☆**MSTAR**
INTERVENTION

L17

Lesson 17: Identifying Proportionality on a Graph

Lesson Objectives

- Students will make connections between tables and graphing and recognize proportional relationships, using graphs.

Instructional Materials

Material	Quantity	Description
How Am I Doing? graph	1 per student	
Colored pencils	1 per student	
Display Masters	1 each	• Preview: Key Idea: Identifying Proportionality • Demonstrate: Burger A–E • Demonstrate: Ham A–E
Handouts	1 per student	• Cumulative Review • Burger Table • Graph Comparison • Ham Table • Practice • Independent Practice
Answer Keys	1 each	• Cumulative Review • Practice • Independent Practice

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 using tables to identify proportional relationships.

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

- Graphs of proportional relationships pass through the origin. Graphs of nonproportional relationships do not pass through the origin.

Use the Key Idea: Identifying Proportionality **DM** display master as needed.

Engage Prior/Informal Knowledge

To open the lesson, present problems to activate students' background knowledge and preskills, such as the following:

Create a table of values for the following proportional relationship to find the missing information:

Mandy washes cars in her neighborhood for $7 per car. How much will she earn in the next 2 weeks if she washes 5 cars this week and 7 cars next week?

Demonstrate

1. Create a table for a proportional relationship and graph it on a coordinate plane.

>   **Say:** *Today we will use tables to graph proportional relationships and identify*
>   *characteristics on the graphs that indicate proportional relationships.*

>   **Say:** *Consider this problem: Chris will serve burgers at the party. He knows that*
>   *1 pound of hamburger meat makes 3 patties.*

Use the Burger A **DM** display master as needed. Distribute the Burger Table
handout.

>   **Say:** *Let's build a table based on this information to show the relationship*
>   *between the pounds of meat and number of patties. We know that from*
>   *1 pound of meat, Chris can make 3 patties.*

Use the Burger B **DM** display master as needed.

>   **Say:** *From 2 pounds of meat, how many patties will Chris be able to make? (6)*
>   *What operation gets me from 1 to 3 and from 2 to 6? (multiply by 3)*

Use the Burger C **DM** display master as needed. Complete the table with students.

>   **Say:** *Now that we know what operation to use, we can complete the table*
>   *for the missing values. For 3 pounds of meat, we multiply 3 times 3 and*
>   *know that Chris can make 9 patties. Continuing with this pattern, how*
>   *many patties can Chris make with 6 pounds of meat? (18 patties)*

Distribute the Graph Comparison handout.

>   **Say:** *Using the table of values, we can create a graph on a coordinate plane.*
>   *The x values in this problem represent the number of pounds of meat. The*
>   *y values in the problem represent the number of patties Chris can make.*

Use the Burger D **DM** display master as needed. Graph on the coordinate plane on the display master as students do the same on the Graph Comparison handout.

> **Say:** *To begin graphing, we start with the first data point: 1 pound of meat and 3 patties, (1, 3). Beginning at the origin, we go right 1 unit in the positive direction and up 3 units in the positive direction and make a point. This point represents the first row in the table. We repeat the same process with the other points on the graph.*

> **Say:** *Will we be able to graph all points on the coordinate plane? (no) Why? (because the graph does not include all possible data points) To indicate that the pattern continues in the same fashion, we draw a line to connect the data points.*

Complete the graph. Use the Burger E **DM** display master as needed.

> **Say:** *Notice the completed graph on the screen. In the graph we made together, we began with the first point on the table, (1, 3). This graph begins at the origin, (0, 0). Why might this graph reflect the origin? (various answers) The graph reflects the origin because if Chris had 0 pounds of meat, how many patties could he make? (0) Therefore, (0, 0) is a data point on this graph. Why does the graph not include any negative quantities? (you cannot have negative pounds of meat or patties)*

> **Say:** *1 of the ways we can tell that a relationship is proportional is that its graph passes through the origin.*

2. Create a table for a nonproportional relationship and graph it on a coordinate plane.

> **Say:** *Now, we will graph a relationship that is nonproportional to see how it is different from the graph of a proportional relationship.*

> **Say:** *Listen to this scenario: Laura is buying ham. With every 1 pound of ham, she can make 8 sandwiches. She wants to know how many sandwiches she can make for her party, after she gives each of her 3 children a sandwich.*

Use the Ham A **DM** display master as needed.

> **Say:** *First, we need to build a table based on the information in the problem.*

Use the Ham B **DM** display master as needed. Distribute the Ham Table handout.

> **Say:** *This table shows the relationship between the number of pounds of meat purchased and the number of sandwiches for the party. We know that from 1 pound of ham, Laura can make 8 sandwiches, but we have to subtract the 3 sandwiches for her children. How many sandwiches are left? (5)*

> **Say:** *From 2 pounds of ham, how many sandwiches could Laura make for the party? (16 – 3, or 13 sandwiches) What operations get me from 1 to 5 and from 2 to 13? (multiply by 8, then subtract 3)*

Use the Ham C **DM** display master as needed. Complete the table with students.

> **Say:** *Now that we know what operations to use, we can complete the table for the missing values. For 3 pounds of ham, we multiply 3 by 8 and subtract 3, telling us that Laura will have 21 sandwiches for the party. Continuing with this pattern, how many sandwiches will Laura have for the party if she buys 4 pounds of ham? (29) 5 pounds? (37) 6 pounds? (45)*

> **Say:** *Using the table of values, we can create a graph on a coordinate plane. The x values in this problem represent the pounds of ham. The y values in the problem represent the number of sandwiches Laura will have for her party.*

Use the Ham D **DM** display master as needed. Graph on the coordinate plane on the display master as students do the same on the Graph Comparison

handout.

> **Say:** *To begin graphing, we start with the first data point: 1 pound of ham and 5 sandwiches, (1, 5). Beginning at the origin, we go right 1 unit in the positive direction and up 5 units in the positive direction and make a point. This point represents the first row in the table. We will repeat the same process with the other points on the graph.*

> **Say:** *Will we be able to graph all points on the coordinate plane? (no) Why? (because the graph does not include all possible data points) To indicate that the pattern continues in the same fashion, we draw a line to connect the data points.*

Complete the graph. Use the Ham E **DM** display master as needed.

> **Say:** *Notice the completed graph. In the graph we made together, we began with the first point on the table, (1, 5). Does this graph begin at the origin? (no) Following our pattern, how many sandwiches will Laura have for the party if she buys 0 pounds of ham? (-3) Can you have -3 sandwiches? (no) No, you can't, but the important thing to notice on this graph is that it does not go through the origin, or (0, 0), so it does not represent a proportional relationship.*

3. Compare graphs and draw conclusions.

Display the Burger E and Ham E **DM** display masters.

> **Say:** *Let's look together at the completed graphs. What do you notice that is different about the graphs? (various answers) Why?*

When fielding answers, draw students' attention to where the graphs cross the y-axis.

> **Say:** *What do you notice that is the same? (various answers) Why?*

Practice

For the 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: Help students complete the activity on the Practice handout.

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 answer to the following questions:

- What is 1 of the characteristics of a graph that represents a proportional relationship?

- Why does a proportional graph pass through the origin and a nonproportional graph not?

Clear up any misconceptions. Students who are not confident with how to determine whether a graph represents a proportional relationship need additional instruction.