



San Diego Unified School District

Instructional Module to Enhance the Teaching of

H A R C O U R T

Math

California Edition

Grade 3

Module 7: Revised

Multiply and Divide by 1-Digit Numbers

–WORK IN PROGRESS–

San Diego City Schools
Instruction and Curriculum Division
GRADE 3 – MATHEMATICS CURRICULUM MAP

MODULE 7 – MULTIPLY AND DIVIDE BY 1-DIGIT NUMBERS
Modules represent individual units of study that lead to essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.

- Students will:**
- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
 - Develop understanding of and fluency in basic computation and procedural skills.
 - Use mathematical reasoning to solve problems.
 - Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts.
 - Use equations and variables to express generalizations of patterns and relationships.
 - Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
 - Make connections among mathematical ideas and between other disciplines.
 - Develop and use strategies, skills, and concepts to solve problems.
 - Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- *Students use the distributive property to make sense of multiplication problems with money and solve and record their solutions efficiently.*
- *Students use the context to understand the two models of division (making equal groups and finding out how many each group).*
- *Students use the context to understand the meaning of products, quotients and remainders.*
- *Students use place value patterns to multiply single digits by the powers of ten.*

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- How do I use Base 10 blocks* and arrays* to model multiplication and division?
- How do I use the context or situation to make sense of the meaning of products, quotients and remainders?
- How do I efficiently record solutions to multiplication and division problems?
- How do I use the distributive property to help solve multiplication and division problems?
- How do I use basic facts, mental math, and place value patterns to multiply multiples of 10, 100, and 1,000 by single digit factors?
- How do I model and explain the two division models?
- How do I use estimation to determine reasonableness of products and quotients?
- How do I use the distributive property in the process of multiplying and dividing money?
- How do I use my understanding of the array model*, partial products and the base 10 model of multiplication to help me solve division problems?

*** Presented in previous grade(s)**

Resources: Van de Walle: Chapter 13 (pp. 214-225); Mathematics Source Book: *Multiplication and Division* (pp.37-58)

Unit 2: Chapters 5 & 6: Money & Time concepts will be taught through "Routines" not as a unit of instruction.

UNIT 6: MULTIPLY AND DIVIDE BY 1-DIGIT NUMBERS

4 4/5 Weeks of Instruction
Chapters 17 - 20

Key Mathematical Concepts:

- Understand how to solve and record simple multiplication problems - multi-digit numbers by one-digit numbers accurately and efficiently-
- Understand how to solve and record division problems – a multi-digit number divided evenly by a one-digit number accurately and efficiently-
- Understand how to use the operations to solve problems that require two or more operations-
- Use models and representations to describe the process of multiplication and division-
- Understand the two division models: Sharing: finding groups of equal size and How many groups of: using repeated subtraction to determine the number of groups-
- Explain the meaning of the answer to multiplication and division problems and understand “what to do” with the remainder-
- Know how to make reasonable estimates when solving problems and use the problem solving strategy of making and solving a simpler problem-
- Express solutions clearly and logically using appropriate math notation, terms, and clear language; justify solutions verbally and in symbolic work-
- Check validity of results using the context of the problem-

<p>Chapter 17: <u>Multiply by 1-Digit Numbers</u></p> <p>Lesson 1: Hands On: Multiply 2-Digit Numbers Lesson 2: Record Multiplication Lesson 3: Practice Multiplication Lesson 4: Problem Solving Skill: <i>Choose the Operation</i></p>	<p>Chapter 18: <u>Multiply Greater Numbers</u></p> <p>Lesson 1: Mental Math: Patterns in Multiplication Lesson 2: Problem Solving Strategy: <i>Find a Pattern</i> Lesson 3: Estimate Products Lesson 4: Multiply 3-Digit Numbers Lesson 5: Find Products Using Money Lesson 6: Practice Multiplication</p>
<p>Chapter 19: <u>Divide by 1-Digit Numbers</u></p> <p>Lesson 1: Hands On: Divide with Remainders Lesson 2: Model Division of 2-Digit Numbers Lesson 3: Record Division of 2-Digit Numbers Lesson 4: Practice Division Lesson 5: Problem Solving Skill: <i>Interpret the Remainder</i></p>	<p>Chapter 20: <u>Divide Greater Numbers</u></p> <p>Lesson 1: Mental Math: Patterns in Division Lesson 2: Estimate Quotients Lesson 3: Place the First Digit in the Quotient Lesson 4: Practice Division of 3-Digit Numbers Lesson 5: Hands On: Divide Money Lesson 6: Problem Solving Strategy: <i>Solve a Simpler Problem</i></p>

Grade 3
Module 7 - Unit 6: Multiply and Divide by 1-Digit Numbers

MODULE 7 NOTES

The multiplication model presented on P. 295, Examples A, B, and C, is also called the “Partial Products” method. This model helps students understand the process of multiplying a multi-digit number by a single-digit number and preserves the place value of the digits.

It is **strongly recommended** that third grade students develop understanding, proficiency and accuracy with this model. It **is not** necessary for them to be proficient with the traditional standard algorithm (for multiplying multi-digit numbers) at this time.

Note: Even though the state standards do not call for division with remainders. Teach the skills developed in Chapters 19 and 20. These chapters focus teaching on division of multi-digit numbers by a 1-digit number.

The following lessons can be delayed or eliminated to provide additional instruction for other lessons:

Day 6, Lesson 18.1: Mental Math: Patterns in Multiplication

Day 7, Lesson 18.2: Find a Pattern

Day 18, Lesson 20.1: Mental Math

Day 23, Lesson 20.6: Problem Solving Strategy

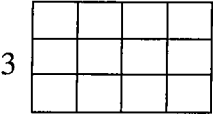
Note: Day 24: Review and Assessment: The module **does not** have plans for Day 24.

Page 315: **Lattice Multiplication**: It is recommended that Lattice Multiplication is **not** taught to students. It is an interesting process for multiplying multi-digit numbers but it **does not** help students understand the multiplication process.

It is not an essential skill for third grade students to learn.

<p><u>Day 1</u> CHAPTER 17 Hands On: Multiply 2-Digit Numbers Lesson 17.1 Hands On: Multiply 2-Digit Numbers</p>	<p><u>Day 2</u> Lesson 17.2 Record Multiplication Day 1 of a 2-Day Lesson</p>	<p><u>Day 3</u> Lesson 17.2 Record Multiplication Day 2 of a 2-Day Lesson</p>	<p><u>Day 4</u> Lesson 17.3 Practice Multiplication</p>	<p><u>Day 5</u> Lesson 17.4 Problem Solving Skill: <i>Choose the Operation</i></p>
<p><u>Day 6</u> CHAPTER 18 Multiply Greater Numbers *18.1 Mental Math: Patterns in Multiplication</p>	<p><u>Day 7</u> *Lesson 18.2 Problem Solving Strategy: <i>Find a Pattern</i></p>	<p><u>Day 8</u> Lesson 18.3 Estimate Products</p>	<p><u>Day 9</u> Lesson 18.4 Multiply 3-Digit Numbers</p>	<p><u>Day 10</u> Lesson 18.5 Find Products Using Money</p>
<p><u>Day 11</u> Lesson 18.6 Practice Multiplication</p>	<p><u>Day 12</u> CHAPTER 19 Divide by 1-Digit Numbers Lesson 19.1 Hands On: Divide with Remainders</p>	<p><u>Day 13</u> Lesson 19.2 Model Division of 2-Digit Numbers</p>	<p><u>Day 14</u> Lesson 19.3 Record Division of 2-Digit Numbers Day 1 of a 2-Day Lesson</p>	<p><u>Day 15</u> Lesson 19.3 Record Division of 2-Digit Numbers Day 2 of a 2-Day Lesson</p>
<p><u>Day 16</u> Lesson 19.4 Practice Division</p>	<p><u>Day 17</u> Lesson 19.5 Problem Solving Skill: <i>Interpret Remainder</i></p>	<p><u>Day 18</u> CHAPTER 20 Divide Greater Numbers *Lesson 20.1 Mental Math: Patterns in Division</p>	<p><u>Day 19</u> Lesson 20.2 Estimate Quotients</p>	<p><u>Day 20</u> Lesson 20.3 Place the First Digit in the Quotient</p>
<p><u>Day 21</u> Lesson 20.4 Practice Division of 3-Digit Numbers</p>	<p><u>Day 22</u> Lesson 20.5 Hands On: Divide Money</p>	<p><u>Day 23</u> *Lesson 20.6 Problem Solving Strategy: Solve a Simpler Problem</p>	<p><u>Day 24</u> Review Assessment</p>	

DAY 1
 Unit 6: MULTIPLY AND DIVIDE BY 1-DIGIT NUMBERS
 Chapter 17: Multiply by 1-Digit Numbers
 LESSON 17.1, Pp. 292-293

MATERIALS:	36 small squares of paper or color tiles for partner work; Grid paper for each student TRP 57; *Transparency 17.1.
LESSON FOCUS:	Hands On: Multiply 2-Digit Numbers
CALIFORNIA STANDARDS:	Mathematical Reasoning 2.4, 2.6, 3.2 2.3: Use a variety of methods (words, numbers, symbols, charts, graphs, tables...) to explain math reasoning. Number Sense 2.0 2.4: Solve simple problems involving multiplication of multi-digit numbers by 1-digit numbers. Algebra and Functions 1.1, 1.2
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand how arrays model the process of multiplying a two-digit number by a single-digit. • Recognize that Base-10 Blocks model the multiplication array showing the product and the groups of tens and ones called partial products. • Know that the partial products must be added to find the product. The process of finding partial products models the Distributive Property of Multiplication: $a(b+c) = (a \times b) + (a \times c)$.
LAUNCH: Introduce students to concepts. Transparency 17.1 Small squares of paper or color tiles for partner work or linking cubes.	<p>Area Models for multiplication → Arrays</p> <ul style="list-style-type: none"> • Discuss the array model (area) for multiplication – emphasize that the model helps determine how many. • Have students model: 3 groups of 4: <div style="text-align: center;"> 4  </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> $3 \times 4 = 12$ $4 \times 3 = 12$ </div> </div> <p>This also can be thought of as 4 groups of 3.</p> <p>Questions:</p> <ul style="list-style-type: none"> • Use your small squares to represent/model each problem. <i>If each row seats 6 students, how many students can sit in 3 rows? What multiplication sentence shows the number of students?</i> • Record and discuss. <i>Are there other ways to find the solution?</i> • Discuss repeated addition (adding three 6s) as another way to get they same answer. • Ask why this also makes sense for this problem. <ul style="list-style-type: none"> • Ask students to consider this context: <i>If each row seats <u>12</u> students, how many students can sit in 3 rows?</i> • Discuss the model/representation for this problem. Use your small squares to show 3 rows of 12. (Students can draw Xs to represent each seat in lieu of using squares.) • Discuss students' strategies for solving the problem. Record their "procedures." Discuss adding three 12s. (If students multiply to solve, have them share their work also.)

	<ul style="list-style-type: none"> • Students identify/show how each partial product (30 and 6) were determined and combine them for the total product. Highlight place value: $3 \times 10 = 30$ and $3 \times 2 = 6$. 						
<p>EXPLORE: Work with the concept. Focus on students "doing mathematics." Grid paper and color tiles or small pieces of paper for modeling and recording.</p>	<ul style="list-style-type: none"> • Explore, P. 299. Read together & discuss problem. • Teach, P. 292; Guided Instruction questions to guide discussion. • Ask students to model as they discuss. • Discuss Reasoning, SE P. 292. • Try It, P. 292. Do Ex. A with students. 						
<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Connect, P. 293:</p> <ul style="list-style-type: none"> • Discuss the example. Have students model & discuss. <p>Practice, P. 293 #s 1-4:</p> <ul style="list-style-type: none"> • Students can draw Xs or use grid paper or square tiles to draw/model arrays to represent and record the problems. • Practice, P. 293 #7-9. Discuss. 						
<p>SUMMARIZE: Connect purpose to activities.</p>	<ul style="list-style-type: none"> • Students explain how using arrays on grid paper helps them model multiplication. Remind them they are using an area model. <p>ASSESS, P. 293: WRITE. Students use Xs or color tiles to show an array for 5 rows of 16 chairs each. Find how many in all?</p> <ul style="list-style-type: none"> • Write the related three multiplication sentences for each partial product and final product. <table style="margin-left: 40px;"> <tr> <td>Ones: $5 \times 6 = 30$</td> <td>Tens: $5 \times 10 = 50$</td> </tr> <tr> <td></td> <td>Add ones and tens: $30 + 50 = 80$</td> </tr> <tr> <td></td> <td>So: $5 \times 16 = 80$</td> </tr> </table> • Share/discuss process. 	Ones: $5 \times 6 = 30$	Tens: $5 \times 10 = 50$		Add ones and tens: $30 + 50 = 80$		So: $5 \times 16 = 80$
Ones: $5 \times 6 = 30$	Tens: $5 \times 10 = 50$						
	Add ones and tens: $30 + 50 = 80$						
	So: $5 \times 16 = 80$						
<p>HOMEWORK:</p>	<p>Practice, P. 293: #s 5-6: Use Xs to show/model each problem or color in arrays on grid paper. Students record partial products: Ex: $6 \times 14 = (6 \times 10) + (6 \times 4)$. $60 + 24 = 84$</p> <p>Mixed Review and Test Prep, P. 293 #s 10-14.</p>						

ROUTINES:

Skip Counting Wholes and Parts

Start skip counting. Record the numbers as you say them.

Example: $\frac{1}{2}$, 1, $1 \frac{1}{2}$, 2, ...

Each student in turn names the next fraction.

Continue with: $15 \frac{1}{2}$, 15, $14 \frac{1}{2}$, 14, ...

Use varied sets of numbers, e.g.:

1:00, 1:30, 2:00, ...

10,000, 9,500, 9,000, ...

12:00, 11:30, 11:00, ...

50, 48, 46, 44, ...

500, 550, 600, 650, ...

7, 14, 21, ...

Discuss strategies for solving. Use models such as number line, hundred chart, or multiplication tables.

DAY 2
 Unit 6: MULTIPLY AND DIVIDE BY 1-DIGIT NUMBERS
 Chapter 17 Multiply 2-Digit Numbers
 DAY: 2 LESSON 17.2, Pp. 294-297
 Day 1 of a 2-Day Lesson

MATERIALS:	Pencils, crayons, Copy of Grids A, B, C (Module Page 11) for each student, *Transparency of P. 11. Base 10 Blocks Tiles
LESSON FOCUS:	Record Multiplication
CALIFORNIA STANDARDS:	Mathematical Reasoning 2.4, 2.6, 3.2 2.3: Use a variety of methods (words, numbers, symbols, charts, graphs, tables...) to explain math reasoning. Number Sense 2.0 2.4: Solve simple problems involving multiplication of multi-digit numbers by 1-digit numbers. Algebra and Functions 1.1, 1.2
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand how to record the process of multiplying a two-digit number by a single digit. • Connect the multiplication process to the representation or model of the Base-10 Blocks. • Learn to use the recording process that includes multiply the ones, multiply the tens, and add the two partial products together.
LAUNCH: Introduce students to concepts. Tiles or grid paper	<ul style="list-style-type: none"> • Ask students to use an area model (array) to solve this problem: <i>Four strings of lights each have 12 lights on them. How many lights are there all together?</i> <ul style="list-style-type: none"> - Use model on grid paper or with tiles solve this problem? - Ask students to write a multiplication sentence for each part of the problem and the total. - Discuss/share their models/representations. - Record each number sentence as the parts of the drawing are shown. - Highlight the expanded notation (place value) used to get the partial products. ($12 = 10 + 2$) <div style="border: 1px dashed black; padding: 5px; width: fit-content; margin: 5px 0;"> $4 \times 2 = 8$ $4 \times 10 = 40$ Add partial products: $8 + 40 = 48$ $4 \times 12 = 48$ </div> <ul style="list-style-type: none"> • Repeat the procedure for this problem: <i>The boys lined up in three equal rows of 13 each. How many boys lined up in all?</i> <ul style="list-style-type: none"> - Students model with arrays. - Students share their representations and number sentences. - Discuss: Highlight where partial products are in the drawing. <div style="border: 1px dashed black; padding: 5px; width: fit-content; margin: 5px 0;"> $3 \times 3 = 9$ $3 \times 10 = 30$ Add partial products: $9 + 30$ $3 \times 13 = 39$ </div>

<p>EXPLORE: Work with the concept. Focus on students “doing mathematics.”</p> <p>Grid on Module p. 11 *Transparency of P. 11</p>	<ul style="list-style-type: none"> • Give each student a grid sheet/ Use Grid A. <ul style="list-style-type: none"> - How many <u>rows of 10</u> would you color to show 30? To show 90? - How many <u>rows of 10</u> and how many ones would you color to show 25 as 10s and 1s? - Shade in 25 showing rows of tens and ones. Share and discuss. • Look at Grid B. Count to see how many small squares are in each row and column. Discuss. <ul style="list-style-type: none"> - You have a grid that is 7 by 15. - What are your strategies to find how many small squares in all? Talk with a partner then share. • Emphasize finding the number of tens first. <ul style="list-style-type: none"> - Record student strategies. - Discuss how many rows of ten and how many small squares or ones all together. - Write the multiplication sentence below the rows of tens. $7 \times 10 = 70$ 7 tens = 70 ones. - Shade the 10’s and 1’s with different colors to match the number sentence. $7 \times 5 = 35$ - Then, discuss and record: $70 + 35 = 105$ so $7 \times 15 = 105$ and $7 \times 15 = (7 \times 10) + (7 \times 5)$. <p>Ask students to describe/match the parts of the number sentences.</p> <p>Collect and save Grid papers for tomorrow’s lesson.</p>
<p>PRACTICE: Focus on Communication and Representation.</p> <p>Base-10 blocks. Students have books closed.</p>	<p>Examples A, B, and C, P. 295 (in the middle of the page) with students.</p> <ul style="list-style-type: none"> • Put examples on board/overhead to discuss, so students are reacquainted with base 10 blocks. <p>Practice & Problem Solving, P. 296: #s 5-7 at the top of page.</p> <ul style="list-style-type: none"> • Do with students. • Students work with partners to represent and record each problem. • Students write 1 situation/context for one problem (#s 5-7). • Share/discuss problems and solutions.
<p>SUMMARIZE: Connect purpose to activities.</p>	<p>ASSESS, TE P. 297: DISCUSS.</p> <ul style="list-style-type: none"> • Discuss strategies and solution. Allow for area models (arrays) and/or number sentences with partial products and/or base 10 block representations.
<p>HOMEWORK:</p>	<p>Practice & Problem Solving, P. 296: #s 8, 10, 12, and 14. Model/represent each problem (as shown in Problems 5-7).</p> <p>Students use lines () to represent 10s and dots or Xs to show 1s.</p>

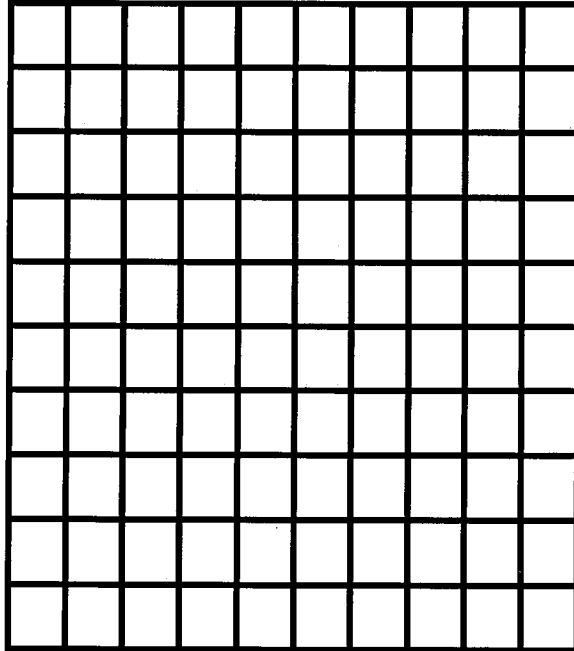
ROUTINES:

Routine from a previous lesson that meets students’ needs

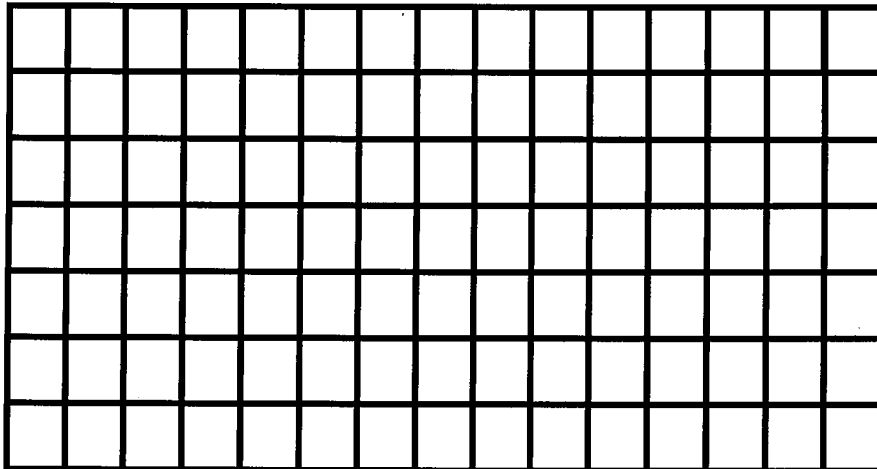
OR

P. 297: *Link Up To Reading.*

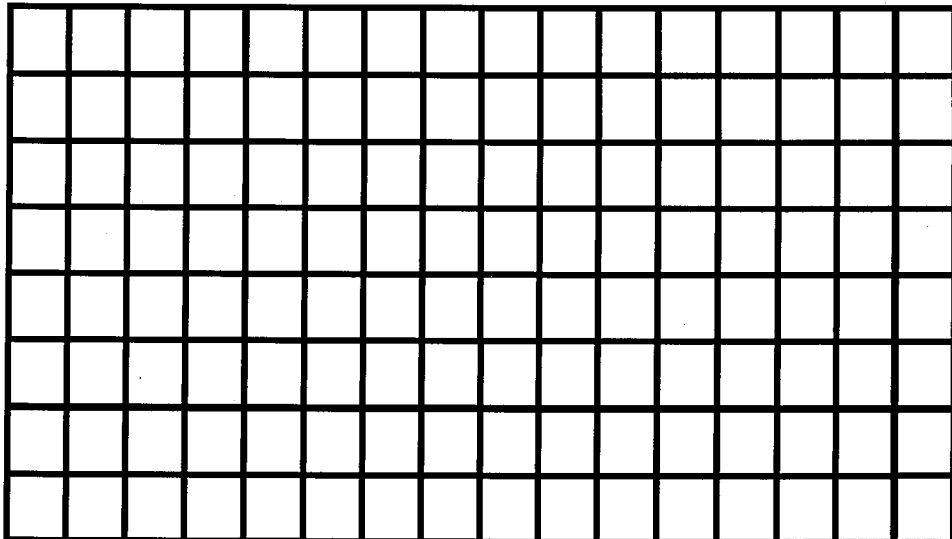
Grid A



Grid B



Grid C



DAY 3
 Unit 6: MULTIPLY AND DIVIDE BY 1-DIGIT NUMBERS
 Chapter 17 Multiply 2-Digit Numbers
 LESSON 17.2, Pp. 294-297
 Day 2 of a 2-Day Lesson

MATERIALS:	Pencils, crayons, and grid paper for each student; Grids on Module P. 11 from yesterday’s lesson.
LESSON FOCUS:	Record Multiplication
CALIFORNIA STANDARDS:	Mathematical Reasoning 2.4, 2.6, 3.2 2.3: Use a variety of methods (words, numbers, symbols, charts, graphs, tables...) to explain math reasoning. Number Sense 2.0 2.4: Solve simple problems involving multiplication of multi-digit numbers by 1-digit numbers. Algebra and Functions 1.1, 1.2
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand how to record the process of multiplying a two-digit number by a single digit. • Connect the multiplication process to the representation or model of the Base-10 Blocks. Learn to use the recording process that includes multiply the ones, multiply the tens, and add the two partial products together.
LAUNCH: Introduce students to concepts. Grids A, B & C from yesterday’s lesson	Questions: Grid C (8 x 16): <i>How many small squares are in one row and one column?</i> (Use grids from the previous day to review strategies.) <ul style="list-style-type: none"> • Complete Grid C. Follow the same procedure used with Grid B. • Discuss the number of squares in the row and the number of rows and columns. <ul style="list-style-type: none"> - Ask students to describe/explain how you can find how many small squares in all. Encourage students to use tens and ones or rows and columns rather than counting each square. - Discuss strategies. - Record the number sentence below the rows of 10. $8 \times 10 = 80$ Connect to: 8 tens = 80 ones - Record the number sentence below the 48 units. $8 \times 6 = 48$. - Share and discuss how students found 48. Discuss and record the totals number of squares by adding the partial products: $80 + 48 = 128$ so $8 \times 16 = 128$. $8 \times 16 = (8 \times 10) + (8 \times 6)$
PRACTICE: Focus on Communication and Representation.	Practice & Problem Solving, P. 296 #29 – 33. <ul style="list-style-type: none"> • Students work with partners. Draw models to show solutions. • Then, #24 – 27.
SUMMARIZE: Connect purpose to activities.	Practice & Problem Solving, P. 296, Ex. 17: <ul style="list-style-type: none"> • Students write/show how 2-digit numbers are separated into tens and ones. • Students use models/different strategies to show solutions, then write explanations in words.

HOMEWORK:	<p>Practice & Problem Solving, P. 296: #20-23:</p> <ul style="list-style-type: none"> • Students record/model problems. • Provide a number sentence for each partial product. Ex: $41 \times 3 = (3 \times 40 = 120) + (3 \times 1 = 3)$ Add partial products: $120 + 3 = 123$. <p>Mixed Review and Test Prep, P. 297: #s 34-41</p>
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ROUTINES:**Use Your Head With Your Money**

When you buy something do you have a good idea how much it costs and how much change you should receive?

Let's see how well you can tell how much money you should get back by figuring it out in your head.

Ask the following:

You have \$5.00. You spend \$4.50. How much should you get back?

You have \$10.00. You spend \$9.90. How much should you get back?

Discuss students' strategies for solving problems.

Record process on board/overhead.

$$\begin{array}{r}
 \$5.00 \\
 - 4.50 \\
 \hline
 \$.50
 \end{array}$$

Continue. Then have students take turns being the leader and asking similar questions.

