Grade 3

Unit	Unit Title	Lesson	Day
2.4	Relationships Between Multiplication and Division	1 of 4	1 - 2

Lesson Focus

1. Standards Addressed	2. Content to be Learned	3. Mathematical Practices	4. Essential Question
3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret. 56 ÷ 8 as the number of shares when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*	•Solve division equations and problems with whole numbers having no remainders. •Use models to explore the meaning of partitive (sharing) or quotative (measurement) division. •Model division by using equal groups and bar models.	**SMP1** Make sense of problems and persevere in solving them. **SMP5** Use appropriate tools strategically.	How can you model a division problem to find how many in each group? How can you model a division problem to find how many equal groups? How can you use bar models to solve division problems?

5. Prerequisite Knowledge	6. Essential Vocabulary	7. Possible Misconceptions	8. Necessary Materials
Place objects into groups and determine how many in one group or how many groups. Model division with objects to find how many in each group. Understand that the quotient can be the number of groups or the number of objects in one of the groups.	Divide Equal groups Dividend Divisor Quotient		**OnCore** Lessons 3 - 5 Student pp. 5 - 10 Counters

Instruction

9. Instruction Practices (What are the teachers doing)	10. Learning Practices (What are the students doing)
Teachers will guide children to use models to explore the meaning of partitive (sharing) or quotative (measurement) division and model division by using equal groups and bar models following the lesson guidelines in OnCore lessons 3-5 (TM pp. 4-6), teachers will: •Tell students that when they *divide*, they are separating into equal parts. Talk about how students might use counters or draw pictures to make equal groups and complete the chart on pp. 5 and 6. •Discuss how students can find the number of equal groups when they know the total number of counters and the number in each group to complete the chart on pp. 7 and 8. •Remind students how they found the number of groups or the number in each group when they worked with counters. Write the division example on the board and guide students to model the division by drawing the number of counters shown into the circles that represent the groups. Point out the dividend and the divisor and explain what the quotient is. • Draw a related bar model and show them how they can see that a bar model can also be used to solve division problems. The equal bars in the bar model represent the equal groups. •Have students write a division equation for each problem on page 10.	In Lessons 3 - 5 students will: • Use counters or draw pictures to make equal groups and find the number in each group. • Model division when they know the number in each group and need to find the number of equal groups. •Write division equations for each picture on pp. 9 and 10. •Complete the bar models to solve the division problems and write equations for each bar model. • Complete On Core Student Practice pp. 5-10

Grade 3

Unit	Unit Title	Lesson	Day
2.4	Relationships Between Multiplication and Division	2 of 4	3 - 5

Lesson Focus

1. Standards Addressed	2. Content to be Learned	3. Mathematical Practices	4. Essential Question
3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 X ? = 48,* 5 = ☐ ÷ 3, 6 X 6 = ?	•Solve multiplication and division equations with an unknown number (fact families). •Use an array or a multiplication table to find an unknown factor. •Use repeated subtraction, a related multiplication fact, or a multiplication table to divide by 8.	**SMP2** Reason abstractly and quantitatively. **SMP4** Model with mathematics.	How can you use an array or a multiplication table to find an unknown factor? How does a fact family help you solve a division problem? What strategies can you use to divide by 8?

5. Prerequisite Knowledge	6. Essential Vocabulary	7. Possible Misconceptions	8. Necessary Materials
Model a multiplication as equal groups. Divide by counting backwards from the dividend to 0 on a number line.	Factor		**OnCore** Lessons 16 - 17 Student pp. 31-34 Counters **Investigations** Unit 5 Session 4.4 Transparency T72 Cubes and Array cards (optional) Resource Master M41-43 & SAB p. 46-47

Instruction

9. Instruction Practices (What are the teachers doing)	10. Learning Practices (What are the students doing)
Teachers will guide children to use an array or a multiplication table to find an unknown factor and use repeated subtraction, a related multiplication fact, or a multiplication table to divide by 8 following the lesson guidelines in OnCore lessons 16-17 (TM pp. 17-18), teachers will: •Write 4X3 = ☐ and remind students that the ☐ symbol stands for the unknown. Ask students to show how to find the unknown number by making equal groups. Explain that the letter in the equations stands for the unknown number. •Review how to count backwards on a number line and tell students they can use a number line to help them learn division facts that involve dividing by 8. Teachers will be following lesson activities from Inv. Unit 5 session 4.4. (TM pp.129-132) In the activity teachers will: Introduce Missing Factors. Display the transparency Recording Sheet and demonstrate where the equations should be written.	In Lessons 16-17 students will: • Use counters or a drawing to find the unknown factor. • Find unknown factors and quotients. •Use repeated subtraction, a related multiplication fact, or a multiplication table to divide by 8. • Complete On Core Student Practice pp. 31-34 In Investigations Unit 5 Session 4.4 students will: •Use multiplication combinations to solve division problems. •Use inverse relationship between multiplication and division to solve problems. •Use and understand multiplication and division notation. • Complete Inv. SAB pp. 46-47.

Grade 3

Unit	Unit Title	Lesson	Day
2.4	Relationships Between Multiplication and Division	3 of 4	6 - 7

Lesson Focus

1. Standards Addressed	2. Content to be Learned	3. Mathematical Practices	4. Essential Question
3.OA.5 Apply properties of operations as strategies to multiply and divide.[2] Examples: If 6 X 4 = 24 is known, then 4 X 6 = 24 is also known. (Commutative property of multiplication.) 3 X 5 X 2 can be found by 3 X 5 = 15, then 15 X 2 = 30, or by 5 X 2 = 10, then 3 X 10 = 30. (Associative property of multiplication.) Knowing that 8 X 5 = 40 and 8 X 2 = 16, one can find 8 X 7 as 8 X (5 + 2) = (8 X 5) + (8 X 2) = 40 + 16 = 56. (Distributive Property.)	•Understand the Associative Property of Multiplication. •Use the Associative Property of Multiplication to multiply with three factors. •Divide using the rules for 1 and 0.	**SMP7** Look for and make use of structure. **SMP6** Attend to precision.	How can you use the Associative Property of Multiplication to find products? What are the rules for dividing with 1 and 0?

5. Prerequisite Knowledge	6. Essential Vocabulary	7. Possible Misconceptions	8. Necessary Materials
Use equal groups to model products and factors. Multiply with 1, 2, 3, 4, 5, 6, and 10. Use models to divide.	Associative Property of Multiplication	The use of zero in multiplication and division is a source of misconception among students. Many students think zero represents nothing and a multiplication by zero just leaves the number unchanged. Students also think it is possible to divide by 0. They mix up dividing 0 by a number and getting 0, with dividing a number by 0 and thinking that gets 0.	**OnCore** Lessons 21 - 22 Student pp. 41- 44 Counters

Instruction

9. Instruction Practices (What are the teachers doing)	10. Learning Practices (What are the students doing)
Teachers will guide children to use the Associative Property of Multiplication to multiply with three factors and divide using the rules for dividing with 1 and 0 following the lesson guidelines in OnCore lessons 21-22 (TM pp. 22-23), teachers will: •Remind students they have learned to model multiplication facts by making equal groups and they will use equal groups to learn about multiplication with three factors. Discuss the meaning of the term Associative Property of Multiplication. Check that students understand the use of parentheses as a grouping symbol. (Make sure students understand that they should not change the order of the factors.) •Remind students they have learned rules for multiplying with 1 and 0 and that they will learn rules to help them divide with 1 and 0. Read rules A, B, and C on p. 43 calling attention to the two ways to record the division. Talk through the rules and tell students that they cannot illustrate rule D with a picture because dividing by 0 makes no sense. You cannot divide any number by 0. Advise them to look carefully at each problem to see which rule applies.	In Lessons 21 - 22 students will: • Use the Associative Property of Multiplication to rewrite another way to group the factors and find the product. • Use parentheses and the Associative property before finding the product. •Find the quotient when dividing by 1 and 0. • Complete On Core Student Practice pp. 41 - 44

Grade 3			
Unit 2.4	**Unit Title** Relationships Between Multiplication and Division	**Lesson** 4 of 4	**Day** 8 - 10

Lesson Focus

1. Standards Addressed	2. Content to be Learned	3. Mathematical Practices	4. Essential Question
3.OA.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.	Understand division as an unknown factor problem. Use multiplication combinations to solve division problems. Use bar models and arrays to relate multiplication and division as inverse operations.	**SMP7** Look for and make use of structure.	How can you use multiplication to divide?
5. Prerequisite Knowledge	**6. Essential Vocabulary**	**7. Possible Misconceptions**	**8. Necessary Materials**
Use arrays with multiplication. Use basic multiplication facts.	Array Factor Division		**OnCore** Lessons 23 Student pp. 45-46 Counters **Investigations** Unit 5 Sessions 4.1-4.3 and 4.5-4.6 SAB pp. 39-40, 42-44, 48-49 Resource Master M39 Cubes, multiples charts, array cards (optional) K-5 Math Resources Division as Unknown Factor Problems and Multiplication/Division Number Stories

Instruction

9. Instruction Practices (What are the teachers doing)	10. Learning Practices (What are the students doing)
•Teachers will guide children to use bar models and arrays to relate multiplication and division as inverse operations following the lesson guidelines in OnCore lessons 21-22 (TM pp. 22-23), teachers will: Discuss how they have used arrays to model multiplication and will now use them to model division and see how multiplication and division are related. Share that they can use related multiplication to check answers to a division problem, or they can solve a division problem if they know the related multiplication. •Teachers will be following lesson activities from Inv. Unit 5 session 4.1-4.3 and 4.5-4.6. (TM pp.116-128 and 133-140) In the activities teachers will: Model division story problems with the class and discuss strategies to solve the problem. Have students work on solving both *grouping* problems and *sharing* problems. Before assigning a mix of multiplication and division problems discuss how to determine which type of problem each is. Help students recognize and become familiar with standard notations for multiplication and division. Explain that they will be writing two related story problems- one that is about a division situation and one that is about a multiplication situation. Give students a story problem and have them give examples of notation for it. Ask for ways to notate this story with numbers mixing up multiplication and division story problems. Then switch and give an example of a notation and ask them to make a story problem to match. •Provide computers for students to practice Division as Unknown Factor Problems and Multiplication/Division Number Stories from K-5 Math Resources.	In Lessons 23 students will: • Use arrays to complete related multiplication and division equations. • Complete On Core Student Practice pp. 45 - 46 In Investigations Unit 5 Session 4. 1-4.3 and 4.5-4.6 students will: •Understand division as the splitting of a quantity into equal groups. •Use inverse relationship between multiplication and division to solve problems. •Use multiplication combinations to solve division problems. •Use and understand multiplication and division notation. •Write and solve problems for a class book. • Complete Inv. SAB pp. 39-40, 42-44, 48-49