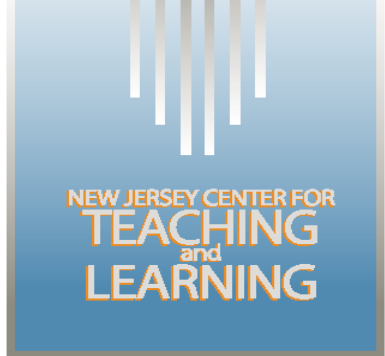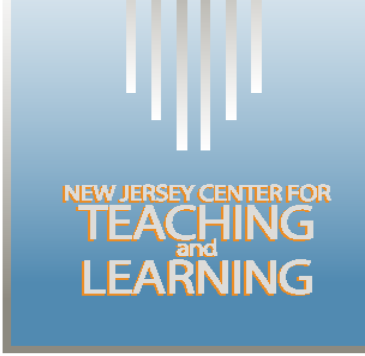# Progressive Mathematics Initiative

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7th Grade Math

Ratios & Proportions

2013-05-20

www.njctl.org

Setting the PowerPoint View

Use Normal View for the Interactive Elements

To use the interactive elements in this presentation, do not select the Slide Show view. Instead, select Normal view and follow these steps to set the view as large as possible:

- On the View menu, select Normal.

- Close the Slides tab on the left.

- In the upper right corner next to the Help button, click the ^ to minimize the ribbon at the top of the screen.

- On the View menu, confirm that Ruler is deselected.

- On the View tab, click Fit to Window.

Use Slide Show View to Administer Assessment Items

To administer the numbered assessment items in this presentation, use the Slide Show view. (See Slide 9 for an example.)

Table of Contents

Common Core: 7.RP.1, 7.RP.2, 7.G.1

Click on the topic to go to that section

Writing Ratios

Ratios

What do you know about ratios?

When have you seen or used ratios?

Ratios

There are 48 animals in the field. Twenty are cows and the rest are horses.

Write the ratio in three ways:

a. The number of cows to the number of horses

b. The number of horses to the number of animals in the field

Remember to write your ratios in simplest form!

1 There are 27 cupcakes. Nine are chocolate, 7 are vanilla and the rest are strawberry. What is the ratio of vanilla cupcakes to strawberry cupcakes?

A   7 : 9

B $\dfrac{7}{27}$

C $\dfrac{7}{11}$

D   1 : 3

2 There are 27 cupcakes. Nine are chocolate, 7 are vanilla and the rest are strawberry. What is the ratio of chocolate & strawberry cupcakes to vanilla & chocolate cupcakes?

○ A $\dfrac{20}{16}$

○ B $\dfrac{11}{7}$

○ C $\dfrac{5}{4}$

○ D $\dfrac{16}{20}$

3 There are 27 cupcakes. Nine are chocolate, 7 are vanilla and the rest are strawberry. What is the ratio of chocolate cupcakes to total cupcakes?

A $\dfrac{7}{9}$

B $\dfrac{7}{27}$

C $\dfrac{9}{27}$

D $\dfrac{1}{3}$

4 There are 27 cupcakes. Nine are chocolate, 7 are vanilla and the rest are strawberry. What is the ratio of total cupcakes to vanilla cupcakes?

A 27 to 9

B 7 to 27

C 27 to 7

D 11 to 27

Equivalent Ratios

Equivalent ratios have the same value

3 : 2   is equivalent to   6: 4
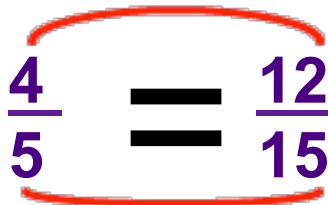
1 to 3 is equivalent to 9 to 27

$\dfrac{5}{6}$ is equivalent to $\dfrac{35}{42}$

There are two ways to determine if ratios are equivalent.

1. Common Factor

$$\frac{4}{5} = \frac{12}{15}$$

x 3

$$\frac{4}{5} = \frac{12}{15}$$

x 3

Since the numerator and denominator were multiplied by the same value, the ratios are equivalent

2. Cross Products

$$\frac{4}{5} = \frac{12}{15}$$

Since the cross products are equal, the ratios are equivalent.

$$4 \times 15 = 5 \times 12$$
$$60 = 60$$

5 $\frac{4}{9}$ is equivalent to $\frac{8}{18}$?

○ True

○ False

6 $\frac{5}{9}$ is equivalent to $\frac{30}{54}$?

◯ True

◯ False

7   18:12 is equivalent to $\frac{9}{6}$, which is equivalent to $\frac{36}{24}$?

○ True

○ False

8 $\frac{2}{24}$ is equivalent to $\frac{10}{120}$, which is equivalent to $\frac{40}{480}$?

○ True

○ False

9   1:7 is equivalent to $\frac{10}{70}$, which is equivalent to 5 to 65?

○ True

○ False

Rates

Rates

Rate: a ratio of two quantities measured in different units

Examples of rates:

    4 participants/2 teams

    5 gallons/3 rooms

    8 burgers/2 tomatoes

Unit Rates

Unit rate: Rate with a denominator of one
Often expressed with the word "per"

Examples of unit rates:

34 miles/gallon

2 cookies per person

62 words/minute

Finding a Unit Rate

Six friends have pizza together. The bill is $63. What is the cost per person?

Hint: Since the question asks for cost per person, the cost should be first, or in the numerator.

Since unit rates always have a denominator of one, rewrite the rate so that the denominator is one.

Unit Price Game

Are you getting **Value For Money**?

The "Unit Price" tells you the cost per liter, per kilogram, per pound, etc, of what you want to buy.

It is a good way of comparing costs. To help you become expert at calculating Unit Prices we have this game for you:

28oz

$1.95

$1.57 per oz

$0.14 per oz

$2.07 per oz

$0.07 per oz

Score

0

10 **Sixty cupcakes are at a party for twenty children. How many cupcakes per person?**

11 **John's car can travel 94.5 miles on 3 gallons of gas. How many miles per gallon can the car travel?**

12 The snake can slither 240 feet in half a day. How many feet can the snake move in an hour?

13 **There are five chaperones at the dance of 100 students. How many students per chaperone are there?**

14   **The recipe calls for 6 cups of flour for every four eggs. How many cups of flour are needed for one egg?**

15   Sarah rode her bike $14\frac{}{4}$ miles in $\frac{}{4}$ hour. What is Sarah's unit rate in miles per hour?

We often use unit rates to easily compare rates.

Example:

Sebastian and Alexandra both work during the summer. Sebastian worked 26 hours one week and earned $188.50 before taxes. Alexandra worked 19 hours and earned $128.25 before taxes. Who earns more per hour at their job?
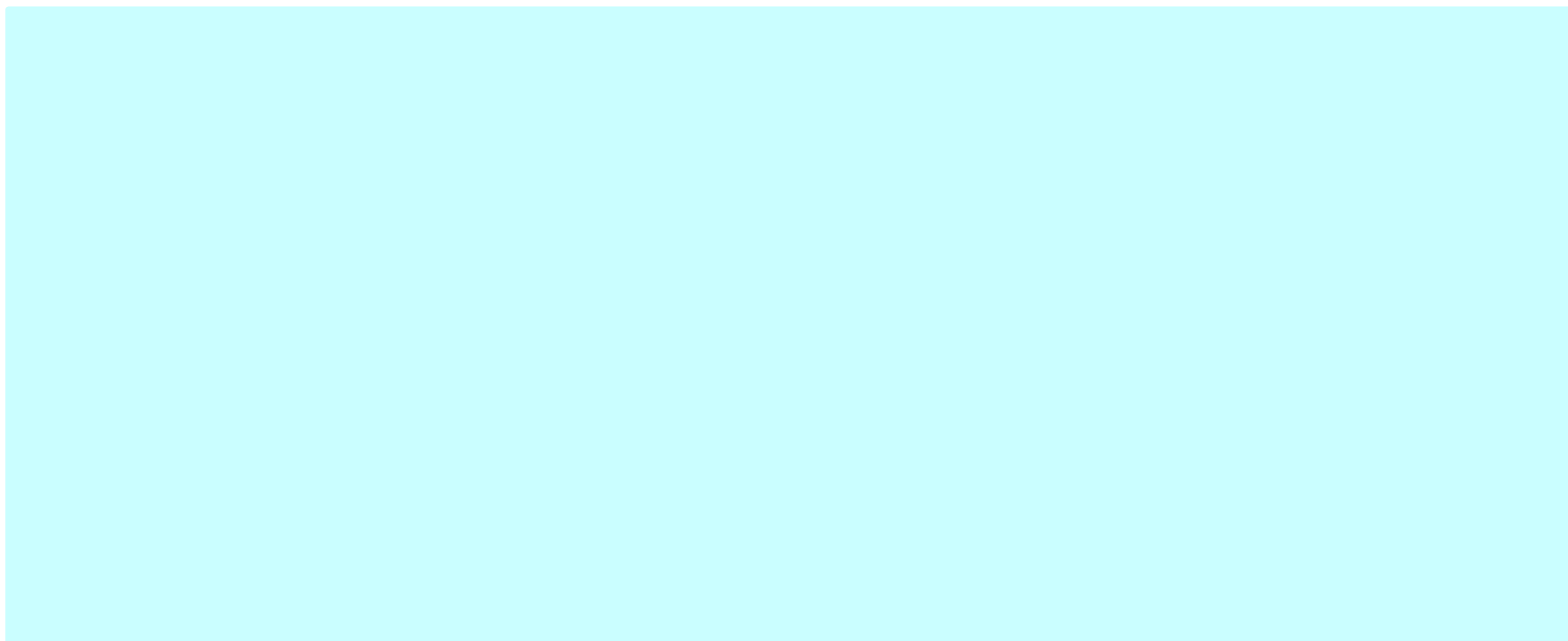
Sebastian

Alexandra

Jim traveled 480 miles on a full tank of gas. His gas tank holds 15 gallons.

Tara traveled 540 miles on a full tank of gas. Her gas tank holds 18 gallons.

Which person's car gets better gas mileage?

Jim   **Tara**

16 Tahira and Brendan going running at the track. Tahira runs 3.5 miles in 28 minutes and Brendan runs 4 miles in 36 minutes. Who runs at a faster pace (miles per hour)?

Show your work!

○ A   Tahira

○ B   Brendan

17   Red apples cost $3.40 for ten. Green apples cost $2.46 for six. Which type of apple is cheaper per apple?

Show your work!

○   A   Red apples

○   B   Green apples

18 Fruity Oats is $2.40 for a 12 oz. box. Snappy Rice is $3.52 for a 16 oz. box. Which cereal is cheaper per ounce?

Show your work!

○ A   Fruity Oats

○ B   Snappy Rice

19 Two families drive to their vacation spot. The Jones family drives 432 miles and used 16 gallons of gas. The Alverez family drives 319 miles and uses 11 gallons of gas. Which family got more miles per gallon of gas?

Show your work!

○ A Jones Family

○ B Alverez Family

20 Mariella typed 123 words in 3 minutes. Enrique typed 155 words in 5 minutes. Who typed more words per minute?
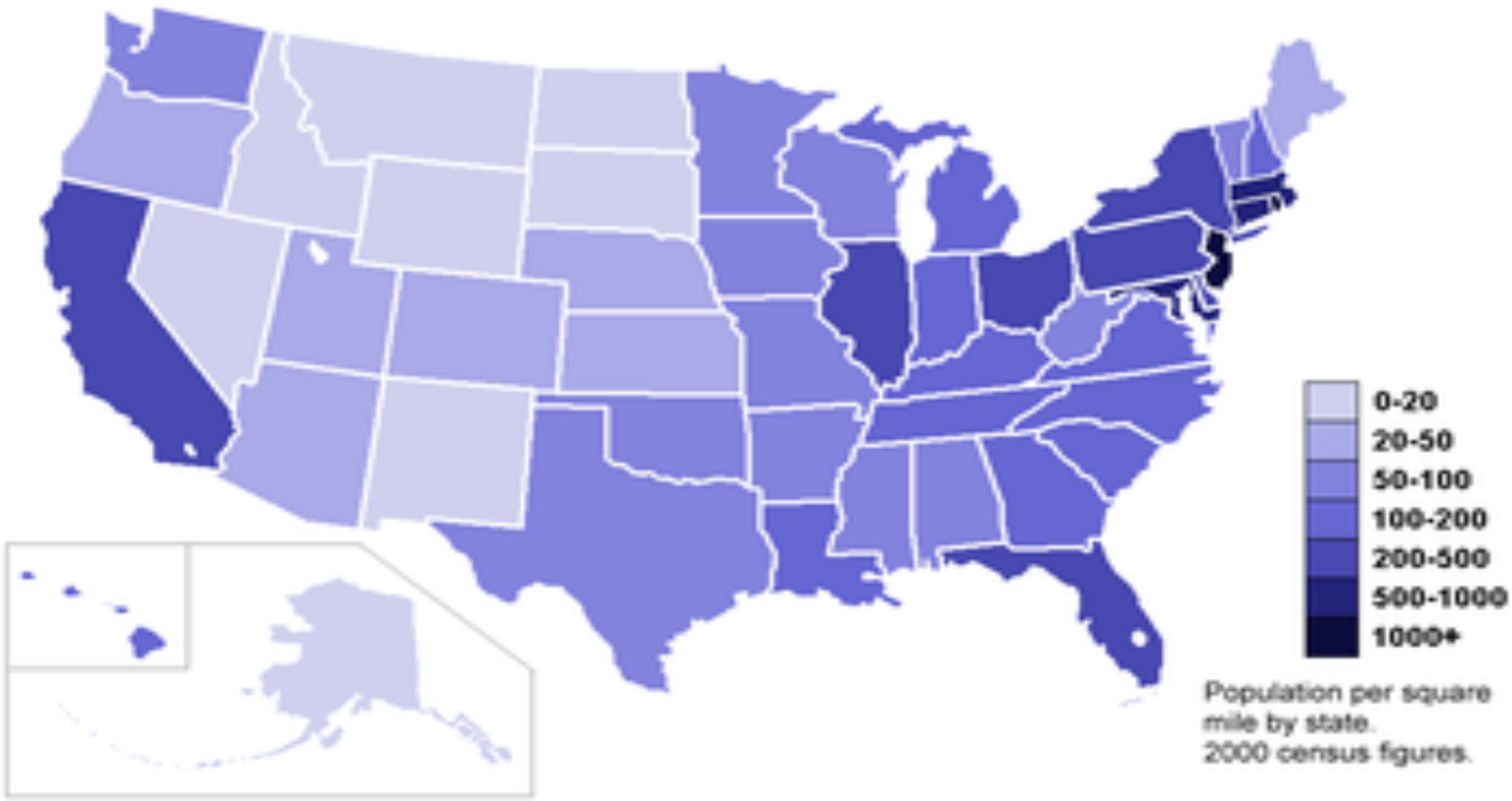
Show your work!

○ A   Mariella

○ B   Enrique
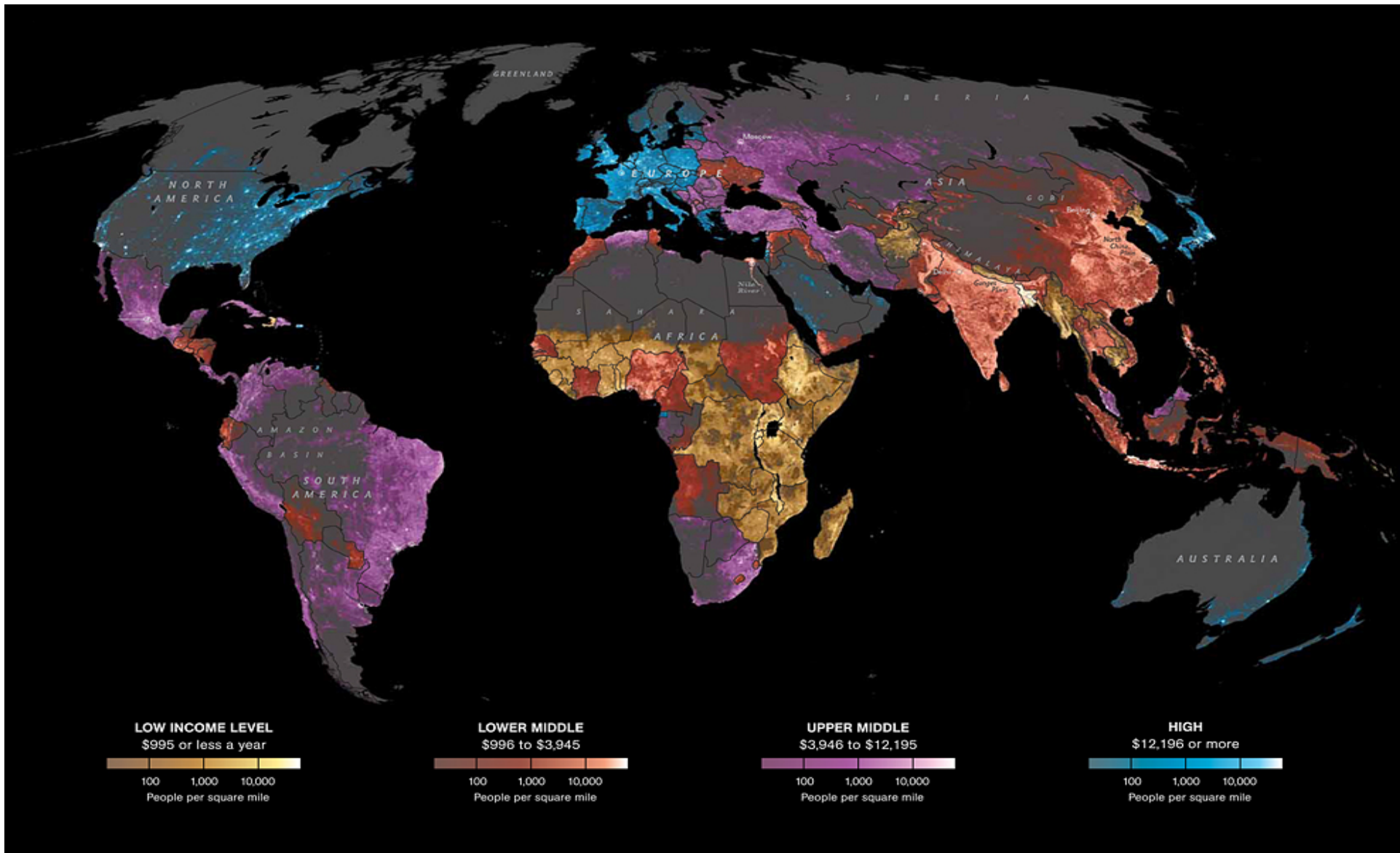
Population Density

Population Density: A unit rate of people per square mile

This data is compiled by the US Census Bureau every 10 years and is used when determining the number of Representatives each state gets in the House of Representatives.

Population Density

Population per square
mile by state.
2000 census figures.

Legend:
- 0-20
- 20-50
- 50-100
- 100-200
- 200-500
- 500-1000
- 1000+

LOW INCOME LEVEL
$995 or less a year

100   1,000   10,000
People per square mile

LOWER MIDDLE
$996 to $3,945

100   1,000   10,000
People per square mile

UPPER MIDDLE
$3,946 to $12,195

100   1,000   10,000
People per square mile

HIGH
$12,196 or more

100   1,000   10,000
People per square mile

To calculate population density:

- **Find the population of the state.**
  NJ = 8,791,894 people

- **Find the area of the state.**
  NJ = 7,790 square miles

- **Divide**

$$\frac{8,791,894}{7,790} = 1,129$$ **people per square mile**

Map View: 2010 Census Interactive Population Map

2010 Census Interactive Population Search

🖨 Print | ➕ Share this page

NJ - New Jersey

Population

Total Population	8,791,894

Housing Status
(in housing units unless noted)

Total	3,553,562
Occupied	3,214,360
Owner-occupied	2,102,465
Population in owner-occupied (number of individuals)	5,859,337
Renter-occupied	1,111,895

Population by Sex/Age

Male	4,279,600
Female	4,512,294
Under 18	2,065,214
18 & over	6,726,680
20 - 24	541,238
25 - 34	1,109,801
35 - 49	1,942,813
50 - 64	1,720,845
65 & over	1,185,993

Click to find area of another state and calculate the population density.

Fast Facts Study Guide
(State Areas)

This table ranks each state by area (Square Miles)

(Information from the U.S. Geological Survey.)

Rank	State Name	Area (Sq Miles)
1	Alaska	587,878
2	Texas	266,874
3	California	158,648
4	Montana	147,047
5	New Mexico	121,599
6	Arizona	114,007
7	Nevada	110,567
8	Colorado	104,100
9	Wyoming	97,818
10	Oregon	97,052

21 The population of Newark, NJ is 278,980 people in 24.14 square miles. What is its population density?

Newark, NJ

The population of Moorestown, NJ is 19,509 people in 15 square miles. What is its population density?

Moorestown, NJ

23 The population of Waco, TX is 124,009 people in 75.8 square miles. What is its population density?

Waco

24   The population of Argentina is 40,091,359 people and Argentina is 1,042,476 square miles. What is the population density?

The population of San Luis, Argentina is 432,310 people and the Provence is 29,633 square miles. What is the population density?

San Luis, Argentina

Proportions

Proportions

A proportion is an equation that states that two ratios are equivalent.

Example:

$$\frac{2}{3} = \frac{12}{18}$$

$$\frac{5}{9} = \frac{15}{27}$$

$$\frac{4}{5} = \frac{12}{15}$$

$$\frac{2}{3} = \frac{8}{9}$$

$$\frac{25}{72} = \frac{13}{24}$$

$$\frac{60}{96} = \frac{5}{8}$$

$$\frac{4}{9} = \frac{8}{16}$$

$$\frac{17}{19} = \frac{5}{7}$$

$$\frac{21}{33} = \frac{7}{11}$$

$$\frac{6}{11} = \frac{18}{33}$$

If one of the numbers in a proportion is unknown, mental math can be used to find an equivalent ratio.

Example 1:

$$\frac{2}{3} = \frac{6}{x}$$

x 3

$$\frac{2}{3} = \frac{6}{x}$$

Hint: To find the value of x, multiply 3 by 3 also.

$$\frac{2}{3} = \frac{6}{9}$$

x 3

If one of the numbers in a proportion is unknown, mental math can be used to find an equivalent ratio.

Example :

$$\frac{28}{32} = \frac{7}{x}$$

$\div 4$

$$\frac{28}{32} = \frac{7}{x}$$

Hint: To find the value of x, divide 32 by 4 also.

$$\frac{28}{32} = \frac{7}{8}$$

$\div 4$

26 **Solve the proportion using equivalent ratios?**

$$\frac{2}{5} = \frac{8}{x}$$

27 **Solve the proportion using equivalent ratios?**

$$\frac{4}{9} = \frac{x}{36}$$

28 Solve the proportion using equivalent ratios?

$$\frac{7}{2} = \frac{35}{x}$$

$$\frac{x}{60} = \frac{4}{12}$$

Solve the proportion using equivalent ratios?

$$\frac{3}{x} = \frac{21}{28}$$

In a proportion, the cross products are equal.

$$\frac{5}{2} = \frac{30}{12}$$

$$5 \cdot 12 = 2 \cdot 30$$

$$60 = 60$$

Proportions can also be solved using cross products.

$$\frac{4}{5} = \frac{12}{x}$$

Cross multiply

$$4x = 5 \cdot 12$$

$$4x = 60$$

Solve for x

$$x = 15$$

Example 2

$$\frac{7}{8} = \frac{x}{48}$$

Cross multiply

$$7 \cdot 48 = 8x$$

$$336 = 8x$$

Solve for x

31   Use cross products to solve the proportion?

$$\frac{9}{51} = \frac{x}{17}$$

Use cross products to solve the proportion?

$$\frac{x}{12} = \frac{56}{96}$$

33   Use cross products to solve the proportion?

$$\frac{45}{18} = \frac{x}{6}$$

$$\frac{2}{15} = \frac{x}{60}$$

35 **Use cross products to solve the proportion?**

$$\frac{7}{x} = \frac{3}{21}$$

Direct & Indirect Relationships
in
Tables & Graphs

You can determine if a relationship is proportional by looking at a table of values or the graph.

How?

Table
If all the ratios of numbers in the table are equivalent, the relationship is proportional.
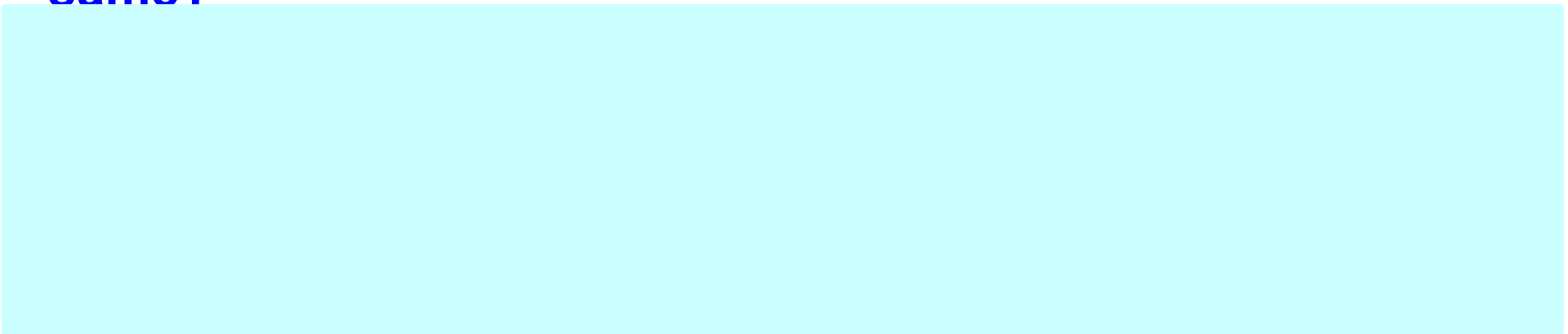
Graph
If the graph of the numbers forms a straight line through the origin (0,0), the relationship is proportional.

On a field trip, every chaperone is assigned 12 students. Is the student to chaperone ratio proportional?

If you use a table to demonstrate, you would need several ratios to start.

Chaperones	1	2	3	4	5
Students					

Next, find the simplified ratios and compare them. Are they the same?

Try this:

The local pizza place sells a plain pie for $10. Each topping costs an additional $1.50. Is the cost of pizza proportional to the number of toppings purchased?

Toppings	1	2	3	4
Cost ($)				

Is the relationship shown in the table proportional?

○ Yes

○ No

Year	1	2	4	5
Income	$22,000	$44,000	$88,000	$110,000

Is the relationship shown in the table proportional?

○ Yes

○ No

x	2	5	6	9
y	7	17.5	21	34.5

Is the relationship shown in the table proportional?

○ Yes

○ No

x	1	2	6	9
y	5	11	31	46

39 Is the relationship shown in the table proportional?

○ Yes

○ No

x	1	2	4	7
y	4	8	16	35

40 Is the relationship shown in the table proportional?

○ Yes

○ No

x	2	4	6	8
y	-3	-10	-15	-20

Remember:

Table
If all the ratios of numbers in the table are equivalent, the relationship is proportional.

Graph
If the graph of the numbers forms a straight line through the origin (0,0), the relationship is proportional.

On a field trip, every chaperone is assigned 12 students. Is the student to chaperone ratio proportional?

Chaperones	1	2	3	4	5
Students	12	24	36	48	60

Connected points form a straight line

Line crosses through the origin
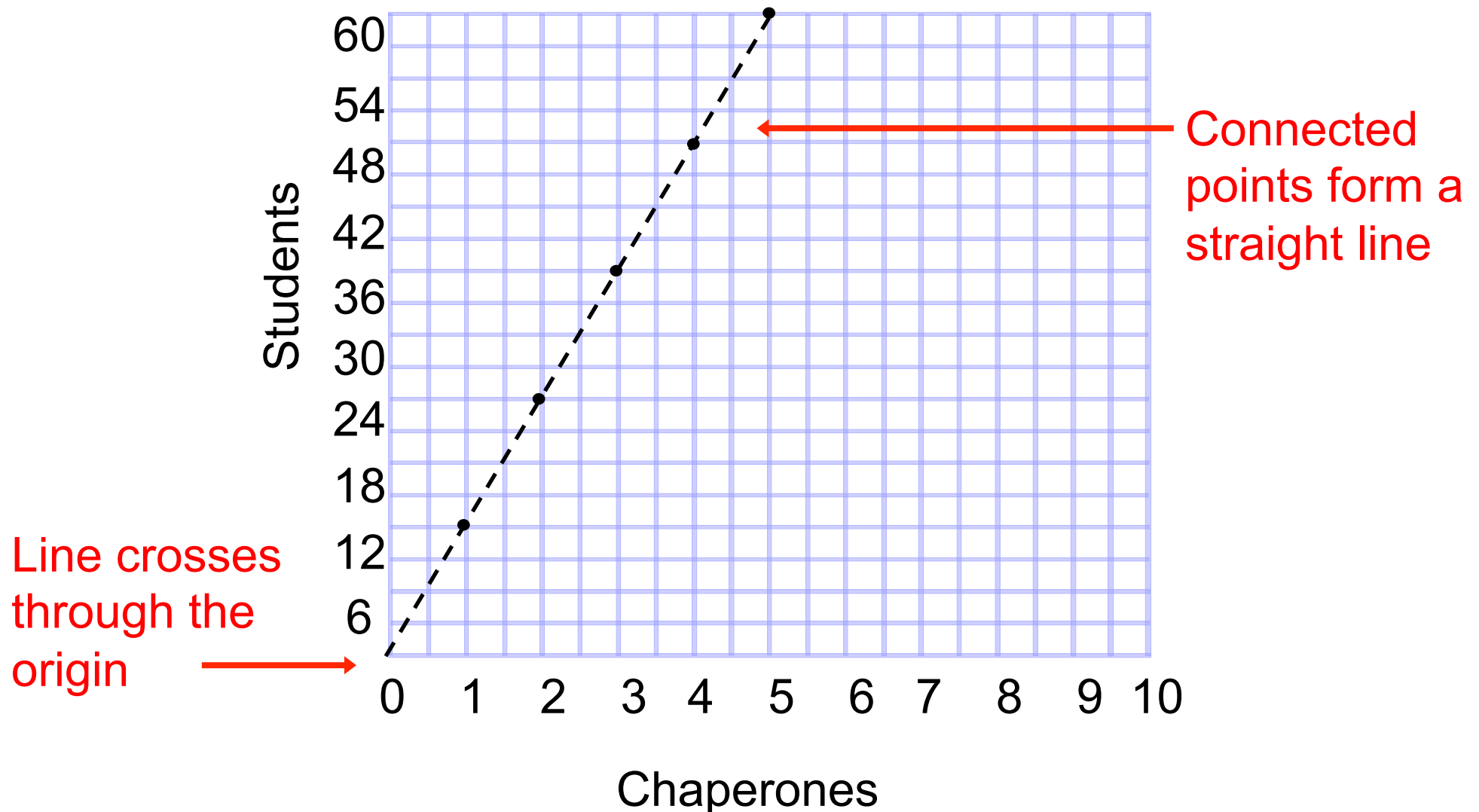
Example.

Draw a graph to represent the relationship. Is the relationship proportional?

X	Y
1	5.5
2	7
3	8.5
4	10
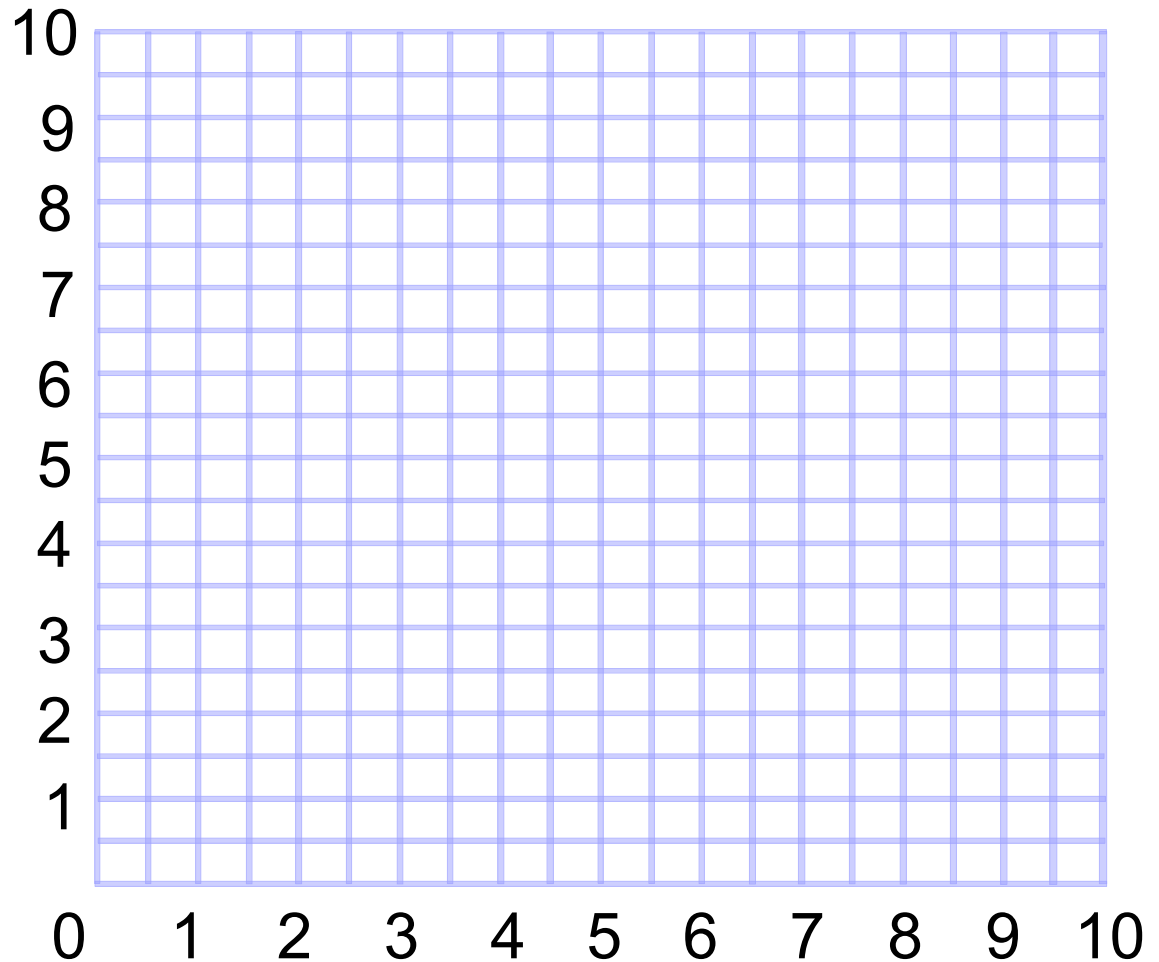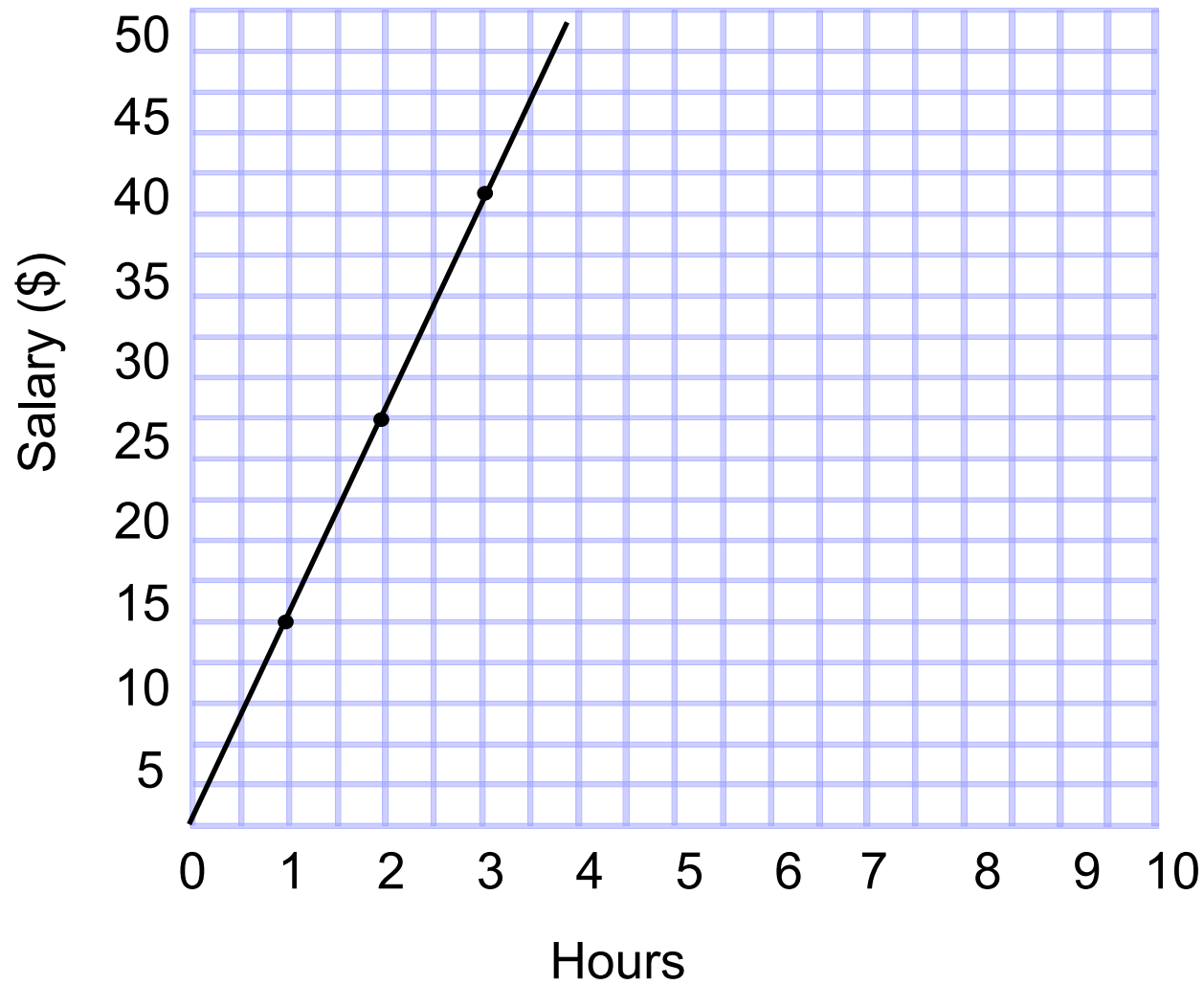
○ **Yes**

○ **No**

Is the relationship shown in the graph proportional?

○ **Yes**

○ **No**

Is the relationship shown in the graph proportional?

○ **Yes**

○ **No**

○ **Yes**

○ **No**

◯ **Yes**

◯ **No**
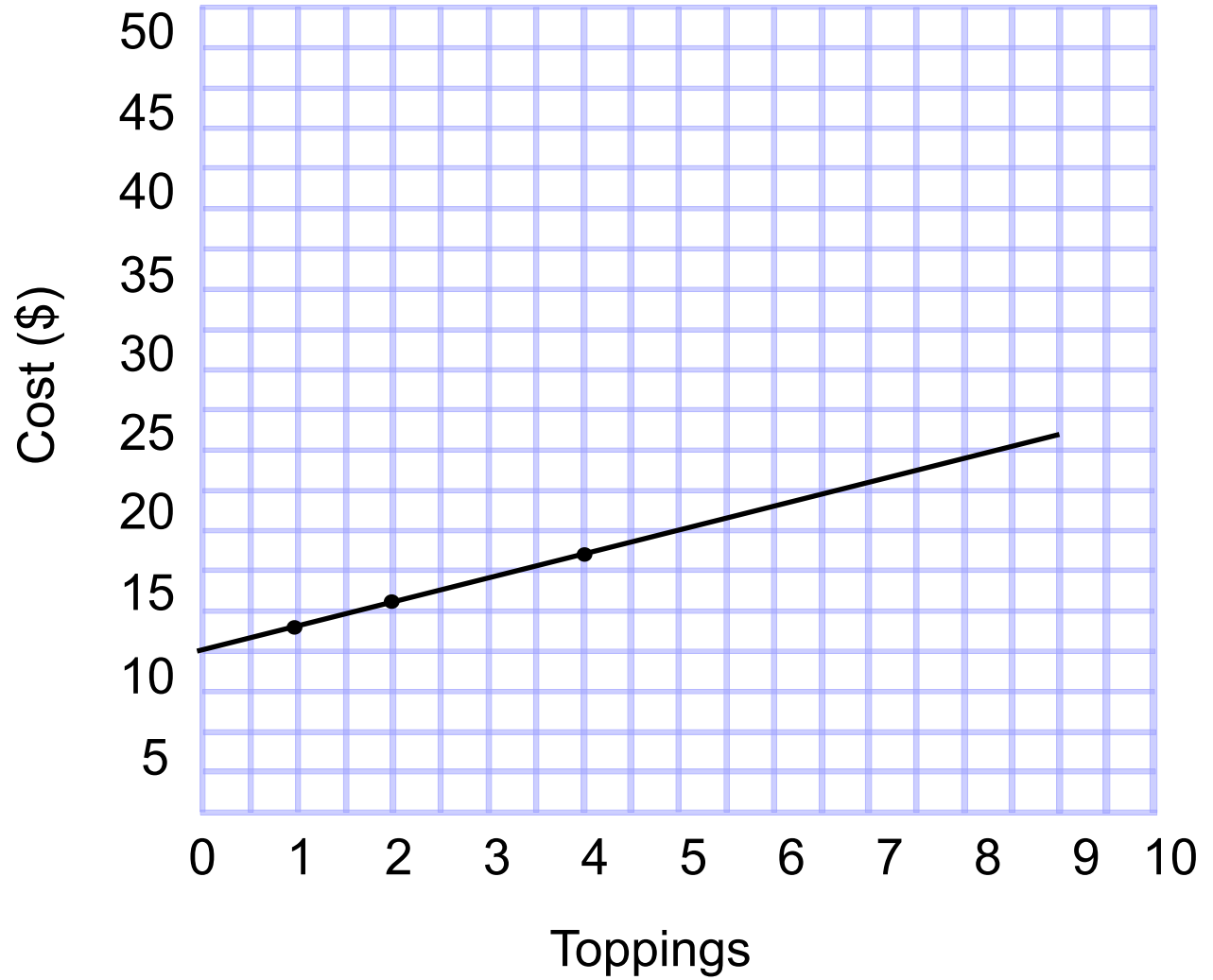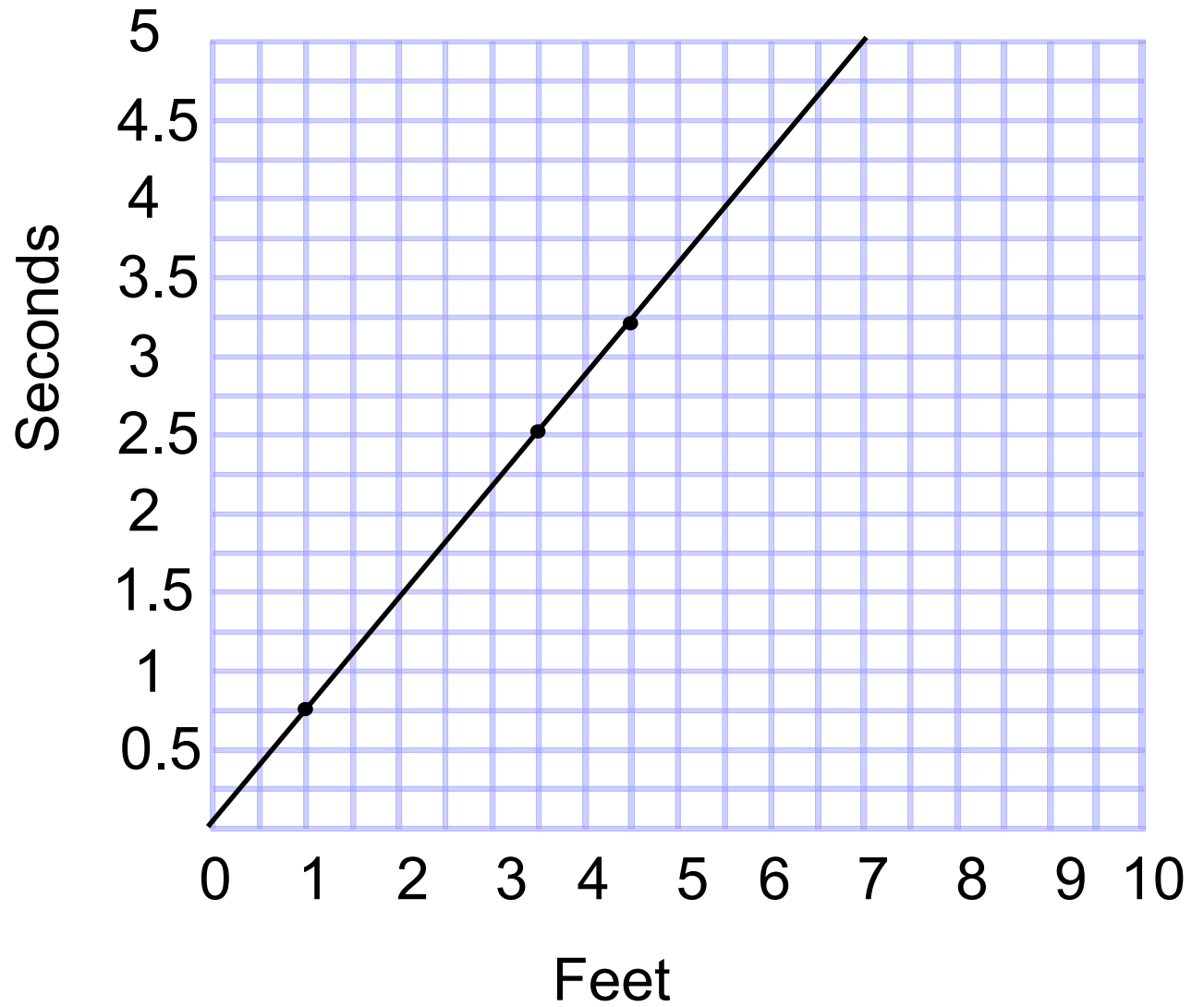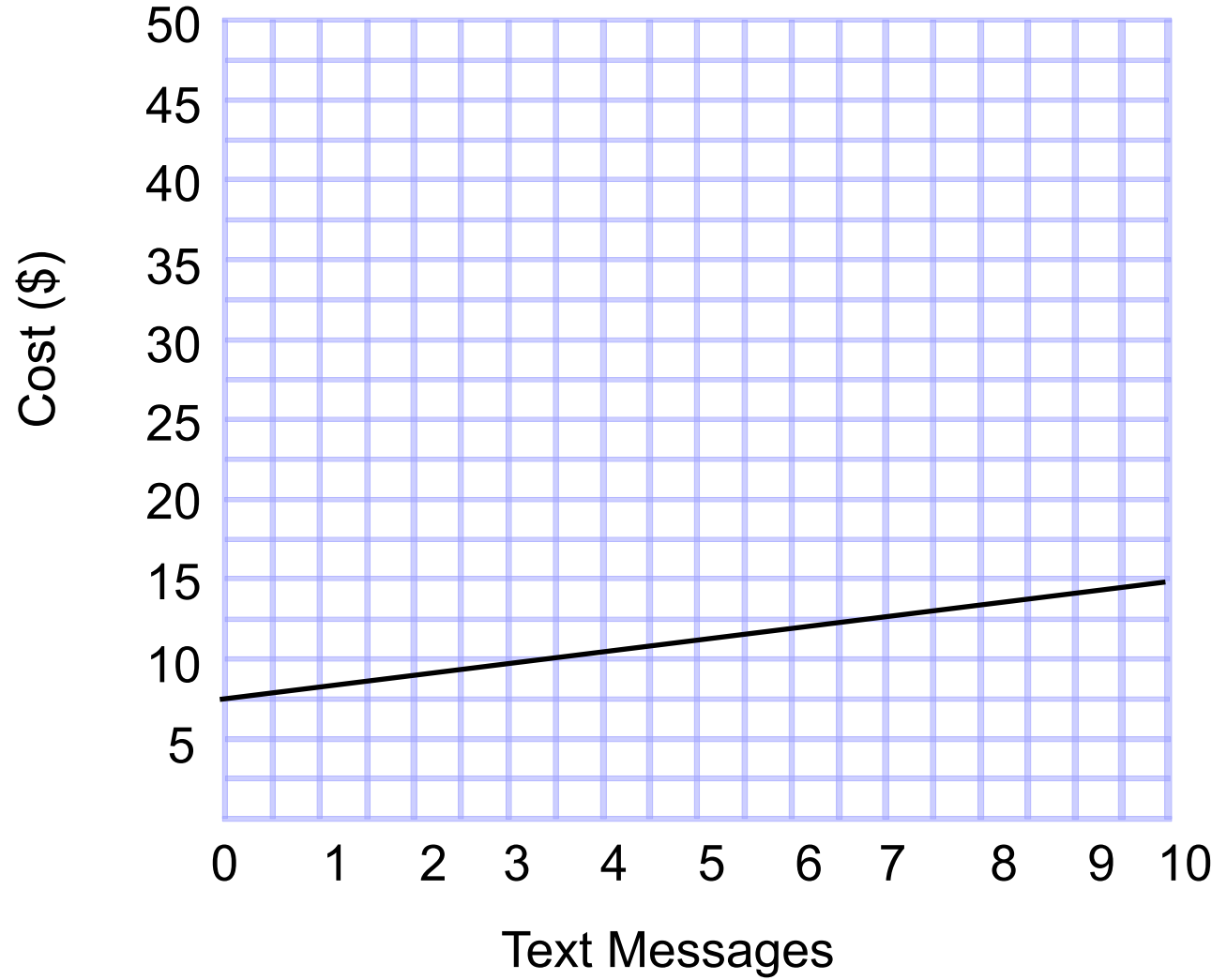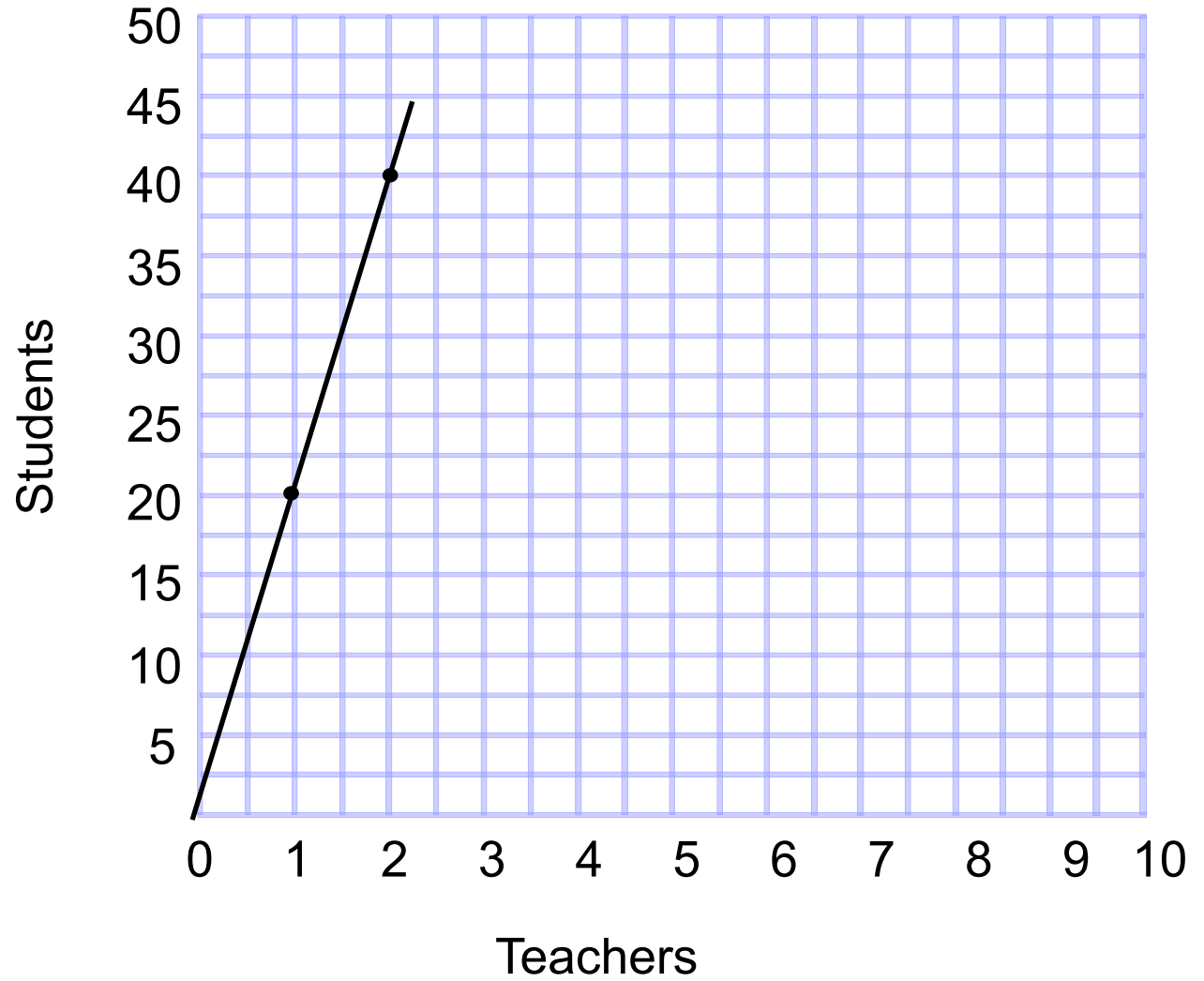
Constant of Proportionality

The constant of proportionality is a constant ratio (unit rate) in any proportional relationship.

We use the letter *k* to represent the constant of proportionality.

Equations:

$$y = kx \quad \text{or} \quad k = \frac{y}{x}$$

We can find the constant of proportionality from a table of values, equation and a graph.

In a table, simplify any one of the ratios.

Chaperones	1	2	3	4	5
Students	12	24	36	48	60

$$k = \frac{y}{x} = \frac{36}{3} = 12$$

Find the constant of proportionality:

Apples (lbs)	2	2.5	3	3.5	4
Cost ($)	3.96	4.95	5.94	6.93	7.92

Click

Find the constant of proportionality:

X	Y
3	4.5
4	6
5	7.5
8	12
9	13.5

Click

Find the constant of proportionality.

X	Y
2	1.5
5	3.75
10	7.5
12	9

Find the constant of proportionality.

X	Y
2	2.5
3	3.75
4	5
9	11.25

Find the constant of proportionality.

X	Y
50	3
75	4.5
100	6
140	8.4

In an equation, write the equation in the form y = kx.

Examples:

$y = 5x$

Click

$y = \dfrac{1}{4}x$

Click

$y = 3.5x$

Click

Find the constant of proportionality:
(click to reveal)

$y = 3.6x$

$y = 53x$

$y = 0.38x$

$y = \dfrac{3}{8}x$

$y = \dfrac{2}{3}x$

$y = 1.85x$

49   **Find the constant of proportionality.**

$$y = \frac{1}{9}x$$

50 **Find the constant of proportionality.**

$$y = 12.9x$$

51   **Find the constant of proportionality.**

$$y = 0.45x$$

In a graph, choose a point (x, y) to find and simplify the ratio.
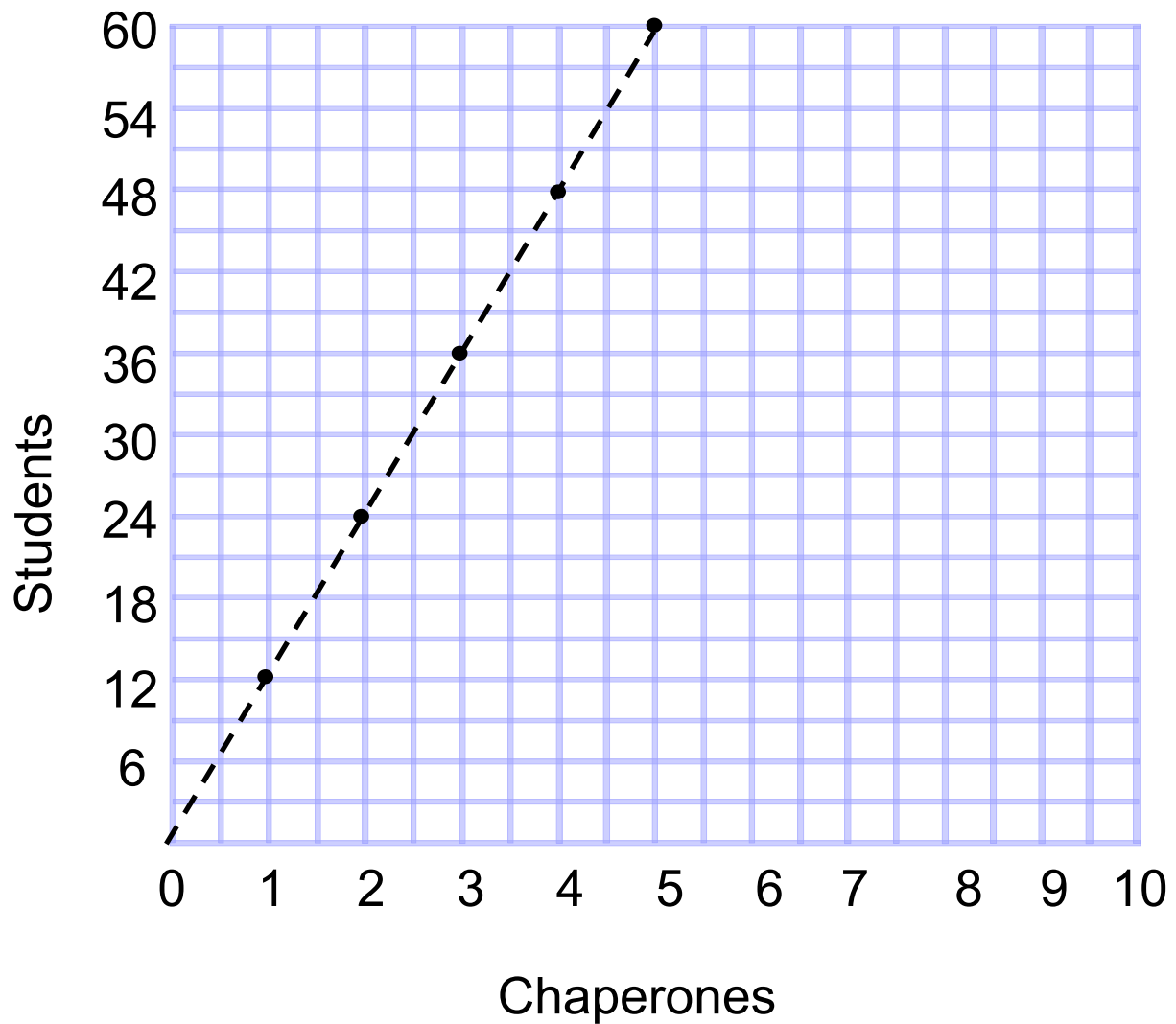
(2, 24)

$$k = \frac{y}{x} = \frac{24}{2} = 12$$

Find the constant of proportionality.

Click
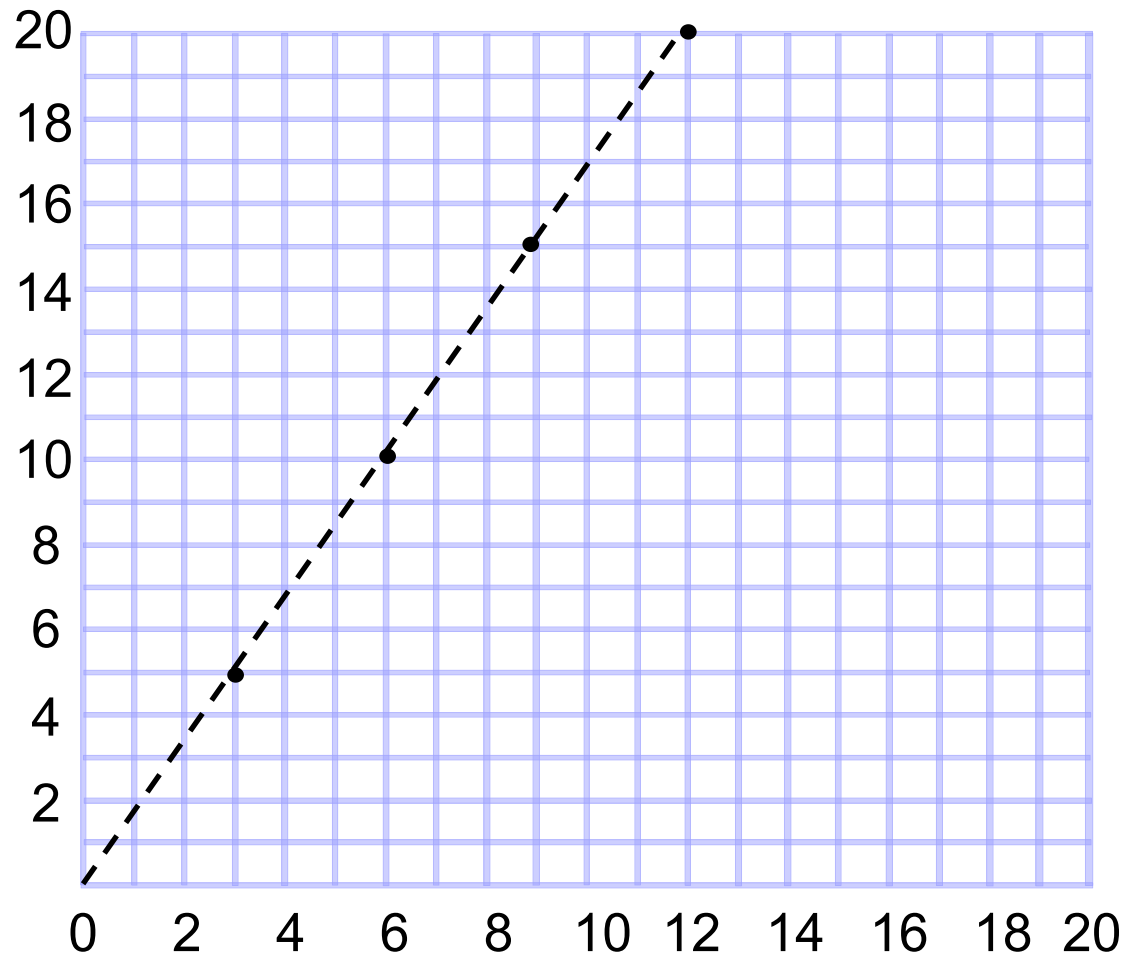
Find the constant of proportionality.
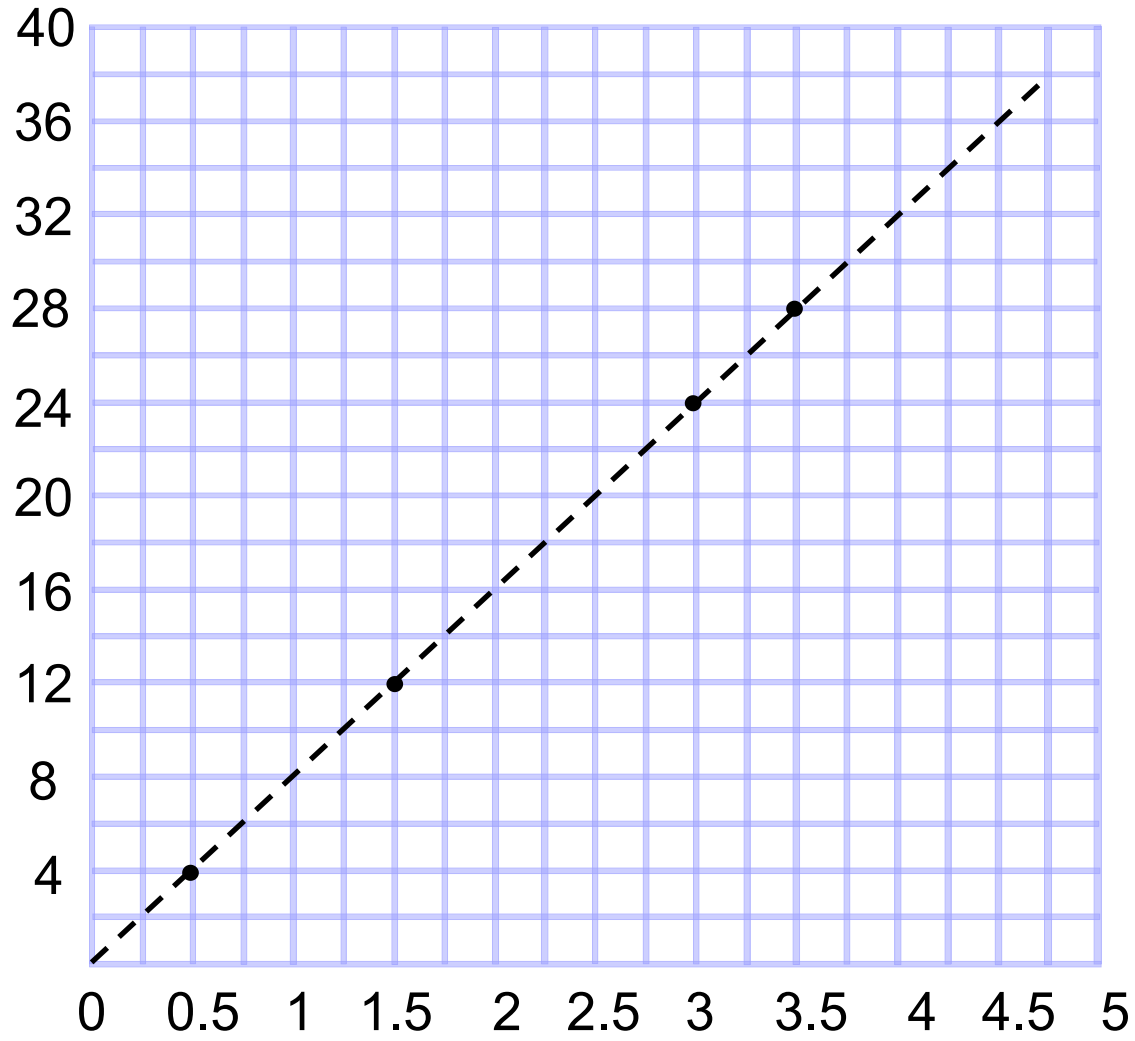
53   Find the constant of proportionality.
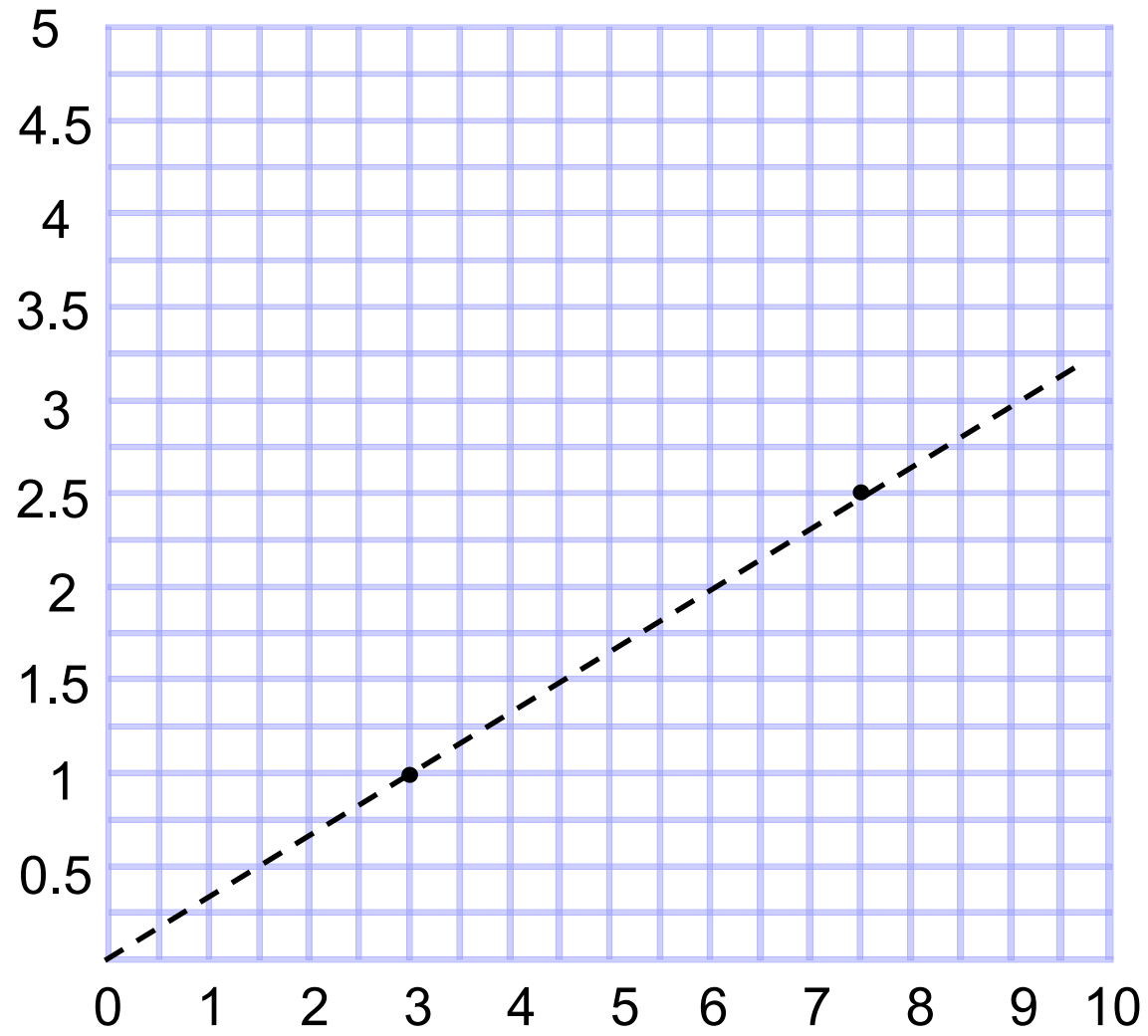
Find the constant of proportionality.
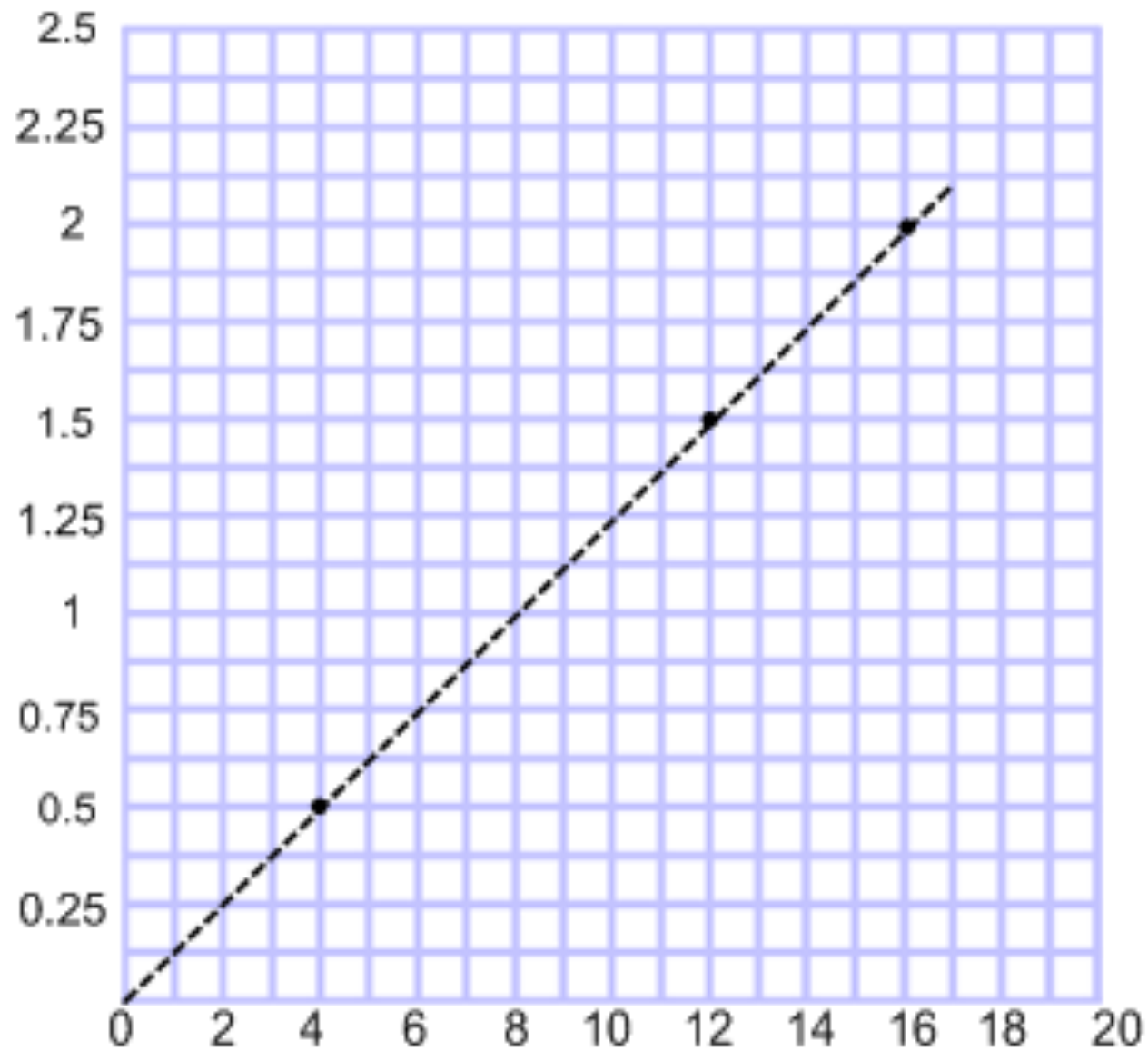
Writing Equations
For Proportions

The constant of proportionality and the unit rate are equivalent.

We can use the constant of proportionality to help write equations using proportional relationships.

By transforming the equation from: $k = \dfrac{y}{x}$ to y = kx, we can

write an equation that can be applied to various situations.

*Remember: x is the independent variable and y is the dependent variable. This means that a change in x will effect y.

EXAMPLE

You are buying Jersey Tomatoes for a cost of 2 pounds for $3.98. Write an equation to represent the proportional relationship.
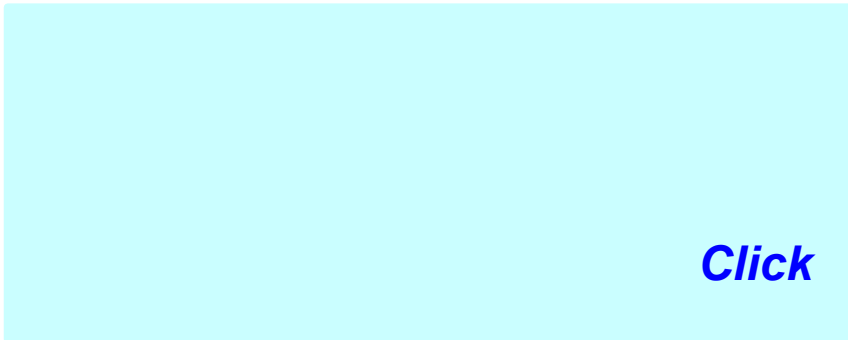
- **Let c = cost**
      p = pounds

TRY THIS:

At the candy store, you purchase 5 lbs for $22.45. Write an equation to represent the proportional relationship.

- Let c = cost
    p = pounds

- Determine the unit rate:

  Click

- Write an equation to relate the two quantities:

  Click

Write an equation to represent the proportional relationship shown in the table.

Gallons	10	15	20	25
Miles	247	370.5	494	617.5

$$k = \frac{m}{g} = \frac{247}{10} = \frac{24.7}{1}$$

**Let g = gallons
     m = miles**

Click

55 Write an equation that represents the proportional relationship.

The total cost (c) of grapes for $1.40 per pound(p)

○ A $c = 1.4p$

○ B $p = 1.4c$

Write an equation that represents the proportional relationship.

Shirts	5	15	25	35
Cost	$57.50	$172.50	$287.50	$402.50

○ A   s = 11.5c

○ B   c = 11.5s

○ C   c = 0.09s

○ D   s = 0.09c

Write an equation that represents the proportional relationship.

A $y = \dfrac{1}{3}x$

B $y = 3x$

C $y = 2.5x$

D $y = 7.5x$
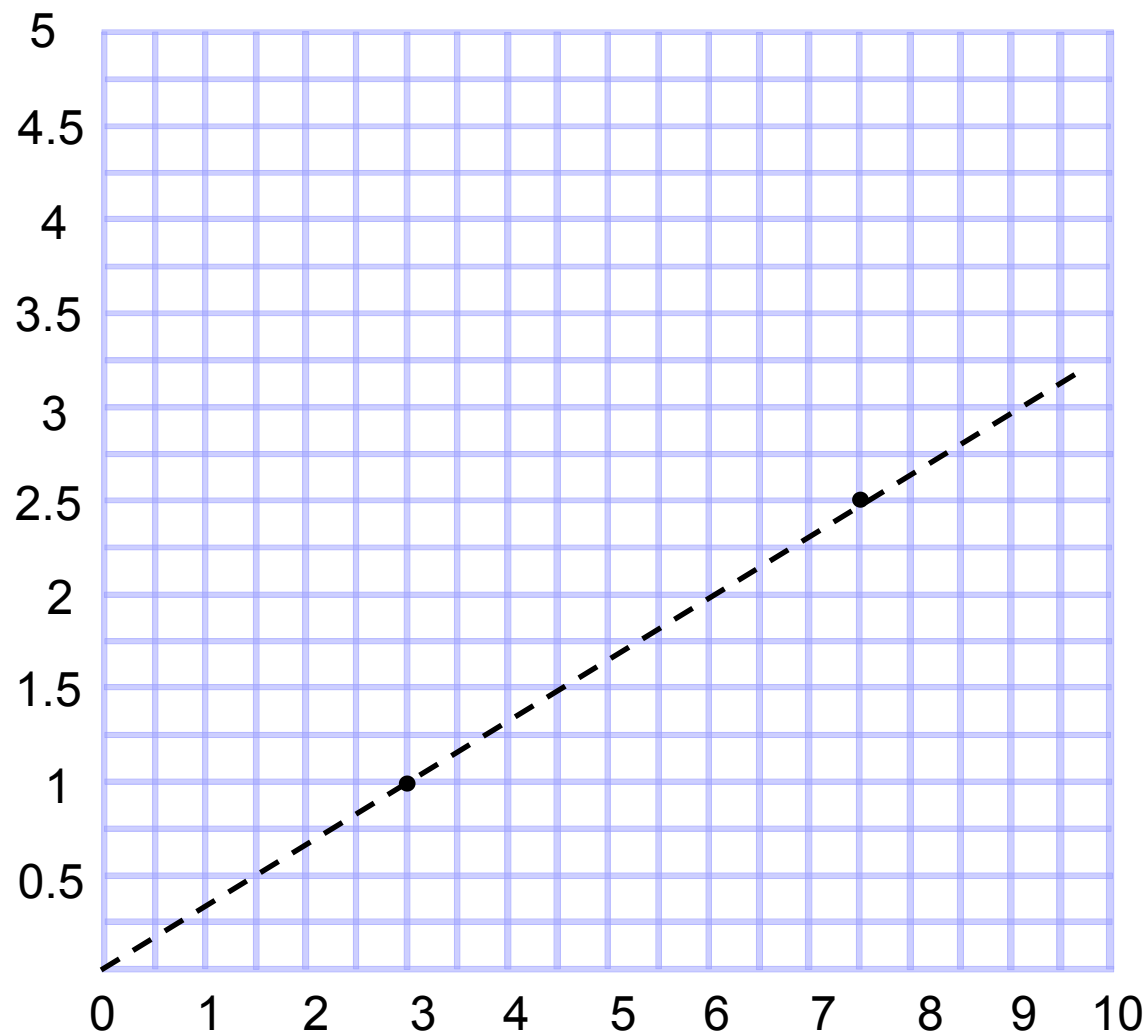
58   Write an equation that represents the proportional relationship.

You are ordering new menus for your restaurant. You pay $362.50 for 50 menus.

○ A $c = 0.14m$

○ B $m = 7.25c$

○ C $m = 0.14c$

○ D $c = 7.25m$

59 Write an equation that represents the proportional relationship.

Days, d	2	3	4	5
Hours, h	17	25.5	34	42.5

A $d = 8.5h$

B $d = \dfrac{2}{17}h$

C $h = \dfrac{2}{17}d$

D $h = 8.5d$

Understanding Graphs
of Proportions

Return to Table
of Contents

Remember, you can use a graph to determine if a relationship is proportional. How?

If the graph is a straight line going through the origin (0, 0).

Once you determine that the relationship is proportional, you can calculate *k*, the constant of proportionality. Then, write an equation to represent the relationship.

What do these equations mean? Once we have determined the equation, we can understand what the graph was showing us visually.

EXAMPLE

The jitneys in Atlantic City charge passengers for rides. What amount do they charge per ride?

- **Find a point on the graph**

  Click

- **Use the point to find the unit rate**

  Click

- **What does the unit rate represent?**

  Click

- **What coordinate pair represents the unit rate?**

  Click

- **Does the line run through the unit rate?**

  Click

Dollars (y-axis) vs. Passengers (x-axis)
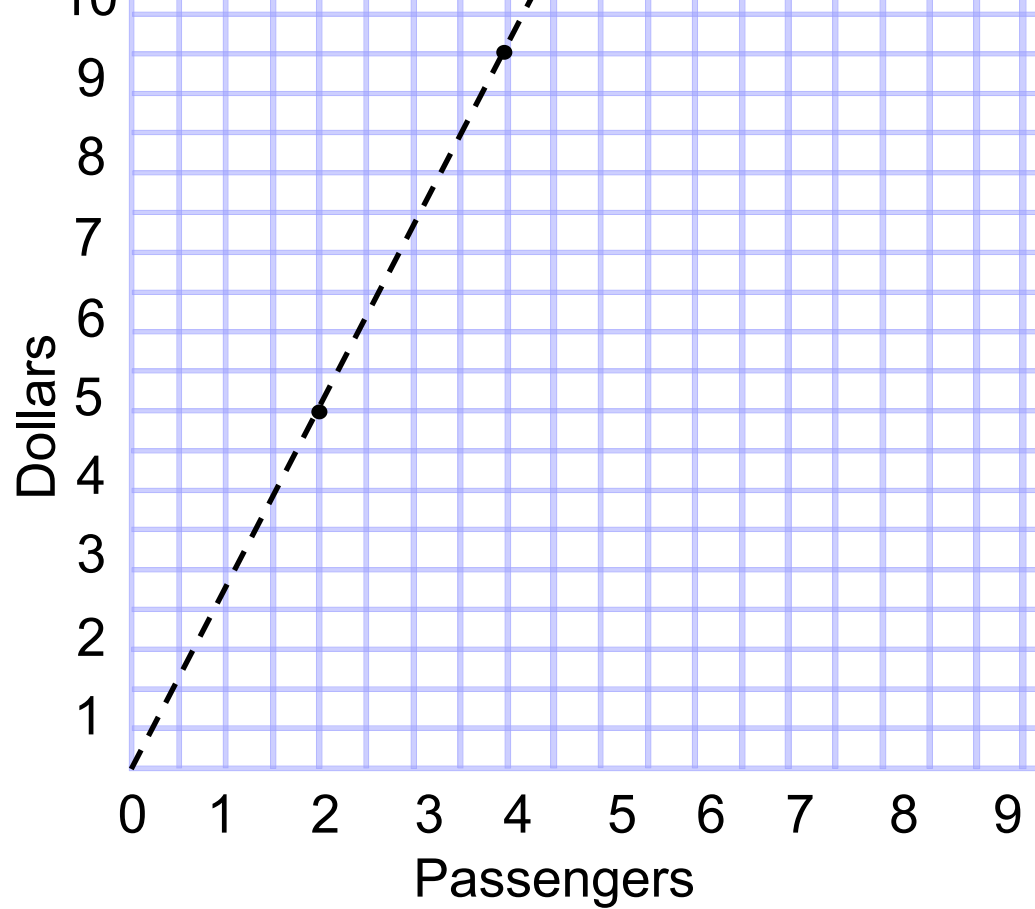
EXAMPLE

Mark drives to work each day. His gas mileage is shown in the graph. What is the unit rate? What does it represent?

- **Find a point on the graph**

  Click

- **Use the point to find the unit rate**

  Click

- **What does the unit rate represent?**

  Click

- **What coordinate pair represents**

  Click

- **Does the line run through the unit rate?**

TRY THIS

Jasmine gets paid for every dog that she walks according to the graph at the right. What does she earn per dog?

- **Find a point on the graph**

  Click

- **Use the point to find the unit rate**

  Click

- **What does the unit rate represent?**

  Click

- **What coordinate pair represents the unit rate?**
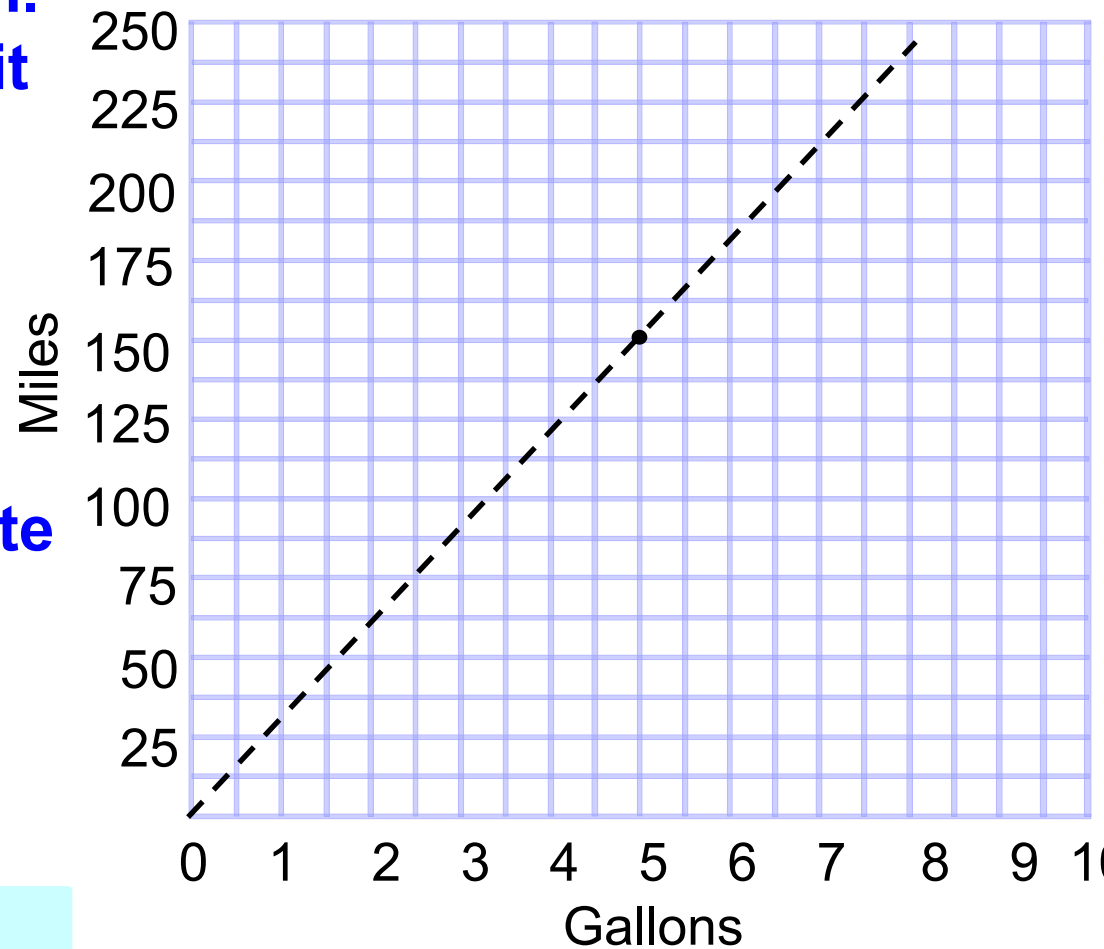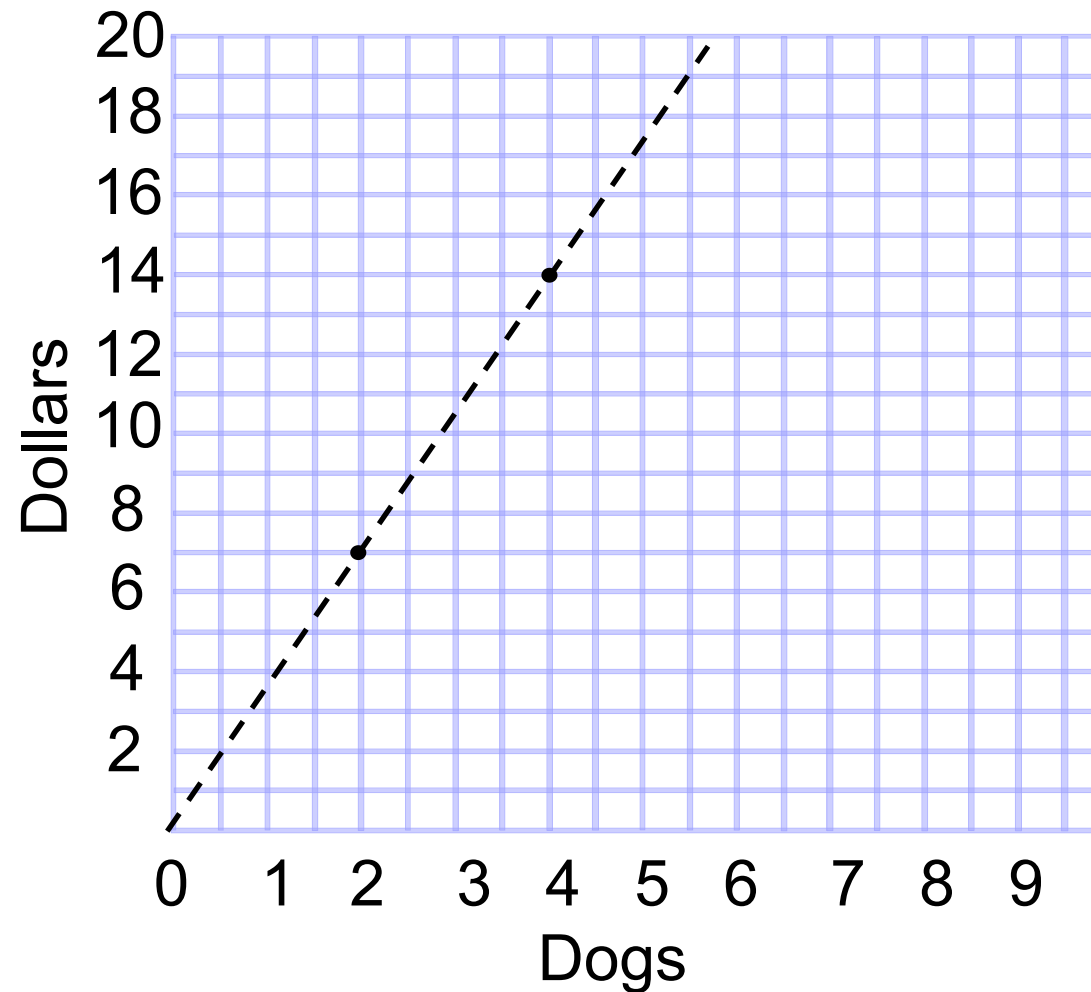
  Click

- **Does the line run through the unit rate?**

  Click

TRY THIS

Mary drives the bus. Her rate is shown in the graph. What is the unit rate? What does it represent?

- **Find a point on the graph**

  Click

- **Use the point to find the unit rate**

  Click

- **What does the unit rate represent?**

  Click

- **What coordinate pair represents the unit rate?**
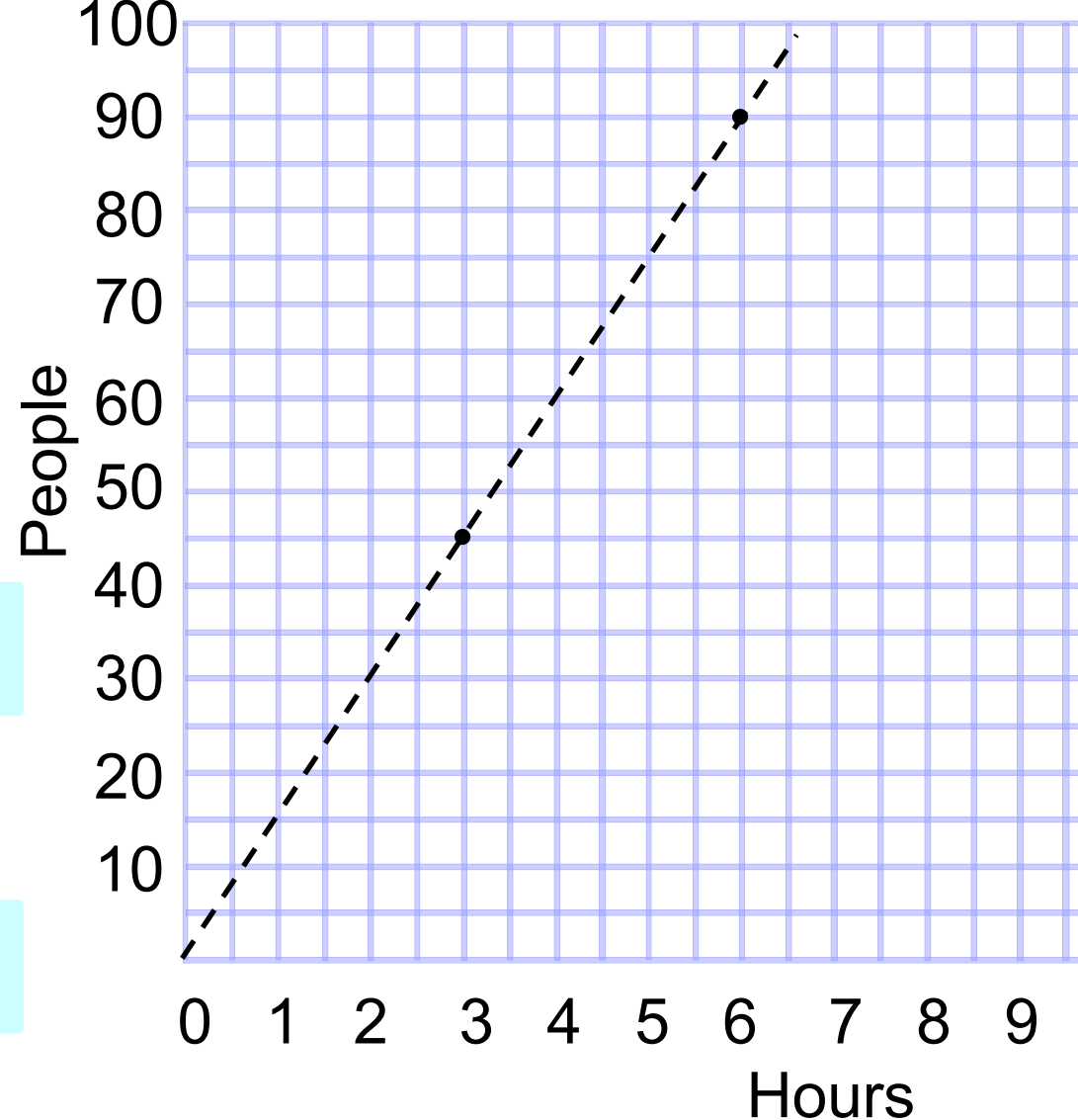
  Click

- **Does the line run through the unit rate?**

  Click

Problem Solving

Chocolates at the candy store cost $6.00 per dozen. How much does one candy cost? Round your answer to the nearest cent.

Solution:

$$\frac{\$}{\text{candy}} \qquad \frac{6.00}{12} = \frac{x}{1}$$

(Use equivalent rates to set up a proportions)

$$6.00\,(1) = 12x$$

$$0.50 = x$$

$0.50 per candy

Example 2:

There are 3 books per student. There are 570 students. How many books are there?

Set up the proportion:

Books
Students

$$\frac{3}{1} = \underline{\hspace{3cm}}$$ Where does the 570 go?

$$\frac{3}{1} = \frac{x}{570}$$

$3 \cdot 570 = 1x$

$x = 1{,}710$ books

Example 3:

The ratio of boys to girls is 4 to 5. There are 135 people on a team. How many are girls?

Set up the proportion:

<u>Girls</u>
People   How did we determine this ratio?

$$\frac{5}{9} = \underline{\hspace{3cm}}$$ Where does the 135 go?

$$\frac{5}{9} = \frac{x}{135}$$

$$5 \cdot 135 = 9x$$

$$675 = 9x$$

$$x = 75$$

60 **Cereal costs $3.99 for a one pound box. What is the price per ounce? Round your answer to the nearest penny.**

61 **Which is the better buy?**

Brand A: $2.19 for 12 ounces

Brand B: $2.49 for 16 ounces

○ A Brand A

○ B Brand B

62   **There are 4 girls for every 10 boys at the party. There are 56 girls at the party. How many boys are there?**

63 **The farmer has cows and chickens. He owns 5 chickens for every cow. He has a total of 96 animals. How many cows does he own?**

64 The auditorium can hold 1 person for every 5 square feet. It is 1210 square feet. How many people can the auditorium hold?

65 The recipe for one serving calls for 4 oz of beef and 2 oz of bread crumbs. 50 people will be attending the dinner. How many ounces of bread crumbs should be purchased?

66 **Mary received 4 votes for every vote that Jane received. 1250 people voted. How many votes did Jane receive?**

67 To make the desired shade of pink paint, Brandy uses 3 oz. of red paint for each oz. of white paint. She needs one quart of pink paint. How many oz. of red paint will she need?
(1 quart = 32 ounces)

Making Sense of
Your Answers

Sometimes your answer will be a decimal or fraction that may not make sense as an answer.

Double check:
- Reread the problem
- Does your answer make sense?
- Do you need to round your answer?
- If so, which way should you round your answer?

68 Cole earned a total of $11 by selling 8 cups of lemonade. How many cups of lemonade does Cole need to sell in all to earn $15? Assume the relationship is directly proportional.

69   **Hayley learned a total of 13 appetizer recipes over the course of 3 weeks of culinary school. How many weeks does she need to complete to have learned 21 appetizers? Assume the relationship is directly proportional.**

70 Kailyn took a total of 2 quizzes over the course of 5 days. After attending 16 days of school this quarter, how many quizzes will Kailyn have taken in total? Assume the relationship is directly proportional.

71   Brittany baked 18 cookies with 1 cup of flour. How many cups of flour does Brittany need in order to bake 27 cookies? Assume the relationship is directly proportional.

72   Shane caught a total of 10 fish over the course of 2 days on a family fishing trip. At the end of what day will Shane have caught his 22 fish? Assume the relationship is directly proportional.

73 In a sample of 50 randomly selected students at a school, 38 students eat breakfast every morning. There are 652 students in the school. Using these results, predict the number of students that eat breakfast.

○ A   76

○ B   123

○ C   247

○ D   496

Scale Drawings

Scale drawings are used to represent objects that are either too large or too small for a life size drawing to be useful.

Examples:

A life size drawing of an ant or an atom would be too small to be useful.

A life size drawing of the state of New Jersey or the Solar System would be too large to be useful.

A scale is always provided with a scale drawing.

The *scale* is the ratio: $$\frac{drawing}{real\ life\ (actual)}$$

When solving a problem involving scale drawings you should:

- **Write the scale as a ratio**
- **Write the second ratio by putting the provided information in the correct location (drawing on top & real life on the bottom)**
- **Solve the proportion**

Example:

This drawing has a scale of "1:10", so anything drawn with the size of "1" would have a size of "10" in the real world, so a measurement of 150mm on the drawing would be 1500mm on the real horse.

Real Horse
1500 mm high
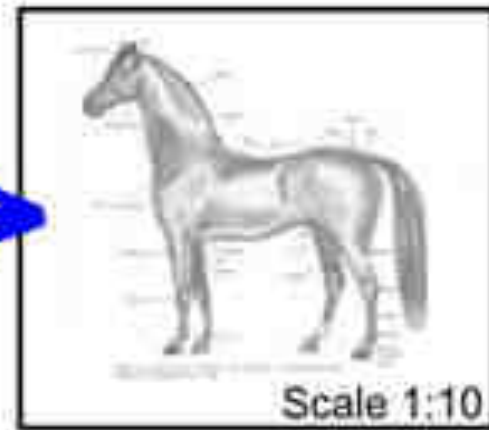
Drawn Horse
150 mm high

Scale 1:10

Example:

The distance between Philadelphia and San Francisco is 2,950 miles. You look on a map and see the scale is 1 inch : 100 miles. What is the distance between the two cities on the map?

$$\frac{\text{drawing}}{\text{actual}} = \frac{1}{100}$$ *Write the scale as a ratio*

$$\frac{1}{100} = \frac{x}{2950}$$

100x = 2950
x = 29.5

29.5 inches on the map

On a map, the distance between your town and Washington DC is 3.6 inches. The scale is 1 inch : 55 miles. What is the distance between the two cities?

74 On a map with a scale of 1 inch =100 miles, the distance between two cities is 7.55 inches. If a car travels 55 miles per hour, about how long will it take to get from one city to the other.

○ A 13 hrs 45 min.

○ B 14 hrs 30 min.

○ C 12 hrs

○ D 12 hrs 45 min.

75 On a map, the scale is 1/2 inch= 300 miles. Find the actual distance between two stores that are 5 1/2 inches apart on the map.

○ A 3000 miles

○ B 2,727 miles

○ C 3,300 miles

○ D 1,650 miles

76 The figure is a scale of the east side of a house. In the drawing, the side of each square represents 4 feet. Find the width and height of the door.

○ A   4 ft by 9 ft

○ B   4 ft by 12 ft

○ C   4 ft by 8 ft

○ D   4 ft by 10 ft
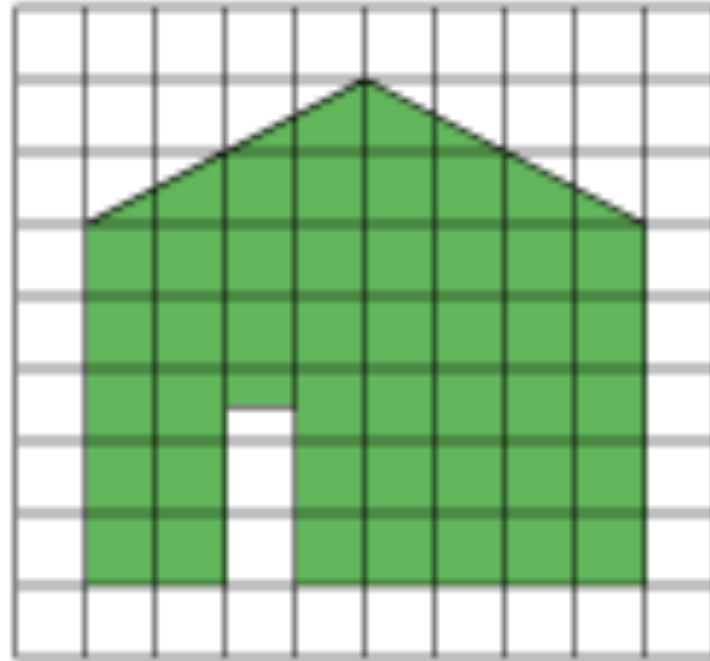
77   The distance between Moorestown, NJ and Duck, NC is 910 miles. What is the distance on a map with a scale of 1 inch to 110 miles?

78   The distance between Philadelphia and Las Vegas is 8.5 inches on a map with a scale 1.5 in : 500 miles . What is the distance in miles?

79 **You are building a room that is 4.6 m long and 3.3 m wide. The scale on the architect's drawing is 1 cm : 2.5 m. What is the length of the room on the drawing?**

80 You are building a room that is 4.6 m long and 3.3 m wide. The scale on the architect's drawing is 1 cm : 2.5 m. What is the width of the room on the drawing?

81 Find the length of a 72 inch wide wall on a scale drawing with a scale 1 inch : 2 feet.

82 You recently purchased a scale model of a car. The scale is 15 cm : 10 m. What is the length of the model car if the real car is 4 m?

83 You recently purchased a scale model of a car. The scale is 15 cm : 10 m. The length of the model's steering wheel is 1.25 cm. What is the actual length of the steering wheel?

Similar Figures

Two objects are similar if they are the same shape but different sizes.

In similar objects:
- **corresponding angles are congruent**
- **corresponding sides are proportional**

To check for similarity:

- **Check to see that corresponding angles are congruent**
- **Check to see that corresponding sides are proportional (Cross products are equal)**

Example:

Is the pair of polygons similar? Explain your answer.

4 yd

6 yd

3 yd

4.5 yd
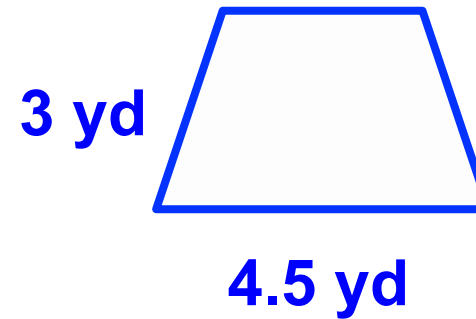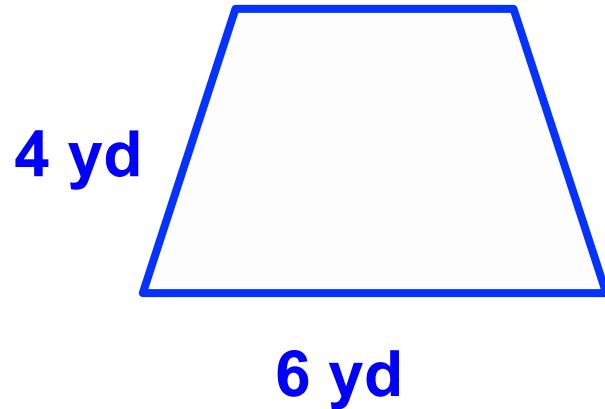
$$\frac{4}{6} = \frac{3}{4.5}$$

$4(4.5) = 6(3)$

$18 = 18$

YES

OR

$$\frac{4}{3} = \frac{6}{4.5}$$

$4(4.5) = 6(3)$

$18 = 18$

YES

Example:

Is the pair of polygons similar? Explain your answer.

8 m

5 m

10 m

13 m
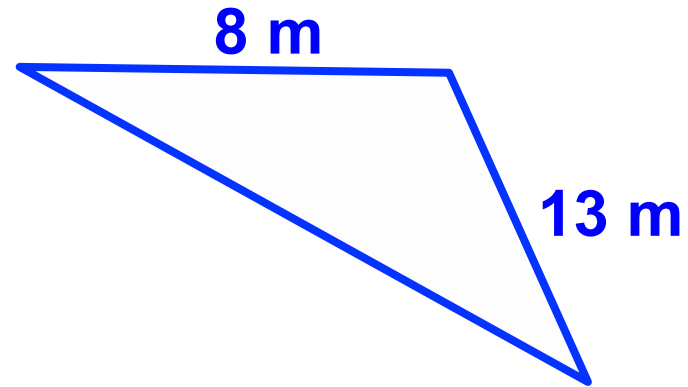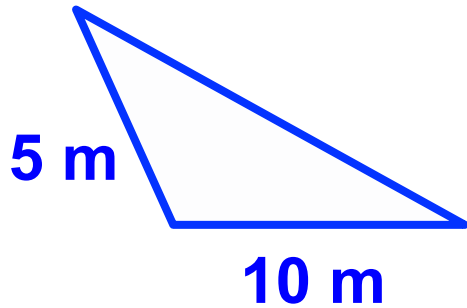
$$\frac{5}{10} = \frac{8}{13}$$

5(13) = 10(8)

65 = 80

NO

OR

$$\frac{5}{8} = \frac{10}{13}$$

5(13) = 8(10)

65 = 80

NO

84 **Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)**

○ Yes

○ No

15 ft

9 ft

21 ft

12 ft

85 **Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)**

○ Yes

○ No

10 m

8 m

2.5 m

2 m

Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)

○ Yes

○ No

37.5 yd

15 yd

15 yd

6 yd
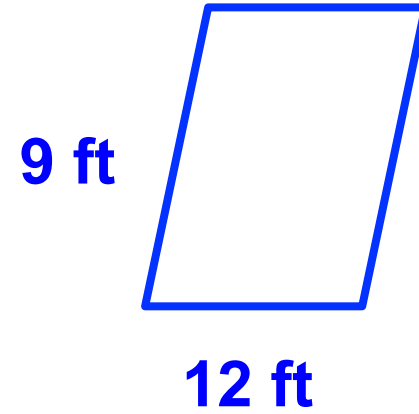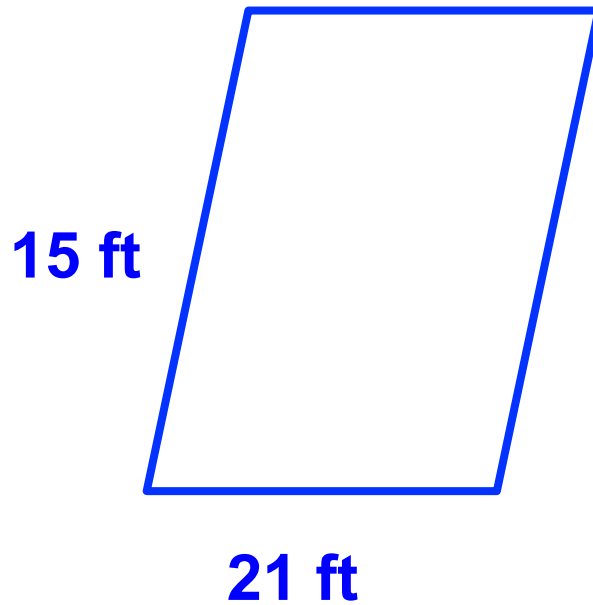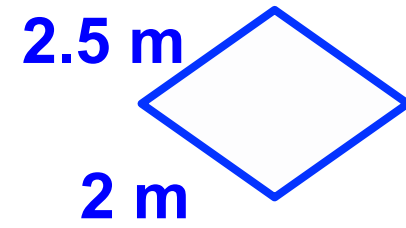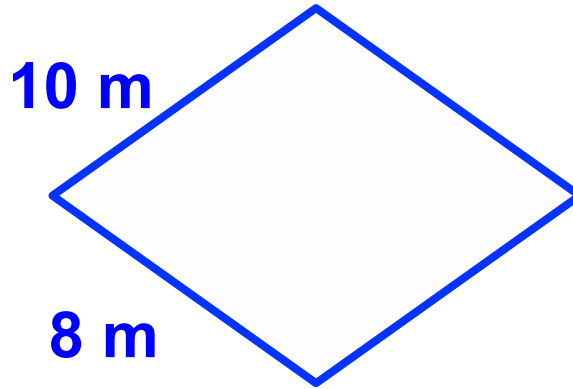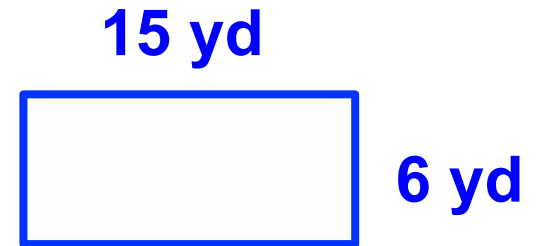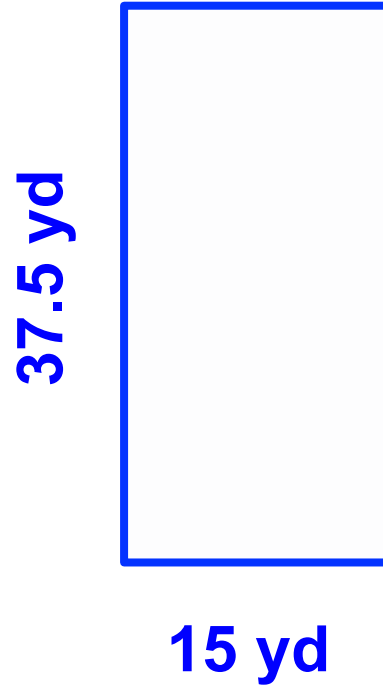
Example:

Find the value of *x* in the pair of similar polygons.

15 cm

x

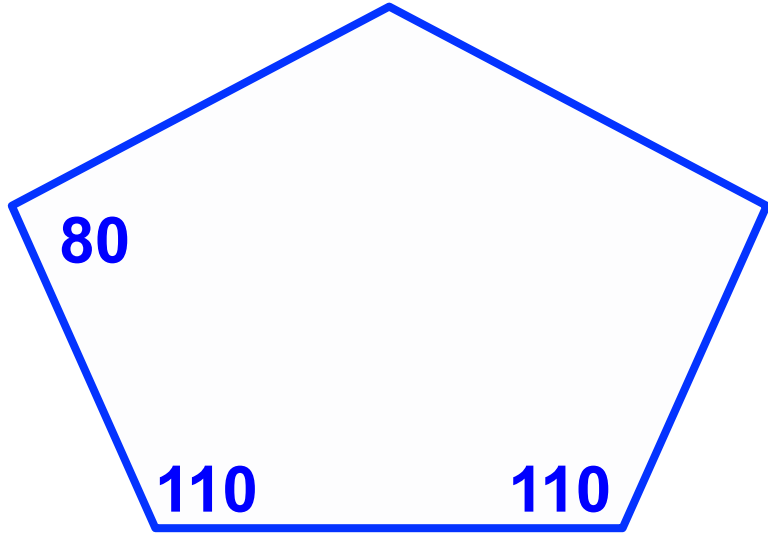10 cm

6 cm

8 cm
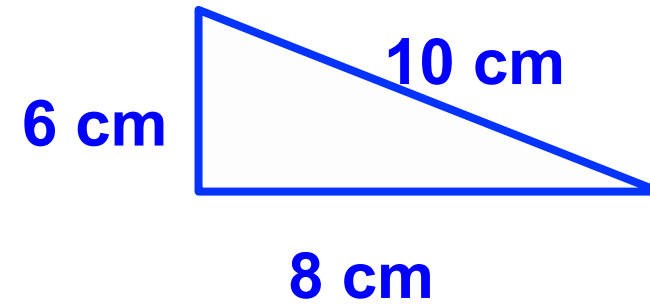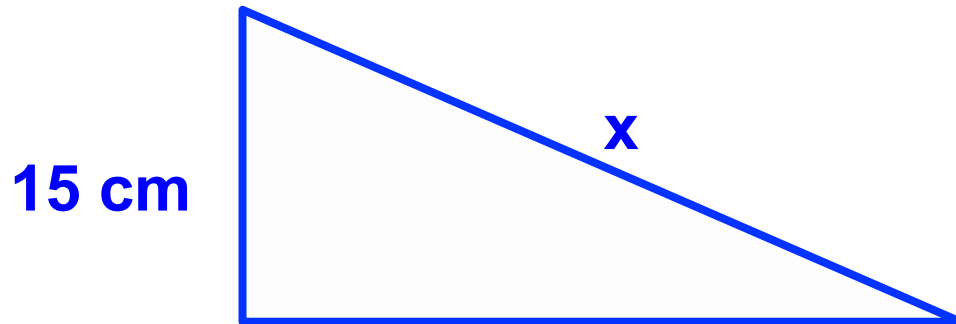
$$\frac{15}{x} = \frac{6}{10}$$

15(10) = 6x

150 = 6x

25 cm = x

OR

$$\frac{15}{6} = \frac{x}{10}$$

15(10) = 6x

150 = 6x

25 cm = x

Try This:

Find the value of *y* in the pair of similar polygons.
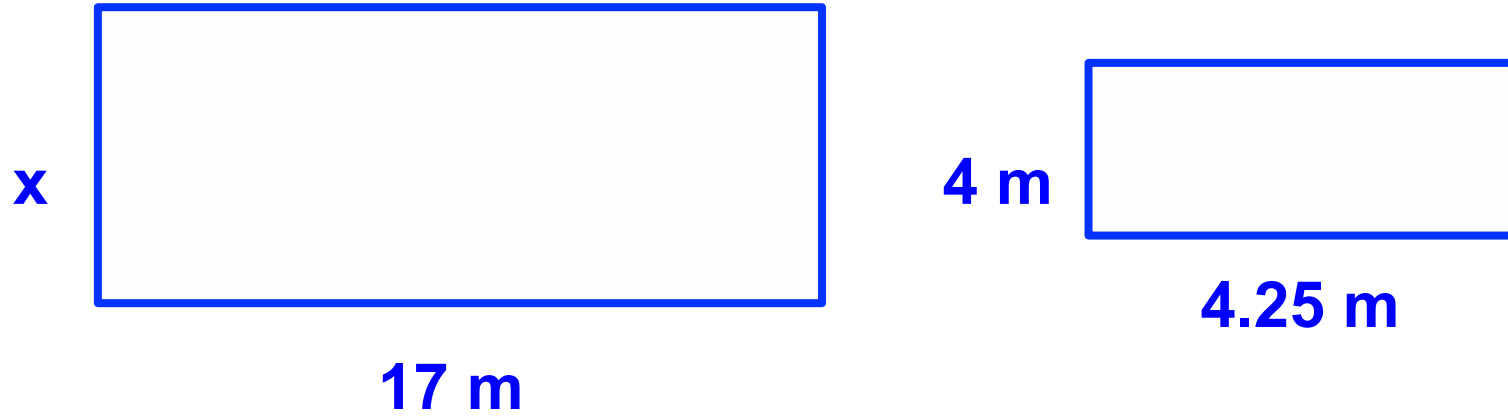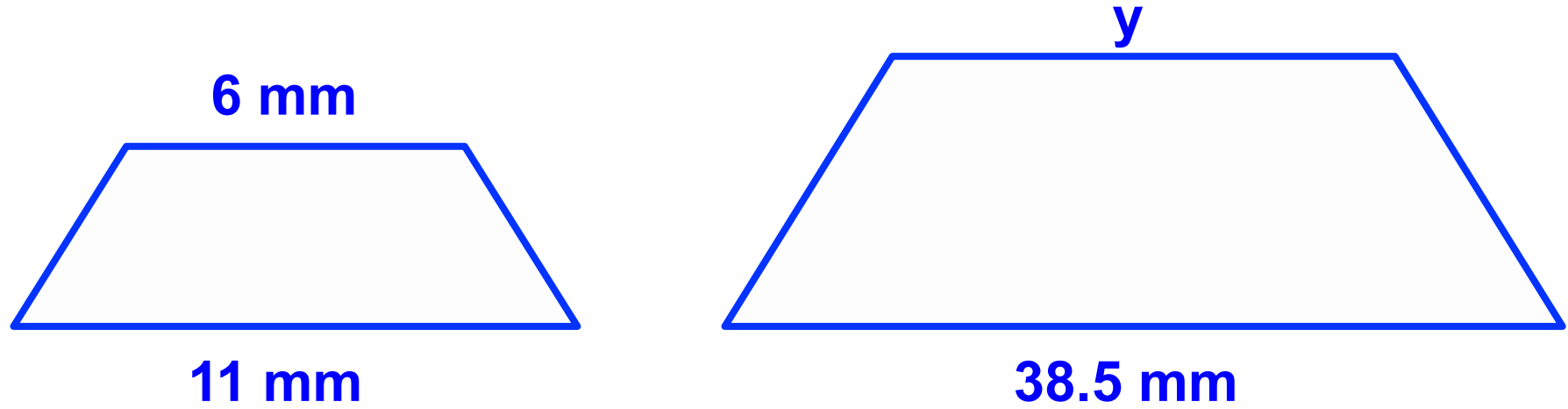
15 in

y

7.5 in

5 in
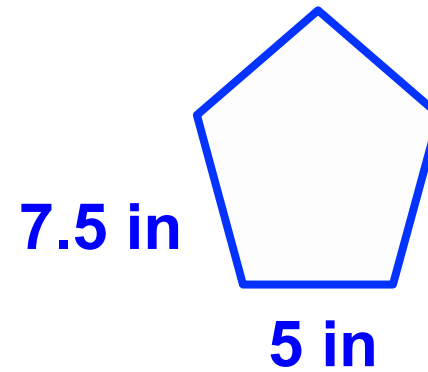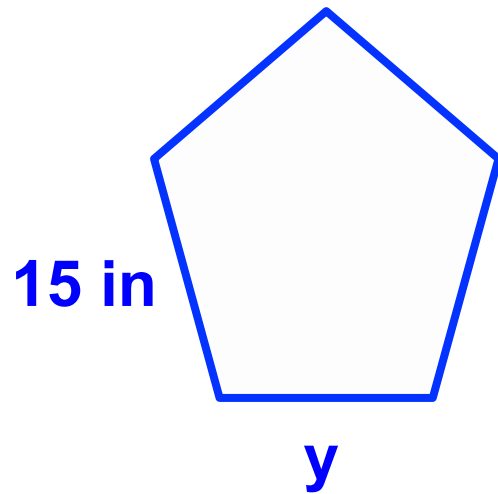
87 **Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)**

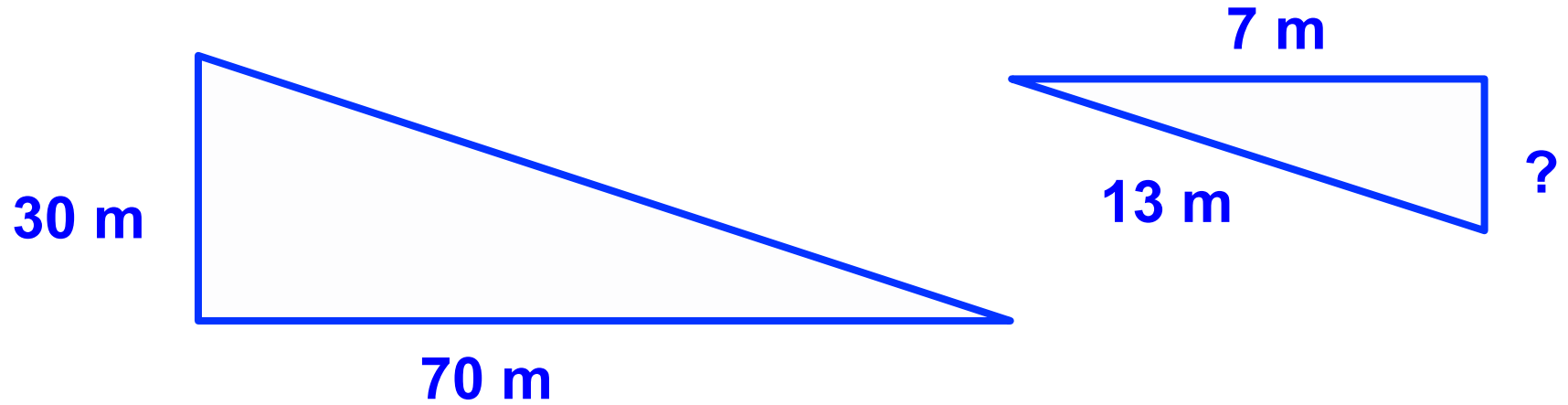**88** **Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)**
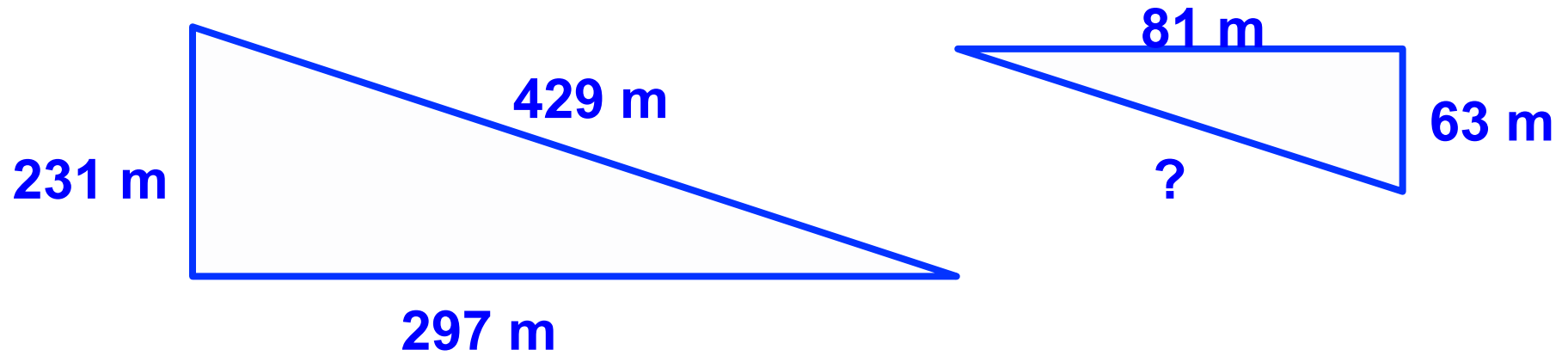
17.5 ft

25 ft   25 ft

w

18 ft

89 **Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)**

x

17 m

4 m

4.25 m

Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)

6 mm

11 mm

y

38.5 mm

Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)

30 m

70 m

7 m

13 m

?

Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)

429 m

231 m

297 m

81 m

63 m

?

93 **Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)**

2 mm

5 mm

27.5 mm

x