

## Lesson 1: Multiplication as Repeated Addition

### Lesson Objective

- Students will solve problems that relate multiplication to repeated addition.

### 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	<ul style="list-style-type: none"> <li>• Preview: Key Ideas: Relationship of Addition to Multiplication</li> <li>• Preview: Grouped Objects Picture</li> <li>• Demonstrate: Number Line by 5s A</li> <li>• Demonstrate: Number Line by 5s B</li> <li>• Demonstrate: Number Line by 5s C</li> <li>• Demonstrate: Number Line by 5s D</li> <li>• Demonstrate: Car Problem</li> </ul>
Handouts	1 per student	<ul style="list-style-type: none"> <li>• Timed Fact Practice 1</li> <li>• Number Line by 5s</li> <li>• Car Problem</li> <li>• Practice</li> <li>• Independent Practice</li> </ul>
Answer Keys	1 each	<ul style="list-style-type: none"> <li>• Timed Fact Practice 1</li> <li>• Number Line by 5s</li> <li>• Car Problem</li> <li>• Practice</li> <li>• Independent Practice</li> </ul>
Name Sticks	1 per student	<ul style="list-style-type: none"> <li>• Write student names on craft sticks, half-index cards, or strips of paper. Use the name sticks to randomly select students without having them raise their hands, thus holding all students accountable and ready to answer any question.</li> </ul>

## Timed Fact Practice

Distribute the Timed Fact Practice 1 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 1 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.

## Preview



### TEACHER NOTE

This lesson provides students with opportunities to relate repeated addition to multiplication using both the number line and an organizational table. It is recommended that the concepts be taught across several class periods in order for students to develop a firm foundation for subsequent lessons.

This lesson will build on students' conceptual knowledge of repeated addition and skip-counting. Students will apply this knowledge to the meaning of multiplication and represent multiplication and repeated addition on the number line. 

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

- Multiplication can be thought of as repeated addition, the joining of equal groups.

- Multiplication is equivalent to adding a number to itself a particular number of times.

Use the Key Ideas: Relationship of Addition to Multiplication

 display master as needed. 



**TEACHER NOTE**

To help students visualize the meaning of multiplication by thinking about groups, display the **Grouped Objects**

**Picture DM** display master, which shows a multiplicative structure.

## 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:

- What are examples of things that come in 2s? (eyes, ears, pair of shoes, pair of socks)
- How many eyes are in this class/at this table/in this row?  
Explain how you counted.

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



**TEACHER NOTE**

Students may be skilled in count-bys and the concept of repeated addition. Acknowledge this and explain that this lesson is an introduction to later lessons on multiplication and division.

## Demonstrate

1. Skip-count by 5s to illustrate the relationship between repeated addition and multiplication.

**Say:** *What are examples of things that come in 5s?  
(fingers, toes, or cents in 1 nickel)*

Distribute the Number Line by 5s handout. Have students fill out their number line as you complete each step.

Ask a student to skip-count by 5s from 0 to 15 aloud for the class.

Display the Number Line by 5s A  display master, indicating each jump by looping from 5 to 10 and so forth and labeling each mark on the number line as the student counts from 0 to 15. Use the Number Line by 5s B  display master as an example.

Display the Number Line by 5s C  display master to explain repeated addition of 5.

**Say:** *When there is 1 group of 5, we have 5 in all. When there are 2 groups of 5, or  $5 + 5$ , we have 10 in all. When we have 3 groups of 5, or  $5 + 5 + 5$ , we have 15 in all.*

Complete the number line through 45, relating the addition sentence to the total amount.

Referring to the completed number line, think aloud as you ask and answer questions such as:

- What is 20 equal to? ( $5 + 5 + 5 + 5$ ) How many groups of 5? (4)
- What is 25 equal to? ( $5 + 5 + 5 + 5 + 5$ ) How many groups of 5? (5)
- What is 30 equal to? ( $5 + 5 + 5 + 5 + 5 + 5$ ) How many groups of 5? (6)

Emphasize the connection between multiplication and repeated addition.

**Say:** *15 is equal to  $5 + 5 + 5$ . Does anyone know a different way to determine that same result?*

If no student responds correctly, model relating this process to a multiplication fact by thinking aloud.

Move along the number line as you count each of the following numbers: 5, 10, 15.

**Say:** *3 groups of 5 ... 3 groups of 5 is 15, 3 times 5 equals 15.*

Write each multiplication sentence below its product on the number line. Use the

Number Line by 5s D  display master as needed.

**Say:** *How can I use multiplication as a different way to skip-count for each multiple of 5?*

If no student responds correctly, provide the multiplication fact for each skip-count. Relate this fact to repeated addition.

Refer back to the number line to emphasize the connection between repeated addition and multiplication.

2. Display the problem below and have a student read it aloud. Use the Car Problem  display master as needed.

Evan needs to pack some model cars. He just finished packing 8 cars in 1 box. He has 6 boxes. Evan uses a number line and chart to help him determine the number of cars he can pack. How many cars can he pack if he has 6 boxes? How do you know?

**Say:** *What information is required to determine how many boxes Evan will need?*

3. Distribute the Car Problem handout to show how you will organize your work.

Think aloud to explain how the entries in columns 1 and 2 of the table were used to fill in the number line.

Display the Car Problem  display master.

**Say:** *To find out how many cars fit into one box, I make one jump on the number line. I have 8 written above the jump because we jumped 8 units on the number line. There is no addition sentence for 1 group of 8, so I write 'none' in that box. What multiplication sentence should I write for 1 group of 8 cars? ( $1 \times 8$ ) What does  $1 \times 8$  equal? (8)*

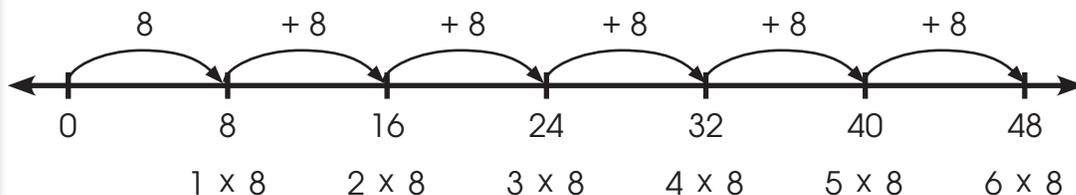
Have students fill in the first row of the chart as you do. Repeat with the second and third rows, explaining how to mark the jumps on the number line and how to fill in the chart. For the second row, model the text for the think aloud column.

**Say:** *2 groups of 8 can be thought of as  $8 + 8$  or  $2 \times 8$ , which equal 16.*

4. Have students turn to their partner and discuss how to fill in the number line and complete the chart for rows 4 and 5. Tell students to be prepared to share their responses and thoughts once the number line and rows are completed. 

5. Emphasize the connection between multiplication and repeated addition as you discuss each entry, writing the multiplication sentence below each product on the number line.

Below is an example of a completed table and number line.



**TEACHER NOTE**

Students should answer that the number of packed model cars is equal to 8 times the number of boxes (multiplication). Alternatively, students might say that each time a box is added, 8 cars are added (repeated addition).

Boxes	Cars	Addition Sentence	Multiplication Equation	Total Cars	Think Aloud
1	8	none	$1 \times 8 = 8$	8	1 box of 8 cars is equal to 8 total cars.
2	8	$8 + 8$	$2 \times 8 = 16$	16	2 groups of 8 can be thought of as $8 + 8$ or $2 \times 8$ , which equal 16.
3	8	$8 + 8 + 8$	$3 \times 8 = 24$	24	3 groups of 8 can be thought of as $8 + 8 + 8$ or $3 \times 8$ , which equal 24.

4	8	$8 + 8 + 8 + 8$	$4 \times 8 = 32$	32	4 groups of 8 can be thought of as $8 + 8 + 8 + 8$ or $4 \times 8$ , which equal 32.
5	8	$8 + 8 + 8 + 8 + 8$	$5 \times 8 = 40$	40	5 groups of 8 can be thought of as $8 + 8 + 8 + 8 + 8$ or $5 \times 8$ , which equal 40.

## Practice

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:** Have students work in small groups (or pairs) to complete the final row (row 6) in the Car Problem handout.

Select a name stick and ask the student how to show the number of cars packed in 6 boxes on the number line. If the student cannot answer, ask a classmate to help.

Select another student to provide the addition sentence and multiplication equation. Select a final student to say the think aloud entry.

Select name sticks and have students answer the following questions, using their completed tables:

- What relationship did you notice between the number line and the table? (Each jump on the number line represented one row of the table. The total number of cars on the chart matches the value on the number line.)



### WATCH FOR

Some students believe repeated addition is the definition of multiplication. Teach students that repeated addition is only 1 way to represent multiplication.

**WATCH FOR**

Some students believe multiplication can be used with any addition of groups problem. Teach students that multiplication cannot be used when the number of objects in each group is not the same. Present examples and nonexamples (e.g.  $5 + 5 + 5$  and  $3 + 5 + 6$ ). Demonstrate and have students differentiate between equal and unequal groups and explain when multiplication can and cannot be used.

- What relationships did you observe in the table? (The number of model cars is equal to 8 times the number of boxes. Each time a box is added, 8 cars are added.)
- What do you notice about the Total column? (The numbers increase by 8s, as on the number line.)
- How can you find the number of cars for any number of boxes? (Multiply the number of boxes by 8. If there are 24 cars, for instance, the number of boxes is 3. If there are  $n$  boxes, the number of cars is  $8n$ .)
- What other questions could be answered from this table? (Example: If Evan has 32 cars, how many boxes will he need?)
- What did you learn about the connection between addition and multiplication? (Repeated addition is 1 way to solve multiplication problems.)

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

## 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 ideas. Have students provide examples from the lesson.

Have students discuss their answers to the following questions.

- How could you use a number line to show  $7 \times 4$ ?
- What is the relationship between addition and multiplication?

Clear up any misconceptions. Students who believe repeated addition is the only definition of multiplication need additional instruction.