San Diego Unified School District

Instructional Module to Enhance the Teaching of

HARCOURT

Math

California Edition

Grade 5

Module 5 – Reorganized

Multiply Whole Numbers and Decimals; Percent

—WORK IN PROGRESS—

Reorganized 9/04/04

San Diego City Schools
Instruction and Curriculum Division

MATHEMATICS CURRICULUM MAP - GRADE 5

MODULE 5 – Multiply Whole Numbers and Decimals; Percent
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 and translate between different representations.
- 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 apply their understanding of the operations and properties of multiplication using whole numbers to multiply decimals.
- Students use patterns of powers of ten and the area model to understand and compute with decimals.
- Students understand that multiplication with whole numbers and decimals results in the same digits, and they can place the decimal point using powers of ten and estimation.
- Students use fractions and decimals to represent percents as a hundredth of a unit.
- Students find the percent of a number by multiplying by fractions or decimals.
- Students use models to represent, solve and explain solutions to percent problems.

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

- **How do I connect whole number concepts and strategies to solve decimal multiplication problems?*
- How do I model, identify, and use multiplication properties with decimals?
- How do I use estimation strategies to evaluate decimal multiplication problems for reasonableness?
- How do I use an **area model* to multiply a decimal by a decimal and translate the model to a numerical expression?
- How do I use patterns to multiply by hundredths and tenths?
- How do I explain and use strategies to place the decimal point in the product?
- How do I translate between percents, *fractions*, decimals* and base-10 materials**?
- How do I use my understanding of multiplying and dividing by powers of ten and benchmark percents to find the percent of a number?
- How and why can I multiply by an equivalent decimal to find the percent of a number?
- How do I use models to understand finding percents and to explain the meaning of the procedure I use?

Presented in previous grades

Resources: *Van de Walle: Chapter17 (pp. 280-294); Mathematics Source Book: Decimals and Percents (pp. 77, 78, 95–98)*

MULTIPLY WHOLE NUMBERS AND DECIMALS
PERCENT

Key Mathematical Concepts:

- Connect whole number concepts and strategies to solve decimal multiplication problems.
- Use estimation to evaluate multiplication problems for reasonableness.
- Use several strategies to place the decimal point in the product; estimation, decimal model, patterns, and "moving" the decimal point using multiplication and division by powers of ten.
- Model multiplication on a grid using repeated addition and an area model. Translate the graphical representations to numerical expressions that are equivalent.
- Interpret percent as part of a hundred.
- Know that percents represent a part-to-whole ratio/relationship.
- Understand how percents, fractions, and decimals can represent the same value.
- Understand that percent can be expressed as a fraction or decimal to compute a given percent of a whole number.

MODULE 5 NOTES

Chapter 18
Percent

- **Lessons 4 and 5 in Chapter 18 are reversed so that mental strategies can be emphasized prior to learning the algorithm.**
- **Lessons 18.6 and 18.7 are omitted because the lessons do not address key fifth grade standards.**

Day 1: Chapter 9: Multiply Whole Numbers Lesson 9.1 Estimation: Patterns in Multiples	**Day 2:** Lesson 9.2 Multiply by a 1-Digit Number	**Day 3:** Lesson 9.3 Multiply by a 2-Digit Number	**Day 4:** Lesson 9.5 Evaluate Answers for Reasonableness	**Day 5:** Chapter 10: Multiply Decimals Lesson 10.1 Multiply Decimals and Whole Numbers
Day 6: Lesson 10.2 Algebra: Patterns in Decimal Factors and Products	**Day7:** Lesson 10.3 Model Decimal Multiplication	**Day 8:** Lesson 10.4 Place the Decimal Point	**Day 9:** Lesson 10.5 Zeros in the Product	**Day 10:** Chapter 18: Percent Lesson 18.1 Hands On: Understand Percent
Day 11 Lesson 18.2 Relate Decimals and Percents	**Day 12:** Lesson 18.3 Relate Fractions, Decimals, and Percents	**Day 13:** Lesson 18.5 Mental Math: Percent of a Number	**Day 14:** Lesson 18.4 Find a Percent of a Number	

DAY 1
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 9.1

MATERIALS:	Number line blacklines, 3 per student, p. TR6
LESSON FOCUS:	**Estimation: Patterns in Multiples**
CALIFORNIA STANDARDS:	**Number Sense: 1.1** Estimate, round and manipulate very large and very small numbers. **Mathematical Reasoning: 1.1** Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
Purpose of Lesson:	• To round factors and determine an estimate. • To use patterns in multiples as a tool for estimation.
LAUNCH: Introduce students to concepts. Number Line Blackline pg. TR 6	**Number of the Day, T.E. p. 144A** **Alternative Teaching Strategy, T.E. p. 144B** • Label Number line #1 by 10s (0-100) #2 by 100s (100-1,000) and have students make a third number line: #3 by 1,000s (1,000-10,000). Include some numbers for students to place on line #3.
EXPLORE: Work with the concept. Focus on students "doing mathematics." ***Generally, Student books are closed during this part of the lesson. The teacher uses the book as a resource for presenting information to students.	**Learn, p. 144:** Orbiting Numbers • Write problem on board/overhead. • Highlight that the question begins "About..." • Encourage students to use their number lines to help them calculate an estimate. Note: Accept any reasonable estimate; i.e., the correct place value. • Remind students that an estimate is not computing the actual solution and rounding off. **Teach, p. 144,** Guided Instruction questions and Modifying Instruction to guide discussion. Another Question to consider: • *What patterns do you notice when you multiply tens with tens, tens with hundreds, hundreds with ones, etc.?* (One pattern is the total number of zeros in the factors is the same as the number of zeros in the product.)
PRACTICE: Focus on Communication and Representation.	**Practice & Problem Solving, p. 145 #26-30** • Discuss with partner groups to talk about any patterns they noticed. Then share whole group.
SUMMARIZE: Connect purpose to activities. Assess Individually.	**T.E. ASSESS, p. 145: Write** **Practice & Problem Solving, p. 145 #31** • Discuss.
HOMEWORK:	**Practice & Problem Solving, p. 145** #22 - 25 **Mixed Review, p. 145**

DAY 2
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 9.2

MATERIALS:	Practice 9.2 one per student
LESSON FOCUS:	**Multiply by 1-Digit Numbers**
CALIFORNIA STANDARDS:	**Number Sense: 1.0** Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers. **Mathematical Reasoning: 2.1** Use estimation to verify the reasonableness of calculated results. **Mathematical Reasoning 2.2** Apply strategies and results from simpler problems to more complex problems.
Purpose of Lesson:	• Use estimation to determine reasonableness of a product & the number of digits in the product. • Multiply by a one-digit number using distributive property as one strategy.
LAUNCH: Introduce students to concepts.	**Problem of the Day, T.E. p. 146A.** Discuss solutions. **Learn, p. 146:** Heavyweights. Write problem on board/overhead. • Ask students to: – Determine an estimate for the solution. – Share their strategy with a partner. – Calculate an exact answer. – Compare their estimate with their exact answer. – Share their solution strategies with the class. • Record the different strategies. **Teach, p. 146, Modifying Instruction,** discuss the reasoning behind this strategy. • Relate to Example of distributive property (a partial product strategy), p. 146 bottom, as a way to get the actual product. • Allow students to discuss and explain the process.
EXPLORE: Work with the concept. Focus on students "doing mathematics."	**Check, p. 147** #1. Discuss. Then, #5 & 6. • Student partners ESTIMATE FIRST, then try strategies use to solve. • Share strategies. **Practice & Problem Solving, p. 147** #18-21 with a partner. • Show distributive property solutions for # 18 & 19.
PRACTICE: Focus on Communication and Representation.	**Practice 9.2** OR **Practice & Problem Solving, p. 147** #15 – 17. • Estimate first. • Discuss strategies for solving.
SUMMARIZE: Connect purpose to activities.	**T.E. ASSESS, p. 147: DISCUSS** **T.E. ASSESS, p. 147: WRITE:** ***In practice problem #2, how could you use addition to check your multiplication?*** • *How did you use the* ***distributive property*** *when solving multiplication problems?*
HOMEWORK:	**Mixed Review, p. 147** **Advanced Learners** T.E. p. 142F (**See Challenge 9.4 TE 151** for more problems like this)

DAY 3
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 9.3

<table>
<tr><td>MATERIALS:</td><td>Dice/number cubes
Grid paper, p. TR32, as necessary</td></tr>
<tr><td>LESSON FOCUS:</td><td>Multiply by 2-Digit Numbers</td></tr>
<tr><td>CALIFORNIA STANDARDS:</td><td>Number Sense: 1.0
Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers.
Mathematical Reasoning: 2.1
Use estimation to verify the reasonableness of calculated results.</td></tr>
<tr><td>Purpose of Lesson:</td><td>Use understanding of the distributive property to use the strategy of partial products to multiply two-digit numbers.</td></tr>
<tr><td>LAUNCH:
Introduce students to concepts.

Grid paper: TR32

700 + 0 + 4
<table><tr><td>20</td><td>14000</td><td>0</td><td>80</td></tr><tr><td>3</td><td>2100</td><td>0</td><td>12</td></tr></table></td><td>English Language Learners, T.E. p. 150B, to clarify “partial”
• Continue the discussion with a review of 3 different strategies for partial products (distributive property; multiplication algorithm; area with expanded notation).
• Practice partial products in different representations.
Distributive Property: see Example, bottom p. SE146
315 x 26 = (315 x 6) + (315 x 20) = 8,190
315 x 26 = (6 x 5) + (6 x 10) + (6 x 300) + (20 x 5) + (20 x 10) + (20 x 300) = 8,190
*Traditional algorithm: grid for aligning partial products,
See Alternative Teaching Strategy, T.E. p. 150B
• Area Model: with expanded notation,
See Modifying Instruction, T.E. p. 151, margin</td></tr>
<tr><td>EXPLORE:
Work with the concept. Focus on students “doing mathematics.”</td><td>Learn, p. 148: Pedal Power
• Write problem on board/overhead.
• First, students estimate a possible answer.
• Accept all reasonable estimates.
• Ask students to work with a partner to develop a partial product with each strategy to solve the problems.
• Share 3 representations and any other strategies, including any used for estimation.
• Discuss and connect the different multiplication strategies.
• Ask what students notice as they examine the strategies. Chart responses.
Practice & Problem Solving, p. 149 #15 – 16. Students show at least 2 different strategies for solutions.</td></tr>
<tr><td>PRACTICE:
Focus on Communication and Representation.</td><td>Practice & Problem Solving, p. 149 #23 -28.
• Ask students to ESTIMATE FIRST. Ask students to use 2 of the methods discussed to solve problems.
• Discuss. Share #28.</td></tr>
</table>

SUMMARIZE: Connect purpose to activities.	**T.E. ASSESS, p. 149: DISCUSS:** • Students use different strategies and explain. • Chart strategies used so students can refer back to them. • Be sure distributive property is represented. **T.E. ASSESS, p. 149: WRITE:** • Describe how to multiply 45 x 61. Use words & diagrams & numbers.
HOMEWORK:	**Practice & Problem Solving, p. 149** #18 - 22 **Mixed Review, p. 149**

DAY 4
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 9.5

LESSON FOCUS:	**Problem Solving Skill: Evaluate Answers for Reasonableness**
CALIFORNIA STANDARDS:	**Mathematical Reasoning: 2.1** Use estimation to verify the reasonableness of calculated results. **Mathematical Reasoning: 3.1** Evaluate the reasonableness of the solution in the context of the original situation.
Purpose of Lesson:	To learn to use estimation as a tool to check for reasonableness before solving problems.
LAUNCH: Introduce students to concepts.	**Science Connection, T.E. p. 152B** Prompt: *Why is it a good idea to determine if an answer is reasonable?* Students suggest a real life situation when estimation would be helpful.
EXPLORE: Work with the concept. Focus on students "doing mathematics."	**Present the problem, p. 152** • Paper Products. Write on board/overhead. • Include **Teach, p. 152,** Guided Instruction questions and Talk About It (bottom p. 152) to guide discussion. Note: Whenever students give estimates, accept any reasonable estimate, that is, an estimate with the correct number of digits. **Problem Solving Practice, p. 153** Discuss #2 Reasoning: "What If." Discuss: **T.E. ASSESS, p. 153: WRITE** **Problem Solving Practice, p. 153** #1, 3, 4. Discuss. Share thinking.
PRACTICE: Focus on Communication and Representation.	**Mixed Application, p. 153.** • Students work with partners. • Discuss solutions & strategies.
SUMMARIZE: Connect purpose to activities.	**T.E. ASSESS, p. 153: DISCUSS**
HOMEWORK:	**Review/Test** #1-2, 20 - 25

DAY 5
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 10.1

MATERIALS:	Decimal modules (100 grids) p. TR9-10
LESSON FOCUS:	**Multiply Decimals and Whole Numbers**
CALIFORNIA STANDARDS:	**Number Sense: 2.1** Add, subtract, multiply, and divide with decimals; add with negative numbers; subtract positive integers from negative integers; and verify the reasonableness of the results.
PURPOSE OF LESSON:	• Connect multiplying of whole numbers and decimals to models. • Understand that the product of a whole number and a decimal less than 1 will always be less than the whole number. • Understand the relationship of the number of decimal places in the factors and in the product.
LAUNCH: Introduce students to concepts. TR9-10: Hundreds Grid	**Problem of the Day, T.E. p. 158A.** • Share strategies. Highlight decimal placement. Also, connect repeated addition to check decimal placement (0.20 + 0.20 + 0.02 = 0.42). **Quick Review, p 158.** • Discuss representation (labels) as with #1 (450¢ OR $4.50 but not 4.50¢) **Write Explore problem, p. 158** on the board/overhead and read with students. • Provide students decimal models T.R. pg. 9-10 (hundreds grids) to represent the problem. (You may need to remind students that they can represent multiplication as repeated addition. Example: 2 x 0.53 = 0.53 + 0.53). **Teach, T.E. p. 158,** Guided Instruction questions to guide discussion. **Try It, p. 158 and Connect, p. 159** provide further explanations and checks for understanding.
EXPLORE: Work with the concept. Focus on students "doing mathematics." **TR 9-10: hundreds grids**	**Practice, p. 159 #**1, 5, 7 • Students work with partners. • Discuss. • Share decimal representations.
PRACTICE: Focus on Communication and Representation.	**Practice, p. 159 #**9 – 14 • Students work with partners or independently. • Students do a written explanation for #14. • Students share solutions & strategies with the class.
SUMMARIZE: Connect purpose to activities.	**T.E. ASSESS, p. 159: DISCUSS** **T.E. Assess, p. 159: WRITE:** • Explain how to use a model to find the product 5 x 0.37. • Provide students decimal models to use to verify products.
HOMEWORK:	**Mixed Review, p. 159**

DAY 6
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 10.2

MATERIALS:	Hundreds grids.
LESSON FOCUS:	**Algebra: Patterns in Decimal Factors and Products**
CALIFORNIA STANDARDS:	**Mathematical Reasoning: 1.1** Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns. **Number Sense: 1.0** Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers.
Purpose of Lesson:	To use a decimal model, mental math and patterns to find decimal products.
LAUNCH: Introduce students to concepts. Hundreds grids	**Books Closed:** **Quick Review, p. 160.** Discuss patterns **Alternative Teaching Strategy, T.E. p. 160B:** • Use the decimal model to have students investigate patterns numerically and also verify with the grids: (0.04x1, 0.04 x 10, 0.04 x 100). • Continue with other examples. • For example: Ask students to predict/investigate patterns. (0.98 x1), (0.98 x 10), (0.98 x100), and (0.98 x 1,000) (0.24 x 1), (x10), (x100) and (x1000)
EXPLORE: Work with the concept. Focus on students "doing mathematics."	**Learn, p. 160.** Review examples. **Teach, T.E. p. 160,** Guided Instruction questions to guide discussion. **Check, p. 161** #1. Discuss patterns. Apply discussion to #5, 6, 7. Discuss.
PRACTICE: Focus on Communication and Representation.	**Practice & Problem Solving, p. 161** #16 – 23. Discuss. Highlight decimal patterns by charting responses.
SUMMARIZE: Connect purpose to activities. Assess Individually.	**Practice & Problem Solving, p. 161:** Discuss #24. • Ask students to generalize a rule about what they observe about the movement of the decimal. • *Where does it move, which direction, how many places does it move, and WHY? What if there was no decimal in the factors of the problem – is there still a decimal "moving"?* (yes) • Connect back to money as in #22.
HOMEWORK:	**Practice & Problem Solving, p. 161** #13 - 15 **Mixed Review, p. 161**

DAY 7
UNIT 3: Multiply Whole Numbers and Decimals
LESSON 10.3

MATERIALS:	Hundreds decimal model (grid), p. TR 10
LESSON FOCUS:	**Model Decimal Multiplication**
CALIFORNIA STANDARDS:	**Number Sense: 2.1** Add, subtract, multiply, and divide with decimals; add with negative integers; subtract positive integers from negative integers; and verify the reasonableness of the results. **Mathematical Reasoning: 2.3** Use a variety of methods, such as words, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
PURPOSE OF LESSON:	Use an area model to multiply a decimal by a decimal; translate the model to a numerical representation.
LAUNCH: Introduce students to concepts Hundreds grids	**Early Finishers, T.E. p. 162B.** • Students work with partners. • Whole class discussion. **Alternative Teaching Strategy, T.E. p. 162B.** • Highlight finding a decimal (fractional) part of a decimal (fractional) amount. • Discuss student strategies and models using the board/overhead. • Record the numerical expression and product.
EXPLORE: Work with the concept. Focus on students "doing mathematics." **TR10: hundreds grids**	**Learn, p. 162.** • Present Fast Food problem on board/overhead. • Ask students to create a model to solve the problem. **Teach, p. 162,** Guided Instruction questions to guide discussion of p. 162, especially **Reasoning, middle of SE p. 162.** • Help students translate the equation into words to help find the value of the variable. E.g., n x 0.2 = 0.14 translated into words is: "*What number times two tenths is equal to fourteen one-hundredths?*" **Check, p. 162** #1 – 5. • Groups discuss how the colored model in the book is equivalent to the numerical expression and how it is used to find the product.
PRACTICE: Focus on Communication and Representation.	**Practice & Problem Solving, p. 162,** #29 -33. • Use decimal models to find products, where appropriate, particularly #30. • Ask students to look for patterns with the decimal point. **For Early Finishers** write a Challenge Problem on the board (T.E. pg. 163).
SUMMARIZE: Connect purpose to activities.	**T.E. ASSESS, p. 163: WRITE** **THEN, T.E. ASSESS, p. 163: DISCUSS:** • Discuss the error in p. 163 #32: *How does using a decimal model help you find the product?* • Discussion points: "*What do you notice about the size of the product compared to the size of the factors?*" "*What patterns did you notice with the decimal point?*"
HOMEWORK:	**Pg. 163,** #12, 13 **Mixed Review**, p. 163