How Does Your Garden Grow?

1

Proportional Relationships

MATERIALS

Scissors
Tape or glue sticks

Lesson Overview

Students explore tables and graphs that illustrate proportional relationships. First, students review equivalent ratios and the fact that the graphs of equivalent ratios form straight lines that pass through the origin. They are then given three sets of scenarios, equations, and graphs to match, using any strategy. Each group illustrates a different type of relationship: linear and proportional, linear and non-proportional, and non-linear. Students classify the groups of representations as linear or non-linear and use tables of values to classify the linear relationships as proportional or non-proportional. They summarize the relationships between the terms *linear relationship*, *proportional relationship*, and *equivalent ratios*.

Students are then given three new situations to analyze. They create tables of values and graphs and determine if a proportional relationship exists between the two quantities. Finally, the term *direct variation* is introduced and explored using multiple representations.

Grade 7
Proportionality

(4) The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to:

(A) represent constant rates of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including $d = rt$.

(C) determine the constant of proportionality ($k = \frac{y}{x}$) within mathematical and real-world problems.

ELPS

1.A, 1.C, 1.E, 1.F, 1.G, 2.C, 2.E, 2.I, 3.D, 3.E, 4.B, 4.C, 4.D, 4.J, 5.B, 5.F, 5.G

Essential Ideas

- Graphs of equivalent ratios form a straight line that passes through the origin.
- Linear relationships are also proportional relationships if the ratio between corresponding values of the quantities is constant.

- The graph of a proportional relationship is a straight line that passes through the origin.
- A linear relationship represents a direct variation if the ratio between the output values and input values is constant. The quantities are said to vary directly.
- Multiple representations such as tables and graphs are used to show examples of proportional, or direct variation, relationships between two values within the context of real-world problems.

Lesson Structure and Pacing: 3 Days

Day 1

Engage

Getting Started: Keep on Mixing!

Students revisit a table of ratios, similar to what they experienced in Course 1. The table of ratios includes two different sets of equivalent ratios. Students determine how many different equivalent ratios are in the table. They plot the values from the ratio table on a coordinate plane and conclude that equivalent ratios lie on the same line that passes through (0, 0).

Develop

Activity 1.1: Representations of Varying Quantities

Students sort a set of scenarios, equations, and graphs into groups of corresponding representations. They describe their strategies for their groupings.

Day 2

Activity 1.2: Defining Proportional Relationships

Students create tables of values for the scenarios represented in Activity 1.1. They classify the groups into linear and non-linear relationships and classify the linear relationships as proportional and non-proportional relationships. They use ratios in tables to determine if linear relationships represent proportional relationships.

Activity 1.3: Proportional or Not?

Students analyze three scenarios to determine which involve proportional relationships. In the first scenario, students consider two brothers who want to build 10 bird feeders. Then, they consider the possible dimensions of a rectangle having an area of 12 square inches. Finally, students consider a type of bamboo that can grow at an average rate of 60 centimeters per day. In each case, they create a table of values, plot the ordered pairs, and explain if the scenario represents a proportional relationship.

Day 3

Activity 1.4: Direct Variation

Students learn that proportional relationships are also called *direct variations*. The graph of a direct variation is a straight line passing through the origin. Students examine a Worked Example and then explain how to use the graphs in Activity 1.3 to determine which scenarios represented direct variations.

Demonstrate

Talk the Talk: Determining Proportionality from Tables and Graphs

Students reflect on all the graphs they used in this lesson and generalize characteristics related to the graph of two proportional quantities. They also use tables to determine if two quantities are proportional.

ENGAGE

Getting Started: Keep on Mixing!

Facilitation Notes

In this activity, students are given a table of ratios which contains two different sets of equivalent ratios. The table of values are then plotted on a coordinate plane, and it is shown that equivalent ratios lie on the same line that passes through (0, 0).

Have students work with a partner or in a group to complete Questions 1 through 3. Share responses as a class.

Differentiation strategy

Have students model the shades of paint in the table by using blue and yellow transparency squares, with each square representing one pint of paint. They can compare the stacks of squares to visualize the different bluish green paint colors and connect them to the ordered pairs in the graph.

As students work, look for

Students who are graphing the wrong columns from the table in the graph. Discuss the column titles and the axis labels, as well as how they could have completed the first column themselves.

Questions to ask

- What does it mean to be the same shade of paint?
- What ratios of yellow paint to blue paint were used?
- What strategies can you use to compare ratios?
- What do you remember about the graphs of equivalent ratios?
- Do the graphs of equivalent ratios lie on the same line?
- Does the line containing equivalent ratios always pass through the origin?
- If you draw a line to model the ratio relationship, does that mean that each point on the line will make sense in the problem situation?

Summary

Equivalent ratios are linear, and the graph of equivalent ratios passes through the origin.

Activity 1.1
Representations of Varying Quantities

DEVELOP

Facilitation Notes

In this activity, students cut out and match the components in a sorting activity that includes three different representations: scenarios, equations, and graphs. They also explain their reasoning for the groupings. Note, students will complete the table representation for the Urban Garden Project in the next activity.

Ask a student to read the introduction aloud. Discuss as a class.

Have students work with a partner or in a group to complete Question 1. Share responses as a class.

Questions to ask

- How does the scenario relate to the equation?
- How did you decide which equation matched each scenario? What phrases in the scenario helped you decide which equation to choose?
- How does the scenario relate to the graph?
- How did you decide which equation matched each graph?
- How does the equation relation to the graph?
- Do all the equations look the same? What is the same and different as you compare the equations?
- Do all the graphs look the same? What is the same and different as you compare the graphs?

Differentiation strategy

To extend the activity, have students sketch a diagram of the context to accompany the 3 sets of representations from the sort. Note that the table column will be addressed in the next activity.

Summary

Linear and non-linear relationships can be represented using scenarios (descriptions), equations, and graphs.

Activity 1.2
Defining Proportional Relationships

Facilitation Notes

In this activity, tables of values are created for the linear relationships in the previous activity. The linear relationships are classified as proportional and non-proportional relationships. Ratios in tables are used to determine if linear relationships represent proportional relationships.

Have students work with a partner or in a group to complete Questions 1 through 3. Share responses as a class.

Questions to ask

- What does a graph representing a linear relationship look like?
- What does a graph representing a non-linear relationship look like?
- What are the characteristics of a linear equation?
- What are the characteristics of a non-linear equation?
- How did you decide what values to use to represent x in the table?
- How does the graph of an additive relationship look different than the graph of a multiplicative relationship?
- How does the equation of an additive relationship look different than the equation of a multiplicative relationship?

Ask a student to read the information following Question 3 aloud. Discuss as a class.

Have students work with a partner or in a group to complete Questions 4 through 6. Share responses as a class.

Questions to ask

- Are the ratios formed by $\frac{y}{x}$ in the table of values equivalent?
- If the ratios formed by $\frac{y}{x}$ in the table of values are equivalent, what does this imply about the relationship between the variables?
- If the ratios formed by $\frac{y}{x}$ in the table of values are not equivalent, what does this imply about the relationship between the variables?

Differentiation strategy

Have students take summary notes on the template with the cutouts.

- Label the rows with the terms non-linear relationship, linear relationship and/or proportional relationship.
- Create an additional row at the bottom titled Proportional Relationship; in each cell, list the characteristics of a proportional relationship that are evident in that column's representation. For example, in the graph cell, students should write that the line must go through the origin.

Summary

For a relationship to illustrate a proportional relationship, all the ratios $\frac{y}{x}$ or $\frac{x}{y}$ must represent the same constant.

Activity 1.3

Proportional or Not?

Facilitation Notes

In this activity, students create a table of values, plot the ordered pairs, and explain if various scenarios represent a proportional relationship.

Differentiation strategy

Give each group only one of the three scenarios. Allow time for group presentations to the class. Encourage students to ask their classmates questions.

Misconceptions

Students sometimes think that the terms linear and proportional are synonyms. To clarify this misunderstanding,

- Discuss the fact that proportional relationships are a special case, or subset, of linear relationships.
- Have students identify the 2 characteristics of a proportional relationship: (1) it is linear, and (2) it includes the value (0,0).
- Have students identify the characteristics that distinguish proportional relationships from all linear relationships in tables, graphs and equations.

As students work, look for errors in graphing due to disregarding the interval spacing on the axes.

Have students work with a partner or in a group to complete Questions 1 through 4. Share responses as a class.

Questions to ask

- How did you determine how many bird feeders Jake needs to build in each situation?
- How would you describe the graph of this data set?
- Do the points on the graph increase or decrease?
- At which point on the graph do both brothers build the same number of bird feeders?
- Which points on the graph show that Jake builds more bird feeders than his brother?
- Which points on the graph show that Bob builds more bird feeders than his brother?
- Does the graph represent equivalent ratios? Explain.

Have students work with a partner or in a group to complete Questions 5 through 8. Share responses as a class.

Questions to ask

- What is the formula for the area of a rectangle?
- Given the width of the rectangle and the area of the rectangle, how did you determine the length of the rectangle?
- Given the length of the rectangle and the area of the rectangle, how did you determine the width of the rectangle?
- Is the data set discrete or continuous? Explain.
- Does the graph of the data model a linear relationship?
- What unit of measure describes the length and width of the rectangle?
- What unit of measure describes the area of the rectangle?
- As the length of the rectangle increases, what effect does this have on the width?
- As the width of the rectangle increases, what effect does this have on the length?
- Does the graph represent equivalent ratios? Explain.

Differentiation strategy

To extend the activity, discuss the graph in Question 6 in more detail. Use the context to discuss why it does not have an x-intercept or y-intercept. Have students determine two more points on the graph $(x, 24)$ and $(24, y)$ and visualize how the graph approaches the axes, but never quite reaches them.

Have students work with a partner or in a group to complete Questions 9 through 11. Share responses as a class.

Questions to ask

- How could you determine the height of the plant in 10 days?
- How could you determine the height of the plant in 30 days?
- How many hours are in one-half of a day?
- How could you determine the height of the plant in one-half of a day?
- How could you determine the length of time the plant had been growing to reach a height of 20 centimeters?
- How could you determine the length of time the plant had been growing to reach a height of 200 centimeters?
- Is the data set discrete or continuous? Explain.
- Does the graph of the data model a linear relationship?
- Is the time the plant has grown proportional to the height of the plant? Explain.

Summary

When the points on a graph represent equivalent ratios, the relationship between the two quantities is a proportional relationship.

Activity 1.4
Direct Variation

Facilitation Notes

In this activity, students use the graphs from the previous activity to determine which scenarios represent direct variations.

Ask a student to read the introduction and Worked Example aloud. Discuss as a class.

Misconception

As students read the definition of a *direct variation*, they may assume that a proportional relationship and a direct variation relationship mean the exact same thing. Clarify that this is not the case, and make the distinction between the terms explicit to students.

- A side note in Activity 1.2 states, "You can decide if two quantities are in a proportional relationship by testing that all ratios, $\frac{y}{x}$ or $\frac{x}{y}$, in a table of values are equivalent."
- In this activity it states, "A situation represents a direct variation if the ratio between the y-value and its corresponding x-value is constant for every point."

- When testing for proportionality, it does not matter what value is the numerator and what value is the denominator, as long as their is consistency in writing the ratios in the same order. When writing
  a ratio for a direct variation, it matters entirely what value is in the numerator and what value is in the denominator; the order is determined by which variable is the dependent variable, y, and which variable is the independent variable, x. The direct variation must be written as $\frac{y}{x}$.
- The quantities of a direct variation relationship can be described as directly proportional, because the variable relationship is taken into account.
- In the next lesson, the ratio for a direct variation will be named the constant of proportionality, k.

Have students work with a partner or in a group to complete Questions 1 through 3. Share responses as a class.

Questions to ask

- If the car travels for one hour, what is the distance the car travels?
- If the car travels for two hours, what is the distance the car travels?
- If the car travels for three hours, what is the distance the car travels?
- What is constant in this situation?
- What varies directly in this situation?
- How can you tell just by looking at the graph that it represents a proportional relationship?
- Do all the points on the line make sense in this problem situation?
- Is the bird-feeder graph a straight line that passes through the origin?
- Is the area graph a straight line that passes through the origin?

Summary

The graph of a direct variation is a straight line passing through the origin.

Talk the Talk: Determining Proportionality from Tables and Graphs

DEMONSTRATE

Facilitation Notes

In this activity, students use the graphs in the lesson to summarize the characteristics of proportional relationships. They then use tables of values to identify proportional relationships and explain their reasoning.

Have students work with a partner or in a group to complete Questions 1 through 3. Share responses with the class.

Questions to ask

- Do the points in the graph appear to have a linear or non-linear relationship?
- Does the line pass through the origin?
- Does the ratio value $\frac{y}{x}$ remain constant throughout the table of values?

Summary

The graph of a proportional relationship is linear and passes through the origin. The table of values of a proportional relationship shows that the ratio $\frac{y}{x}$ remains constant.

NOTES

How Does Your Garden Grow?

1

Proportional Relationships

WARM UP

1. A bus travels 18 miles in 15 minutes. At the same rate, what distance will the bus travel in 50 minutes?
2. A copy machine averages 210 copies in 5 minutes. At the same rate, how many copies can the machine make in 12 minutes?

LEARNING GOALS

- Use tables and graphs to explore proportional relationships.
- Decide whether two quantities are in a proportional relationship by testing for equivalent ratios in a table.
- Decide whether two quantities are in a proportional relationship by graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

KEY TERMS

- origin
- proportional relationship
- direct variation

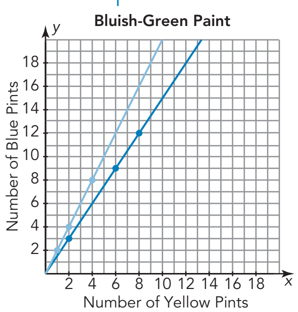
You have learned about the relationship between ratios, a comparison of two quantities, and proportions. How can you determine if a proportional relationship exists between two quantities?

Warm Up Answers

1. 60 miles

2. 504 copies

Answers

1. The students made two different shades of bluish-green paint. The mixtures equivalent to a ratio of $\frac{1 \text{ yellow pint}}{2 \text{ blue pints}}$ are one bluish-green shade and the mixtures equivalent to a ratio of $\frac{2 \text{ yellow pints}}{3 \text{ blue pints}}$ are a second bluish-green shade.
2. The most yellow mixtures are those equivalent to $\frac{2 \text{ yellow pints}}{3 \text{ blue pints}}$ or $\frac{2 \text{ yellow pints}}{5 \text{ total pints}}$.
3. 

If two mixtures are the same shade, they lie on the same line because they are equivalent ratios.

Getting Started

Keep on Mixing!

Amount of Bluish Green Paint	Amount of Yellow Paint	Amount of Blue Paint
3 pt	1 pt	2 pt
5 pt	2 pt	3 pt
6 pt	2 pt	4 pt
12 pt	4 pt	8 pt
15 pt	6 pt	9 pt
20 pt	8 pt	12 pt

The students in Mr. Raith's art class created various quantities of bluish green paint using pints of yellow and blue paint.

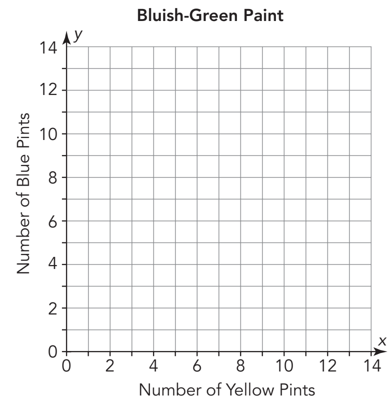
The table shows the different mixtures of paint, in pints, that the students made.

1. How many different shades of paint did the students make? How do you know?

2. Some of the shades of the paint are more yellow than others. Which mixture(s) are the most yellow? Explain your reasoning.

The **origin** is a point on a graph with the ordered pair (0, 0).

3. Plot an ordered pair for each bluish-green paint mixture. Draw a line connecting each point to the origin. What do you notice?



ACTIVITY
1.1

Representations of Varying Quantities

The student government association (SGA) at Radloff Middle School is creating an urban garden at their school for use by their community. They divided up into groups to design different parts of the garden and were asked to (1) describe their project, (2) create an equation to model part of their design or to answer a question about their design, and (3) sketch a graph of their equation.

1. Isaac, the president of the SGA, mixed up the representations of the projects after they were submitted to him. Help Isaac match the scenarios, equations, and graphs.

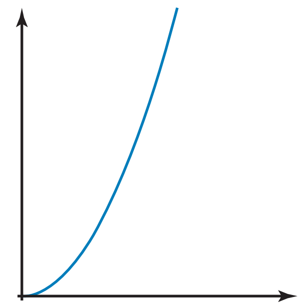
- **Cut out the scenarios, equations, and graphs at the end of the lesson.**
- **Sort the scenarios, equations, and graphs into corresponding groups.**
- **Tape the representations into the table provided.**

When you connect an equation to a graph, you are establishing a dependency between the quantities. Remember, the independent quantity is always represented on the *x*-axis.

Answers

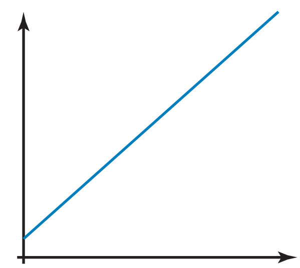
1. Sample answers.
Group A Scenario:

$y = \pi x^2$



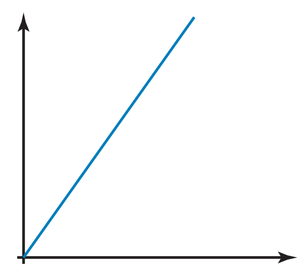
Group B Scenario:

$y = x + 6$



Group C Scenario:

$y = 1.6x$



The Urban Garden Project

Scenario			
Equation			
Graph			
Table			

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ACTIVITY 1.2

Defining Proportional Relationships

NOTES

When looking over the submissions from the urban garden working groups, Isaac notices that there are two different types of graphical relationships represented: linear and non-linear.

1. Classify each group's graph as representing a linear or a non-linear relationship between quantities.

Isaac notices that the linear graphs are slightly different, but he doesn't know why. He decides to analyze a table of values for each linear graph.

2. Create a table of at least 4 values for each linear relationship in the urban garden project.

Isaac knows that simple equations can represent additive or multiplicative relationships between quantities.

3. Analyze the equations.

a. Based on the equations, which graph represents an additive relationship between the variables and which represents a multiplicative relationship?

b. Which variable represents the independent variable (input) and which represents the dependent variable (output)?

Answers

1. Group A's graph represents a non-linear relationship. Groups B and Cs' graphs represent linear relationships.

2. Sample answers.

Group B: $y = x + 6$

x	y
0	6
2	8
4	10
6	12

Group C: $y = 1.6x$

x	y
0	0
2	3.2
4	6.4
6	9.6

3a. Group B's design, $y = x + 6$, represents an additive relationship.

Group C's design, $y = 1.6x$, represents a multiplicative relationship.

3b. The independent variable is x. The dependent variable is y.

Answers

4. Specific ratios will vary for Group B, but the ratios will not be equivalent. Specific ratios will vary for Group C, but the ratios should be equivalent to $\frac{8}{5} = 1.6$.
5. Tables of values and ratios will vary, but the ratios will not be equivalent.
6. Graphs B and C are both linear relationships, but Graph C is a special linear relationship called a proportional relationship. If the ratios of the quantities in a table of values for a linear relationship are equivalent, or constant, then the linear relationship is also a proportional relationship.

One special type of relationship that compares quantities using multiplicative reasoning is a ratio relationship. When two equivalent ratios are set equal to each other, they form a proportion. The quantities in the proportion are in a **proportional relationship**.

You can decide if two quantities are in a proportional relationship by testing that all ratios, $\frac{y}{x}$ or $\frac{x}{y}$, in a table of values are equivalent.

For a relationship to illustrate a proportional relationship, all the ratios $\frac{y}{x}$ or $\frac{x}{y}$, must represent the same constant.

4. Use your tables of values in Question 2 to determine which, if any, of the linear relationships illustrate a proportional relationship. Show the values of the ratios in each relationship.

> Isaac says the equation $y = \pi r^2$ represents a proportional relationship between y and r because it includes multiplication between a numerical coefficient and a variable expression.

5. Use a table of values and corresponding ratios in the form of $\frac{y}{x}$ to explain why Isaac is incorrect.

6. Explain to Isaac how the graphs in the urban garden design project are different. Include the terms *linear relationship* and *non-linear relationship, proportional relationship*, and *equivalent ratios*.

ACTIVITY
1.3

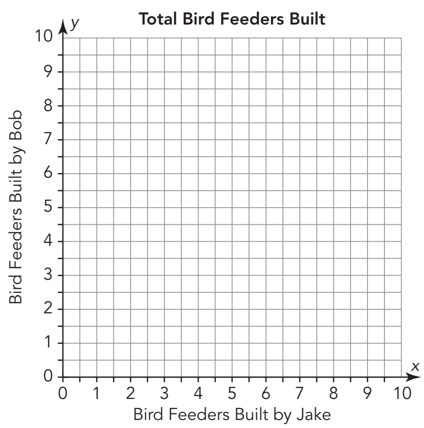
Proportional or Not?

In this activity you will analyze three different problem situations and then determine which represents a proportional relationship.

Bob and his little brother Jake want to build bird feeders to sell at a local farmers market. They have enough money to buy materials to build 10 bird feeders.

1. Complete a table of values by listing possible ways in which they can divide up the work. Assume that each brother only makes whole bird feeders. Then complete the graph.

Bird Feeders Built by Bob	Bird Feeders Built by Jake

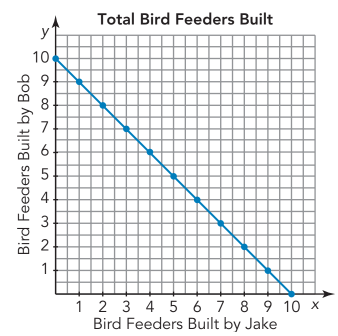


"You can draw a line through your points to model the relationship. Then decide if all the points make sense in terms of the problem situation."

Answers

1. Sample values are provided.

Bird Feeders Built by Bob	Bird Feeders Built by Jake
10	0
9	1
8	2
7	3
6	4
5	5
4	6
3	7
2	8
1	9
0	10



Answers

2. The total number of bird feeders must be 10. The more Bob builds, the fewer Jake needs to build. The fewer Bob builds, the more Jake needs to build.
3. There is no one ratio because the ratio changes for each number of bird feeders each person builds.
4. No. Dontrell is not correct. Even though the quantities on the graph form a line, the ratio of the quantities is not constant. The points on the graph do not represent equivalent ratios. Therefore, the relationship between the two quantities is not a proportional relationship.

2. Describe how the number of bird feeders built by Bob affects the number of bird feeders Jake builds.

3. What is the ratio of bird feeders that Bob builds to the number of bird feeders that Jake builds? Explain your reasoning.

4. Dontrell claims that the number of bird feeders Bob builds is proportional to the number of bird feeders Jake builds. Do you agree with Dontrell's claim? Explain your reasoning.

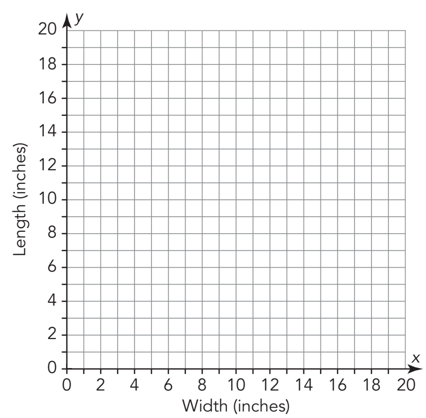
Vanessa was given a math problem to determine how many different rectangles can be constructed with an area of 12 square inches.

5. Vanessa thinks that there are only two: one with a width of 2 inches and a length of 6 inches, and another with a width of 3 inches and a length of 4 inches.

Is she correct? Explain your reasoning.

6. Complete a table of values for the width and length of a rectangle with an area of 12 square inches. Then complete the graph.

Width of Rectangle (in.)	Length of Rectangle (in.)



7. Describe how the width of the rectangle affects the length of the rectangle.

8. Do the width and length of a rectangle with an area of 12 square inches form a proportional relationship? Explain your reasoning.

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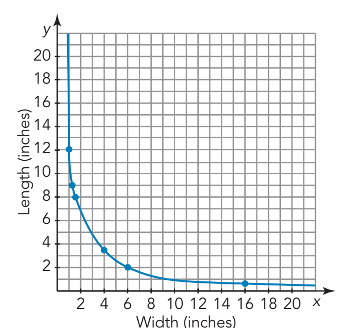
Answers

5. No. There are more rectangles with an area of 12 square inches. For example, I can construct a rectangle with a width of 1 inch and a length of 12 inches.
6. Sample answers.

Width of Rectangle (in.)	Length of Rectangle (in.)
1	12
6	2
4	3
1.5	8
$1\frac{1}{3}$	9
20	0.6
16	$\frac{3}{4}$

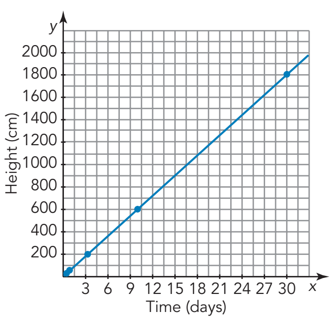


7. The product of the width and the length is equal to 12.
8. The width and length are not proportional. The ratio of length to width changes for every set of values.

Answers

9. Sample answers.

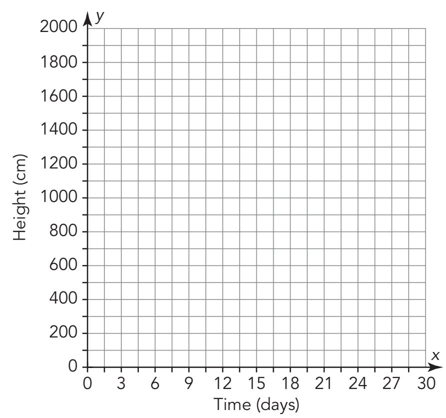
Time (days)	Height of Bamboo (cm)
10	600
30	1800
$\frac{1}{2}$	30
$\frac{1}{3}$	20
$3\frac{1}{3}$	200



One species of bamboo can grow at an average rate of 60 centimeters per day.

9. Complete a table of values using the given growth rate of the bamboo plant. Then complete the graph.

Time (days)	Height of Bamboo (cm)



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10. **Describe how the time affects the height of the bamboo plant.**

11. **Is the number of days of growth proportional to the height of the bamboo plant? Explain your reasoning.**

ACTIVITY 1.4

Direct Variation

You saw that the height of a bamboo plant varies based on the number of days the bamboo grows. For example, for each increase of one day, the bamboo grows 60 centimeters.

A situation represents a **direct variation** if the ratio between the y-value and its corresponding x-value is constant for every point. If two quantities vary directly, the points on a graph form a straight line, and the line passes through the origin.

You can describe the quantities of a direct variation relationship as directly proportional.

Answers

10. As the number of days increases by 1 day, the height of the bamboo increases by 60 cm.
11. Yes, the number of days and height of the bamboo form a proportional relationship. The graph displays sets of equivalent ratios.

Answers

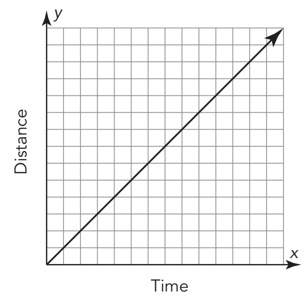
1. As the time increases by 1 hour, the distance traveled by the car increases by a constant of 60 miles. The distance traveled increases as time increases.
2. If the graphs are straight lines that pass through the origin, they represent direct variations. In Activity 1.3, the bird feeders graph and the area graph do not fit either of these characteristics.
3. Answers will vary.

Examine the Worked Example.

WORKED EXAMPLE

A car driving at a constant rate of 60 miles per hour is an example of direct variation. The distance traveled varies directly with time.

A sketch of a graph that could represent this situation is shown.



When you sketch a graph, be sure to include the labels for each axis. However, you don't *always* have to show values.

1. Explain how the situation in the Worked Example is an example of a direct variation.

Think about how the quantities relate to each other at any given point.

2. Explain how you can use each graph in the previous activity, *Proportional or Not?*, to determine which scenarios represent direct variations.

3. List another example of quantities that vary directly. Then, sketch a graph that could represent the relationship between the quantities.

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ELL Tip

Read the introduction text aloud. Direct English Language Learners to the graph in the Worked Example, and ask them to share why this is an example of a direct variation. Prompt students to then share other real-world examples of direct variations.

NOTES

TALK the TALK

Determining Proportionality from Tables and Graphs

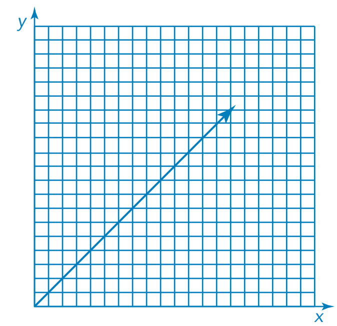
Go back and examine the graphs in this lesson. Do you see a pattern?

1. How are all the graphs that display proportional relationships the same?

2. Sketch a graph that displays a proportional relationship.

Answers

1. The points form a straight line that passes through the origin.
2. Answers will vary, but they should be a variation of the provided graph.



ELL Tip

In small groups or pairs, have students display their graphs from this section. Tell students they are looking to compare the graphs and determine how they are alike. Listen for students to use a variety of grammatical structures, sentence lengths, sentence types, and connecting words with accuracy. Support students in their speaking by having another adult or peer record their sentences to be shared with the class.

Answers

3. Tables a, b, and c display linear relationships. Table b is the only table that displays a proportional relationship.

NOTES

3. Which tables display linear relationships? Which display proportional relationships? Explain your reasoning.

a.

x	y
1	10
2	11
4	13
5	14

b.

x	y
0	0
1	6
3	18
4	24

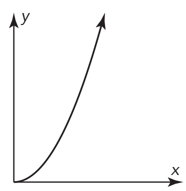
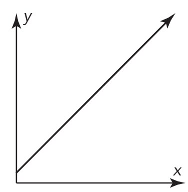
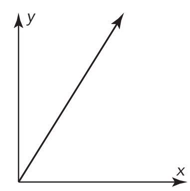
c.

x	y
0	4
1	8
2	12
3	16

d.

x	y
1	30
2	15
4	10
5	5

Cutouts for The Urban Garden Project

Group A is designing one section of the garden to include fresh herbs grown in circular beds. The group needs to determine the area of each herb bed given the radius of the bed.	Group B is developing a plan to landscape the perimeter of the urban garden. They could only find a meter stick broken at 6 cm, so they reported the dimensions of the garden based on the measurements read off the meter stick. This group needs to determine the actual side lengths of the garden.	Group C is designing the vegetable patches and have decided that each rectangular vegetable patch will be 5 inches wide for every 8 inches long. This group needs to determine the possible dimensions for the lengths of the vegetable patches.
		
$y = 1.6x$	$y = \pi x^2$	$y = x + 6$

Why is this page blank?

So you can cut out the Urban Garden Project materials on the other side.