7 SDAP 1.3

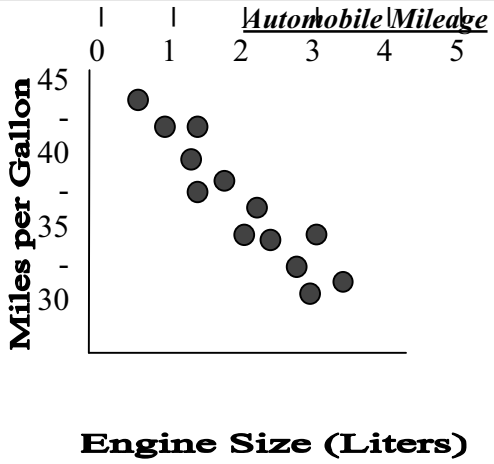
The median is the middle number of a set of numbers *when they are in order.*

5, 7, 7, 7, ***8, 14***, 17, 17, 18, 22

On this problem the middle is between the 8 and the 14. When this occurs, take the mean (many people say average) of those two numbers.

$$\frac{8+14}{2} = 11$$

Choose C.



58. Francisco did some research on gas mileage for a project on energy use. The results of his research are shown in the scatter plot above. What conclusion can Francisco draw that is supported by his data?

A. The number of miles per gallon attained increases as the size of a car's engine increases.
B. The number of miles per gallon attained decreases as the size of a car's engine increases.
C. The number of miles per gallon attained remains the same as the size of a car's engine increases.
D. The number of miles per gallon attained has no relationship to the size of a car's engine.

Grade 7 SDAP 1.2

As you go to the right on the graph the engine size increases. The graph goes down as you go to the right. As you go down the mileage decreases.

Therefore, as the engine size increases, the miles per gallon decreases.

Choose B.

MODULE 18 – 7th Grade Statistics, Data Analysis, and Probability

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Grade 7 SDAP 1.3

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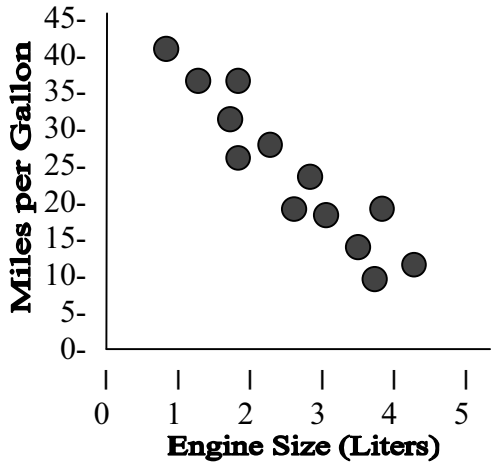
B. 8
C. 11
D. D. 14

Grade 7 SDAP 1.3

Automobile Mileage



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Grade 7 SDAP 1.2

59. Avery is able to remember her house alarm code because her house number is a multiple of the three numbers in the code. If her alarm code is 8-3-6, which of these could be her house number?

A. 12
B. 17
C. 18
D. 24

Grade 7 MR 1.1

We are looking for any common multiple of 8, 3, and 6. 12 is a multiple of 3 and 6, but not 8. 17 is not a multiple of any of the three numbers in the code. 18 is a multiple of 3 and 6, but not 8. 24 is the only choice that is a multiple of all three numbers in the code. (Another way of stating this is that 24 is divisible by all three numbers in the code.)

Choose D.

Hint: It is often helpful when finding common multiples to look at the multiples of the largest number and determine which is divisible by the other numbers.

8 x 1 = 8 (not divisible by 3 or 6)
8 x 2 = 16 (also not divisible by 3 or 6)
8 x 3 = 24 , which is also divisible by 3 and 6
So 24 is a common multiple of 3, 6, and 8.

Choose D.

60. In isosceles triangle *ROD*, the measure of the vertex angle is equal to the sum of the measures of the base angles. Which of the following statements about Δ*ROD* is true?

A. Δ*ROD* is an acute triangle.
B. Δ*ROD* is an obtuse triangle.
C. Δ*ROD* is an equilateral triangle.
D. Δ*ROD* is a right triangle.

Grade7 MR 1.2

Let b = measure base angle
Then 2b = measure of vertex angle.
Since the sum of the measures of the angles of a triangle is 180……..

$$2b + b + b = 180$$
$$4b = 180$$
$$b = 45$$

So the vertex angle (which is 2b) measures 90º.
This means that the triangle is a right triangle.

Choose D.

61. The schedule below shows the departure and arrival times for passenger trains from Long Beach, California, to San Diego, California.

Departure Time from Los Angeles	Arrival Time in San Diego
9:45 AM	11:55 AM
10:25 AM	12: 30 PM
11:00 AM	1:15 PM
2:15 PM	4:45 PM

Which train makes the trip in the shortest time?

A. The train that departs at 9:45 A.M.
B. The train that departs at 10:25 A.M.
C. The train that departs at 11:00 A.M.
D. The train that departs at 2:15 P.M.

Grade 7 MR 1.1

9:45 departure takes 2 hours 10 minutes
10:25 departure takes 2 hours 5 minutes
11:00 departure takes 2 hours 15 minutes
2:15 departure takes 2 hours 30 minutes

The 10:25 departure takes the shortest time.

Choose B.

59. Avery is able to remember her house alarm code because her house number is a multiple of the three numbers in the code. If her alarm code is 8-3-6, which of these could be her house number?

A. 12
B. 17
C. 18
D. 24

Grade 7 MR 1.1

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Grade 7 MR 1.2

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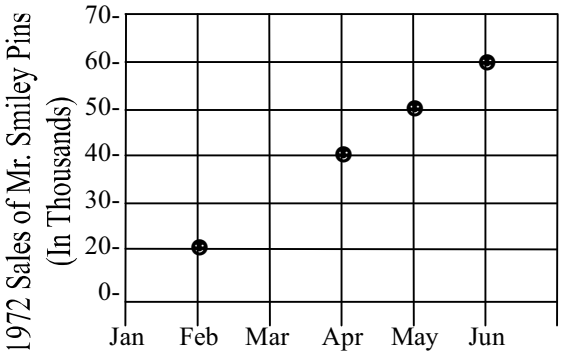
B. The train that departs at 10:25 A.M.
C. The train that departs at 11:00 A.M.
D. The train that departs at 2:15 P.M.

Grade 7 MR 1.1

62. G*roovy*
***Pins & Buttons*™ introduced their new *Mr. Smiley Pin*™ in late January of 1972. The sales data for the month of March has been lost.**



Based on the information in the chart, what is the <u>most likely</u> value for the number of Mr. Smiley Pins sold in March of 1972?

A. 30
B. 20,000
C. 30,000
D. 70,000

Grade 7 MR 2.3

Draw a line through the dots on the graph and above March it will hit 30.

The graph is in thousands so the answer is 30,000.

<u>Choose C.</u>

63. At lunch, Angel stated the following:

If I have to work this weekend, then I will not be able to go to the beach with Chris.

If I do not go to the beach with Chris, then Tracy will go to the beach with Chris.

If Tracy goes to the beach with Chris, I will not be very happy.

Which of the following conclusions can be drawn from Juan's statements?

A. If Angel is very happy, then Angel did not have to work this weekend.
B. If Angel is not very happy, then Angel did have to work this weekend.
C. If Angel does not have to work this weekend, then Angel will be very happy.
D. If Tracy goes to the beach with Chris, then Angel had to work this weekend.

Grade 7 MR 2.4

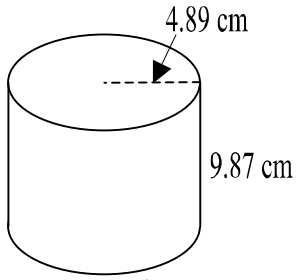
A. is correct. If Angel had to work this weekend, then he would not have gone to the beach with Chris, Tracy would have gone to the beach with Chris, and he would not be very happy. Since he **is** happy, he must not have had to work this weekend.

B. Angel might not have to work, but something else could make him unhappy.

C. Same as B; Angel might not have to work but could still end up unhappy.

D. Tracy might go to the beach with Chris even if Angel does not have to work.

<u>Choose A.</u>



$V = \pi r^2 h$

64. Using a calculator, Mirabel found the volume of the cylinder pictured above to be 7410.7902 cm^3. She immediately new that she had made an error because the volume of the cylinder should be approximately

A. $3 \cdot 3 \cdot 5 \cdot 10 = 450$
B. $3 \cdot 5 \cdot 5 \cdot 10 = 750$
C. $5 \cdot 5 \cdot 5 \cdot 10 = 1250$
D. $314 \cdot 5 \cdot 10 = 15{,}700$

Grade 7 MR 2.1

Estimation (or approximation) is rounding to "easier to use" numbers.

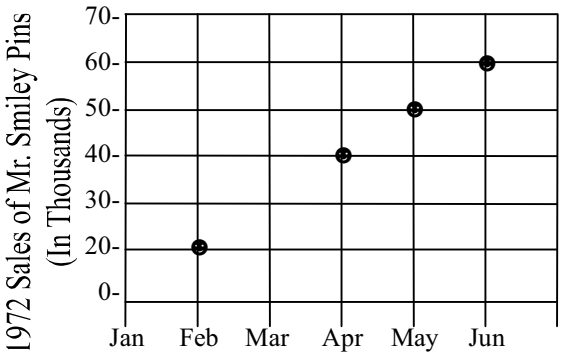
Many students don't get the idea that it is supposed to simplify a problem.

$$V = \pi r^2 h$$
$$V = (3.14)(4.89)^2(9.87)$$
$$\textit{Approximating}:$$
$$V = (3)(5)^2(10)$$
$$V = (3)(5)(5)(10)$$

This yields 750 as an approximation to the volume of the cylinder.

Choose B.

62. ***Groovy Pins & Buttons*™ introduced their new *Mr. Smiley Pin*™ in late January of 1972. The sales data for the month of March has been lost.**



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A. 30
B. 20,000
C. 30,000
D. 70,000

Grade 7 MR 2.3

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Which of the following conclusions can be drawn from Juan's statements?

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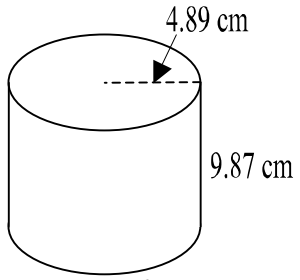
Grade 7 MR 2.4



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B. $3 \cdot 5 \cdot 5 \cdot 10 = 750$
C. $5 \cdot 5 \cdot 5 \cdot 10 = 1250$
D. $314 \cdot 5 \cdot 10 = 15{,}700$

Grade 7 MR 2.1

65. Rene and Jordan always like to leave a tip for about 15% of the cost of a meal when they eat out at a nice restaurant. Their dinner bill was $24.79. Which of the following is a reasonable amount to leave for a tip?

A. $2.50
B. $3.75
C. $5.50
D. $7.50

Grade 7 MR 3.1

Solution 1:

(.15)($24.79) = $3.7185

The answer closest to this is $3.75

Solution 2:

Round/Approximate $24.79 to $25.00.

15% = 10% + 5%

10% is $2.50 (move decimal)

5% is $1.25 (half of 10%)

Add: $2.50 + $1.25 = $3.75

Choose B.

Celsius (°C) Temperature	Fahrenheit (°F) Temperature
0	32
10	50
20	68
30	86
40	?

66. Use the data in the table above to find the unknown Fahrenheit temperature.

A. 98
B. 100
C. 104
D. 20

Grade 7 MR 3.3

Note that the Fahrenheit temperatures increase by 18 for every 10 degree increase in the Celsius temperatures.

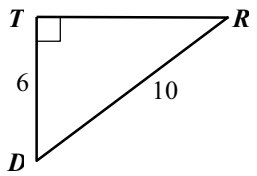
To find the unknown Farenheit temperature,

Add 18 to 86.

86 + 18 = 104

Choose C.

67. In the figure below, $\angle T$ is a right angle. What is the length of $\overline{TR}$?



A. 4
B. 8
C. 10
D. 11.66

Grade 7 MG 3.3

Use Pythagorean Theorem

$$a^2 + b^2 = c^2$$
$$6^2 + b^2 = 10^2$$
$$36 + b^2 = 100$$
$$36 - 36 + b^2 = 100 - 36$$
$$b^2 = 64$$
$$\sqrt{b^2} = \pm\sqrt{64}$$
$$b = \pm 8$$

Discard the negative because length is a distance and is, therefore, always positive.

Choose B.

65. Rene and Jordan always like to leave a tip for about 15% of the cost of a meal when they eat out at a nice restaurant. Their dinner bill was $24.79. Which of the following is a reasonable amount to leave for a tip?

A. $2.50
B. $3.75
C. $5.50
D. $7.50

Grade 7 MR 3.1

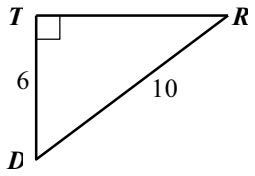
Celsius (°C) Temperature	Fahrenheit (°F) Temperature
0	32
10	50
20	68
30	86
40	?

66. Use the data in the table above to find the unknown Fahrenheit temperature.

A. 98
B. 100
C. 104
D. 20

Grade 7 MR 3.3

67. In the figure below, $\angle T$ is a right angle. What is the length of $\overline{TR}$?



A. 4
B. 8
C. 10
D. 11.66

Grade 7 MG 3.3

68. While landscaping the backyard, the Aguayo family rented a wood-chipper from Purkhiser Hardware & Plumbing. The charge for renting the wood-chipper is $35.50 plus $19.90 per day. The total cost for the rental came to $135.00. Which of the following equations could be used to determine the number of days that they rented the wood-chipper?

A. 135 = 19.9d − 35.5
B. 19.9 = 135 + 35.5d
C. 19.9d = 135 + 35.5
D. 35.5 + 19.9d = 135

Algebra One 15.0

This problem is quite wordy. The key phrase to use when writing an expression to model the cost is "***$35.50 plus $19.90 per day".***

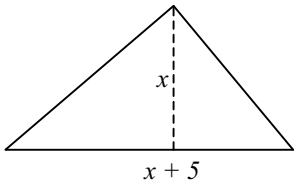
This can be represented algebraically by:

35.5 + 19.9d = total cost

So, since *"the total cost for the rental came to $135.00"*, substituting yields the equation

35.5 + 19.9d = 135

Choose D.



69. The base of the above triangle is 5 units longer than its height. Which of the following expressions could stand for the area of the triangle?

A. $\frac{x^2+5x}{2}$

B. $\frac{2x+5x}{2}$

C. $\frac{x^2+5x+5}{2}$

D. $\frac{x^2+10x+25}{2}$

Algebra One 10.0

$$A = \frac{(base)(height)}{2}$$

The base = $x + 5$.

The height = x.

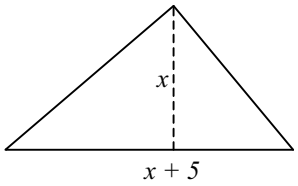
$$\frac{(x+5)(x)}{2} = \frac{x^2+5x}{2}$$

Choose A.

68. While landscaping the backyard, the Aguayo family rented a wood-chipper from Purkhiser Hardware & Plumbing. The charge for renting the wood-chipper is $35.50 plus $19.90 per day. The total cost for the rental came to $135.00. Which of the following equations could be used to determine the number of days that they rented the wood-chipper?

A. $135 = 19.9d - 35.5$
B. $19.9 = 135 + 35.5d$
C. $19.9d = 135 + 35.5$
D. $35.5 + 19.9d = 135$

Algebra One 15.0



69. The base of the above triangle is 5 units longer than its height. Which of the following expressions could stand for the area of the triangle?

A. $\frac{x^2 + 5x}{2}$

B. $\frac{2x + 5x}{2}$

C. $\frac{x^2 + 5x + 5}{2}$

D. $\frac{x^2 + 10x + 25}{2}$

Algebra One 10.0

MODULE 23 – Algebra One

$$\frac{12}{d+9} = \frac{7}{d-3}$$ **70. Which equation below is equivalent to the one shown above?** A. $(d-3)(d+9) = 84$ B. $12(d+9) = 7(d-3)$ C. $12(d-3) = 7(d+9)$ D. $19 = (d-3) + (d+9)$ *Alggebra One 4.0*	Cross multiply when solving proportions (proportions are equations of two fractions). The cross products here are shown on answer C. *Choose* C.
71. Which ordered pair is a solution for this system of equations? $$\begin{aligned} 2x - y &= 5 \\ y &= x - 3 \end{aligned}$$ A. $(-1, 2)$ B. $(1, -2)$ C. $(-2, 1)$ D. $(2, -1)$ *Algebra One 9.0*	This can be solved by substitution. Replace y in the first equation with $x - 3$ from the second equation. $2x - y = 5$ $2x - (x - 3) = 5$ $2x - x + 3 = 5$ $x + 3 - 3 = 5 - 3$ $x = 2$ ***STOP***. Only answer D has x = 2. Check (2, -1) in each equation. ALSO: If you do not know how to solve equations with two variables, you can just check each answer to see which point satisfies both equations. Substitute the first coordinate of each answer choice in for x and the second coordinate of each answer choice in for y in each of the given equations. *Choose D.*
$$8(4m + 5) = 7(3m - 1) + 11$$ **72. To solve for *m* in the equation above the first thing that should be done is** A. apply the distributive property. B. add –11 to each side. C. divide each side by 8. D. divide each side by 7. *Algebra One 5.0*	The first thing to do in solving equations is to simplify both sides using the order of operations. On this problem you would start by multiplying on the left side using the distributive property… 8(4m + 5) = 7(3m – 1) +11 32m + 40 = …….. *Choose A.*

$$\frac{12}{d+9} = \frac{7}{d-3}$$

70. Which equation below is equivalent to the one shown above?

A. $(d - 3)(d + 9) = 84$
B. $12(d + 9) = 7(d - 3)$
C. $12(d - 3) = 7(d + 9)$
D. $19 = (d - 3) + (d + 9)$

Algebra One 4.0

71. Which ordered pair is a solution for this system of equations?

$$\begin{aligned} 2x - y &= 5 \\ y &= x - 3 \end{aligned}$$

A. $(-1, 2)$
B. $(1, -2)$
C. $(-2, 1)$
D. $(2, -1)$

Algebra One 9.0

$$8(4m + 5) = 7(3m - 1) + 11$$

72. To solve for *m* in the equation above the first thing that should be done is

A. apply the distributive property.
B. add –11 to each side.
C. divide each side by 8.
D. divide each side by 7.

Algebra One 5.0

MODULE 24 – Algebra One

73. Given that *n* is an integer, what is the solution set for 6 |*n*| = 18? A. {–3, 0} B. {–3, 0, 3} C. {–3, 3} D. {0, 3} *Algebra One 3.0*	Absolute value means the distance from zero. Distance is always positive. $6\,\lvert n \rvert = 18$ $\frac{6\lvert n\rvert}{6} = \frac{18}{6}$ (divide both sides by 6) $\lvert n \rvert = 3$ (reduce) $n = 3$ or -3. (since n is 3 units from zero) <u>*Choose C*</u>.
74. Which inequality is equivalent to $3 + 4m \le 5(m - 7)$ **?** A. $3 + 4m \le 5m - 2$ B. $3 + 4m \le 5m - 7$ C. $3 + 4m \le 5m - 12$ D. $3 + 4m \le 5m - 35$ *Algebra One 4.0*	Applying the Distributive Property to the right side of the given inequality reveals the correct answer. $3 + 4m \le 5(m - 7)$ is equivalent to $3 + 4m \le 5m - 35$ <u>*Choose D*</u> Quadratic equations usually have 2 solutions. That's why the answers are in *{braces}*.
75. Solve for x. $\mathbf{5x^2 - 7 = 73}$ A. {–4, 4} B. {0, 16} C. {–2, 2} D. {–2, 4} *Algebr One 2.0*	**1) Checking Solutions:** THIS IS NOT A TIMED TEST. If students don't know how *to solve* an equation, they can just substitute answers and check for the right one. Answer A suggests solutions – 4 and 4. Beginning with – 4……. $5x^2 - 7 = 73$ $5(-4)^2 - 7 = 73$ $5(-4)(-4) - 7 = 73$ $5(16) - 7 = 73$ $80 - 7 = 73$ $73 = 73$ *– 4* is a solution because it makes the equation true. **Stop.** The only answer with *– 4* as a solution is A so it is not necessary to check any more choices. **Solving:** $5x^2 - 7 = 73$ $5x^2 - 7 + 7 = 73 + 7$ $5x^2 = 80$ $\frac{5x^2}{5} = \frac{80}{5}$ <u>*Choose A.*</u> $x^2 = 16$ $\sqrt{x^2} = \pm\sqrt{16}$ $x = \pm 4$

EQUITY PRINCIPLE

Excellence in mathematics education requires equity—
high expectations and strong support for all students.

All students, regardless of their personal characteristics, backgrounds, or physical challenges, must be provided opportunities to study and learn mathematics. This does not mean that every student should be treated the same. Some students may need additional support and resources, while others may need enrichment opportunities. All students need access to a coherent, challenging mathematics curriculum that is taught by competent and well-supported mathematics teachers each year they are in school.

Too many students – especially students who are economically disadvantaged, English Learners (EL), disabled, female, members of ethnic minority groups, or Standard English Learners (SEL) – are victims of low expectations in mathematics. For example, tracking has consistently consigned disadvantaged groups of students to mathematics classes that concentrate on remediation and basic skills or do not offer significant mathematical substance. The Equity Principle demands that high expectations for meaningful mathematics learning be communicated to all students through spoken and written words and through meaningful and challenging tasks. Furthermore, all students must be provided appropriate and timely support to provide access and equity in their learning of mathematics.

Some students may need more than an ambitious curriculum and excellent teaching to meet high expectations. Students who are having difficulty may benefit from such resources as after-school programs, peer mentoring, or cross-age tutoring. Students with special learning needs in mathematics should be supported by both their classroom teachers and special education staff.

Likewise, students with special interests or exceptional talent in mathematics may need enrichment programs or additional resources to keep them challenged and engaged. The talent and interest of these students must be nurtured so that they have the opportunity and guidance to excel in mathematics.

Well-documented examples demonstrate that all children can learn mathematics when they have access to high-quality mathematics instruction. Such instruction needs to become the norm.

Adapted from National Council of Teachers of Mathematics (NCTM)

RESOURCES
http://standards.nctm.org/document/chapter2/equity.htm

ENGLISH LEARNERS (EL) AND STANDARD ENGLISH LEARNERS (SEL)

Research has shown that five to ten years of appropriate instruction are needed to acquire a second language (Collier & Thomas 1995*)*. However, this does not mean that rigorous content instruction is postponed until English Learners gain full mastery of English. Students acquiring English can be successful in mathematics when lessons are carefully planned to meet linguistic and cultural needs. Scaffolding mathematical concepts fosters higher order thinking, language development and habits of mind. To promote student success, a classroom should provide:

- A *safe environment* that reduces student anxiety and offers opportunities for active involvement
- Instruction that ensures students are given *comprehensible input* (sufficient and appropriate language for student understanding)
- Frequent opportunities to increase *comprehensible output* (verbal interaction using accountable talk), and exposition (written explanation of a student's thinking process).

Although English Learners need instruction that amplifies rather than simplifies language, teachers should and can maintain rigor while increasing access to mathematics. Teachers should:

- Select tasks that require high-quality thinking from everyone (e.g. Unit Concept Lessons)
- Build upon prior understanding, prior language, and informal mathematical thinking
- Model (use visuals and/or realia) and develop key vocabulary to guide and move to independence
- Expect and support active student engagement and discourse
- Provide situations and activities for students to develop and communicate their mathematical thinking through listening, speaking, reading and writing
- Amplify, rather than simplify, mathematical language
- Listen to students articulate their mathematical thinking; paraphrase or restate to check for understanding and to amplify academic language; pose questions to clarify and extend student thinking; pause and allow for ***wait time***

RESOURCES

http://www.ncela.gwu.edu/pubs/directions/04.htm **"**Acquiring a Second Language for School"**,** by Virginia P. Collier, George Mason University, National Clearinghouse for Bilingual Education , Vol. 1, No. 4, Fall 1995

http://www.ncrel.org/sdrs/areas/issues/content/cntareas/math/ma700.htm "Critical Issue: Mastering the Mosaic—Framing Impact Factors to Aid Limited-English-Proficient Students in Mathematics and Science", Valdez, NCREL

http://www.crede.org/links/4teachers.html Links for teachers and schools

http://www.wested.org/cs/we/view/rs/760 A Framework for Teaching English Language Learners

STUDENTS WITH DISABILITIES

The *Individuals with Disabilities Education Act* (IDEA) 2004, requires that students with disabilities be involved and progress in, the general education curriculum. The LAUSD Mathematics Instructional Guide provides the framework for the general education curriculum and as such, is used as the guiding instructional document for all students; including those with disabilities whose Individual Education Program (IEP) has determined will participate in the District general education curriculum for his/her grade level or the District general education curriculum using accommodations/modifications identified in the IEP. This information is located in Section M of the student's IEP.

Special Education Supports and Services
A continuum of special education services and supports is provided to students with disabilities to support meaningful participation and progress in general education curriculum. These begin with co-planning between general educators, special educators, and math coaches. Co-planning provides teachers with the opportunity to develop instructional strategies, scaffolds, and accommodations needed for students to access rigorous instruction. It is also a time when teachers determine co-teaching roles and responsibilities. Co-teaching, the next layer of support, consists of two teachers teaching together in the same room. There are a variety of co-teaching methods that provide needed support for all learners in the general education classroom. Another layer of support is the use of the Learning Center. Students can use the Learning Center for short interludes during the instructional period (pullout) or for an extended period provided as an elective. Instruction in the Learning Center includes pre-teaching in the concepts, re-teaching of prior learned material, and instruction in basic skills or strategies.

Evidenced-based strategies
Many instructional strategies used to teach students with disabilities are the same effective strategies used for students without disabilities. The use of differentiated instruction and appropriate scaffolds assist teachers in meeting the needs of the diverse learners within the Los Angeles Unified School District. Additional strategies are listed below:

- Scaffolded instruction
- Use of mnemonics, pictures or manipulatives to support retention of concepts
- Use of graphic organizers to effectively chunk information
- Small chunks of instruction interspersed with opportunities for guided practice
- Variation in instructional groupings: whole group, small cooperative groups, peer assisted learning, etc.
- Repetition of instructions
- Use of small incremental steps in instruction or presentation
- Provision of corrective feedback

Accommodations
The determination of what accommodations or modifications a student will need to meaningfully participate and progress in the general education curriculum is determined by the IEP team. Identified accommodations or modifications are found in section J of the IEP.

Accommodations are considered "changes in course content, teaching strategies, test presentation, location, timing, scheduling student response, or environmental structuring that **do not** substantially

change the standards or expectations for student performance." Accommodations are changes to how the student demonstrates mastery of skills associated with meeting grade level standards.

Modifications are "changes in course content, teaching strategies, test presentation, location, timing, scheduling student response, or environmental structuring that **do** substantially change the standards or expectations for student performance." Modifications are changes to the content of instruction and expected learning.

A variety of accommodations might be considered by the IEP team. Examples are listed below:

- Use of cue sheets
- Use of a marker or place holder
- Testing in smaller groups
- Reducing the number of problems required to demonstrate mastery
- Use of the calculator (if it does not violate the construct being taught. This cannot be used in standardized testing)
- Use of manipulatives
- Extended time for learning or task completion

This list is not exhaustive. IEP teams will want to access the Special Education Accommodations/Modifications for California Statewide Assessments available at the following website: www.cde.ca.gov/ta/tg/sa/documents/matrix5.pdf to determine appropriate accommodations for the STAR testing.

RESOURCES

http://dse-web.lausd.k12.ca.us/ Division of Special Education website
www.carsplus.org California Association of Resource Specialists & Special Education Teachers (CARS+)
www.ideapractices.org IDEA Practices
www.cast.org. Center for Applied Special Technology

ADVANCED LEARNERS AND GIFTED AND TALENTED EDUCATION (G.A.T.E.)

Advanced learners and Gifted and Talented students demonstrate academic performance that exceeds that of their grade level peers. Ensuring mastery of the mathematics standards through challenging and enriched instruction is the goal for advanced learners. Students who readily understand the basic underpinnings of the standards pursue a richer understanding of standards-based mathematics content. Advanced learners must be encouraged to extend their knowledge through available enrichment opportunities. Enrichment lessons have high levels of standards-based mathematics content proportionate to the amount of time that the lessons take. Enrichment projects should be designed so that the student does most of the work in the classroom. Differentiating instruction for the Advanced Learner is to provide depth and breadth into the content of grade-level standards.

The state has mandated that all school districts provide a comprehensive continuum of services and program options responsive to the needs, interests, and abilities of gifted students.

Teachers can address the needs of G.A.T.E. students through differentiated instruction which can be demonstrated in the following manner:

- Use open, flexible classroom space and varied levels of materials
- Encourage students to express their thoughts and ideas and allow them to engage in cooperative and individual learning
- Monitor and accurately evaluate students' skills
- Develop strategies that enable students to form personal goals
- Permit students to engage in self-talk as well as dialogue with others in order to increase their problem-solving capabilities
- Encourage students to exhibit independence through projects that culminate in real products and employ the methods of inquiry used by real scholars
- Facilitate the communication of thoughts and ideas in ways which nurture and develop the multiple intelligences
- Vary placement of students in learning groups (i.e. provide experiences in both heterogeneous and homogeneous groups)

RESOURCES

www.lausd.k12.ca.us/lausd/offices/GATE LAUSD Gifted/Talented Programs
www.cagifted.org California Association for the Gifted
www.thomasarmstrong.com/multiple_intelligencies.htm Multiple Intelligences

DIFFERENTIATED INSTRUCTION

" No two children are alike,
no two children learn in the identical way,
an enriched environment for one student is not necessarily enriched for another,
in the classroom we should teach children to think for themselves."

Marian Diamond

All students must have access to the same basic curriculum. Current educational research informs teachers that successful teaching requires that instruction must be differentiated. Differentiated instruction means that multiple paths are provided so that students of differing abilities, interest, learning styles, educational needs all experience equal access to curriculum. The opportunities that students have to absorb, use, and develop their understanding of the concepts, ideas, and information taught must allow for students to take a greater role in their own learning. Students are allowed to demonstrate their mastery of concepts in varied ways and at varied levels of complexity.

Successful teaching requires a skilled interweaving of various components. These components should include:

1) Pre-assessment: student interests, learning styles, readiness levels
2) Curriculum and state standards: what is to be taught
3) Content decision: adapt or modify what tasks or activities students will use to access the curriculum
4) Process decision: in what ways will students interact with the ideas, concepts, and information; whether whole class, groups, pairs, or individually
5) Assessment: adapt or modify the product by which students will provide evidence of understanding the curriculum; provide students a choice

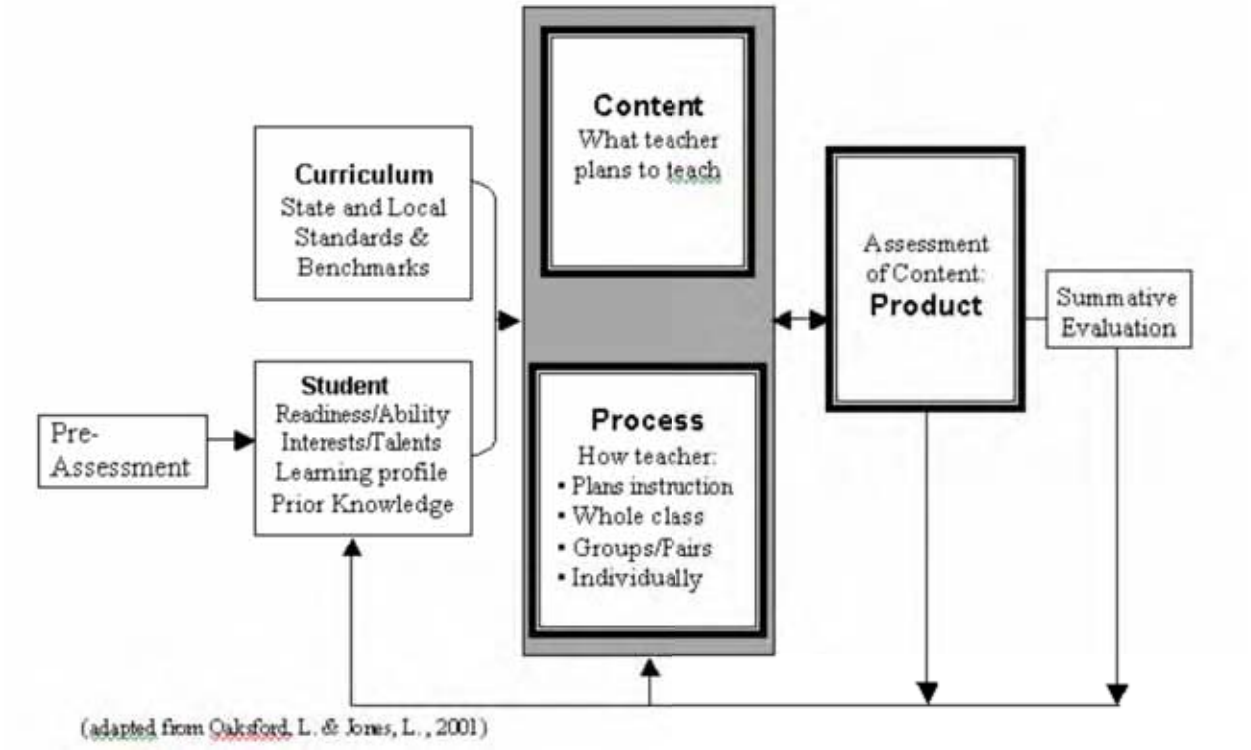
Successful teaching requires two elements: student understanding and student engagement. Students must really understand, or make sense of, what they have studied. They must also feel engaged in or "hooked by" the ways in which they learn.

The classroom needs to be engaging to students. A classroom is engaging when it shows students the connection between their own lives and the mathematics they are learning. It provides a challenge that pushes each learner a bit further than is comfortable, and it supports success. Sometimes those things are fun. Often they are knotty and hard.

Differentiated instruction will dignify each learner with learning that is "whole", important, and meaningful. The core of what the students learn remains relatively steady. How the student learns—including the degree of difficulty, working arrangements, modes of expression, and methods of scaffolding—may vary considerably. Differentiation is not so much the *stuff* as the *how*. If the stuff is ill-conceived, the how is doomed.

Differentiated instruction is an integral part of an instructional cycle involving planning, classroom implementation, student participation, assessment, and re-teaching, if necessary.

Learning Cycle and Decision Factors Used in Planning and Implementing Differentiated Instruction



In summary, the effective teacher:

- Plans for what students should know, understand, and be able to do at the end of a sequence of learning
- Recognizes each learner by planning tasks that are interesting, relevant, and powerful
- Invites each student to make conjectures and try different approaches
- Determines where each student is in knowledge, skill, and understanding, and where he or she needs to move

RESOURCES

http://members.shaw.ca/priscillatheroux/differentiating.html Differentiating Instruction
http://www.cast.org/publications/ncac/ncac_diffinstruc.html Differentiated Instruction by Tracey Hall
Oaksford, L. and Jones, L, 2001, Learning Cycle

CULTURALLY RELEVANT AND RESPONSIVE EDUCATION (CRRE)

Teachers of mathematics need to affirm the culture and home language of the students to allow them to master mathematical language and content. The purpose of culturally relevant teaching is to maximize learning for all students, including those whom the system has historically failed to reach.

The District has adopted the definition of Culturally Relevant and Responsive Education (CRRE) from Gay (2000). Culturally Relevant and Responsive Education is defined as

> "Adjusting how we teach to the needs and experiences of students by using their cultural knowledge, prior experiences, and performance styles to make learning encounters more relevant and effective for them".

The following are examples of what would be observed in a Culturally Responsive classroom:

- A safe and caring classroom environment in which students are comfortable using their home language, asking questions and making mistakes. ("Students don't care what you know unless they know that you care.")
- Learning tasks that enable different possibilities, strategies and products to emerge
- Students engaged in critical thinking and investigative activities with *multiple entry points* that promote dialogue and sharing of strategies
- Lessons and tasks that meet students' diverse needs and learning modalities through
    - *Scaffolding*
    - *SDAIE strategies* including the use of manipulatives, graphic organizers, technology, cooperative groups, and pair sharing
- Clarifying, probing, connecting, and open-ended questions that allow students to explain their understanding
- Increased *wait time* providing students an opportunity to process and think
- Teacher circulating through the classroom providing support and listening for misconceptions and other barriers to achievement
- Students are provided with opportunities to assist other students which include translating for those who need English language support
- Students' culture and experiences reflected in context of lesson, tasks, and classroom environment

RESOURCES

http://www.nccrest.org/publications.html National Center for Culturally Responsive Educational System
http://iss.lausd.net/aemp/resources.html Los Angeles School District: Academic English Mastery Program
http://www.collegeboard.com/about/association/academic/taskforce/taskforce.html
Advancing Minority High Achievement Calculus and Community; Reaching the Top College Board

ASKING QUESTIONS

The process of asking questions reveals what students truly understand about procedures and problem solving in mathematics. This will assist a teacher in directing a student to a deeper mathematical understanding.

By asking open-ended, thought-provoking questions, teachers:

- Engage and guide students' thinking to deeper levels
- Gain insight into what students understand and the depth of that understanding
- Engage and guide the class in deeper mathematical thinking about the concepts
- Place greater emphasis on mathematical thinking and reasoning

These questions cannot be answered effectively with single-word responses. Asking students to formulate more elaborate responses promotes learning.

A low-stress, low-anxiety environment in the classroom can be accomplished by:

- Anticipating the questions students will likely ask
- Organizing students in ways that allow them to interact more freely with each other
- Using wait time, which allows students more time to process the questions and develop multiple responses
- Honoring ALL responses and remaining neutral in order to allow students opportunities to validate each others' responses

RESOURCES

Chapin, O'Connor, and Anderson *"Classroom Discussions: Using Math Talk to Help Students Learn, Grades 1-6"*
LAUSD Grades 4 and 5 Intervention Kits
NCTM: "The Art of Questioning in Mathematics"

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THINKING THROUGH THE LESSON PROTOCOL (TTLP)

The purpose of the *Thinking Through a Lesson Protocol* is to prompt thinking deeply about a specific lesson to be taught that is based on a cognitively challenging mathematical task.

It is suggested that using the following questions may serve as a guide for the teacher in the preparation of a lesson. The Concept Lessons are designed according to this 3 part format:

- **Part 1: Selecting and Setting up a Mathematical Task**
- **Part 2: Supporting Students' Exploration of the Task**
- **Part 3: Sharing and Discussing the Task**

TTLP in Depth

Part 1: Selecting and Setting up a Mathematical Task

- What are the mathematical objectives for the lesson? What is it that the students should know and understand about mathematics as a result of this lesson?
- In what ways does the task build on students' previous knowledge? What definitions, concepts, or ideas do students need to know in order to begin to work on the task?
- What are all the ways the task can be solved?
    - Which of these methods will your students use?
    - What misconceptions might students have?
    - What errors might students make?
- What are the expectations for students as they work on and complete this task?
    - What resources or tools will students have to use in their work?
    - How will the students work – independently, in small groups, or in pairs – to explore this task? How long will the work individually or in small groups/pairs? Will students be partnered in a specific way? If so, in what way?
    - How will students record and report their work?
- How will students be introduced to the activity so as not to reduce the demands of the task? What will be heard that indicates that the students understood the task?

Part 2: Supporting Students' Exploration of the Task

- As students are working independently or in small groups:
    - What questions will be asked to focus students' thinking?
    - What will be seen or heard that indicates that the students are thinking about the mathematical ideas?
    - What questions will be asked to assess students' understanding of key mathematics ideas, problem solving, or representations?
    - What questions will be asked to advance students' understanding of the mathematics ideas?
    - What questions will be asked to encourage students to share their thinking with others or to assess their understanding of their peer's ideas?
- How will students remain engaged in the task?
    - What will be done if a student does not know how to begin to solve a task?

- What will be done if a student finishes the task almost immediately and becomes bored or disruptive?
- What will be done if students focus on non-mathematical aspects of the activity? What if student's focus on a project is making colorful drawings or downloading pictures from the internet and the mathematics is not addressed?

Part 3: Sharing and Discussing the Task

- How will the class discussion be orchestrated so that the mathematical objectives are accomplished? Specifically:
  - Which solution paths will be shared during class discussion? In what order will the solutions be presented? Why?
  - In what ways will the order in which solutions are presented help develop students' understanding of the mathematical ideas that are the focus of the lesson?
  - What specific questions will be asked so that students will:
    - Make sense of the mathematical ideas that need to be learned?
    - Expand on, debate, and question the solutions being shared?
    - Make connections between the different strategies that are presented?
    - Look for patterns?
    - Begin to form generalizations?
- What will be seen or heard that indicates that the students understand the mathematical ideas taught?
- What will be done tomorrow to build on this lesson?

REFERENCES

Smith, M. S. & Bill, V. (2004, January). *Thinking Through A lesson: Collaborative Lesson Planning as a Means for Improving the Quality of Teaching.* Presentation at the annual meeting of the Association of Mathematics Teachers Educators, San Diego, CA.

Hughes, E. K, & Smith, M. S. (2004, April). Thinking Through a Lesson: Lesson Planning as Evidence of and a Vehicle for Teacher Learning. Poster presented as part of a symposium, "Developing a Knowledge Base for Teaching: Learning Content and Pedagogy in a Course on Patterns and Functions" at the annual meeting of the American Educational Research Association, San Diego, CA.

ACADEMIC RIGOR IN A THINKING CURRICULUM	Principles of Learning: Accountable Talk
Commitment to a Knowledge Core • There is an articulated curriculum in each subject that avoids needless repetition and progressively deepens understanding of core concepts. • The curriculum and instruction are clearly organized around major concepts specified in the standards. • Teaching and assessment focus on students' mastery of core concepts. **High-thinking Demand** • In every subject students are regularly expected to raise questions, to solve problems, to think, and to reason. • Students are doing challenging, high-level assignments in every subject. • Assignments in each subject include extended projects in which original work and revision to standards is expected. • Students are challenged to construct explanations and to justify arguments in each subject. • Instruction is organized to support reflection on learning processes and strategies. **Active Use of Knowledge** • Each subject includes assignments that require students to synthesize several sources of information. • Students in each subject are challenged to construct explanations and to test their understanding of concepts by applying them and discussing them. • Students' prior knowledge and out-of-school knowledge is used regularly in the teaching and learning process. • Instructional tasks and classroom discourse require students to interpret texts and construct solutions.	**Accountability to the Learning Community** • Active participation in classroom talk. • Listen attentively. • Elaborate and build on each other's ideas. • Work to clarify or expand a proposition. **Accountability to Knowledge** • Specific and accurate knowledge. • Appropriate evidence for claims and arguments. • Commitment to getting it right. **Accountability to Rigorous Thinking** • Synthesize several sources of information. • Construct explanations and test understanding of concepts. • Formulate conjectures and hypotheses. • Employ generally accepted standards of reasoning. • Challenge the quality of evidence and reasoning.

MATHEMATICAL REASONING AND COMMUNICATION

"When students apply basic computational and procedural skills and understandings to solve new or perplexing problems, their basic skills are strengthened, the challenging problems they encounter can become routine, and their conceptual understanding deepens." – *2000 Mathematics Framework for California Public Schools*

Reasoning and communication should be developed in all mathematics contexts. Students are most likely to strengthen mathematical reasoning over their K-12 mathematics education by communicating their thinking about procedures and mathematical structure in a series of related problem solving experiences. Likewise, students are assessed on both content and reasoning standards as indicated by the CAHSEE released questions below (Numbers 119 and 133, NS 1.2, Grade 7).

A flower shop delivery van traveled these distances during one week: 104.4, 117.8, 92.3, 168.7, and 225.6 miles. How many gallons of gas were used by the delivery van during this week?

119. What other information is needed in order to solve this problem?

A The average speed traveled in miles per hour

B The cost of gasoline per gallon

C The average number of miles per gallon for the van

D The number of different deliveries the van made

Len runs a mile in 8 minutes. At this rate how long will it take him to run a 26-mile marathon?

133. Which of the following problems can be solved using the same arithmetic operations that are used to solve the problem above?

A Len runs 26 miles in 220 minutes. How long does it take him to run each mile?

B A librarian has 356 books to place on 18 shelves. Each shelf will contain the same number of books. How many books can the librarian place on each shelf?

C A cracker box weighs 200 grams. What is the weight of 100 boxes?

D Each basket of strawberries weighs 60 grams. How many baskets can be filled from 500 grams of strawberries?

M00137

Problems occur in many forms. Some are simple and routine, providing practice for skill development. Others are more complex and take a longer time to complete. Whatever their nature, it is important that the kinds of problems students are asked to solve balance situations in the real world with more abstract situations. The process of solving problems generally has three stages. (Geary 1994; Mayer 1985).

The **first stage** is formulation, analysis, and translation. Important considerations in the formulation and analysis in any problem situation include determining mathematical hypotheses, making conjectures, recognizing patterns, searching for connections to known mathematical structures, and translating the gist of the problem into mathematical representations.

MATHEMATICAL REASONING AND COMMUNICATION

Mathematical Reasoning	**Problem Solving**	**Mathematical Communication**
Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information (Grade 7 MR 1.1)	*Formulate*	Students restate the problem in their own words and formulate conjectures about the problem.
	Analyze	Students develop and explain their problem solving strategy (ies) and process.
	Translate	Students use mathematical language and representations to express the information and relationships in the problem in their own words.

The **second stage** is integration and representation. Integration involves putting together different pieces of information that are presented in complex problems. Students use representation when they change relationships in a problem from their own words into mathematical language. Regardless of how such problems are represented, a wide variety of basic and technical skills are needed in solving the problems; and, given this need, a mathematics program should include a substantial number of ready-to-solve exercises that are designed specifically to develop and reinforce such skills.

The **third stage** is solutions and justifications. Students should have a range of strategies to use in solving problems and should be encouraged to think about all possible procedures that might be used to aid in solving any problem. Some of the strategies are:

- Acting it out
- Using concrete models
- Drawing a picture or sketch
- Using manipulatives
- Looking for patterns
- Finding a simpler related problem
- Organizing data in a table
- Making a diagram or chart
- Estimating
- Using an appropriate formula
- Writing an equation
- Using guess and check
- Working backwards
- Computing directly
- Drawing a graph
- Making a conjecture and verifying it using theorems

FAMILY INVOLVEMENT

Families demonstrate the many ways they use math everyday which nurtures a positive attitude towards mathematics. They provide children with early experiences in mathematics that build an important foundation for learning.

Activities such as Math Family Night and parent workshops are designed to inform families about the importance of mathematical reasoning and problem-solving skills. These activities are designed to help families become familiar with current teaching strategies and to help them guide and support their children in learning mathematics.

Teachers play a critical role in providing information to parents regarding their child's K-12 mathematics journey. Such information includes: grade-level standards; current state assessments; intervention and support beyond the school day; graduation requirements; college entrance requirements; and enrichment opportunities in mathematics.

RESOURCES

www.school.discovery.com Math games, puzzles, challenges, and information
www.Harcourtschool.com On line math help
www.Math.com On line tutoring and referrals
www.Mathforum.org On line math help with "Dr.Math", resources
www.Coolmath.com A commercial math help line and resource center for parents and students
www.Webmath.com K-12 math help, resource and support
www.Kidsource.com Links to many resources
www.scottforesman.com Home-School connection
www.onlineintervention.com Homework Help, Family Education Connection,
www.cde.ca.gov Parent Handbook for Mathematics
www.greatsource.com Parent Guides (Helping Your Child Succeed in Math)
http://mathforum.org/ Links to other resources
www.ed.gov U.S. Department of Education Publications

- *Math in the Home*
- *Math at the Grocery Store*
- *Math on the Go*
- *Math for the Fun of It*
- *What Our Children Are Learning*
- *What You Can Do To Help Your Child Achieve in Math*
- *How Will Math Look in Your Child's Classroom*

Math Solutions Publications: What Are You Teaching My Child? *Marilyn Burns video*

THE CALIFORNIA STANDARDS TEST (CST)

The California Standards Test (CST) is part of the California Standardized Testing and Reporting (STAR) Program. The purpose of the STAR Program is to measure to what extent students have acquired the knowledge and skills identified in the California academic standards. Students in grades two through eleven participate in the STAR Program in the spring of each year.

The CST score for each student is compared to preset criteria to determine if the student's performance on the test is advanced, proficient, basic, below basic, or far below basic. The state target is for all students to score at the proficient and advanced levels.

Scores are reported to individual students and they are aggregated in reports to the public for schools, school districts, counties and the state. The results are also disaggregated by grade level, gender, economic disadvantage, major racial and ethnic groups, students with disabilities, and English learners for reports to the public.

The CST's are a major component of California's accountability system for schools and districts. CST results are the major component used for calculating each school's Academic Performance Index (API). These results are also used for determining if elementary and middle schools are making adequate yearly progress in helping all students become proficient on the state's academic content standards as required by the federal No Child Left Behind Act of 2001.

RESOURCES
http://www.cde.ca.gov/ta/tg/sr/

CALIFORNIA STANDARDS TEST: GRADE 6 BLUEPRINT	# of Items	%
Number Sense	**25**	**39%**
Standard Set 1.0* Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages:		
1.1*Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.	**3**	
1.2*Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (*a/b*, *a* to *b*, *a:b*).	**1**	
1.3*Use proportions to solve problems (e.g., determine the value of *N* if 4/7 = *N*/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.	**6**	
1.4*Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.	**5**	
Standard Set 2.0* Students calculate and solve problems involving addition, subtraction, multiplication, and division:		
2.1 Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.	**1/2****	
2.2 Explain the meaning of multiplication and division of positive fractions and perform the calculations (e.g., 5/8 divided by 15/16 = 5/8 × 16/15 = 2/3).	**1/2****	
2.3*Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.	**6**	
2.4*Determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).	**3**	
Algebra and Functions	**19**	**29%**
Standard Set 1.0 Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results:		
1.1*Write and solve one-step linear equations in one variable.	**6**	
1.2 Write and evaluate an algebraic expression for a given situation, using up to three variables.	**1**	
1.3 Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process.	**1**	
1.4 Solve problems manually by using the correct order of operations or by using a scientific calculator.	**1**	
Standard Set 2.0 Students analyze and use tables, graphs, and rules to solve problems involving rates and proportions:		
2.1 Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).	**1**	
2.2*Demonstrate an understanding that *rate* is a measure of one quantity per unit value of another quantity.	**6**	
2.3 Solve problems involving rates, average speed, distance, and time.	**1**	
Standard Set 3.0 Students investigate geometric patterns and describe them algebraically:		
3.1 Use variables in expressions describing geometric quantities (e.g., $P = 2w + 2l$, $A = \frac{1}{2} bh$, $C = \pi d$ – the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively).	**1**	
3.2 Express in symbolic form simple relationships arising from geometry.	**1**	

Measurement and Geometry	10	15%
Standard Set 1.0 Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems:		
1.1*Understand the concept of a constant such as π; know the formulas for the circumference and area of a circle.	**3**	
1.2 Know common estimates of π (3.14; 22/7) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements.	**1/2****	
1.3 Know and use the formulas for the volume of triangular prisms and cylinders (area of base × height; compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid.	**1/2****	
Standard Set 2.0 Students identify and describe the properties of two-dimensional figures:		
2.1 Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms.	**1**	
2.2*Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle.	**4**	
2.3 Draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle).	**1**	
Statistics, Data Analysis, and Probability	**11**	**17%**
Standard Set 1.0 Students compute and analyze statistical measurements for data sets:		
1.1 Compute the range, mean, median, and mode of data sets.	**1/3****	
1.2 Understand how additional data added to data sets may affect these computations of measures of central tendency.	**1/3****	
1.3 Understand how the inclusion or exclusion of outliers affect measures of central tendency.	**1/3****	
1.4 Know why a specific measure of central tendency (mean, median, mode) provides the most useful information in a given context.	**NA*****	
Standard Set 2.0 Students use data samples of a population and describe the characteristics and limitations of the samples:		
2.1 Compare different samples of a population with the data from the entire population and identify a situation in which it makes sense to use a sample.	*NA****	
2.2*Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population.	**3**	
2.3*Analyze data displays and explain why the way in which the question was asked might have influenced the results obtained and why the way in which the results were displayed might have influenced the conclusions reached.	**NA*****	
2.4*Identify data that represent sampling errors and explain why the sample (and the display) might be biased.	**NA*****	
2.5*Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.	**1/3****	
Standard Set 3.0 Students determine theoretical and experimental probabilities and use these to make predictions about events:		
3.1*Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.	**3**	
3.2 Use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).	**NA*****	
3.3*Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if *P* is the probability of an event, 1 - *P* is the probability of an event not occurring.	**3**	

3.4 Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.	**1/3****	
3.5*Understand the difference between independent and dependent events.	**1/3****	
Mathematical Reasoning	**Embedded**	
Standard Set 1.0 Students make decisions about how to approach problems.		
1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.	**Embedded**	
1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.	**Embedded**	
1.3 Determine when and how to break a problem into simpler parts.	**Embedded**	
Standard Set 2.0 Students use strategies, skills, and concepts in finding solutions:		
2.1 Use estimation to verify the reasonableness of calculated results.	**Embedded**	
2.2 Apply strategies and results from simpler problems to more complex problems.	**Embedded**	
2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.	**Embedded**	
2.4 Use a variety of methods, such a words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.	**Embedded**	
2.5 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.	**Embedded**	
2.6 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.	**Embedded**	
2.7 Make precise calculations and check the validity of the results from the context of the problem.	**Embedded**	
Standard Set 3.0 Students move beyond a particular problem by generalizing to other situations.		
3.1 Evaluate the reasonableness of the solution in the context of the original situation.	**Embedded**	
3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.	**Embedded**	
3.3 Develop generalizations of the results obtained and the strategies used and apply them in new problem situations.	**Embedded**	
GRADE 6 TOTAL	**65**	**100%**

CALIFORNIA STANDARDS TEST: GRADE 7 BLUEPRINT	# of Items	%
Number Sense	**22**	**34%**
Standard Set 1.0 Students know the properties of, and compute with, rational numbers expressed in a variety of forms:		
1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.	**1**	
1.2* Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	**4**	
1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.	**1**	
1.4* Differentiate between rational and irrational numbers.	**1**	
1.5* Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.	**1**	
1.6 Calculate the percentage of increases and decreases of a quantity.	**1**	
1.7* Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.	**5**	
Standard Set 2.0 Students use exponents, powers, and roots and use exponents in working with fractions:		
2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.	**1**	
2.2* Add and subtract fractions by using factoring to find common denominators.	**1**	
2.3* Multiply, divide, and simplify rational numbers by using exponent rules.	**3**	
2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.	**1**	
2.5* Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.	**2**	
Algebra and Functions	**25**	**38%**
Standard Set 1.0 Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:		
1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).	**1**	
1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.	**1**	
1.3* Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	**5**	
1.4 Use algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly.	**1/3****	
1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.	**2/3****	
Standard Set 2.0 Students interpret and evaluate expressions involving integer powers and simple roots:		
2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	**1**	
2.2 Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.	**1**	
Standard Set 3.0 Students graph and interpret linear and some nonlinear functions:		
3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.	**2/3****	
3.2 Plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying lengths).	**1/3****	

3.3*Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.	**2**	
3.4*Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	**2**	
Standard Set 4.0* Students solve simple linear equations and inequalities over the rational numbers:		
4.1*Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.	**5**	
4.2*Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	**5**	
Measurement and Geometry	**13**	**20%**
Standard Set 1.0 Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:		
1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).	**2/3****	
1.2 Construct and read drawings and models made to scale.	**1/3****	
1.3*Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.	**3**	
Standard Set 2.0 Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:		
2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.	**1/3****	
2.2 Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.	**1/3****	
2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.	**1/3****	
2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft^2] = [144 in^2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in^3] = [16.38 cm^3].	**1/3****	
Standard Set 3.0 Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:		
3.1 Identify and construct basic elements of geometric figures (e.g., altitudes, midpoints, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge.	**1/3****	
3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.	**1/3****	
3.3*Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.	**4**	

3.4*Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.	**2**	
3.5 Construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms, and cones.	**NA*** **	
3.6*Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).	**1**	
Statistics, Data Analysis, and Probability	**5**	**8%**
Standard Set 1.0 Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program:		
1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and- whisker plot; use the forms to display a single set of data or to compare two sets of data.	**1**	
1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).	**1**	
1.3*Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.	**3**	
Mathematical Reasoning	**Embedded**	
Standard Set 1.0 Students make decisions about how to approach problems:		
1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.	**Embedded**	
1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.	**Embedded**	
1.3 Determine when and how to break a problem into simpler parts.	**Embedded**	
Standard Set 2.0 Students use strategies, skills, and concepts in finding solutions:		
2.1 Use estimation to verify the reasonableness of calculated results.	**Embedded**	
2.2 Apply strategies and results from simpler problems to more complex problems.	**Embedded**	
2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.	**Embedded**	
2.4 Make and test conjectures by using both inductive and deductive reasoning.	**Embedded**	
2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.	*Embedded*	
2.6 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.	**Embedded**	
2.7 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.	**Embedded**	
2.8 Make precise calculations and check the validity of the results from the context of the problem.	**Embedded**	
Standard Set 3.0 Students determine a solution is complete and move beyond a particular problem by generalizing to other situations:		
3.1 Evaluate the reasonableness of the solution in the context of the original situation.	**Embedded**	
3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.	**Embedded**	
3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.	**Embedded**	
GRADE 7 TOTAL	**65**	**100%**

GENERAL MATHEMATICS CALIFORNIA STANDARDS TEST *CALIFORNIA CONTENT STANDARDS: GRADE 7*	# of Items	%
Number Sense	**24**	**37%**
Standard Set 1.0 Students know the properties of, and compute with, rational numbers expressed in a variety of forms:		
1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.	**1**	
1.2*Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	**4**	
1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.	**4**	
1.5*Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.	**2**	
1.6 Calculate the percentage of increases and decreases of a quantity.	**1**	
1.7*Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.	**2**	
Standard Set 2.0 Students use exponents, powers, and roots and use exponents in working with fractions:		
2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.	**1**	
2.2*Add and subtract fractions by using factoring to find common denominators.	**4**	
2.3*Multiply, divide, and simplify rational numbers by using exponent rules.	**2**	
2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.	**1**	
2.5*Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.	**2**	
Algebra and Functions	**21**	**32%**
Standard Set 1.0 Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:		
1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).	**3**	
1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.	**3**	
1.3*Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	**2**	
1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.	**1**	
Standard Set 2.0 Students interpret and evaluate expressions involving integer powers and simple roots:		
2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.	**1**	
2.2 Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.	**1**	
Standard Set 3.0 Students graph and interpret linear and some nonlinear functions:		
3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.	**1**	
3.3*Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.	**2**	

CALIFORNIA STANDARDS TEST GENERAL MATHEMATICS *CALIFORNIA CONTENT STANDARDS: GRADE 7*	**# of Items**	**%**
3.4*Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	**1**	
Standard Set 4.0* Students solve simple linear equations and inequalities over the rational numbers:		
4.1*Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.	**4**	
4.2*Solve multistep problems involving rate, average speed, distance, and time or a direct variation.	**2**	
Measurement and Geometry	**11**	**17%**
Standard Set 1.0 Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:		
1.1Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).	**1**	
1.2 Construct and read drawings and models made to scale.	**1**	
1.3*Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.	**2**	
Standard Set 2.0 Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:		
2.1Use formulas routinely for finding the perimeter and area of basic two dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.	**1**	
2.2 Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.	**1**	
2.3Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.	**1/2****	
2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft^2] = [144 in^2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in^3] = [16.38 cm^3].	**1/2****	
Standard Set 3.0 Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:		
3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.	**1**	
3.3*Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.	**3**	

CALIFORNIA STANDARDS TEST GENERAL MATHEMATICS *CALIFORNIA CONTENT STANDARDS: GRADE 6*	**# of Items**	**%**
Statistics, Data Analysis, and Probability	**9**	**14%**
Standard Set 1.0 Students compute and analyze statistical measurements for data sets:		
1.1 Compute the range, mean, median, and mode of data sets.	**1**	
Standard Set 2.0 Students use data samples of a population and describe the characteristics and limitations of the samples:		
2.5*Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.	**1**	
Standard Set 3.0 Students determine theoretical and experimental probabilities and use these to make predictions about events:		
3.1*Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.	**1**	
3.3*Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if *P* is the probability of an event, 1-*P* is the probability of an event not occurring.	**1**	
3.5*Understand the difference between independent and dependent events.	**1**	
CALIFORNIA CONTENT STANDARDS: GRADE 7		
Statistics, Data Analysis, and Probability		
Standard Set 1.0 Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program:		
1.1Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.	**1**	
1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).	**1**	
1.3*Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.	**2**	
Mathematical Reasoning	**Embedded**	
Standard Set 1.0 Students make decisions about how to approach problems:		
1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.	*Embedded*	
1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.	**Embedded**	
Standard Set 2.0 Students use strategies, skills, and concepts in finding solutions:		
2.1Use estimation to verify the reasonableness of calculated results.	**Embedded**	
2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.	**Embedded**	
2.4 Make and test conjectures by using both inductive and deductive reasoning.	**Embedded**	
Standard Set 3.0 Students determine a solution is complete and move beyond a particular problem by generalizing to other situations:		
3.1Evaluate the reasonableness of the solution in the context of the original situation.	**Embedded**	
3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.	**Embedded**	
GENERAL MATHEMATICS TOTAL	**65**	**100%**

CALIFORNIA STANDARDS TEST: ALGEBRA I BLUEPRINT	# of Items	%
Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed and used in a wide variety of problem-solving situations.		
Algebra I	**65**	**100%**
Standard Set 1.0 Students identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable:		
1.1 Students use properties of numbers to demonstrate whether assertions are true or false.	**1/2****	
2.0* Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.	**4**	
3.0 Students solve equations and inequalities involving absolute values.	**1**	
4.0* Students simplify expressions prior to solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.	**3**	
5.0* Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.	**6**	
6.0* Students graph a linear equation and compute the x- and y- intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).	**4**	
7.0* Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations using the point-slope formula.	**4**	
8.0 Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.	**1**	

CALIFORNIA CONTENT STANDARDS: ALGEBRA I		# of Items	%
9.0*	Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.	**5**	
10.0*	Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.	**4**	
11.0	Students apply basic factoring techniques to second-and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.	**2**	
12.0*	Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.	**3**	
13.0*	Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.	**4**	
14.0*	Students solve a quadratic equation by factoring or completing the square.	**3**	
15.0*	Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.	**4**	
16.0	Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions.	**1/2****	
17.0	Students determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.	**1**	
18.0	Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.	**1/2****	
19.0*	Students know the quadratic formula and are familiar with its proof by completing the square.	**2**	
20.0*	Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.	**3**	

CALIFORNIA CONTENT STANDARDS: ALGEBRA I	# of Items	%
22.0 Students use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points.	**1**	
21.0* Students graph quadratic functions and know that their roots are the *x*-intercepts.	**3**	
23.0* Students apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.	**3**	
Standard Set 24.0 Students use and know simple aspects of a logical argument:		
24.1 Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.	**1/3****	
24.2 Students identify the hypothesis and conclusion in logical deduction.	**1/3****	
24.3 Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.	**1/3****	
Standard Set 25.0 Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements:		
25.1 Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.	**1/2****	
25.2 Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.	**1/2****	
25.3 Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.	**1/2****	
ALGEBRA I TOTAL	**65**	**100%**

CALIFORNIA STANDARDS TEST: GEOMETRY BLUEPRINT		# of Items	%
The geometric skills and concepts in this discipline are useful to all students. Aside from learning these skills and concepts, students will develop their ability to construct formal, logical arguments and proofs in geometric settings and problems.			
Geometry		**65**	**100%**
1.0*	Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.	**2**	
2.0*	Students write geometric proofs, including proofs by contradiction.	**3**	
3.0*	Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.	**4**	
4.0*	Students prove basic theorems involving congruence and similarity.	**5**	
5.0	Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles.	**2**	
6.0	Students know and are able to use the triangle inequality theorem.	**1**	
7.0*	Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.	**5 2/3****	
8.0*	Students know, derive, and solve problems involving perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.	**4**	
9.0	Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders.	**2**	
10.0*	Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.	**4**	
11.0	Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.	**1**	

CALIFORNIA CONTENT STANDARDS: GEOMETRY		# of Items	%
12.0*	Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.	**5**	
13.0	Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical, and exterior angles.	**2**	
14.0*	Students prove the Pythagorean theorem.	**1/3****	
15.0	Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.	**2**	
16.0*	Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.	**4**	
17.0*	Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.	**3**	
18.0*	Students know the definitions of the basic trigonometric functions defined by the angles of a right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x) = \sin(x)/\cos(x)$, $(\sin(x))^2 + (\cos(x))^2 = 1$.	**3**	
19.0*	Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.	**3**	
20.0	Students know and are able to use angle and side relationships in problems with special right triangles, such as 30°, 60°, and 90° triangles and 45°, 45°, and 90° triangles.	**1**	
21.0*	Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.	**5**	
22.0*	Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translations, and reflections.	**3**	
GEOMETRY TOTAL		**65**	**100%**

CALIFORNIA STANDARDS TEST: ALGEBRA II BLUEPRINT		# of Items	%
This discipline complements and expands the mathematical content and concepts of Algebra I and Geometry. Students who master Algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.			
Algebra II		**60**	**92%**
1.0*	Students solve equations and inequalities involving absolute value.	**1**	
2.0*	Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.	**5**	
3.0*	Students are adept at operations on polynomials, including long division.	**4**	
4.0*	Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.	**3**	
5.0*	Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane.	**2**	
6.0*	Students add, subtract, multiply, and divide complex numbers.	**3**	
7.0*	Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.	**6**	
8.0*	Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.	**4**	
9.0*	Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as a, b, and c vary in the equation $y = a(x-b)^2 + c$.	**2**	
CALIFORNIA CONTENT STANDARDS: ALGEBRA II		**# of Items**	**%**
10.0*	Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	**4**	

Standard Set 11.0* Students prove simple laws of logarithms.			
11.1*	Students understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents.	**3**	
11.2*	Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.	**2 1/2****	
12.0*	Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.	**3**	
13.0	Students use the definition of logarithms to translate between logarithms in any base.	**1**	
14.0	Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.	**2**	
15.0*	Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true.	**4**	
16.0	Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it.	**1/3****	
17.0	Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.	**1**	
18.0*	Students use fundamental counting principles to compute combinations and permutations.	**2**	
19.0*	Students use combinations and permutations to compute probabilities.	**2**	
20.0*	Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.	**2**	
CALIFORNIA CONTENT STANDARDS: ALGEBRA II		**# of Items**	**%**
21.0	Students apply the method of mathematical induction to prove general statements about the positive integers.	**1/3****	
22.0	Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.	**2**	
23.0*	Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.	**NA*****	

24.0	Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.	**1/2****	
25.0	Students use properties from number systems to justify steps in combining and simplifying functions.	**1/3****	
Probability and Statistics		**5**	**8%**
1.0	Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.	**1**	
2.0	Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces.	**2**	
7.0	Students compute the variance and the standard deviation of a distribution of data.	**2**	
ALGEBRA II TOTAL		**65**	**100%**

academic language The vocabulary which a student needs to access mathematical content.

Academic Performance Index This index is the cornerstone of California's Public School Accountability Act of 1999. It's purpose is to measure the academic performance and growth of schools. A school's score on the API is an indicator of the school's performance level.

accommodation Any change in course content, teaching strategy, test presentation, location, timing scheduling, student response, or environmental structure that **does not** substantially change the standards or expectation for the student's performance. See **modification.**

accountable talk A principle of learning. Some indicators are: 1) active student participation in classroom talk; 2) active listening to other students' ideas; 3) employment of accepted standards of reasoning; 4) commitment to getting it right.

Adequate Yearly Progress A statewide accountability system mandated by the federal No Child Left Behind Act of 2001 (NCLB) that requires each state to ensure that all schools and districts make Adequate Yearly Progress.

API Acronym for Academic Performance Index.

assessment A tool which is used to inform instruction by pinpointing skills and concepts which students have difficulty mastering or about which they have misunderstandings; not an evaluation tool.

AYP Acronym for Adequate Yearly Progress.

blueprint A document which explicitly states the concepts, skills, or standards to be assessed and the relative importance of each of these.

CAHSEE California High School Exist Exam. Beginning with the Class of 2006, all public school children are required to pass the exam to earn a high school diploma.

CARS+ The California Association of Resource Specialists & Special Education Teachers.

chunk The partition of a task into "bite-size" portions so that a student is not overwhelmed by a seemingly formidable task.

coherent Logically designed and organized to produce and cohesive, unified, and integrated result.

cooperative groups A teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject. Each member of a team is responsible not only for learning what is taught but also for helping teammates learn, thus creating an atmosphere of achievement. Students work through the assignment until all group members successfully understand and complete it.

concept A mathematical understanding a student is expected to master. Often several content standards are grouped together under one concept. For example, the Grade 6 concept: *Understand the*

basic arithmetic operations on fractions and the relationships among these operations unites several Grade 6 content standards.

concept lesson A higher-level, challenging, multi-standard problem which students are asked to solve using concepts and skills which they have learned in a particular unit.

concept organizer See **unit concept organizer**.

conceptual skill A skill that a student must master to demonstrate his/her understanding of a mathematical concept. For example, 1) solving simple and complex problems; 2) representing solutions in different ways; and 3) explaining procedures used to another person.

content The mathematical concepts and skills which students are supposed to learn and master.

content standards Content standards for mathematics were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level/course. They are set forth in the *Mathematics Framework for California Public Schools (2000).*

CRRE Acronym for Culturally Responsive and Relevant Education. CRRE is intended to help close the achievement gap and benefits both African American students and all other students.

CST Acronym for the California Standards Test. Each student's CST score is compared to preset criteria to determine the achievement level of the student. There are 5 levels of performance ranging from advanced to far below basic.

differentiated instruction Teaching concepts and skills in ways that create multiple access avenues for students with differing interests, abilities, and needs.

diverse learner Students with differing learning modalities, different levels of academic English fluency, different levels of mathematical background and understanding.

EL Acronym for English Learners. Students who are in the process of acquiring English language skills

English Learner A student in the process of acquiring English vocabulary, skills, fluency, and proficiency in academic English and whose native language is not English.

environmental structuring Classroom arrangement and setting, including objects which may distract or adversely stimulate, study carrels, noise buffers.

Equity Principle Articulation of the idea that all students (without exception) require equity in access to a coherent, challenging mathematics curriculum through high expectations and timely and appropriate support.

G.A.T.E. Acronym for Gifted and Talented Education. G.A.T.E. students demonstrate academic performance that exceeds that of their grade level peers.

graphic organizer A pictorial map that shows relationships between concepts. A diagram or chart used to organize information for prioritizing, sequencing, or remembering.

heterogeneous group A small number of students who are clustered together at random without regard to any characteristic, such as ethnicity, gender or level of mathematical understanding.

homogeneous group A small number of students who are clustered together by some characteristic, such as ethnicity, gender or level of mathematical understanding.

inclusion model A protocol which defines the joint instructional roles assumed by both the regular education and special education mathematics teachers.

IDEA The Individuals with Disabilities Act which guarantees that all youth with disabilities receive free, appropriate education in the least restrictive environment.

IEP Individual Educational Plan

instructional unit Content standards are organized into instructional units. Each unit— organized around a big idea—is designed so that work on conceptual understanding, specific skills, and problem solving is balanced.

look-for's An indicator that a goal or expectation has been achieved or mastered.

MIG Mathematics Instructional Guide

modification Any change in course content, teaching strategy, test presentation, location, timing scheduling, student response, or environmental structure that **does** substantially change the standards or expectation for the students' performance. See **accommodation.**

mnemonic A word or device which assists in memorizing a list or sequence of steps.

multiple entry points The many access opportunities provided when content material is presented in various ways so students can "get" or understand the content

multiple intelligences The theory (Dr. Howard Gardner, Harvard University) which proposes eight different intelligences to account for a broader range of human potential in children. These intelligences are: linguistic intelligence (word smart); logical-mathematical intelligence (number/reasoning smart); spatial intelligence (picture smart); bodily-kinesthetic intelligence (body smart); musical intelligence (music smart); interpersonal intelligence
(people smart); intrapersonal intelligence (self smart); naturalistic intelligence (nature smart).

multiple representations The presentations of concepts, principles and problem situations in many ways such as using objects (concrete), mathematical symbols (symbolic), and/or words (verbal)
pair share See **Think-Pair-Share**.

peer mentoring One student assisting another, e.g. translating a problem for an English Language Learner or modeling of a procedure by a knowledgeable student

periodic assessment An essential tool for teachers to diagnose student needs and to group students for instruction. Research has shown that there is a direct correlation between students' success on periodic assessments and their subsequent success on state-mandated tests.

procedural skill Algorithms and sequential steps which are followed to solve a problem.

process Ways in which students interact with ideas and information, e.g. collaborative groups, think-pair-sharing, physical experimentation, group responses, etc.

product Evidence which demonstrates the understanding of a concept or skill is demonstrated, e.g. test, report, project, oral response, etc.

protocol A prescribed procedure which will guide a teacher in the preparation of a cognitively challenging mathematical task.

realia Objects such as coins, fruit, dice, or other physical objects from real life that are used in classroom instruction to help students better understand real life situations.

rigor Instruction of a curriculum organized around major concepts in which students are doing challenging, high-level problems; assessment that focuses on students' mastery and understanding of core concepts.

roadmap A presentation which graphically lays out the instructional sequence of concepts, skills, and problems for each instructional unit.

scaffolding A teaching strategy that consists of teaching new skills by engaging students collaboratively in tasks that would be too difficult for them to complete on their own. The instructor initially provides extensive instructional support, or scaffolding, to continually assist the students in building their understanding of new content and process. Once the students internalize the content and/or process, they assume full responsibility for controlling the progress of a given task.

SDAIE Acronym for Specially-Designed Academic-Instruction in English. Instruction which allows students to move forward with mathematics, while at the same time learning English through contextual clues provided during instruction.

SEL Acronym for Standard English Learner.

SLC Acronym for Small Learning Community.

Small Learning Community A separately defined, individualized learning unit within a larger school setting which has a clearly recognizable identity with defined goals and objectives; a personalized learning environment where every student is known by the educators in the small learning community.

Special Education Instruction for all students—including those whose initial interest, understanding, and performance is either remarkably below or beyond that of their peers—
in which they are challenged to think and produce at increasingly complex levels.

Standard English Learner A student who is in the process of acquiring English vocabulary, skills, fluency, and proficiency in academic English and speaks nonstandard
English.

synergistically Refers to the interaction of discrete components such that the total effect is greater than the sum of the individual components

Think-Pair-Share A strategy designed to provide students with "food for thought" on a given topic enabling them to formulate individual ideas and share these ideas with another
student.

Tool Kit A collection of strategies which can be used by a teacher to increase student achievement.

understand The understanding of a concept is demonstrated when a student is able to:
1) solve simple and complex problems; 2) represent solutions in different ways; and 3) explain procedures to another person.

unit concept organizer A graphic organizer which shows the relationships between the big idea for the unit, the various concepts that support that idea, and the skills which are involving in learning and understanding those concepts.

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