Lesson 2: The Equals Sign and Commutative Property of Multiplication

Lesson Objective

- Students will determine whether 2 quantities are equal.

Instructional Materials

Material	Quantity	Description
Timer	1	
How Am I Doing? graph	1 per student	
Facts Practice graph	1 per student	
Colored pencils	1 per student	
Display Masters	1 each	• Preview: Key Idea: The Equals Sign and Commutative Property of Multiplication • Demonstrate: 5 x 6 Arrays A • Demonstrate: 5 x 6 Arrays B • Demonstrate: 5 x 6 and 6 x 5 Arrays A • Demonstrate: 5 x 6 and 6 x 5 Arrays B • Demonstrate: 5 x 6 and 6 x 5 Arrays C • Demonstrate: Are the Expressions Equal?
Handouts	1 per student	• Timed Fact Practice 2 • Cumulative Review • 6 x 5 Arrays • Practice 1 • Practice 2 • Independent Practice
Answer Keys	1 each	• Timed Fact Practice 2 • Cumulative Review • 6 x 5 Arrays • Practice 1 • Practice 2 • Independent Practice

Timed Fact Practice

Distribute the Timed Fact Practice 2 handout of the chosen set of facts: multiplication, division, or mixed. Remember to use the same set of facts throughout the module.

Say: *When I say, "begin," you will have one minute to complete the 20 multiplication/division/mixed facts. Start with the first one, going across the rows. If you make a mistake, cross out the wrong answer and write the correct answer next to it. When I say, "stop" or the timer goes off, put your pencil down.*

Say: *Ready? Begin.*

After the timer goes off, display the Timed Fact Practice 2 Answer Key and have students use a colored pencil or marker to check their work and write the number correct on the score line on the Facts Practice Graph.

Then have students graph the number correct. As the lessons go along, connect the new point with the previous lesson's point.

Cumulative Review

Have students answer the questions on the Cumulative Review handout. Go over the answers. Correct misconceptions. Have students use a colored pencil to make corrections as needed. Collect student papers to determine who needs additional instruction.

Preview

This lesson will build on students' conceptual knowledge of the meaning of the equals sign. Students will interpret the equals sign to mean "is equal to," or "equals" and determine whether two expressions are equal.

Display and introduce through a brief explanation the key idea for this lesson:

- The equals sign means "equals," or "is equal to."

Use the Key Idea: The Equals Sign and Commutative Property of Multiplication DM display master as needed.

Engage Prior/Informal Knowledge

To open the lesson, present questions to activate students' background knowledge related to the content to be taught in this lesson. Ask students questions such as:

- Are the two expressions 3 + 5 and 5 + 3 equal? (yes) Why? (the commutative property of addition)
- How can the multiplication fact 8 x 3 be written using repeated addition? (8 + 8 + 8)
- What multiplication fact represents 6 + 6 + 6 + 6 + 6? (6 x 5)

If students cannot answers these questions, stop and explicitly teach the material.

Demonstrate

1. Generate a mathematical equation for two 5 x 6 arrays and explain how to prove that the arrays are equal.

Display two 5 x 6 arrays. Use the 5 x 6 Arrays A DM display master as needed.

Say: *How many dots are in each array? (30)*

Say: *Do both arrays show the same number of dots? (yes)*

Say: *What mathematical expression could be used to represent the number of dots in each array? (5 x 6)*

Display 5 × 6 below each array.

Say: *5 × 6 represents the number of dots in each array because there are 5 rows of 6 dots each.*

Say: *Does 5 × 6 equal 5 × 6? (yes)*

Display an equals sign between the two expressions.

Say: *How many dots are in each array? (30)*

Display 30 below each 5 × 6 expression. Use the 5 x 6 Arrays B DM display model as needed.

Say: *Is 30 equal to 30? (yes)*

Display an equals sign between the two expressions.

Help students repeat the think-aloud process as they work in pairs to generate a mathematical equation for two 6 x 5 arrays. Distribute the 6 x 5 Arrays handout to each student and have students complete the activity using the think-pair-share technique.

2. Demonstrate the commutative property of multiplication.

Display the 5 x 6 and 6 x 5 Arrays A DM display master.

Draw attention to the 5 × 6 array and the 6 × 5 array.

Say: *Do both of these arrays have the same number of dots? (yes)*

Display 30 = 30.

Say: *Is 5 × 6 is equal to 6 × 5?*

Draw attention to where these expressions are coming from as needed.

Display 5 × 6 = 6 × 5 beneath 30 = 30. Use the 5 x 6 and 6 x 5 Arrays B **DM** display master as needed.

Say: *5 × 6 = 6 × 5 is an example of the commutative property of multiplication. This property means that the order of the factors in a multiplication problem can be changed. For example, whether the problem is 3 x 7 or 7 x 3, the answer will be the same.*

Relate the commutative property of multiplication to the commutative property of addition, with which many students are familiar. 1

1 TEACHER NOTE
Depending on the students, you may want to formally define the commutative property of multiplication.

Draw attention to the 30 above 5 × 6.

Say: *I can substitute 30 for 5 × 6.*

Display 30 below 5 x 6.

Display and say: 30 = 6 × 5. Use the 5 x 6 and 6 x 5 Arrays C **DM** display master as needed. 2

2 TEACHER NOTE
You may want to repeat this example by substituting 6 x 5 with 30.

3. Determine whether two expressions are equal.

Display the Are the Expressions Equal? **DM** display master.

Read each mathematical expression for the first problem.

Think aloud as you determine whether the two mathematical expressions are equal, using the explanations given in the Reason column of the following table.

Be sure to use the words "equals" or "is equal to" for the equals sign.

	Mathematical Expression	Reason
1	6 × 5 5 + 5 + 5 + 5 + 5 + 5	6 × 5 is 6 groups of 5. Using repeated addition, 6 x 5 could be written as 5 + 5 + 5 + 5 + 5 + 5. The two expressions both represent a total of 30 objects. They are equal. 6 x 5 = 5 + 5 + 5 + 5 + 5 + 5.
2	4 x 3 = 3 x 4	4 x 3 can be written as 3 x 4 by the commutative property of multiplication. Both expressions represent 12 objects. They are equal. 4 x 3 = 3 x 4.
3	5 + 5 + 5 + 5 + 5 + 5 6 × 5	5 added 6 times can be represented by 5 x 6. Using the commutative property of multiplication, 5 x 6 = 6 x 5. The two expressions are equal. 5 + 5 + 5 + 5 + 5 + 5 = 6 x 5.

4. Help students draw a conclusion about the equals sign.

Say: *I can use an equals sign only between expressions that have the same value. From these examples, what do you think the equals sign means?*

Select a few students to share.

Say: *The expressions on either side of the equals sign have the same value. The equals sign means "equals," or "is equal to."*

Practice

WATCH FOR
Students may believe that 4 x 3 and 3 x 4 have different answers. Illustrate the commutative property of multiplication using array models to prove that the total (product) is the same.

For each practice activity, provide detailed feedback to students, highlighting what was done correctly and what needs improvement. Provide opportunities for students to correct their errors. Collect student work to review and monitor student progress.

Activity 1: Help students complete the activity on the Practice 1 handout. Select a few students to verbalize their reasoning and each step in the process.

Activity 2: Have students work in pairs or small groups to complete the activity on the Practice 2 handout. Have students verbalize their reasoning and each step in the process to their partners.

WATCH FOR
Some students may believe that 30 = 5 × 6 is written incorrectly because the product or answer (30) must follow the equals sign. Explain that the equals sign means "equals" or "is equal to" and that the expressions on each side of the equals sign have the same value.

Independent Practice

1. Have students work independently to complete the activity on the Independent Practice handout.

2. Go over the answers (students self-check and correct, using a colored pencil).

3.Have students record the number correct in the box and complete their How Am I Doing? graph.

4. Collect the papers to review and monitor student progress.

Closure

Review the key idea. Have students provide examples from the lesson.

Have students discuss their answers to the following questions.

- How would you explain the equals sign?
- What are other ways you can write 7 x 3?

Clear up any misconceptions. Students who still believe the equals sign is not bidirectional need additional instruction.