



San Diego Unified School District

Instructional Module to Enhance the Teaching of

HARCOURT

Math

California Edition

Grade 2

Module 8 - Revised

Multiplication and Division

- WORK IN PROGRESS -

Harcourt Math – Grade 2

3 Weeks

Key Mathematical Concepts:

- Make the connection between models, equations, and strategies
- Model multiplication through skip, counting, equal groups, repeated addition, and arrays
- Multiply by 2, 5 and 10
- Explore properties of multiplication
- Model division through equal shares/equal groups
- Compare division to subtraction
- Solve problems

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| <p>Chapter 28 Multiplication Concepts Lesson 28.1: Explore Multiplication Lesson 28.2: Addition and Multiplication Lesson 28.3: Arrays Lesson 28.5: Properties of Multiplication</p> | <p>Chapter 29 Multiplication Facts 2, 5, and 10 Lesson 29.1: Multiply with 2 Lesson 29.2: Multiply with 5 Lesson 29.3: Multiply with 10 Lesson 29.4: Memorize the Facts Assessment</p> |
| <p>Chapter 30 Division Concepts Lesson 30.1: Equal Shares Lesson 30.2: Equal Groups Lesson 30.3: Subtraction and Division Lesson 30.4: Problem Solving Lesson 30.5: Problem Solving Assessment</p> | |

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| <p><u>Day 1</u> Lesson 28.1</p> | <p><u>Day 2</u> Lesson 28.2</p> | <p><u>Day 3</u> Lesson 28.2 (continued)</p> | <p><u>Day 4</u> Lesson 28.3</p> | <p><u>Day 5</u> Lesson 28.5</p> |
| <p><u>Day 6</u> Lesson 29.1</p> | <p><u>Day 7</u> Lesson 29.2</p> | <p><u>Day 8</u> Lesson 29.3</p> | <p><u>Day 9</u> Lesson 29.4</p> | <p><u>Day 10</u> Assessment</p> |
| <p><u>Day 11</u> Lesson 30.1</p> | <p><u>Day 12</u> Lesson 30.2</p> | <p><u>Day 13</u> Lesson 30.3</p> | <p><u>Day 14</u> Lesson 30.4</p> | <p><u>Day 15</u> Lesson 30.5</p> |
| <p><u>Day 16</u> Assessment</p> | | | | |

MODULE 8 – MULTIPLICATION AND DIVISION

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.
- 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 involves counting groups of like size and determining the total (multiplicative thinking).
- Students understand the relationship between equal groups, repeated addition and counting by multiples and multiplication.
- Students relate multiplication by 2, 5, and 10 to skip counting and multiples.
- Students use models, such as arrays, to solve problems.
- Students understand the relationship between repeated subtraction, equal sharing, forming equal groups with remainders and division.

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

- How can I use the array model to explain multiplication?
- How can I relate what I know about skip counting to help me learn the multiples of 2,5,10?
- How are repeated addition and multiplication related?
- How can I use what I know about repeated subtraction, equal sharing, and forming equal groups to solve division problems?
- How does my knowledge about multiplication facts help me to solve problems?

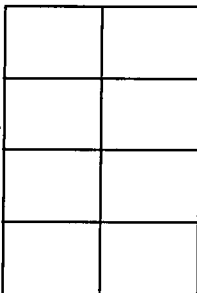
Resources: *Van de Walle, Chapters 13 pp., 214-218, 220-224, Chapter 10, pp., 143-152; Mathematics Source Book, pp. 37-47*

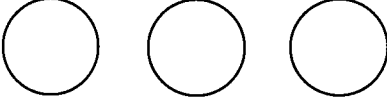
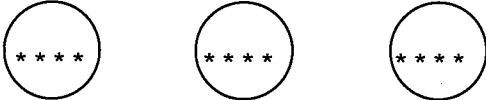
DAY 1
 UNIT 6: 3-Digit Addition and Subtraction,
 Multiplication and Division
 Chapter 28: Multiplication Concepts
 LESSON 28.1
 TE, Pg. 411A

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| LESSON FOCUS: | Explore Multiplication |
| CALIFORNIA STANDARD: | Number Sense 3.0 Students model and solve simple problems involving multiplication and division |
| Purpose of Lesson: | Explore multiplication as repeated addition by examining the numbers of items that come in groups. |
| ROUTINE: Materials: <ul style="list-style-type: none"> • Base ten materials (a variety, including commercially available materials, bundles of sticks, beans and cups, and snap cubes) | Suggestion: Number of the Day <ul style="list-style-type: none"> • Have students brainstorm equations that equal the number of days they have been in school. • Ask students to build a model of the number (using base ten materials, money or another manipulative). • Students report on how the model can be represented in an equation. • On the class number line and 10x18 square chart, fill in the numbers since the last time Number of the Day routine. |
| LAUNCH: Materials: <ul style="list-style-type: none"> • Number of the Day chart • Number of the Day Number Strip • Snap cubes | Number of the Day Number Line Patterns <ul style="list-style-type: none"> • Up to this point, the Number of the Day has been displayed on a 10x18 chart, as well as on an extended strip of paper on which the multiples of 2, 5, and 10 have been coded (e.g., 2, 4, 6, 8, 10 have red circle around each; 5, 10, 15, 20 have a purple square around each; and 10, 20, 30, 40 have a green triangle around each). Students have regularly been asked to revisit these coded numbers. <p>Call students' attention to these number patterns.</p> <ul style="list-style-type: none"> • Ask students to read the red circle numbers (2, 4, 6, 8, etc.) aloud and in order; ask them to report their observations about these number patterns. Repeat this process with those numbers that have purple squares (5, 10, 15, 20, etc.) and green triangles (10, 20, 30, 40, etc.) around them. • Students represent these number patterns using snap cubes: groups of 2 (red circles); groups of 5 (purple squares); groups of 10 (green triangles). Discuss the relationship between the equal-sized groups and the numbers on the Number of the Day number strip (e.g., each time a group is added, the total number of cubes matches the next number circled in red on the number strip: one group of two equals two, two groups of two equals four, three groups of two equals six, etc.). <p>Introduction: Things that Come in Groups As a class, generate a list of things that come in groups of two (e.g., eyes, socks, shoes, gloves, etc.).</p> <ul style="list-style-type: none"> • Record ideas on a chart paper. |

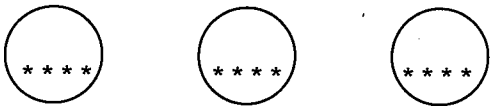
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| <p>EXPLORE:</p> <p>Materials:</p> <ul style="list-style-type: none"> • Chart paper | <p>Things that Come in Groups</p> <ul style="list-style-type: none"> • Each small group of students is given a number (3 – 8) and a piece of chart paper. • Students generate a list of things that usually come in groups of that size (e.g., 3: tricycle wheels; 4: legs on table; 5: fingers on a hand). |
| <p>PRACTICE:</p> | <p>As time allows: pgs. 411 and/or 412</p> |
| <p>SUMMARIZE:</p> | <ul style="list-style-type: none"> • Small groups present their list of Things that Come in Groups to their classmates. <p>Closure: Revisit purpose of the lesson with students.</p> <ul style="list-style-type: none"> • Select an item that comes in groups of two; i.e., feet. • Ask questions such as: <ul style="list-style-type: none"> <i>How many feet if there is 1 person?</i> <i>How many feet if there are 2 people?</i> <i>How many feet if there are 3 people?</i> • As we add 1 person each time, how does the number of feet grow? <ul style="list-style-type: none"> <i>One group of 2 is how many?</i> <i>Two groups of 2 are how many?</i> <i>Three groups of 2 are how many?</i> |
| <p>HOMEWORK:</p> | <p>Suggestion: Students make lists of things that come in groups of 3 and 4.</p> |

DAY 2
 UNIT 6: 3-Digit Addition and Subtraction,
 Multiplication and Division
 Chapter 28: Multiplication Concepts
 LESSON 28.2
 TE, Pg. 413A

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| LESSON FOCUS: | Addition and Multiplication |
| CALIFORNIA STANDARD: | Number Sense 3.1 Use repeated addition, arrays and counting by multiples to do multiplication. |
| Purpose of Lesson: | Learn the relationship between equal groups and repeated. |
| ROUTINE: Materials: <ul style="list-style-type: none"> • Base ten materials (a variety, including commercially available materials, bundles of sticks, beans and cups, and snap cubes) | Suggestion: Number of the Day <ul style="list-style-type: none"> • Have students brainstorm equations that equal the number of days they have been in school. • Ask students to build a model of the number (using base ten materials, money or another manipulative). • Students report on how the model can be represented in an equation. • On the class number line and 10x18 square chart, fill in the numbers since the last time Number of the Day routine. Count hands around the Class <ul style="list-style-type: none"> • Ask students: <i>“If we count the number of hands around the class by counting by 2s, what will be the last number we say (the total number of hands)? Why do you think so?”</i> • Count around the class by 2s: each student says the next multiple in the sequence until all hands are “counted.” • Discuss the relationship between their predictions and the outcome. |
| LAUNCH: Materials: <ul style="list-style-type: none"> • Die (or digit cards, P. TR 38 and 39 or spinner TR 107) | Discuss Homework <ul style="list-style-type: none"> • Students add homework ideas to the Things that Come in 3s and Things that Come in 4s small group charts that were created on Day 1, Lesson 28.1. Introduction: Circles and Stars <ul style="list-style-type: none"> • Show students a sheet of paper that has been folded into 8 sections: <div style="text-align: center;">  </div> |

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| | <ul style="list-style-type: none"> • Draw an enlarged version of this on the board. • Model how to play the game with a student. Players play eight “rounds.” Each round consists of two rolls of a die or spins of a spinner. The first roll corresponds to the number of circles to draw in the first box on the recording sheet. If a three was rolled, three circles would be drawn in the first box:  • The second roll corresponds to the number of stars to draw in each circle. If a four was rolled, the drawing in the first box would now look like this:  <p>Demonstrate how to record an addition equation in each box, for each round. For the above example, the addition equation would be: $4 + 4 + 4 = 12$</p> <ul style="list-style-type: none"> • Model how to leave space within each box for equations that will be explained in the Launch portion of tomorrow’s lesson. • Continue modeling how to play a complete game with eight rounds. For each round, each player rolls a die two times; the first roll corresponds to the number of circles to draw, the second roll corresponds to the number of stars to draw in each circle. • Record on the enlarged version drawn on the board. |
| <p>EXPLORE:</p> <p>Materials per group:</p> <ul style="list-style-type: none"> • One die (or digit cards, P. TR 38 and 39) | <p>Circles and Stars</p> <ul style="list-style-type: none"> • Students play eight rounds of Circles and Stars in Small Groups. • They record an addition equation for each round. |
| <p>PRACTICE:</p> | <p>As time allows:</p> <ul style="list-style-type: none"> • Students discuss their experiences playing Circles and Stars. • Students trade papers and check the accuracy of classmates’ work. |
| <p>SUMMARIZE:</p> | <p>Closure: Revisit purpose of the lesson with students.</p> <p>Questions:</p> <p><i>What is the same about each of the circles?</i> <i>If you wanted to know the total number of stars, what did you do? Why?</i> <i>How did you record this equation?</i></p> |
| <p>HOMEWORK:</p> | <p>Suggestion: Students make lists of things that come in groups of 5 and 6.</p> |

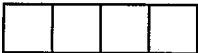
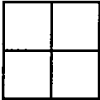


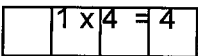
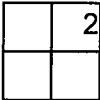
DAY 3
 UNIT 6: 3-Digit Addition and Subtraction,
 Multiplication and Division
 Chapter 28: Multiplication Concepts
 : LESSON 28.2 (continued)
 TE, Pg. 413A

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| LESSON FOCUS: | Addition and Multiplication | | | | | | |
| CALIFORNIA STANDARD: | Number Sense 3.1 Use repeated addition, arrays, counting by multiples to do multiplication. | | | | | | |
| PURPOSE OF LESSON: | Learn the relationship between equal groups, repeated addition and multiplication. | | | | | | |
| ROUTINE | Suggestion: Count around the Class Ask students: If we count the number of fingers on one hand of everyone in the room by counting by 5s, what will be the last number we say? Why do you think so? Count around the class by 5s: each student says the next multiple in the sequence until all students' fingers are "counted." Discuss the relationship between their predictions and the outcome. | | | | | | |
| LAUNCH: Materials: | <p>Discuss Homework</p> <ul style="list-style-type: none"> • Students add homework ideas to the Things that Come in 5s and Things that Come in 6s small group charts that were created on Day 1, Lesson 28.1. <p>More Circles and Stars: Introducing Multiplication Equations</p> <ul style="list-style-type: none"> • Draw a model of a round of Circles and Stars: <div style="text-align: center;">  <p style="margin-left: 100px;">$4 + 4 + 4 = 12$</p> </div> <ul style="list-style-type: none"> • Introduce how to record a multiplication sentence for each round. Explain how the Launch example can be written as: $3 \times 4 = 12$ and <table style="margin-left: 100px; border-collapse: collapse;"> <tr><td style="text-align: right; padding-right: 5px;">4</td><td></td></tr> <tr><td style="text-align: right; padding-right: 5px;"><u> </u></td><td style="text-align: right; padding-left: 5px;">x3</td></tr> <tr><td style="text-align: right; padding-right: 5px;">12</td><td></td></tr> </table> • Explain how this multiplication equation can be read in different ways: <ul style="list-style-type: none"> • Three groups of four equals twelve. • Three sets of four equals twelve. • Three times four equals twelve. • Three fours equals twelve. • Discuss the relationship between the addition equation and the multiplication equation. Show and discuss equations written in the vertical format. | 4 | | <u> </u> | x3 | 12 | |
| 4 | | | | | | | |
| <u> </u> | x3 | | | | | | |
| 12 | | | | | | | |

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| EXPLORE: | <p>More Circles and Stars Students write the multiplication equation for each round/picture of Day 3 (see Launch). They read their equations to a partner in at least three ways.</p> |
| <p>PRACTICE:</p> <p>Materials per pair of students:</p> <ul style="list-style-type: none"> • One die (or digit cards, P. TR 38 and 39) | <p>As time allows: Students continue playing another game of eight rounds of Circles and Stars, recording addition and multiplication equations for each round and reading their multiplication equations to a partner in three ways.</p> |
| SUMMARIZE: | <p>Students discuss the different dice rolls that resulted in the same total number of stars on a page. For example, a page with 12 stars could have:</p> <ul style="list-style-type: none"> • Four circles with three stars in each • Three circles with four stars in each • Two circles with six starts in each • Six circles with two starts in each <p>Closure:</p> <ul style="list-style-type: none"> • Revisit purpose of the lesson with students. • As you played Circle and Stars, you recorded your equations two different ways; i.e., $4+4+4=12$ and $4 \times 3=12$. • <i>How does knowing addition help you with multiplication?</i> |
| HOMEWORK: | <p>Suggestion: Students make lists of things that come in groups of 7 and 8.</p> |

DAY 4
 UNIT 6: 3-Digit Addition and Subtraction,
 Multiplication and Division
 Chapter 28: Multiplication Concepts
 LESSON 28.3
 TE, Pg. 415A


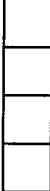
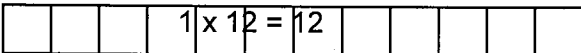
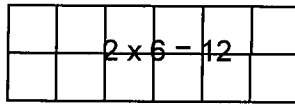
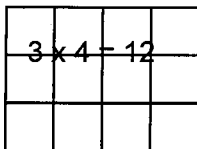
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| LESSON FOCUS: | Arrays |
| CALIFORNIA STANDARD: | Number Sense 3.1 Use repeated addition, arrays and counting by multiples to do multiplication. |
| PURPOSE OF LESSON: | Learn a geometric model of multiplication by using arrays to model multiplication. |
| ROUTINE: Materials: <ul style="list-style-type: none"> • Base ten materials (a variety, including commercially available materials, bundles of sticks, beans and cups, snap cubes) | Suggestion: Solving Problems <ul style="list-style-type: none"> • Give students a problem to solve: <i>I just bought 5 packages of birthday invitations. There were 6 invitations in each package. How many cards did I get?</i> • Discuss: <i>What are ways that you could solve this problem?</i> • Ask students to solve the problem in a way that makes sense to them. Make manipulatives available. • Ask students to share their methods for solving the problem with the whole class. Count around the Class <ul style="list-style-type: none"> • Ask students: <i>"If we count around the class by 10s, what will be the last number we say? (Answer: the number of fingers on both hands of everyone in the class.) Why do you think so?"</i> • Count around the class by 10s: each student says the next multiple in the sequence until all students are "counted." Discuss the relationship between their predictions and the outcome. |
| LAUNCH: Materials: <ul style="list-style-type: none"> • 1 inch or 3/4 inch graph paper (P. TR 103) • Small paper bag holding squares of paper, each written with a number between 1 and 36 • Color tiles • 9 x 12 inch piece of construction paper | Discuss Homework <ul style="list-style-type: none"> • Students add homework ideas to the Things that Come in 7s and Things that Come in 8s small group charts that were created on Day 1, Lesson 28.1. Introduction: Candy Box Research <ul style="list-style-type: none"> • Explain to students that they will be designing candy boxes, using color tiles and graph paper. Each square represents a piece of candy. • Students will draw a number from the bag. This number represents the number of candies a box will hold. • Discuss how candies must be placed in rectangular arrangements. • Discuss how to arrange four candies in rectangular arrangements, asking students to model using color tiles to represent "candies." |

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| | <ul style="list-style-type: none"> Elicit the following arrangements: <div style="display: flex; justify-content: space-around; align-items: center; margin: 10px 0;">   </div> Refer to geometry concepts previously covered to discuss how: <div style="display: flex; justify-content: center; align-items: center; margin: 10px 0;">  and  </div> <p>are congruent and are the same (not different) arrangements. A 1 x 4 array has the same number of squares as a 4 x 1 array; when rotated, they are congruent with each other.</p> <ul style="list-style-type: none"> Students trace arrangements on graph paper and cut them out. Students who have difficulty should place color tiles directly on 1" graph paper and trace around the edges of the color tiles. Explain how to record and read an equation on each arrangement: <div style="display: flex; justify-content: space-around; align-items: center; margin: 10px 0;"> <div style="text-align: center;"> <p>1 x 4 "one <u>by</u> four"</p>  </div> <div style="text-align: center;"> <p>2 x 2 "two <u>by</u> two"</p>  </div> </div> Show and discuss equations written in the vertical format. Model how to glue both arrangements onto one piece of construction paper. "Label" the top of the construction paper with the number being researched (e.g., 4). |
| <p>EXPLORE:</p> <p>Materials:</p> <ul style="list-style-type: none"> Color tiles 1 inch or 3/4 inch graph paper (P. TR 103) 9 x 12 inch (if using 3/4 inch graph paper) or 12 x 18 construction paper (if using 1 inch graph paper) | <p>Candy Box Research</p> <ul style="list-style-type: none"> In partners, students pull a number between 1 and 36 from the bag; this number represents the number of candies in a box. Students model the possible rectangular arrangements of "candies" using color tiles. Partners cut all possible different arrangements out of graph paper, record the corresponding equation on each, glue the arrangements onto a piece of construction paper, and label the top of the construction paper with the number being researched. Students post their posters, arranged in order by the |

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| <ul style="list-style-type: none"> • Glue | <p>number of candies in a box.</p> <ul style="list-style-type: none"> • Students repeat the process by drawing another number from the bag until posters have been made for all numbers from 1 to 36. |
| <p>PRACTICE:</p> | <p>As time allows: pgs. 415 and/416</p> |
| <p>SUMMARIZE:</p> | <ul style="list-style-type: none"> • Students discuss their observations of the posted Candy Box Research posters. <p>Closure:</p> <ul style="list-style-type: none"> • Revisit purpose of the lesson with students. • What have you learned about multiplication by making rectangles? |
| <p>HOMEWORK:</p> <p>Materials:</p> <ul style="list-style-type: none"> • A die or digit cards (P. TR 38 and 39) or spinner (TR 107) | <p>Suggestion:</p> <ul style="list-style-type: none"> • Students play Circles and Stars with a family member. |

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DAY 5
 UNIT 6: 3-Digit Addition and Subtraction,
 Multiplication and Division
 Chapter 28: Multiplication Concepts
 LESSON 28.5
 TE, Pg. 417A and 419A

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| LESSON FOCUS: | Properties of Multiplication |
| CALIFORNIA STANDARD: | Number Sense 3.0 Students model and solve simple problems involving multiplication and division. |
| PURPOSE OF LESSON: | Learn the commutative property of multiplication |
| ROUTINE: Materials: <ul style="list-style-type: none"> base ten materials (a variety, including commercially available materials, bundles of sticks, beans and cups, snap cubes) | Suggestion: Solving Problems <ul style="list-style-type: none"> Give students a problem to solve: <i>I am having friends over for cookies. There were 7 plates and I put 3 cookies on each plate. How many cookies did I serve to my friends?</i> To ensure that students understand what is happening in the problem, ask volunteers to retell the story problem. Discuss: <i>What are ways that you could solve this problem?</i> Ask students to solve the problem in way that makes sense to them. Make manipulatives available. Ask students to share their methods for solving the problem with the whole class. |
| LAUNCH: Materials: <ul style="list-style-type: none"> Candy Box posters from previous lesson | Reviewing Candy Box Research <ul style="list-style-type: none"> Students observe the posters from Explore, Day 4, Lesson 28.4 and review directions for Candy Box Research. <p>Review why  and </p> <p>are the same arrangements (when rotated, they are congruent). Model arrangements of 12:</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <ul style="list-style-type: none"> Model the commutative property of multiplication (conceptual understanding of the property is important for students to understand; the term 'commutative' is not). |

