

Direct Variation

Reporting Category Functions

Topic Determining direct variation

Primary SOL A.8 The student, given a situation in a real-world context, will analyze a relation to determine whether a direct or inverse variation exists, and represent a direct variation algebraically and graphically and an inverse variation algebraically.

Related SOL A.1, A.4f, A.6

Materials

- Graphing calculators (optional)

Vocabulary

proportion, rate, ratio, dependent variable, independent variable

slope (A.6), y-intercept (A.7)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Display the following problem: “A low-flow showerhead uses 5 gallons of water every 2 minutes. How many gallons would it use in 15 minutes?” Ask students to find the solution to this problem and to be prepared to explain how they arrived at their solution.
2. Ask students to share their strategies for solving the problem. Record their ideas for the class to see. Strategies may include setting up proportions, finding unit rates, using an equation, and others. Record all strategies shared.
3. Prompt students to think about how they could represent this situation in a graph, and solicit their ideas. Guide discussion by asking questions, including the following:
 - What variables are involved?
 - What is the independent variable?
 - What is the dependent variable?
 - What amount of water would be used for zero minutes?
 - Is there a constant slope?
 - What does the slope represent in this problem?
4. Ask students to devise an equation for the situation, if they have not already done so.
5. Next, ask questions such as the following:
 - What is the slope in the equation?
 - What is the y-intercept?
 - What do the slope and y-intercept represent in the problem?You may wish to have students use their graphing calculators to view this graph.
6. Tell the class that they have just investigated a *direct variation*, which is a relationship in which two variables are directly proportional. In other words, the ratio between the two variables in a direct variation is constant. A direct variation relationship can be represented with an equation of the form $y = kx$, where k is the constant of variation. Since a direct

variation is a proportional relationship, using an equation is an alternate strategy for solving a proportion.

Assessment

- **Questions**

- How can you tell whether a situation represents a direct variation?
- What does an equation for a direct variation look like?
- What does a graph of the equation for a direct variation look like?

- **Journal/Writing Prompts**

- Give your own example of a direct variation, and explain why your example meets the criteria for a direct variation.
- Explain how you could determine whether a given table of values represents a direct variation.
- Explain how you could create an equation to represent a direct variation, given a table of values representing it.

Extensions and Connections (for all students)

- Have students explore the graphs of direct variations, using graphing calculators.
- In this lesson, students experienced a direct variation situation in which only values in the first quadrant make sense. Prompt students to think about a direct variation situation in which values in the third quadrant would be reasonable. Also, prompt students to think of a direct variation situation having a negative slope.

Strategies for Differentiation

- Use a picture of a showerhead for ELL students.
- Have students create a folded graphic organizer with the characteristics of a direct variation and how these characteristics appear in each of the representations—table, graph, and equation. Include examples and nonexamples.