Los Angeles Unified School District

Elementary Mathematics

Fourth Grade

"Multi-Digit Division"

Warm-Up Problem
"Sid's Jelly Beans"

Sid has a bag of 143 jelly beans. He wants to put the same number of jelly beans in 5 bags. How many jelly beans can he put in each bag?

Use the workspace below (and the back of the paper if necessary) to find at least two different ways to answer this problem. If you use the tools provided, be sure to record your work.

A Reading Protocol for "Toward Computational Fluency"

1. Take 20 minutes to read through the passage. As you read, keep in mind the following questions.

   - **What are some of the reasons that Van de Walle promotes the use of invented strategies?**
   - **In your own classroom, how might you promote the use of your students' own strategies?**
   - **What issues might there be in allowing students to use their own strategies?**
   - **What are some ways to address these issues?**

2. Also record any ideas from the text that interest, puzzle, or surprise you.

3. After reading, choose a facilitator within your table group. The facilitator leads the table group in discussion about the 4 questions above.

4. After 20 minutes, we will summarize whole group.

Models of Division

Partitive Division

- In the partitive model of division, you know
  - how many you are starting with, and
  - how many groups you will be making.

- You are trying to find out
  - how many are in each group.

- The action involved is "dealing out"

Examples

"Juan has 24 candy bars. He shares them equally with 4 of his friends and doesn't keep any for himself. How many candy bars will his 4 friends get?"

"A car traveled 312 miles. It used 12 gallons of gas. How many miles did it travel each gallon?"

Measurement Division

- In the measurement model of division, you know
  - how many you are starting with, and
  - how many are in each group.

- You are trying to find out
  - how many groups there are.

- The action involved is "measuring out"

Examples

"Juan has 24 candy bars. He wants to give 6 bars to each of his friends and not keep any for himself. How many of his friends will get candy bars?"

"A car traveled 312 miles. It traveled 26 miles for each gallon of gas it had. How many gallons of gas did it use?"

Models of Division

Word Problem	What do you know?	What do you need to find out?	What action is suggested by the problem?	Problem Type
A box of pencils has 288 pencils in packets of 12. How many packets of pencils are there?				
There are 365 days in a year. Since there are 52 weeks in a year, how many days should there be in each week?				
A show made $171.25. How many people attended the show if it made $1.25 for each person who attended?				
A show made $171.25. If 137 people attended, how much money did the show make for each person?				

When you finish, consider the following questions.

1. *How were the questions on the top of the chart useful in helping determine whether a problem was measurement or partitive division?*
2. *In what way might the action implied in the problem impact the type of strategy a student uses to solve the problem?*

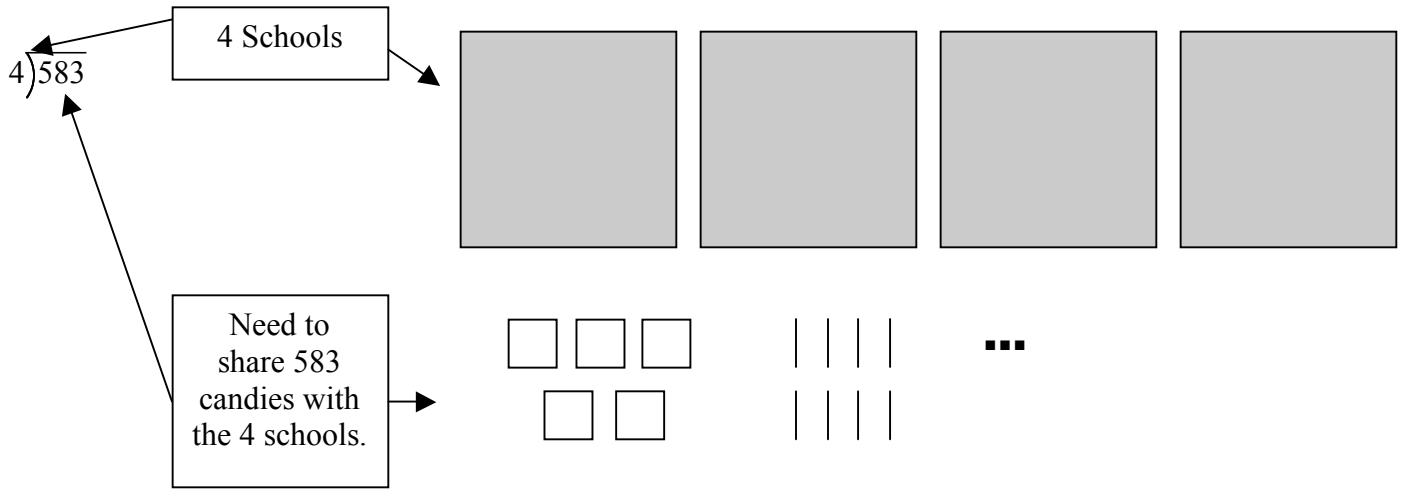
Developing the Written Record

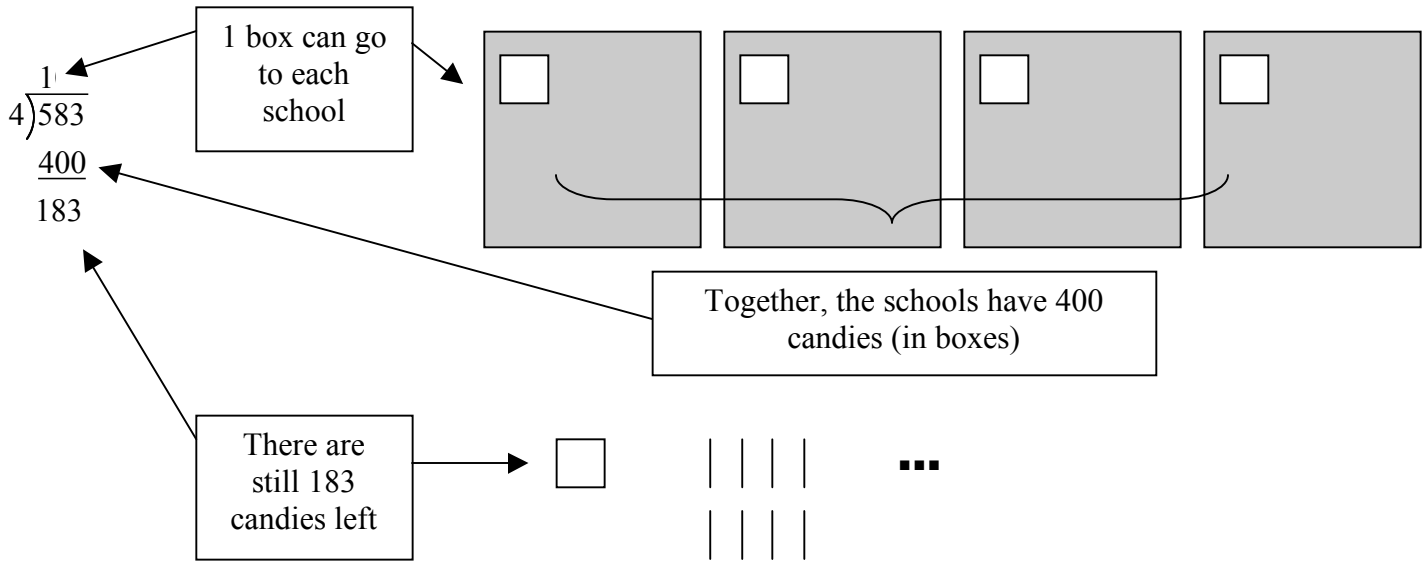
Van de Walle states that one way to help transition students into the Standard Division Algorithm is to start by using contexts that can be modeled with base-10 materials, develop written records, and record explicit trades. The illustration below shows how you might begin developing the written record.

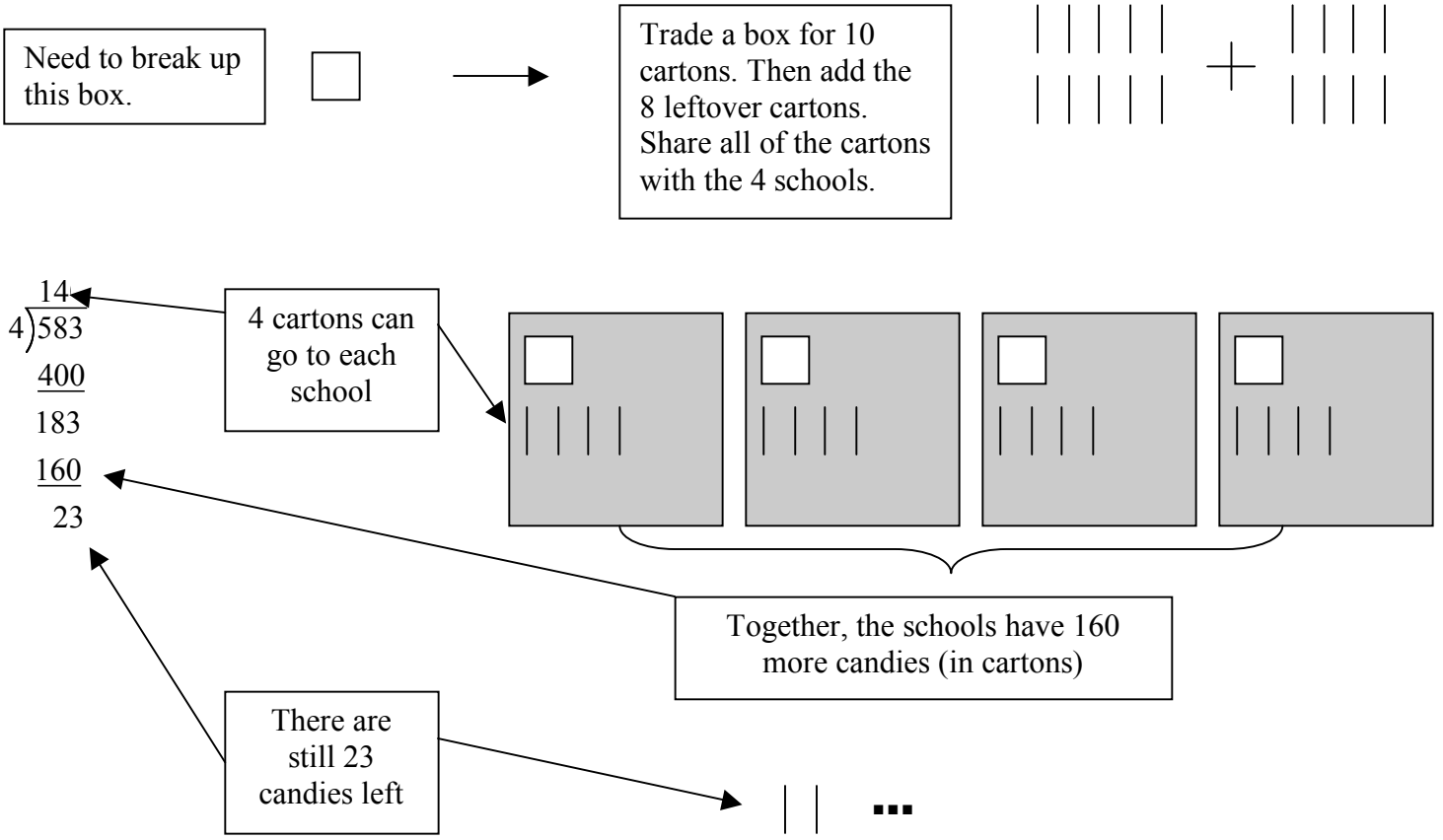
Problem: *We have 5 boxes, 8 cartons, and 3 pieces of candy to share with 4 schools evenly. How much candy will each school get?*

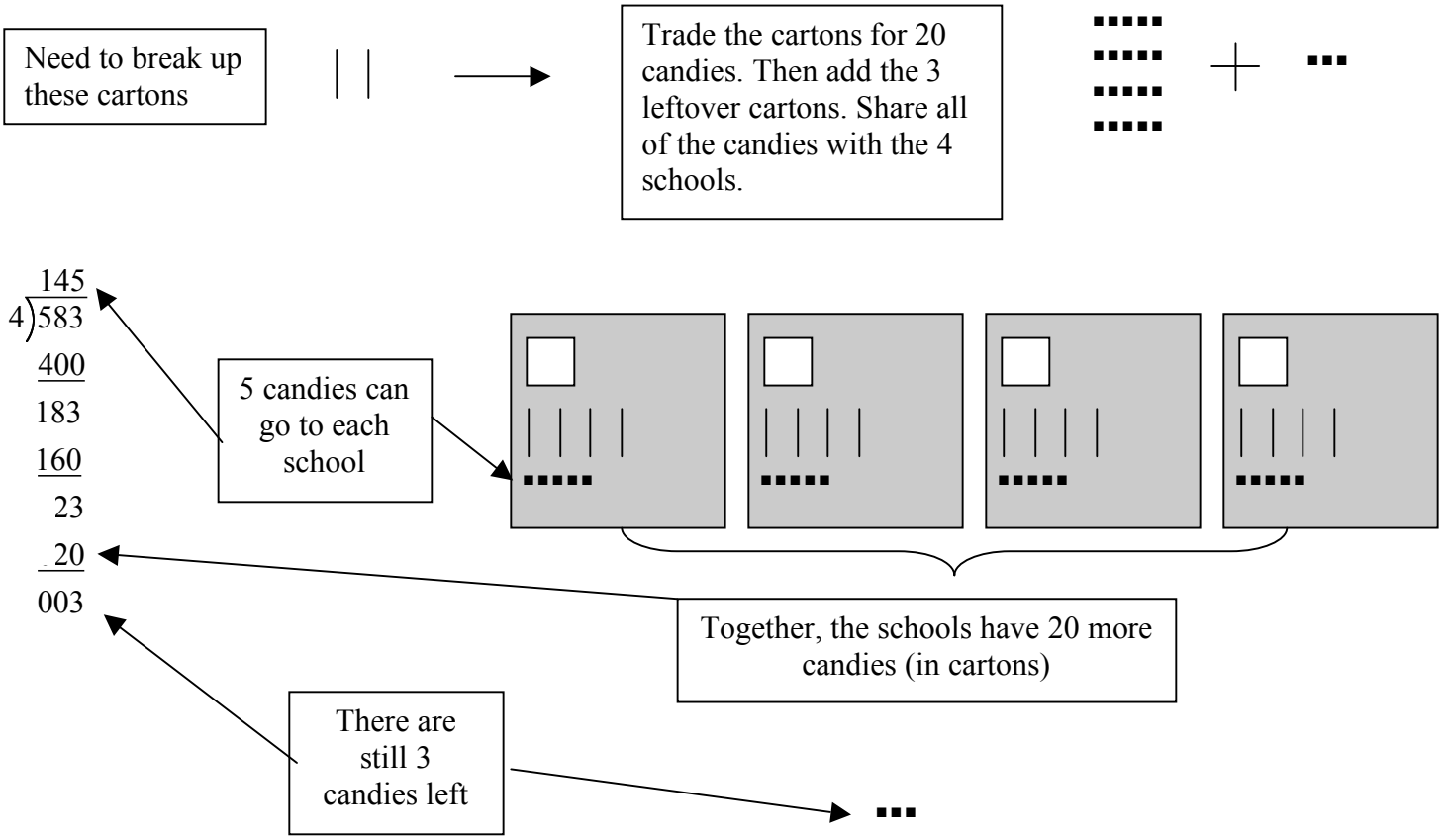
Boxes hold 100 candies (base-10 "flat"), cartons hold 10 candies (base-10 "rod")

The problem could be modeled and recorded in the following way.






Need to break up this box.
Trade a box for 10 cartons. Then add the 8 leftover cartons. Share all of the cartons with the 4 schools.
14
4)583
400
183
160
23
4 cartons can go to each school
Together, the schools have 160 more candies (in cartons)
There are still 23 candies left


Need to break up these cartons
Trade the cartons for 20 candies. Then add the 3 leftover cartons. Share all of the candies with the 4 schools.
145
4)583
400
183
160
23
20
003
5 candies can go to each school
Together, the schools have 20 more candies (in cartons)
There are still 3 candies left

Thinking Through a Lesson Protocol: Considering and Addressing Student Misconceptions and Errors

Los Angeles Unified School District

Elementary Mathematics

Fourth Grade

August 9 & 10, 2006

Overview of Activities

- Review Thinking Through a Lesson Protocol (TTLP)
- Engage in Fourth Grade Lesson considering components of the TTLP that the facilitator demonstrates
- Debrief the lesson with the TTLP as a frame for discussion
- Examine student responses to the Fourth Grade task and determine what the student knows and understands
- Develop questions to scaffold the learning of students who exhibit misconceptions or make errors
- Discuss the value of considering student misconceptions and errors and of developing questions to address them

Thinking Through a Lesson Protocol

The main purpose of the *Thinking Through a Lesson Protocol* is to prompt you in thinking deeply about a specific lesson that you will be teaching that is based on a cognitively challenging mathematical task.

Part 1: Selecting and Setting up a Mathematical Task

- What are your mathematical goals for the lesson (i.e., what is it that you want students to 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 do you think your students will use?
  - What misconceptions might students have?
  - What errors might students make?
- What are your 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 they 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 you introduce students to the activity so as not to reduce the demands of the task? What will you hear that lets you know students understand the task?

Thinking Through a Lesson Protocol

Part 2: Supporting Students' Exploration of the Task

- As students are working independently or in small groups:
  - What questions will you ask to focus their thinking?
  - What will you see or hear that lets you know how students are thinking about the mathematical ideas?
  - What questions will you ask to assess students' understanding of key mathematical ideas, problem solving strategies, or the representations?
  - What questions will you ask to advance students' understanding of the mathematical ideas?
  - What questions will you ask to encourage students to share their thinking with others or to assess their understanding of their peer's ideas?
- How will you ensure that students remain engaged in the task?
  - What will you do if a student does not know how to begin to solve the task?
  - What will you do if a student finishes the task almost immediately and becomes bored or disruptive?
  - What will you do if students focus on non-mathematical aspects of the activity (e.g., spend most of their time making a beautiful poster of their work)?

Thinking Through a Lesson Protocol

Part 3: Sharing and Discussing the Task

- How will you orchestrate the class discussion so that you accomplish your mathematical goals? Specifically:
  - Which solution paths do you want to have shared during the 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 your lesson?
  - What specific questions will you ask so that students will:
    - make sense of the mathematical ideas that you want them to learn?
    - 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 you see or hear that lets you know that students in the class understand the mathematical ideas that you intended for them to learn?

- What will you do tomorrow that will build on this lesson?

Connecting to the Big Idea, Concepts and Skills for Quarter 2

Fourth Grade Quarterly Concept Organizer

Number Relationships and Algebraic Reasoning
Arithmetic and algebra are guided by properties of operations and equivalence.

Commutative, associative, and distributive properties are inherent in the algorithms for operations of rational numbers.

- Add, subtract, multiply, and divide whole numbers.
- Show relationships between operations.
- Solve problems involving addition, subtraction, multiplication, and division.
- Estimate reasonableness.
- Evaluate and use expressions with parentheses.

One of the concepts of algebraic reasoning is balance.

- Show that equals added or multiplied by equals are equal.

Data Analysis
Data can be interpreted from organized visual representations.

Data can be collected, classified, displayed, and analyzed.

- Create survey questions and collect data.
- Identify mode, median, and outliers.
- Interpret and share data.

The Cookie Containers Task

Cookie Containers

Mrs. Baker's Cookies is making their cookies bigger.

Each container holds 8 cookies.

1. If they make 264 cookies in one day, how many containers will they need every day? Explain how you know.
2. Now suppose they make the cookies even bigger and only 5 cookies will fit in each container. Describe how you could find how many containers they will need every day.

Questioning: A Tool for Surfacing Errors and Misconceptions

Review the student responses to the Fourth Grade task. For each response:

- determine what the student knows and understands in terms of the task.
- determine the student's misconception or error.
- determine questions that you would ask to scaffold students' learning without reducing the cognitive demands of the task.

Addressing Misconceptions and/or Errors

Student Response	What does the student know and understand?	What problem is the student having?	What scaffolding questions might you ask?