



San Diego Unified School District

Instructional Module to Enhance the Teaching of

H A R C O U R T

Math

California Edition

Grade 5

Module 10: - Reorganized

Chapter 14: Divide Decimals by Decimals
Chapter 27: Customary and Metric Measurement
Chapter 30: Probability
Chapter 17: Ratio

– Work in Progress –

MODULE 10 – DIVIDE DECIMALS BY DECIMALS; CUSTOMARY AND METRIC MEASUREMENT; PROBABILITY; RATIO

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 the 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 understand that multiplication and division of decimals results in the same digits as multiplication and division of whole numbers.
- Students use estimation and patterns of multiplying and dividing by powers of ten to place the decimal point.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that measurement involves comparing an item with a measurement unit that has the same attribute: length with length; area with area.
 - Students use understanding of base ten and decimals to convert between metric units.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that the probability of the occurrence of an event falls somewhere on the continuum from impossible to certain and they represent probabilities as fractions from 0 to 1.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that ratios compare two quantities and that equivalent ratios result from a multiplicative, not additive relationship.
- Students find equivalent ratios, or proportions, using the same strategies used to determine equivalent fractions.

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

- How do I use my understanding of models of whole number multiplication and flexible procedures multiplication to solve decimals division problems?
- How do I use patterns to find quotients in decimal division?
- How does “removing” the decimal point in the divisor connect to: multiplying or dividing both the numerator and denominator by the same number to find equivalent fractions; and patterns of multiplying and dividing by powers of ten?

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

- How do I use patterns and understanding of base ten and decimals to understand learn to use metric measurements?
- How are the customary measurements different from the metric?
- How do I use measurement tools?
- How do I decide when to estimate and when to be more precise when I measure?

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

- What do I need to know in order to express probability as a fraction?
- Why is the probability of an event occurring expressed as 0, 1, or fractions between 0 and 1?
- How do I predict and write outcomes of probability experiments?
- How do I use a tree diagram to organize and find possible outcomes?

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

- What are the three ways in which I can express a ratio?
- What do I have to know to interpret the meaning of a ratio?
- How do I identify and make equivalent ratios using models and numbers?
- How do I determine when a ratio expressed as a fraction has the same meaning as a fraction?
- How do I use ratios to interpret scale drawings and maps?

* Presented in previous grade(s)

* Presented in previous grade(s)

* Presented in previous grade(s)

Resources: Van de Walle, Chapter 17, 18, 19, and 21

Key Mathematical Concepts:**Chapter 14: Divide Decimals by Decimals** *(Two modified lessons on division from this Chapter are included in Module 6.)*

- Division by decimals asks the same question asked in whole number division.
 $6 \div 2$: How many 2's in 6?
 $.6 \div .2$: How many .2's in .6?
- Multiplying the divisor and dividend by the same multiple of 10, thereby moving the decimal the same number of spaces to the right, until the divisor does not have a decimal can be called "clearing the divisor".
The purpose of "clearing the divisor" is to make the division easier and to know where to place the decimal point in the quotient.
- If the dividend and the divisor are both multiplied by 10 or 100, the quotient remains the same.
- When the divisor and dividend are multiplied by 10 or 100, the decimal point moves to the right the same number of places as the number of zeros in 10 or 100.

Chapter 27: Customary and Metric Measurement

- When adding and subtracting linear measurements and measurements of capacity and weight with customary units, it may be necessary to rename units.
- In customary units, ounces are used to measure both capacity and weight.
- In metric measurement:
The liter is the basic unit for measuring capacity.
The gram is the basic unit for measuring mass.
- Metric units for measuring length, capacity, and mass are related in several ways:
 - The units larger than the basic units (meter, liter, gram) are 10, 100, or 1,000 times as large.
 - The units smaller than the basic unit are $1/10$, $1/100$, or $1/1,000$ as large.
 - The prefixes used to indicate size are the same for each basic unit.
 - A one-centimeter cube holds one milliliter of water and that milliliter of water weighs approximately one gram.

Chapter 30: Probability

- The more times a probability experiment is completed, the closer you come to the expected, or most likely outcome.
- In order to express probability as a fraction, you must know the total number of equally likely possible outcomes.
- The probability of an event occurring can be expressed as 0, 1, or a fraction between 0 and 1.
- An impossible event has a probability of 0, and a certain event has a probability of 1.

Chapter 17: Ratio

- Before interpreting a ratio, it is important to know exactly what information the ratio represents: whole to part; part to whole; or part to part.
- The order of numbers in a ratio determines how the quantities are compared.
- Even though a ratio may look like a fraction, it does not have the same meaning unless it expresses a part whole relationship.

The ratio $2 / 3$ has the same meaning as a fraction if the **2 is the part** and the **the 3 represents the whole**: “Two out of three dentists surveyed”

If the 2 is a part and the 3 is a part, the ratio has a different meaning:
“Two girls for every 3 boys.”

- Ratios can be expressed three ways: **a to b**; **a : b**; and **a / b**.
- Equivalent ratios are ratios that name the same relationship.
(3 to 6, 1 to 2)
- Map scales are ratios that compare the distance on a map to the actual distance.
- Scale drawings show the correct relationship between distances or sizes.

MODULE NOTES**Chapter 14: Divide Decimals by Decimals**

- Consider doing “Check What You Know” on P. 233 before beginning this unit.
- Choosing one-digit divisors and simpler problems will allow students to understand concepts and look for patterns if they are still struggling with two-digit division.
- Lessons 14.1 and 14.2 are reversed so students can do the hands on work first. **Students did modified lessons for 14.1 and 14.2 at the end of Module 6.**
- Lesson 14.3 is a two-day lesson.
Day 1: Problems with one-digit divisors that can be checked with models.
Day 2: Problems with two-digit divisors and annexing zeros.

DAY 1
Unit 4: Divide Whole Numbers and Decimals
Chapter 14
LESSON 14.2, Pp. 236-237

MATERIALS:	Base ten blocks, copies of TR 9, 10, centimeter grid paper, scissors, markers
LESSON FOCUS:	Hands On: Divide with Decimals
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 reasonableness of the results. 2.2: Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.
PURPOSE OF LESSON:	<ul style="list-style-type: none"> To use a model to divide with decimal divisors. To understand that the divisor tells how many groups into which to divide or how many items in each group.
LAUNCH: Introduce students to concepts.	<ul style="list-style-type: none"> Quick Review, P 236. (optional) <p>Explore, P. 236 Ask: <i>What question does $24 \div 2$ ask?</i> (How many 2's are in 24?) <i>What question does $2.4 \div .2$ ask?</i> (How many .2's are in 2.4?)</p> <ul style="list-style-type: none"> Model the problem with base ten blocks as shown on P. 236, Steps 1, 2, 3. (Students may need to review the base ten model for decimals.) Record the problem and the answer in words. Write division equations as shown in Step 3, P. 236.
EXPLORE: Work with the concept. Focus on students "doing" mathematics.	<p>Try It, P. 236: a-d</p> <ul style="list-style-type: none"> For each problem: <ol style="list-style-type: none"> Copy the problem. Make and sketch a model. Write the question the problem asks. (see "think" in Step 3 in Explore) Write the answer in words. Record a division equation that represents the problem. <p>Connect, P. 237.</p> <ul style="list-style-type: none"> Students use Base 10 blocks to model as you discuss.

<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Practice, P. 237 #10 – 13.</p> <ul style="list-style-type: none"> • Discuss modeling of division.
<p>SUMMARIZE: Connect purpose to activities.</p>	<p>ASSESS, TE P. 237: DISCUSS: WRITE.</p> <ul style="list-style-type: none"> • Explain how to use a decimal model to find the quotient of $0.20 \div 0.04$.
<p>HOMEWORK:</p>	<ul style="list-style-type: none"> • Practice, P. 237 #6 – 9 • Mixed Review & Test Prep, P. 237 #16 - 20

ROUTINES:

Open number lines provide another model for division with decimals.
 Example:
 Students draw and label an open number line from 0 to 2.4 in tenths.
 They circle groups of two tenths to see how many two tenths are in 2.4.
 They record the division equation ($2.4 \div 0.2 = 12$).

DAY 2
 Unit 4: Divide Whole Numbers and Decimals
 Chapter 14
 LESSON 14.1, Pp. 234-235

MATERIALS:													
LESSON FOCUS:	Algebra: Patterns in Decimal Division												
CALIFORNIA STANDARDS:	<p>Mathematical Reasoning 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.</p> <p>Number Sense 2.2: Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.</p>												
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • To use patterns to find quotients in decimal division • To understand properties of multiplication & division can be modeled as a fact family: $a \times b = c$; $c \div b = a$; $c \div a = b$ • To understand moving the decimal in the divisor and the dividend the same number of places doesn't change the quotient. 												
<p>LAUNCH: Introduce students to concepts.</p>	<ul style="list-style-type: none"> • Connect Lesson 14.2 and review meaning of division: • Ask students to state the question asked by each problem: <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 20px;">$48 \div 12$</td> <td>(How many 12's in 48?)</td> </tr> <tr> <td style="padding-right: 20px;">$4.8 \div 1.2$</td> <td>(How many 1.2's in 4.8?)</td> </tr> <tr> <td style="padding-right: 20px;">$0.48 \div 0.12$</td> <td>(How many 0.12's in 0.48?)</td> </tr> </table> <p>Learn, P. 234: Follow the Decimal!</p> <p>Teach, P. 234; Guided Instruction questions to guide discussion.</p> <ul style="list-style-type: none"> • Highlight that the divisor and quotient are the same as the factors and the dividend is the same as the product. • Emphasize that moving the decimal the same amount, by multiplying both the divisor and the dividend by the same multiple of 10, does not change the quotient. • Experiment with moving the decimal point to the right. <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 20px;">$.12 \div 0.02 = 6$</td> <td></td> </tr> <tr> <td style="padding-right: 20px;">$.12 (10) \div 0.02 (10) = 1.2 \div 0.2 = 6$</td> <td></td> </tr> <tr> <td style="padding-right: 20px;">$.12 (100) \div 0.02 (100) = 12 \div 2 = 6$</td> <td></td> </tr> </table> (This could be explored with calculators.) 	$48 \div 12$	(How many 12's in 48?)	$4.8 \div 1.2$	(How many 1.2's in 4.8?)	$0.48 \div 0.12$	(How many 0.12's in 0.48?)	$.12 \div 0.02 = 6$		$.12 (10) \div 0.02 (10) = 1.2 \div 0.2 = 6$		$.12 (100) \div 0.02 (100) = 12 \div 2 = 6$	
$48 \div 12$	(How many 12's in 48?)												
$4.8 \div 1.2$	(How many 1.2's in 4.8?)												
$0.48 \div 0.12$	(How many 0.12's in 0.48?)												
$.12 \div 0.02 = 6$													
$.12 (10) \div 0.02 (10) = 1.2 \div 0.2 = 6$													
$.12 (100) \div 0.02 (100) = 12 \div 2 = 6$													
EXPLORE: Work with the concept. Focus on students "doing" mathematics.	<p>Check, P. 234: #1 Do with students. Record responses. Then #2-4</p> <p>Practice and Problem Solving P. 235 # 5-7</p> <p>Practice & Problem Solving, Algebra P. 235 # 17-19</p>												

PRACTICE: Focus on Communication and Representation.	Practice & Problem Solving, Use Data P. 235 # 23-27. Students work individually/with partners. Discuss.
SUMMARIZE: Connect purpose to activities.	ASSESS, P. 235: Write P. 235: <ul style="list-style-type: none">Describe how you would use the multiplication equation: $3 \times 6 = 18$ to solve $0.18 \div 0.03$. •Writing in Mathematics, P. 234B.
HOMEWORK:	Practice & Problem Solving, P. 235 # 8-10, 14-16, 20-22

ROUTINES:

DAY 3
 Unit 4: Divide Whole Numbers and Decimals
 Chapter 14
 LESSON 14.3 (Part 1) Pp. 238-241

MATERIALS:	Base ten blocks or TR 9 and 10 for students
LESSON FOCUS:	Decimal Division
CALIFORNIA STANDARDS:	<p>Number Sense</p> <p>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.</p> <p>2.2: Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.</p>
PURPOSE OF LESSON:	To divide a decimal by a decimal
LAUNCH: Introduce students to concepts.	<p>Check What You Know, P. 233 # 13-24.</p> <ul style="list-style-type: none"> • Summarize: What happens to the decimal point when you multiply by 10? By 100? <p>Learn, P. 238: Pizza Slice.</p> <ul style="list-style-type: none"> • Read problem with students. • Write the problem $1.4 \div 0.7$ on the board. • Ask students to state what this problem is asking (how many groups of 0.7 are in 1.4?) • Ask a student to solve the problem using multiplication on the overhead. (There are two 0.7's in 1.4; $2 \times 0.7 = 1.4$) <p>Teach, P. 238; Guided Instruction questions to discuss One Way and Another Way, Steps 1 & 2.</p> <p>Note: "Clearing the divisor" (by multiplying to eliminate the decimal point) helps us to divide more easily and allows us to know where to place the decimal point in the quotient.</p>

<p>EXPLORE: Work with the concept. Focus on students “doing” mathematics. Base 10 blocks</p>	<ul style="list-style-type: none"> • Students work problems that can be checked with models. (These problems are not in the book.) • They use arrows to show how the decimal points were moved. • They check each problem with a model. <ol style="list-style-type: none"> 1. $1.2 \div 0.6$ 2. $2.1 \div 0.1$ 3. $2.6 \div 0.2$ <p>Discuss Common Error Alert, P. 240.</p> <p>Check, P. 239 #2 and 4. Discuss.</p> <p>Practice and Problem Solving, P. 240: 14, 15 Discuss.</p>
<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Practice and Problem Solving, P. 240 #19, 20, 22-24</p>
<p>SUMMARIZE: Connect purpose to activities.</p>	<p>ASSESS, TE P. 241:Write:</p> <ul style="list-style-type: none"> • Describe how you find the quotient of $4.2 \div 0.6$.
<p>HOMEWORK:</p>	<p>Practice and Problem Solving P. 240: 6-13 Mixed Review & Test Prep, P. 241 #44-47</p>

ROUTINES:

DAY 4

Unit 4: Divide Whole Numbers and Decimals

Chapter 14

LESSON 14.3 (Part 2), Pp. 238-241, 244, 245

MATERIALS:	
LESSON FOCUS:	Decimal Division
CALIFORNIA STANDARDS:	<p>Number Sense</p> <p>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.</p> <p>2.2: Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.</p>
PURPOSE OF LESSON:	To divide a decimal by a decimal
<p>LAUNCH: Introduce students to concepts.</p> <p>Books are closed.</p>	<p>Practice and Problem Solving, P. 240 # 28, 31, 32 as a review of 14.3, Part 1.</p> <ul style="list-style-type: none"> • Discuss multiplying the divisor & dividend by 10 or 100, making it easier to divide, but not changing the quotient. • Write the problem: $8 \div 0.16$ on board/overhead. • Ask students how many places do you need to move the decimal point to clear the divisor? (2) • Ask students what number they need to multiply by to move the decimal 2 places. (100) • Highlight: If you multiply the divisor by 100 to move the decimal 2 places, you need to multiply the dividend by 100 also to keep the quotient the same. • Pose the question: How can you move it two places when 8 doesn't have a decimal point? <i>If 8 had a decimal point, where would it be?</i> <i>What happens to the value of 8 if we add a decimal point?</i> <i>Does $8 = 8.0$? 8.00?</i> <i>Is $8.00 \div 0.16$ the same as $8 \div 0.16$?</i> <p>Whole Numbers & Decimals, P. 239. Read together.</p> <ul style="list-style-type: none"> • See bullet top margin SE P. 239 to discuss Steps 1 and 2 on P. 239. • Go on to discuss Examples.
EXPLORE: Work with the concept. Focus on students "doing" mathematics.	<p>Practice and Problem Solving, P. 240 # 25, 27, 30. Discuss.</p> <ul style="list-style-type: none"> • Practice and Problem Solving, P. 240, Use Data #36 – 41. Students work with partners. Discuss.
PRACTICE: Focus on Communication and Representation.	Practice and Problem Solving P. 240 #34 & 35, 18, 21, 29. Discuss.
SUMMARIZE: Connect purpose to activities.	ASSESS, TE P. 241: Discuss: Explain how to divide a number by a decimal.

HOMEWORK:	Review/Test, P. 244: 11, 13, 14, 19 Cumulative Review, P. 245: 1-3
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ROUTINES:

DAY 5
 Unit : 4 Divide whole Numbers and Decimals
 Chapter 14
 LESSON 14.4, Pp. 242-243, 244, 245

MATERIALS:	
LESSON FOCUS:	Problem Solving Skill: Choose the Operation
CALIFORNIA STANDARDS:	Mathematical Reasoning 1.0: Students make decisions about how to approach problems. 2.0: Students use strategies, skills, and concepts in finding solutions. 3.2: Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
PURPOSE OF LESSON:	To choose the appropriate operation/operations to solve problems
LAUNCH: Introduce students to concepts. Books are closed.	<ul style="list-style-type: none"> • Ask students how they know which operation to use when solving problems: addition, subtraction, multiplication, or division. Chart their answers. • “Weigh Out” in Space, P. 242. • Read problem with students. Discuss and chart responses. Teach, P. 242; Guided Instruction questions to guide discussion on Math Idea & SE p. 242.
EXPLORE: Work with the concept. Focus on students “doing” mathematics.	Talk About It, P. 242. Discuss. Problem Solving Practice, P. 243 #1 – 4. <ul style="list-style-type: none"> • Students work with partners. Discuss. Then do #5 – 6.
PRACTICE: Focus on Communication and Representation.	Mixed Application, P. 243 #7 – 10.
SUMMARIZE: Connect purpose to activities.	ASSESS, TE P. 243: Discuss: <ul style="list-style-type: none"> • <i>How do you choose the correct operation when solving a problem?</i> Advanced Learners, P. 242B. Discuss thinking. <ul style="list-style-type: none"> • Tell students that they will be working with a partner to write down how each operation would be used in planning a class field trip. • Copy the costs in Advanced Learners P 242B on the board. After students finish, chart their answers as they share.
HOMEWORK:	Review/Test P. 244: 22-25 Cumulative Review, P. 245: 7

ROUTINES:

Chapter 27: Customary and Metric Systems

MODULE NOTES

- Rulers provide a measurement model for fractions. The measurement model is labeled differently than the area model.
Use TR 17 and TR 18 to show/discuss the difference.
- Students often have difficulty knowing where to start measuring and begin at the end of the ruler rather than at “0”. “0” is not labeled on most rulers.
- **Lesson 27.5: Metric Capacity and Mass** has been changed extensively to provide hands-on practice with measurement and to focus on commonly used units: liter, milliliter, gram, kilogram, and milligram.

