A *Big Idea* is a statement of an idea that is central to the learning of mathematics, and is an idea that links numerous mathematical understandings into a coherent whole.

(Charles, 2005)
**Classifying Ideas**

**Big Ideas**
- Patterns grow in predictable ways
- Objects can be sorted based on their common attributes
- Data can be collected, recorded, and interpreted
- Geometric figures have attributes that can be classified and described
- Operations for numbers are related and can be represented in multiple ways using the base-10 number system
- Numbers can be represented in many ways to show equivalence
- Equations, expressions, and variables are mathematical models used to represent real situations
- Numbers represent sets of items that can be composed and decomposed

**Other (Topics, Objectives)**
- Students should be able to find fractions equivalent to a given fraction
- Geometry
- Numbers and Operations
- Know algorithms for adding and subtracting
- Create patterns

HO#2
Quarterly Concept Organizer

Example of Big Idea, Concept, and Skill Relationship

**Big Idea**
A statement of an idea that is central to the learning of mathematics, and is an idea that links numerous mathematical understandings into a coherent whole

**Concept**
A mathematical understanding specifically targeted to a grade level

**Skill**
A specific ability that shows understanding of the targeted Big Idea and Concept

An over-arching, global idea that spans preschool through adult uses of mathematics, i.e.- Operations are related.

Specific language to a particular grade level, i.e.- a Big Idea may talk about operations being related, where a Concept for a given grade level will talk specifically about the relationship of addition and subtraction.

Specific things a student within a grade level will do in order to show their understanding of the over-arching Big Idea and grade-specific Concept, i.e.- a skill would be using addition to check the results of a subtraction problem, or knowing the addition facts to 20 and their corresponding subtraction facts.

C. Piangerelli-Math CoordinatorLD2
Number Relationships and Equivalence
Numbers can be represented in multiple ways.

Whole numbers represent discrete objects that can be counted and ordered.
- Count numbers up to 20.
- Relate a numeral to a set of objects.
- Understand the magnitude of numbers.
- Compare two or more sets of objects up to 10 (e.g., equal to, less than, more than).

Addition and subtraction can be represented as joining, separating, part-part-whole, and comparison.
- Use concrete objects to determine the answers to addition and subtraction problems for two numbers that are each less than 5.
- Recognize when an estimate is reasonable.

Data Analysis and Measurement
Data can be collected, recorded, and interpreted and the process of measurement is the same for every attribute that is measurable.

Direct comparison is used to determine the measurement of objects.
- Compare length, volume, and weight.
- Relate time to the hour to everyday events.
- Identify time of everyday events to the nearest hour.

Questions guide the collection of data that is displayed through various pictorial representations.
- Pose information questions.
- Collect data.
- Record the results using objects, pictures, and picture graphs.

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<tr>
<th>CA MATH STANDARDS</th>
<th>NS 1.0</th>
<th>NS 1.1</th>
<th>NS 1.2</th>
<th>NS 1.3</th>
<th>NS 2.1</th>
<th>NS 3.1</th>
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**Number Relationships, Equivalence, and Place Value**

Whole numbers represent sets of items that can be composed (put together) and decomposed (taken apart).

- Numbers beyond nine are composed of groups of tens and ones.
- The same number can be represented in multiple ways.
- Represent equivalent forms of the same number through the use of diagrams and number expressions (to 20).
- Use the inverse relationship between addition and subtraction to solve problems.
- Make precise calculations and check validity of results from context of problem.
- Write and solve number sentences from problem situations that express relationships involving addition and subtraction.
- Identify and know the values of coins and show different combinations of coins that equal the same value.

**Data Analysis**

Data can be interpreted from organized visual representations.

- Data can be sorted, classified, represented and compared.
- Use pictures/picture graphs.
- Use bar graphs.
- Use tally marks.

**Number Relationships, Equivalence, and Place Value**

Whole numbers represent sets of items that can be composed (put together) and decomposed (taken apart).

- Count, read, and write whole numbers to 100.
- Compare whole numbers up to 100.
- Make reasonable estimates when comparing larger or smaller numbers.
- The same number can be represented in multiple ways.
- Represent equivalent forms of the same number through the use of diagrams and number expressions (to 20).
- Use the inverse relationship between addition and subtraction to solve problems.
- Make precise calculations and check validity of results from context of problem.
- Write and solve number sentences from problem situations that express relationships involving addition and subtraction.
- Identify and know the values of coins and show different combinations of coins that equal the same value.
Number Relationships, Equivalence, and Place Value
Whole numbers represent sets of items that can be composed (put together) and decomposed (taken apart).

Number Relationships, Equivalence, and Place Value
Numbers to 500 are composed of groups of hundreds, tens and ones.

- Count, read, and write numbers to 500 and identify place value.
- Use words, models, and expanded form to show numbers to 500.
- Order & compare numbers to 500.

Addition and subtraction of 2-digit numbers are related.

- Check results using the inverse relationship of addition and subtraction.
- Add and subtract two-digit numbers using multiple strategies.

Money and time can be measured in a variety of ways.

- Solve problems using combinations of coins.
- Tell time, know relationships of time and determine duration of intervals of time.

Geometry
Plane and solid shapes are classified and analyzed by their attributes.

- Describe and classify plane and solid shapes.
- Put shapes together and take them apart from other shapes.

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Third Grade Quarterly Concept Organizer

**Number Relationships, Equivalence, and Place Value**
Numbers are represented in multiple ways and operations are related and are represented in multiple ways.

A comparison of a part to a whole can be represented using fractions.

- Compare and order fractions to show equivalency by representing them in drawings or with concrete materials.
- Add and subtract simple fractions.
- Use fractional pieces to represent fractional amounts.
- Know meaning of numerator and denominator.

**Probability**
Events can be measured based on analysis of possible outcomes.

Events can be visually represented and can be used for predictions.

- Determine likelihood of an event.
- Systematically record outcomes of events.
- Visually represent the results of the outcomes.
- Predict future events based on results of probability experiments.

Fractions and decimals can be used to represent equivalent quantities.

- Know that fractions and decimals are two different representations of the same value.
- Know common decimal and fraction equivalents.

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<tr>
<th>CA MATH STANDARDS</th>
<th>NS 3.1</th>
<th>NS 3.2</th>
<th>NS 3.3</th>
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# Fourth Grade Quarterly Concept Organizer

## Number Relationships, Equivalence, and Place Value
Numerical values can be represented in multiple ways.

### Equivalent values can have different numerical representations.

- Read and write whole numbers in the millions.
- Represent fractions, decimals, and mixed numbers in multiple ways.
- Round whole numbers to the millions and decimals to two decimal places.

### Numbers have a unique point on the number line. Two numbers are equal when they represent the same point on the number line.

- Order and compare numbers.
- Place numbers (including positive and negative integers) on the number line.
- Show equivalence of fractions and decimals.

### Numbers can be classified as prime or composite and can be expressed as a product of factors.

- Decompose whole numbers down to their factors.
- Identify prime and composite numbers.

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<th>CA MATH STANDARDS</th>
<th>NS 1.1</th>
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# Fifth Grade Quarterly Concept Organizer

## Number Relationships and Equivalence
Numerical values can be represented in multiple ways.

### Arithmetic operations are represented by both models and algorithms for fractions, decimals, and integers.
- Use mental math when computing with decimals.
- Compute a given percent of a whole number.
- Find decimal and percent equivalents for common fractions.
- Add, subtract, multiply, and divide whole numbers and decimals accurately.

### Fractions, decimals, and percents are identified and represented on a number line.
- Estimate and round numbers.
- Interpret percents as part of 100.
- Represent numbers smaller than one on the number line.

### Numbers are expressed as the product of prime factors and can be written with exponential notation.
- Understand and compute positive integer powers of nonnegative integers.
- Determine prime factors and write in exponential form.
- Identify Greatest Common Factor (GCF) and Least Common Multiple (LCM).

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<th>CA MATH STANDARDS</th>
<th>NS 1.1</th>
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Expert Group Guiding Questions for Grade level: _____

Use these questions to guide your group’s discussion. Each group member needs to record the group’s responses on his/her own sheet. Take your completed sheet back to your home group when you return.

<table>
<thead>
<tr>
<th>How is the topic of EQUIVALENCY developed at your grade level through the Big Idea?</th>
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</thead>
<tbody>
<tr>
<td>How is the topic of EQUIVALENCY developed at your grade level through the grade level Concept?</td>
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<tr>
<td>How is the topic of EQUIVALENCY developed at your grade level through the grade level Skills?</td>
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<tr>
<td>What should a student completing this grade level quarter understand about EQUIVALENCY?</td>
</tr>
</tbody>
</table>
Visual Display for “Walk Through the MIG”

Your group will have 40 minutes to complete a visual display of your assigned section of the Mathematic Instructional Guide. This display must include, but is not limited to:

- Title of the section from the MIG (i.e.-Introduction, parts A, B, and C; Appendix E, part I-III; etc.)

- A clear display of the highlights or important features of your section, so that others who did not read this part, would understand about this part from your display, without someone explaining it to them.
Is motivating
Promotes more understanding
Influences beliefs
Promotes memory

Promotes the development of autonomous learners
Enhances transfer

Reduces the amount that must be remembered
Patterns grow in predictable ways.

Objects can be sorted based on their common attributes.
Data can be collected, recorded, and interpreted.
Geometric figures have attributes that can be classified and described.
Operations for numbers are related and can be represented in multiple ways using the base-10 number system.
Numbers can be represented in many ways to show equivalence.
Equations, expressions, and variables are mathematical models used to represent real situations.
Numbers represent sets of items that can be composed and decomposed.
Students should be able to find fractions equivalent to a given fraction.
Geometry

Numbers and Operations
Know algorithms for adding and subtracting.

Create patterns.
Plane and Solid Shapes
A shape is defined by its attributes, and some attributes can be quantified using measuring tools.

- Identify, describe, and classify plane and solid shapes (polygons and polyhedra).
- Know types of triangles (scalene, obtuse, equilateral, isosceles, right).
- Know attributes of quadrilaterals.
- Identify angles as being right angles or greater than or less than 90° (right, obtuse, or acute).
- Construct and deconstruct solid objects.

An object’s attributes can be measured.

- Use different tools and units of measurement.
- Find area by using tiles (square units) and volume by using cubes.
- Determine perimeter of polygons.
- Carry out simple unit conversions within a system of measurement.
- Know and use customary and metric unit measurements.

A comparison of a part to a whole can be represented using fractions.

- Compare and order fractions by representing them in drawings or with concrete materials.
- Add and subtract simple fractions.
- Use fractional pieces to represent fractional amounts.
- Know meaning of numerator and denominator.
Paint the Building

- On Monday, a painter had to paint a building that was shaped like a cube. When she read the label on the can of paint, she realized one can of paint would cover one face of the building. She had to paint all four sides and the roof of the building.
- On Tuesday, she had to paint the building next door. It was the size of two of the first buildings put together.
- On Wednesday, she had to paint the third building on the block. It was the size of three of the cubic buildings put together.
- On Thursday, she had to paint yet another building that was, of course, like four of the cubic buildings put together.

Your job is to figure out how many gallons of paint she would need each day. Continue this pattern up to ten cubic units put together? Use the T chart to help you. Create a formula to help you figure out how many gallons of paint it would take to paint a building 23 cubic units long.

The formula is__________________. It would take __________ gallons of paint to cover a building 23 cubic units long.
Memorization

• involve either reproducing previously learned facts, rules, formulae, or definitions OR committing facts, rules, formulae or definitions to memory.

• cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure.

• are not ambiguous. Such tasks involve exact reproduction of previously seen material and what is to be reproduced is clearly and directly stated.

• have no connection to the concepts or meaning that underlie the facts, rules, formulae or definitions being learned or reproduced.
Procedures Without Connections

• are algorithmic. Use of the procedure is either specifically called for or its use is evident based on prior instruction, experience, or placement of the task.

• require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it.

• have no connection to the concepts or meaning that underlie the procedure being used.

• are focused on producing correct answers rather than developing mathematical understanding.

• require no explanations or explanations that focus solely on describing the procedure that was used.
Procedures With Connections

• focus students’ attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.

• suggest pathways to follow (explicitly or implicitly) that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts.

• usually are represented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps to develop meaning.

• require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with the conceptual ideas that underlie the procedures in order to successfully complete the task and develop understanding.
Doing Mathematics

• require complex and non-algorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example).

• require students to explore and understand the nature of mathematical concepts, processes, or relationships.

• demand self-monitoring or self-regulation of one’s own cognitive processes.

• require students to access relevant knowledge and experiences and make appropriate use of them in working through the task.

• require students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions.

• require considerable cognitive effort and may involve some level of anxiety for the student due to the unpredictable nature of the solution process required.
Characterizing Mathematical Tasks in Terms of Cognitive Demands

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<th>Task</th>
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<th>High Level</th>
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### MIG Dig

<table>
<thead>
<tr>
<th>Components of the Guide</th>
<th>Which parts of this section are the most supportive for your work? Please be specific.</th>
<th>What questions/comments do you have?</th>
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<tbody>
<tr>
<td>Introduction</td>
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<td>Quarterly Concepts Organizer</td>
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<td>Quarterly Instructional Roadmap</td>
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<td>Quarterly Assessment Blueprint</td>
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<td>Appendices</td>
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SCAVENGER HUNT

DIRECTIONS:
Locate each topic listed below, citing the page number and section.

<table>
<thead>
<tr>
<th>4&lt;sup&gt;th&lt;/sup&gt; &amp; 5&lt;sup&gt;th&lt;/sup&gt; Grade Periodic Assessment Blueprints</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; grade Standards for Quarter 2</th>
<th>5&lt;sup&gt;th&lt;/sup&gt; grade Standards for Quarter 2</th>
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<tr>
<td>Online resources for parents</td>
<td>Hints for combination classes</td>
<td>Differentiated Instruction</td>
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<td>Assessment calendar</td>
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Hint:
A _______ is a statement of an idea that is central to the learning of mathematics, and is an idea that links numerous mathematical understandings into a coherent whole.

The _______________ is organized around big ideas, concepts and skills.

The only one who truly likes change is a ____________.

When Big Ideas of Mathematics are understood, mathematics is no longer seen as a set of ___________ concepts, skills, and facts. Mathematics becomes a _______ set of ideas.

___________ is the learning that students take away with them after they solve problems.

For something to be a problem for a student, he or she must see it as a _______ and must want to know the _____________.

Not all ______ are created equal, and different _________ will provoke different levels and kinds of student thinking.

___________ tasks involve either reproducing previously learned facts, rules, formulae or definitions OR committing facts, rules, formulae or definitions to memory.

Procedures _________ connections tasks require some degree of cognitive effort.

___________ will be incorporated throughout the mathematics instructional roadmap, one per quarter, and will be used to help students develop understanding around key concepts and big ideas.

The concept lesson includes a set up phase, a(n) ____________ phase and a share, discuss and analyze phase.

The four kinds of tasks as categorized by the Task Analysis Guide are memorization, procedures without connections, procedures with connections and ________________.
A big idea is a statement of an idea that is central to the learning of mathematics, and is an idea that links numerous mathematical understandings into a coherent whole.

The Math Instructional Guide is organized around big ideas, concepts and skills.

The only one who truly likes change is a wet baby.

When Big Ideas of Mathematics are understood, mathematics is no longer seen as a set of separate/isolated concepts, skills, and facts. Mathematics becomes a coherent set of ideas.

Residue is the learning that students take away with them after they solve problems.

For something to be a problem for a student, he or she must see it as a challenge/problem and must want to know the solution/answer.

Not all tasks are created equal, and different tasks will provoke different levels and kinds of student thinking.

Memorization/Low-level tasks involve either reproducing previously learned facts, rules, formulae or definitions OR committing facts, rules, formulae or definitions to memory.

Procedures with connections require some degree of cognitive effort.

Concept lessons will be incorporated throughout the mathematics instructional roadmap, one per quarter, and will be used to help students develop understanding around key concepts and big ideas.

The concept lesson includes a set up phase, a(n) explore phase and a share, discuss and analyze phase.

The four kinds of tasks as categorized by the Task Analysis Guide are memorization, procedures without connections, procedures with connections and Doing Mathematics.