Participant Packet

Module 1

Vision and Goals
Third Grade Concept Lesson Professional Development
2008-2009

What is our vision for our students in mathematics?

Goals for 2008-2009
Professional Development

In order to improve student achievement, we will:

1. Strengthen our mathematical content knowledge in order to better meet the instructional needs of all of our students, including English learners (EL), Standards English learners (SEL), Students with Disabilities (SWD), and students identified as gifted and talented (GATE)

2. Address the balance called for in the *Framework* by identifying strategies that develop students' conceptual knowledge, problem solving abilities, and skills proficiency

3. Plan, teach, and reflect on Concept Lessons for third grade students

What conditions for learning need to be present in order for us to learn and grow professionally together?

Guess My Secret Number: Ice Breaker

Materials: extra-sticky post-it notes
Graph paper & color pencils (possible seat activity)

Preparation:

1. Write on the post-it notes whole numbers up to 10,000.
2. As participants enter ask if you could put a post-it note on their back, assuring them it does not say "kick me" and it only has a secret number on it.
3. Once all participants have secret numbers on their backs it is time to play. The object is to try to figure out the number that is on one's back.
4. Participants walk around the room and show each other their number.
5. Participants should ask only one question at a time and then move to a different participant. Only yes/no questions may be asked to try to figure out what their secret number is. (A good question might be, "Is my number an odd number?")
6. Make sure to explain that once the participant has figured out their number they go sit down at their table where there will be a math activity for them to explore. (See "Symmetry Activity" on following page.)
7. After everyone has sat down ask if there are any participants who finished a pattern and would like to share their designs.
8. Ask how having an activity like this to do might be important in the classroom.

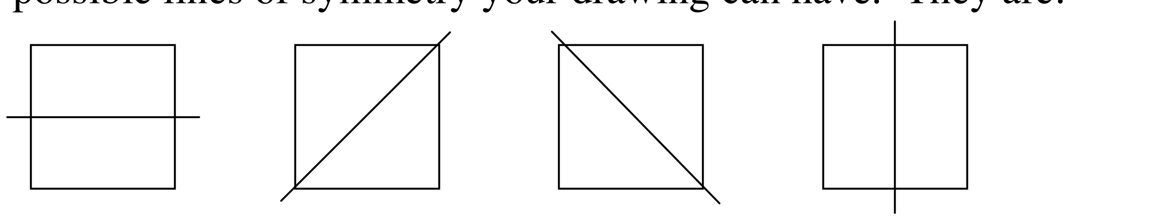
Questions that may be asked about the "Guess My Own Number" activity are:

- How could you use this activity in your classroom?
- How does this activity encourage learning?
- What are the benefits of doing an activity like this?
- What happened when you got the wrong information? How did that impact figuring out your number?
- Why do think you got the wrong information?

Warm-up Activity

Symmetry Activity

- Use grid paper to color in squares to create a pattern that has symmetry.
- How do you know if your pattern has symmetry? Just imagine a line drawn through the middle of your design. If you can fold it, and each side is the same as the other side, then you have symmetry! There are four possible lines of symmetry your drawing can have. They are:



- Color different patterns. For example one design may have just have one line of symmetry. Another design may have all 4 lines of symmetry! Try coloring a design without a line of symmetry. Compare and show your work with your elbow partner.

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Warm-up Activity

Greeting Card Problem

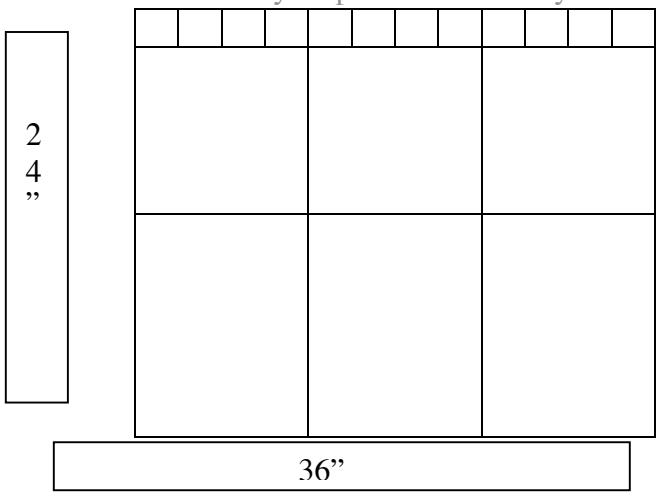
You are making rectangular cards 2 inches by 3 inches for the holidays. What is the greatest number of cards you can get from a rectangular sheet 2 feet by 3 feet?

You may use the grid paper to help you solve your greeting card dilemma.

(Double-copy warm –up activity onto colored paper. Fold so answer is on the inside of table tent).

Method 1 : The area of one card is 6 square inches. The area of the sheet 24 x 34 square inches. Divide 24x 36 by 6 to produce 144.

Method 2 : Make a diagram of the sheet showing one 2” strip. Notice that there are twelve 2” by 3” pieces in the 2” strip. Since there are 12 strips of 2” in 24” there are 12 x12 = 144 2” by 3” pieces in the 2’ by 3’ rectangle.



Adapted from Math Olympiad Contest Problems 1997 by George Lenchner

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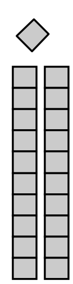
Warm-up Activity

Base-10 Block Patterns

Create a design with your base-10 rods and units. Your design might look like this:



Repeat your design at least 3 times to create a pattern. Then illustrate a strategy that one might use to determine the total number of blocks in your pattern. Share your strategy with a partner.

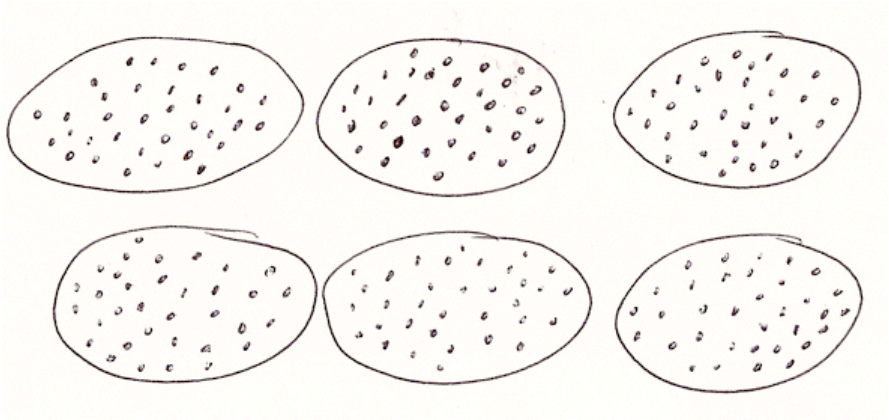
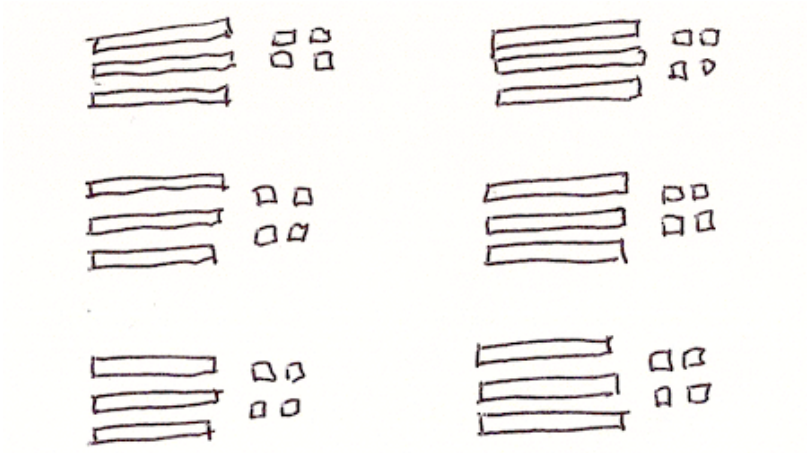
Outcomes

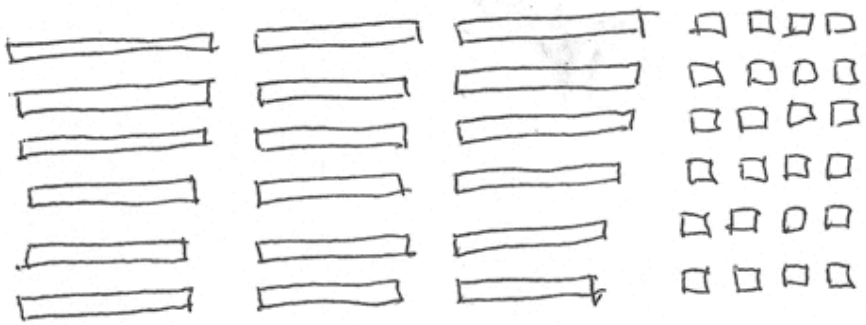
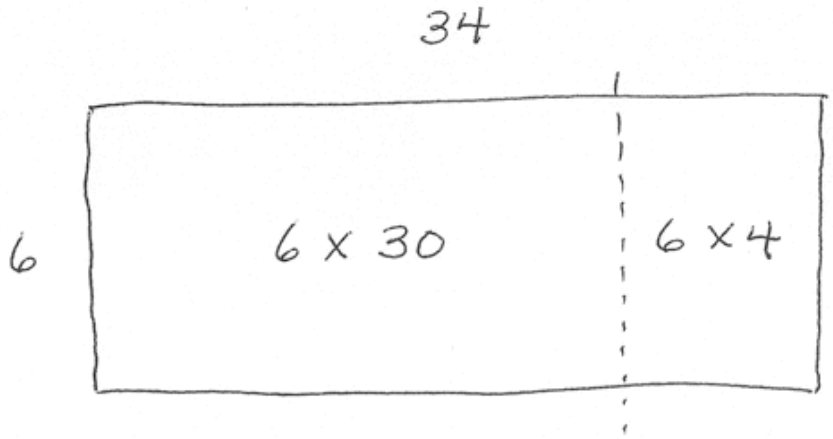
You will learn how the questions that you ask students in your classroom…

- …can help you know what your students understand.
- …can help your students examine and understand their own thinking.
- …can help you understand what your students are thinking when you don't understand their work.

The School Play

The school is holding a play. To get ready, the plant manager needs to set up some chairs. The auditorium can hold 6 rows of chairs, and each row can hold 34 chairs. How many chairs can the auditorium hold? Show how you found your answer.

Example	Strategy	Notes
1		
2		

Example	Strategy	Notes
3		
4		

Guiding Questions

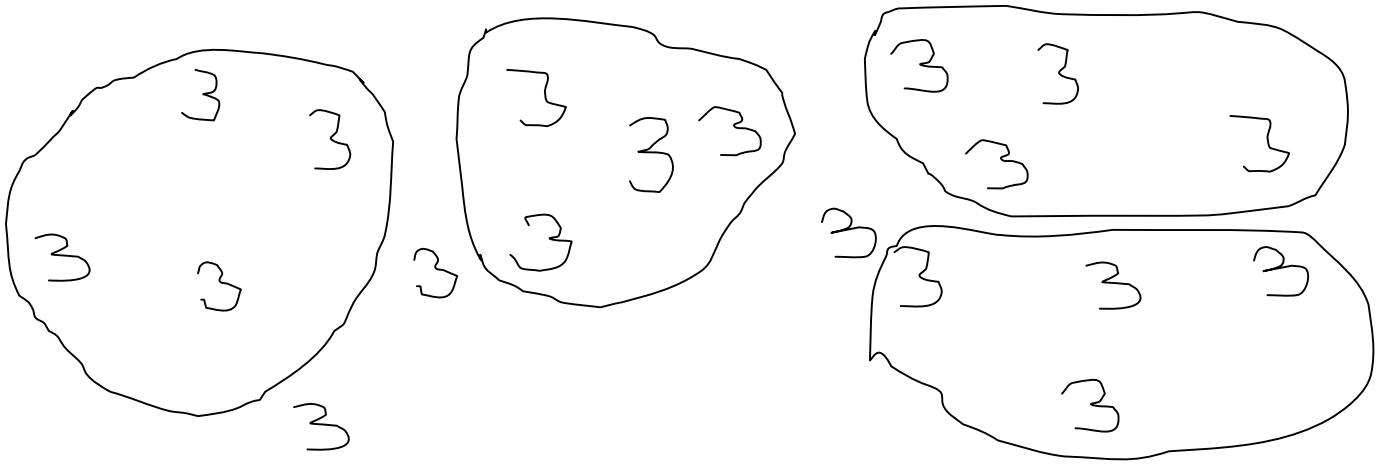
For each of the four student strategies, think about the following questions. Record your responses in the section labeled “Notes”.

1. How is the student solving the problem?

2. What prior knowledge might the student have that led him or her to use this strategy?

3. How might the student have determined his/her final answer?

1. Each hamburger costs $3. There are 17 students in the class. How much does it cost to buy all students in your class a hamburger?



12 x 4 + 3 + 3 + 3

Questions that you might ask this student:

2. How many legs are there in 20 spiders? (A spider has 8 legs.)

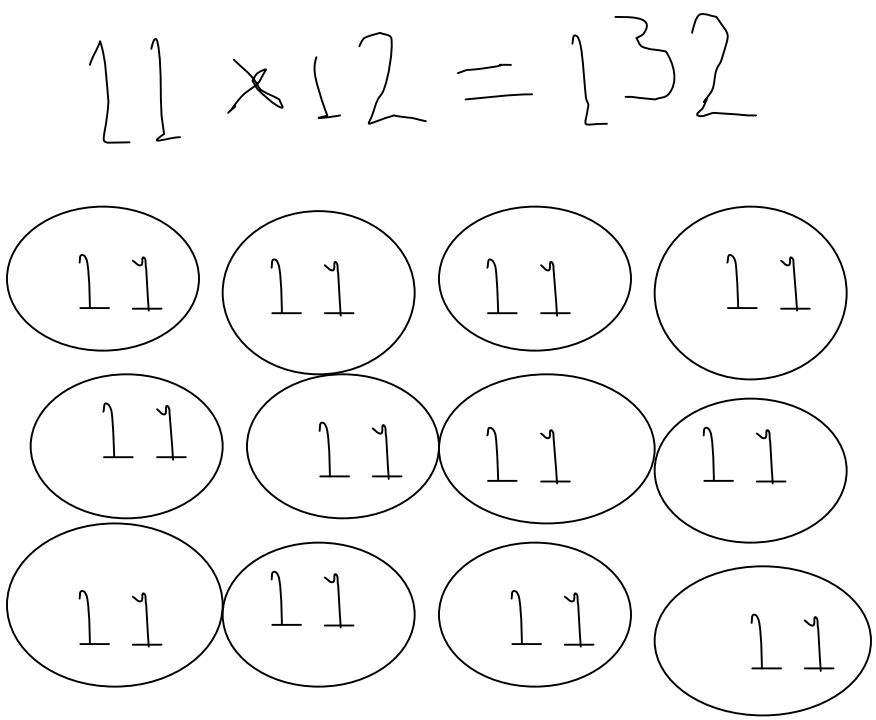
8 x 20 = 160

40

32

Questions that you might ask this student:

3. One carton of eggs has 12 eggs inside. How many are there in 11 cartons of eggs?



Questions that you might ask this student:

HO # 8

4. What number does 25 x 13 equal?

20 x 13 20 x 10 = 200

20 x 3 = 60

5 x 13 5 x 10 = 50

5 x 3 = 15

Questions that you might ask this student:

HO # 9

Participant Packet
Module 3

Thinking Through a Lesson Protocol
Module 3
Third Grade Concept Lesson Professional Development
2008-2009

Outcomes

- Learn about the Thinking Through a Lesson Protocol (TTLP)
- Understand how the TTLP frames the structure of the Concept Lesson for Quarter 2
- Identify strategies (Development of Academic Vocabulary, Instructional Conversations, Graphic Organizers/Visual Tools, and Cooperative Learning) that meet the needs of our diverse learners: English learners (EL), Standard English learners (SEL), Students with Disabilities (SWD), and students identified as Gifted and Talented (GATE)
- Establish norms and what we will be examining during our observation of the Concept Lesson demonstration

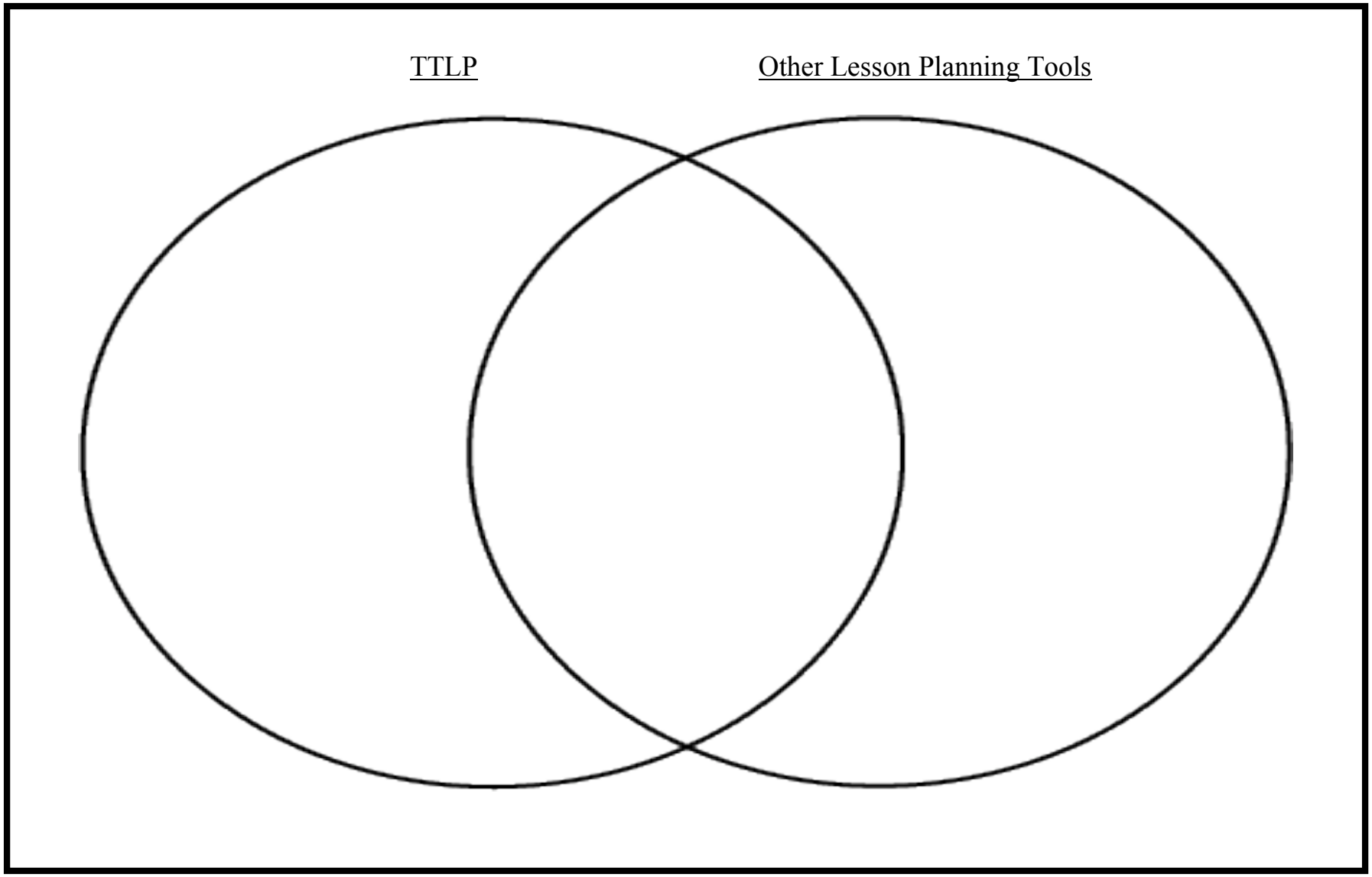
What factors do you consider when lesson planning in mathematics?

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.

SET-UP *Selecting and setting up a mathematical task*	EXPLORE *Supporting students' exploration of the task*	SHARE, DISCUSS, AND ANALYZE *Sharing and discussing the 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?	▪ 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 beautiful poster of their work)?	▪ 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?

Similarities and Differences between the TTLP and Other Lesson Planning Tools



Concept Lesson Observation Norms

- **Teachers are observers / recorders only**
- **Only demonstrating teacher interacts with students**
- **Teachers may move about the room with as little disruption to student learning as possible**
- **All comments and questions for demonstrating teacher should be saved for the Lesson Debrief**
- **Teachers may want to choose a particular group of students on whom to focus their observations**

Connecting the Thinking Through a Lesson Protocol (TTLP) to the Concept Lesson

	What connections do you see between the lesson write-up and the TTLP?	Meeting Student Needs *How might the lesson address the instructional needs of your diverse learners (EL, SEL, GATE, and SWD)?*
Set Up		
Explore		
Share, Discuss, & Analyze		

Data Collection during Concept Lesson Delivery

SET-UP *Selecting and setting up a mathematical task*	EXPLORE *Supporting students' exploration of the task*	SHARE, DISCUSS, AND ANALYZE *Sharing and discussing the task*
▸ What did you hear the students saying that let you know they understood the task?	▸ In what ways did the students solve the task?	▸ What did you hear the students say that let you know the mathematical goals of the lesson were met?

Data Collection during Concept Lesson Delivery

SET-UP *Selecting and setting up a mathematical task*	EXPLORE *Supporting students' exploration of the task*	SHARE, DISCUSS, AND ANALYZE *Sharing and discussing the task*
▸ What did you hear the students saying that let you know they understood the task? ▸ What questions were asked to set up the task for students?	▸ In what ways did the students solve the task? ▸ What questions helped focus, assess, and advance student thinking during the lesson?	▸ What did you hear the students say that let you know the mathematical goals of the lesson were met? ▸ What questions did you hear that created opportunities for instructional conversations?

Concept Lesson: Elena's Patterns

Third Grade – Quarter 2

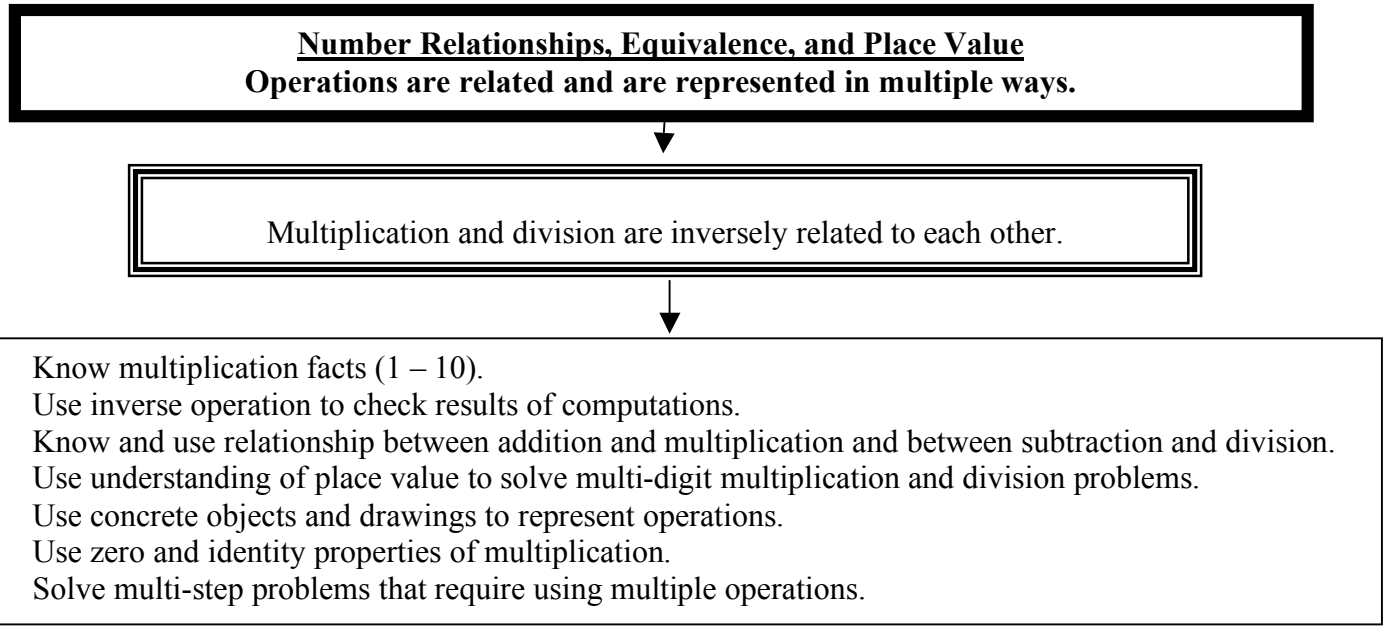
Note: Developing an understanding of the mathematical concepts and skills embedded in a standard requires having multiple opportunities over time to engage in solving a range of different types of problems, which utilize the concepts or skills in question.

Student Task:

In this lesson, students will develop strategies for multiplying multidigit numbers. They will solve two problems as they apply their understanding of place value and the relationship of addition and multiplication.

Materials:

- Base-ten blocks; task sheet (attached); transparencies or chart paper for selected students to record their solutions; overhead markers or markers; pictures of art designs (optional)



Standards Addressed in the Lesson:

NS 2.4	**Solve simple problems involving multiplication of multidigit numbers by one-digit numbers (3,671 x 3 = __).**
AF 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).**
MR 2.1	**Use estimation to verify the reasonableness of the calculated results.**
MR 2.4	**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.**
MR 2.6	**Make precise calculations and check the validity of the results from the context of the problem.**

Mathematical Concepts:

The mathematical concepts addressed in this lesson:

- **Develop strategies for multiplying a multidigit number by a one-digit number.**
- **Deepen understanding of the relationship between addition and multiplication.**

Academic Language

The concepts represented by these terms should be reinforced/developed through the lesson:

- Multiplication • Addition • Factor • Product • Pattern • Place Value

Encourage students to use multiple representations (drawings, manipulatives, diagrams, words, number(s)) to explain their thinking.

Assumption of prior knowledge/experiences:

- Basic knowledge of concepts of multiplication with single-digit factors.
- Understanding of how to add multidigit numbers.

Organization of Lesson Plan:

- The left column of the lesson plan describes rationale for particular teacher questions or why particular mathematical ideas are important to address in the lesson.
- The right column of the lesson plan describes suggested teacher actions and possible student responses.

Key:

Suggested teacher questions are shown in bold print.

Possible student responses are shown in italics.

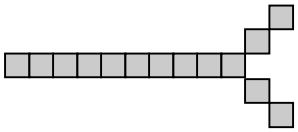
** Indicates questions that get at the key mathematical ideas in terms of the goals of the lesson.

Lesson Phases:

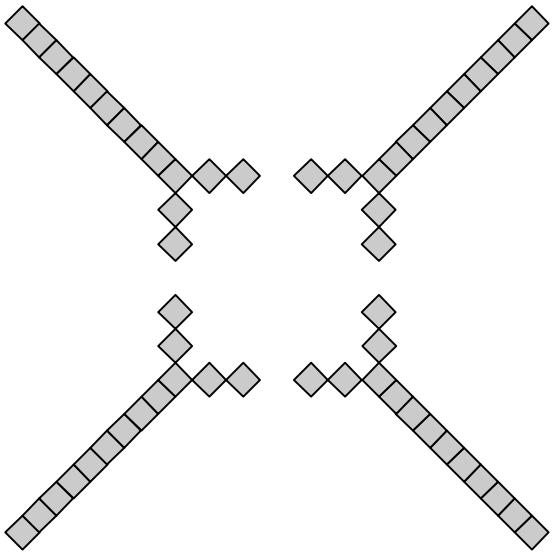
The phase of the lesson is noted on the left side of each page. The structure of this lesson includes the Set-Up; Explore; and Share, Discuss and Analyze Phases.

Elena's Patterns

Elena used her math blocks to make this design.

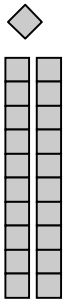


Elena repeated her design 4 times to make a beautiful pattern like this:



- Mikey, Elena's desk partner says that he will buy her pattern for $1 a block (▢). How can you figure out how much he would pay?

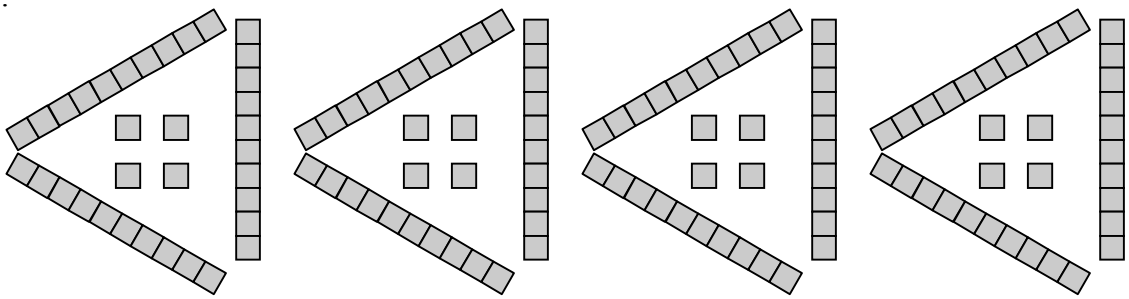
The next day, Elena made a new design like this:



She repeated the new design 5 times to make a new pattern. What do you think her new pattern might look like? How much would Mikey pay to buy this new pattern? (Use words, numbers and pictures to show your work).

How much would Mikey pay to buy these patterns? (Use words, numbers and pictures to show your work).

1.



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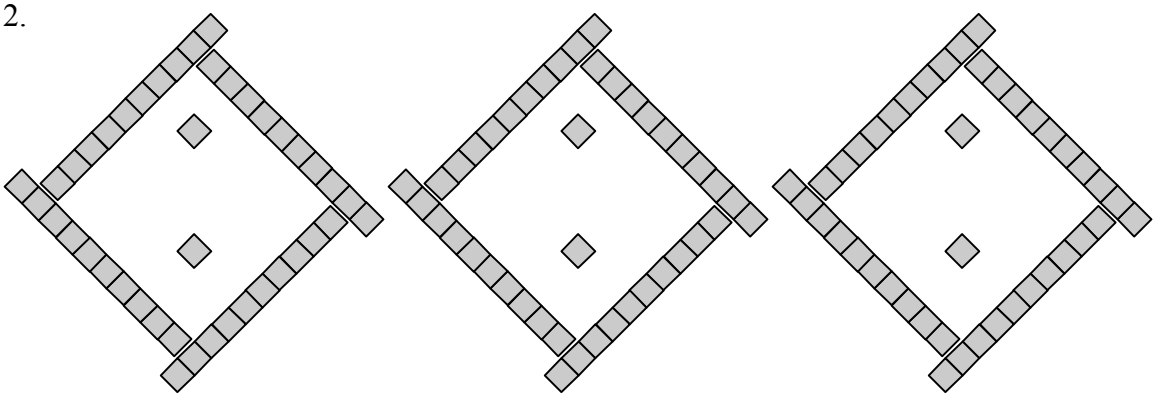

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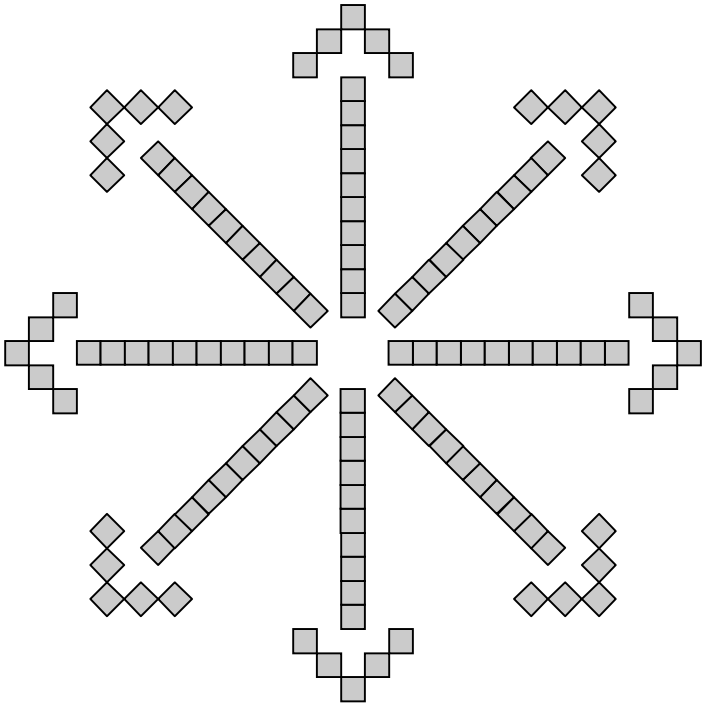


THE LESSON AT A GLANCE

Set Up (pp. 7-8)

Setting up the task: Solving the task prior to the lesson and providing access to students by strategically pairing students, providing manipulatives, posting key vocabulary terms, and considering how vocabulary will be addressed

Setting the context: Linking to prior knowledge and establishing a context for the task in order to create real-world connections

Introducing the task: Ensuring that students understand what they know and what they are trying to find out

Explore (pp. 8-12)

Independent problem solving time

Small group exploration of part 1:

- Considering misconceptions that might occur
- Using questioning to guide students who are experiencing difficulty
- Encouraging student-student sharing of and dialogue around solution paths
- Reviewing solution paths, facilitating through questioning, and selecting student work to share

Share, Discuss, and Analyze (pp. 13-15)

Sharing, discussing, and connecting solutions

Making connections to the traditional algorithm

Considering when alternative algorithms might be more useful

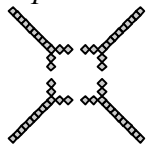
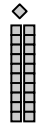
Summarizing the Mathematical Concepts of the Lesson (p. 15)

There are a variety of ways that we can find the product of two numbers.

Our understanding of place value can help us as we multiply multidigit numbers.

The Lesson

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
S E T U P	**HOW DO YOU SET UP THE TASK?** • <u>Solving the task prior</u> to the lesson is critical so that: – you become familiar with strategies students may use. – you consider the misconceptions students may have or errors they might make. – you honor the multiple ways students think about problems. – you can provide students access to a variety of solutions and strategies. – you can better understand students' thinking and prepare for questions they may have. • Planning for how you might help students <u>make connections</u> through talk moves or questions will prepare you to help students develop a deeper understanding of the mathematics in the lesson. • It is important that students have <u>access to solving the task</u> from the beginning. The following strategies can be useful in providing such access: – strategically pairing students who complement each other. – providing manipulatives or other concrete materials. – identifying and discussing vocabulary terms that may cause confusion. – posting vocabulary terms on a word wall, including the definition and, when possible, a drawing or diagram.	**HOW DO YOU SET UP THE TASK?** • <u>Solve</u> the task in as many ways as possible <u>prior</u> to the lesson. • Make certain students have <u>access to solving the task</u> from the beginning by: - having students work with a partner or in small groups. - having the problem displayed on an overhead projector or black board so that it can be referred to as the problem is read. - having base-ten blocks or other manipulatives on students' desks. • Think about how students will understand the concepts used in the task within the context of the lesson. As concepts are explored a word wall can be referenced to generate discussion. The word wall can also be used as a reference if and when confusion occurs. • Think about how you want students to <u>make connections between different strategies</u>.
S E T U P	**SETTING THE CONTEXT FOR THE TASK** <u>Linking to Prior Knowledge</u> It is important that the task have points of entry for students. By connecting the content of the task to previous knowledge, students will begin to make the connections between what they already know and what we want them to learn.	**SETTING THE CONTEXT FOR THE TASK** <u>Linking to Prior Knowledge</u> • You might have students create their own designs with the base-10 blocks prior to teaching the lesson and use their own patterns as a context for introducing the task. • You might begin by asking students when they have used mathematics when doing art or how artists might use mathematics in their work. • You could also prepare some pictures of designs similar to ones that are in the task and ask: - **What patterns do you notice in these pictures?** - **What do you notice in the base-10 block patterns that your classmates created?** - **How might artists use mathematics in their work?**

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
SET UP **EXPLORE** **EXPLORE**	**SETTING THE CONTEXT FOR THE TASK (cont.)** • Having students explain what they are trying to find might reveal any confusions or misconceptions that can be dealt with prior to engaging in the task. • Do not let the discussion veer off into strategies for solving the task, as that will diminish the rigor of the lesson. • The anticipated misconceptions, solutions, and questions to address them are in reference to the first part of the task. • Students should be directed to complete the second part of the task once they have shown how Mikey might figure out how much he would pay for the first pattern. • The problems on the 2nd page of the 3 pages of the task might be used for early finishers. **INDEPENDENT PROBLEM-SOLVING TIME** It is important that students be given <u>private think time</u> to understand and make sense of the problem for themselves and to begin to solve the problem in a way that makes sense to them. <u>Wait time</u> is critical in allowing students time to make sense of the mathematics involved in the problem.	**SETTING THE CONTEXT FOR THE TASK (cont.)** Ask a student to read the problem as others follow along: • *Elena used her math blocks to make this design. Elena repeated her design 4 times to make a beautiful pattern like this:*  • *Mikey, Elena's desk partner says that he will buy her pattern for $1 a block (■). How might he figure out how much he would pay?* • *The next day, Elena made a new design like this:*  • *She repeated the new design 5 times to make a new pattern. What do you think her new pattern might look like? How much would Mikey pay to buy this new pattern? (Use words, numbers and pictures to show your work).* • Ask students to think-pair-share what they know and what they are trying to find out. • Ask students to state what they know and what they are trying to find out in this problem. (*We know that Elena used blocks to make her design and the first design has 14 blocks in it. We need to find out how much Mikey would pay for a pattern that is the design repeated 4 times if each block costs $1.)* Then ask one or two other students to restate what they think they know and what they are trying to find out. **INDEPENDENT PROBLEM-SOLVING TIME** • Tell students to work on the problem by themselves for a few minutes. • Circulate around the class as students work individually. Clarify any confusions they may have by asking questions but do not tell them how to solve the problem. • After several minutes, tell students they may work with their partners or in their groups.

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
E X P L O R E	**FACILITATING SMALL-GROUP EXPLORATION (cont.)**	**FACILITATING SMALL-GROUP EXPLORATION** If students have difficulty getting started, ask questions such as: • **What do you know? What are you trying to figure out?** • **How can you use the blocks to help you solve the problem?** • **What are some ways that you might try to solve this problem?** • **How can you use a picture to solve the problem?** • **What are some ways that you could use numbers or number sentences to help you find an answer to this problem?** • **What strategy might we use to find total cost?**
E X P L O R E	Possible misconceptions or errors: It is important to have students explain their thinking before assuming they are making an error or having a misconception. After listening to their thinking, ask questions that will move them toward understanding their misconception or error. • Having students demonstrate their thinking using a concrete model often allows them to discover their misconception or error. • Asking students to verify their thinking builds in them the practice of checking their work. • By checking their work students make connections to the usefulness of the inverse. • Encouraging students to share their solutions with each other to the extent that their partner could explain it creates accountability and honors student thinking. • Encouraging students to solve the problem in more than one way builds flexibility of thinking and helps students make connections between models, numbers, and language.	Possible misconceptions or errors: • *Figuring the cost of just one design in the pattern* **What is the problem asking?** **What does Mikey offer to buy?** **What is the difference between a design and a pattern in this problem?** • *Making errors in calculation for the standard algorithms for addition and multiplication* **How can you check your work?** **What other methods can you use to solve this problem?** • *Making errors in calculation when using partial product* • *Making errors in counting the blocks when using the pattern or drawing the pattern* **Explain how you solved the problem.** **How do you know your answer is correct?** **How do you know that your answer makes sense?** • *Thinking that each design costs $1 rather than each block* **What do you know?** **How much is Mikey offering to pay?** **What is he paying for?** **What will your answer tell you?** Additional strategies for addressing misconceptions are embedded within the possible solutions.

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
EXPLORE	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** <u>Possible Solution Paths:</u> Monitoring students' progress as they are engaging in solving the task will provide you with the opportunity to select solutions for the whole group discussion that highlight the mathematical concepts. • *"Partial Product"* Students may use their understanding of place value to break the 14 into 10 and 4 and then either add 4 10s and 4 4s and then recombine 40 and 16 or multiply 4 x 10 and 4 x 4 and add the two products. This strategy might lend itself to a discussion of why 4(10 + 4) is the same as 4x10 + 4x4, the distributive property. It could also be used to make a connection to the standard algorithm, when students are ready to consider it.	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** <u>Possible Solution Paths</u> You might ask: • *"Partial Product"* – *14 x 4 = 10 x 4 + 4 x 4* – **Explain your thinking.** – **Where did the 10 come from? Where did the 4 come from?** – **Why did you add 40 and 16?** – **How does your calculation connect to the picture of Elena's pattern?** – **How can you use this strategy to see how much Mikey would pay for Elena's new pattern?**
EXPLORE	• *Repeated Addition* Students might add the value of each design 4 times to decide the cost of Elena's pattern if each block cost $1. This strategy provides an opportunity to establish the relationship of addition to multiplication. Asking students to think about how they might solve the problem another way might help them see alternatives to adding values repeated times. • It is important to consistently ask students to explain their thinking. It not only provides the teacher insight as to how the child may be thinking, but might also assist other students who may be confused.	• *Repeated Addition* – *14 + 14 + 14 + 14 or 10 + 10 + 10 + 10 + 4 + 4 + 4 + 4* – **Explain your thinking.** – **What is another way to calculate the value of the 4 designs in her pattern?** – **Think about other times you have added the same number many times. What connections can you make?**

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
EXPLORE	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** Possible Solution Paths (cont.): Monitoring students' progress as they are engaging in solving the task will provide you with the opportunity to select solutions for the whole group discussion that highlight the mathematical concepts.	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** Possible Solution Paths (cont.)
EXPLORE	• *Counting the blocks individually or by 10s and 1s* Students may decide to count each block individually or by 10s and 1s. They may have a way of keeping track as they count. Asking them to explain how they might keep track may help them see other ways that they could find the total value (cost) of Elena's Patterns. Using concrete models helps students test conjectures, deepen conceptual understanding, and make connections to other representations such as symbols and words.	• *Counting the blocks individually or by 10s and 1s* – **How are you using counting to find the value of Elena's patterns?** – **How can you keep track of how many blocks there are as you count?** – **What is another way you could figure out how many blocks there are?** – **What is another way to find the total number of blocks?**
EXPLORE	• *Creating "friendlier" numbers to add or multiply* Students may see that 14 is close to 15, add 15 4 times, double 15 and then double 30, or multiply 15 x 4. They then could subtract 4 to get 56. Encouraging students to think of numbers that might be easier to use will help them develop a strong number sense and devise novel ways to add and multiply numbers.	• *Creating "friendlier" numbers to add or multiply* – *14 is one less than 15 so 14 x 4 = 15 x 4 - 4* – **How did you find the total value (cost) of Elena's pattern?** – **Why did you use 15?** – **Why did you subtract 4?**
EXPLORE	• *Using the traditional algorithm* Students may have learned the traditional algorithm and could use it to solve the problem. Making connections to other strategies will build a stronger understanding of the mathematics.	• *Using the traditional algorithm* – **How did you find the total value (cost) of Elena's pattern?** – **What does this 1 represent (above the ten's place)?** – **How else can you find the total value?** – **How can you check your work?** 1 14 x4 56

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
EXPLORE **EXPLORE** **EXPLORE**	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** <u>Advancing Questions</u> • All students should have opportunities to be advanced in their thinking, as a way to develop more efficient strategies for solving problems, to deepen their understandings, and to make new connections between their understandings. • As students begin to discuss their solutions, consider questions you will ask to begin and sustain discussions among them so that they can lead their own developing understanding.	**FACILITATING SMALL-GROUP EXPLORATION (cont.)** <u>Advancing Questions</u> • **What is another way that you might solve this problem?** • **How can you solve this problem using the base ten blocks?** • **How can you solve this problem using numbers?** • **How can you record all of the steps that you took in finding your answer?** • **What are some other ways that you might use numbers to solve this problem?** • **How might using a picture have helped you solve this problem?** • **In what ways are the different strategies that you used to solve the problem the same? How are they different?** Once most students have finished, get the students' attention and ask them to stop.

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
S H A R E D I S C U S S A N D A N A L Y Z E	**FACILITATING THE SHARE, DISCUSS, AND ANALYZE PHASE OF THE LESSON** <u>How will sharing student solutions develop conceptual understanding?</u> The purpose of the discussion is to assist the teacher in making certain that students develop a conceptual understanding of multiplication and how addition and multiplication are related. Questions and discussions should focus on the important mathematics and processes that were identified for the lesson. Connections should be made among solutions to deepen understanding that: 1.) there are a variety of strategies that can be used to find the product of two numbers, 2.) multiplication and addition are related, and 3.) understanding place value can help us decompose and recompose numbers to add and multiply. • You might stop here and mark the importance of sharing student thinking. Here is where students will begin to make connections among each other's work as they build understanding of the concept. ** Indicates questions that get at the key mathematical ideas in terms of the goals of the lesson. <u>Possible Solutions to be Shared and How to Make Connections to Develop Conceptual Understanding:</u> • When asking students to share their solutions, the questions you ask should be directed to all students in the class, not just to the student(s) sharing their solution. • Students should be expected and encouraged to ask questions of each other and to make connections to their own thinking. • Asking students consistently to explain how they know something is true develops in them a habit of explaining their thinking and reasoning. This leads to deeper understanding of mathematics concepts. • Asking other students to explain the solutions of their peers builds accountability for learning.	**FACILITATING THE SHARE, DISCUSS, AND ANALYZE PHASE OF THE LESSON** <u>How will sharing student solutions develop conceptual understanding?</u> In this lesson, a whole group discussion of question 1 might be appropriate before students begin working on question 2. The purpose of this first whole group discussion is to provide students opportunities to make connections between various solution strategies. <u>Possible Solutions to be Shared and How to Make Connections to Develop Conceptual Understanding:</u> Consider how you will make connections between the standard algorithm (if used) and invented algorithms and/or other strategies for solving the problem. • *"Partial Product"* – *14 x 4 = 10 x 4 + 4 x 4* – ****How did you know that 10 x 4 + 4 x 4 is the same as 14 x 4?** – **What connections can you make between your solution and someone else's?** – **Talk with a neighbor about how this student solved the problem. What strategy was used?** • *Repeated Addition* – *14 + 14 + 14 + 14 or 10 + 10 + 10 + 10 + 4 + 4 + 4 + 4* – **Why did you add 10 4 times and 4 4 times?** – **What connections can you make between your solution and the one where _____ multiplied 10 by 4 and 4 by 4?** – ****What does your solution tell us about multiplication?**

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
SHARE **DISCUSS** **AND** **ANALYZE**	**FACILITATING THE SHARE, DISCUSS, AND ANALYZE PHASE OF THE LESSON (cont.)** <u>Possible Solutions to be Shared and How to Make Connections to Develop Conceptual Understanding:</u> • *Partial Product and Repeated Addition* Making connections between partial product and repeated addition might help students see the usefulness of the former in executing the latter. • *Counting the blocks individually or by 10s and 1s* Making connections between counting by 10s and 1s and multiplying the 10s by 4 and the 1s by 4 might encourage the student to make the connection that multiplication is a faster way of counting groups. Ask questions to help students make those connections. • *Using the traditional algorithm* See what connections students might be able to make between the partial product solution and this one. Thinking about flexible ways of recording the regrouped ones encourages flexibility of thinking. By continually asking how one might find if the answer is correct, connections can be made to other solutions and ways of finding the total cost. Ask students to think of 1. what connections they can make to their own solutions and 2. the questions they might ask to better understand how the solution shows how much Mikey would pay for Elena's pattern if each block cost $1.	**FACILITATING THE SHARE, DISCUSS, AND ANALYZE PHASE OF THE LESSON (cont.)** <u>Possible Solutions to be Shared and How to Make Connections to Develop Conceptual Understanding:</u> • *Counting the blocks individually or by 10s and 1s* – **Why did you count the blocks?** – ****What does your answer represent?** – **How else could you have determined the total number of blocks?** – **What connections do you see between your method and someone else's?** • *Creating "friendlier" numbers to add or multiply* – *14 is one less than 15 do 14 x 4 = 15 x 4 - 4* – **Why did you use 15?** – ****How did you know to subtract 4?** – **What connections can you make between your solution and someone else's?** • *Using the traditional algorithm* – **How did you find the total value (cost) of Elena's pattern?** – **How else can you find the total value (cost)?** – ****How could you check your work?** – **How else can you record that 1 ten above the 14?** 1 14 <u>x4</u> 56

Phase	RATIONALE	SUGGESTED TEACHER QUESTIONS/ACTIONS AND POSSIBLE STUDENT RESPONSES
SHARE **DISCUSS** **AND** **ANALYZE**	**SUMMARIZING THE MATHEMATICS OF THE LESSON** Making connections between invented algorithms and the standard algorithm helps students conceptually understand how the latter works. Ask students to consider how regrouping is useful and when they might want to consider using an alternative algorithm. It is important for students to summarize the learning and discuss what new ideas have been gained from their discussion. This builds in accountability to the learning as well as enables the teacher to assess what the students have learned. It also establishes why these concepts are important and helps students make connections to its usefulness in their everyday lives.	**SUMMARIZING THE MATHEMATICS OF THE LESSON** You might ask: • **Based on our discussion today, what new understandings do we have around the relationship between addition and multiplication?** • **What new understandings do we have about multiplying larger numbers?** • **What have you learned that you might be able to use in other problem solving situations?** • **Why is the skill of multiplying larger numbers important?** • **When might we use this in our lives outside of school?** • **How do you think the adults in your life use this skill, multiplication?** **<u>Lesson Extension</u>** You might have the students apply one of the strategies that was discussed during the Share, Discuss, and Analyze phase to solve on of the problems (1-3) on the additional pages. You can then have a second Explore phase and choose solutions for second Share, Discuss, and Analyze phase.

Participant Packet
Module 6

Making a Connection to the Mathematics Instructional Guide (MIG)
Third Grade Concept Lesson Professional Development
2008-2009

LAUSD Elementary Mathematics Program

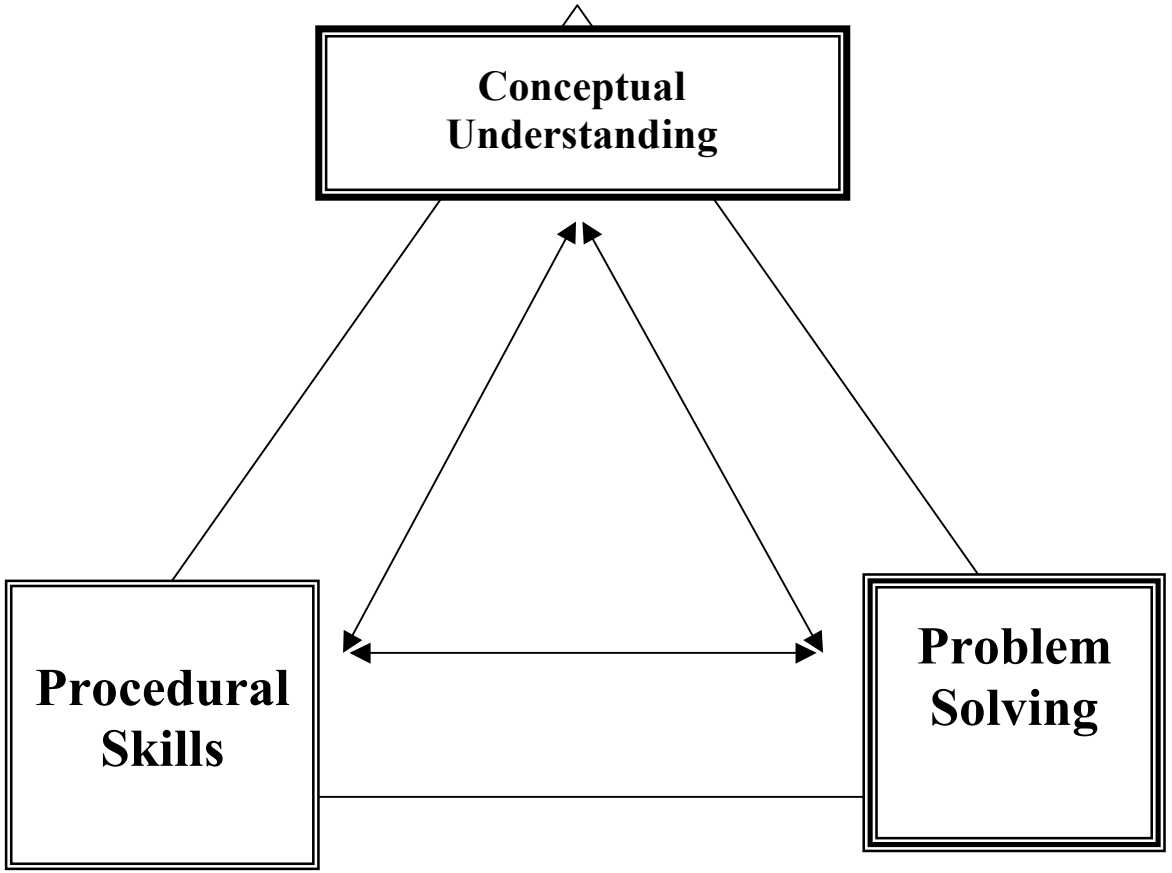
Goals

1. **Understand why the concept lesson is suggested as the introductory lesson for the concept**

2. **Make connections between the concept lesson and the Big Ideas, concepts and skills for the quarter**

3. **Agree to when the concept lesson will be taught in each classroom and what evidence will be collected for the debrief in Quarter 3**

Achieving a Balanced Mathematics Program



Making Connections to the Mathematics Instructional Guide (MIG)

Why does the MIG suggest we teach the concept lesson when introducing NS 2.4?	
Where do we see connections between this lesson and our Big Idea, concepts, and skills for the quarter?	**When will we teach the concept lesson and what evidence will we collect for our debrief in quarter 2?**

How has the experience of learning and collaborating together supported you as you consider the instructional needs of your students?