



**New Jersey Center for Teaching and Learning**  
**Progressive Mathematics Initiative**

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**7th Grade Math**  
**Ratios & Proportions**



2013-12-04

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

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## Writing Ratios

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## Ratios

What do you know about ratios?

When have you seen or used ratios?

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## Ratios

Ratio - A comparison of two numbers by division

Ratios can be written three different ways:

a to b      a : b       $\frac{a}{b}$

Each is read, "the ratio of a to b."  
Each ratio should be in simplest form.

Find the ratio of boys to girls in this class

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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!

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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  $\frac{7}{27}$
- C  $\frac{7}{11}$
- D 1 : 3

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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  $\frac{20}{16}$
- B  $\frac{11}{7}$
- C  $\frac{5}{4}$
- D  $\frac{16}{20}$

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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  $\frac{7}{9}$
- B  $\frac{7}{27}$
- C  $\frac{9}{27}$
- D  $\frac{1}{3}$

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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

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## Equivalent Ratios

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Equivalent ratios have the same value

3 : 2 is equivalent to 6 : 4

1 to 3 is equivalent to 9 to 27

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

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

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

- True
- False

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

- True
- False

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

- True
- False

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

- True
- False

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## Rates

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## 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

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## 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

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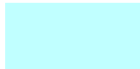
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## Finding a Unit Rate

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.



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**Click for practice.**

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:

The interface shows a 28oz box with a price tag of \$1.95. An arrow points to four buttons with the following unit prices: \$1.57 per oz, \$0.14 per oz, \$2.07 per oz, and \$0.07 per oz. Below the buttons is a score bar with a blue arrow and a score of 0.

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

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

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

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

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

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15 Sarah rode her bike  $\frac{1}{4}$  miles in  $\frac{3}{4}$  hour. What is

Sarah's unit rate in miles per hour?

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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



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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



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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

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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

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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

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19 Two families drive to their vacation spot. The Jones family drives 432 miles and used 16 gallons of gas. The Alvarez 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 Alvarez Family

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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

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**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.**

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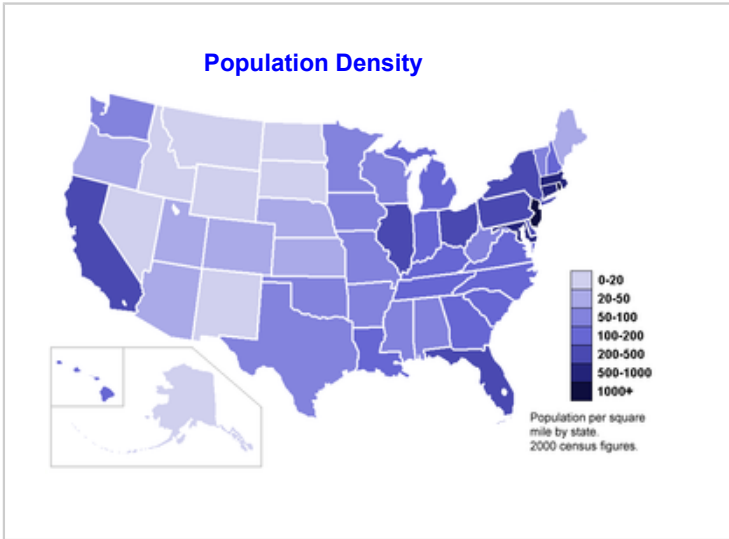
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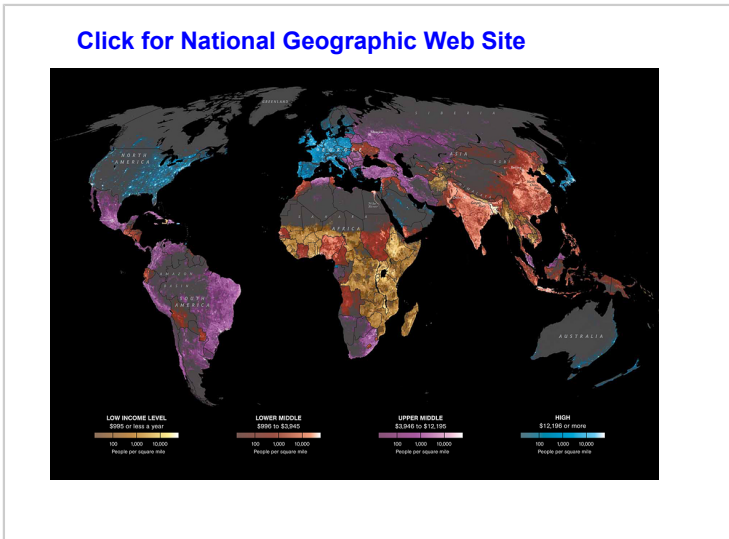
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**To calculate population density:**

- **Find the population of the state.**  
NJ = 8,791,894 people
- **Find the area of the state.**  
NJ = 7,790 square miles
- **Divide**  

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

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We know that New Jersey has a population density of 1,129 people per square mile. Use the links below to compare this data with two other states.

$$\text{Population Density} = \frac{\text{Population}}{\text{Area}}$$

[Click here for population data](#)

[Click here for area data](#)



Fast Facts Study Guide  
(State Areas)  
(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	Florida	147,647
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
11	Utah	84,905
12	Minnesota	84,397
13	Idaho	83,574
14	Kansas	82,282
15	Nebraska	77,359
16	South Dakota	77,122

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



Newark, NJ

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



Moorestown, NJ

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



Waco

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



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



San Luis, Argentina

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# Proportions

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## Proportions

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

Example:

$$\frac{2}{3} = \frac{12}{18}$$
$$\frac{5}{9} = \frac{15}{27}$$

Sorry, this element requires Flash, which is not currently supported in PDFs.

Please refer to the original Notebook file.



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

Example 1:

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

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

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

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

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

Example:

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

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

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

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

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26 Solve the proportion using equivalent ratios

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

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27 Solve the proportion using equivalent ratios

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

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28 Solve the proportion using equivalent ratios

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

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29 Solve the proportion using equivalent ratios

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

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30 Solve the proportion using equivalent ratios

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

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In a proportion, the cross products are equal.

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

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

$$60 = 60$$

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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

$$42 = x$$

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31 Use cross products to solve the proportion

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

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32 Use cross products to solve the proportion

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

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33 Use cross products to solve the proportion

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

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34 Use cross products to solve the proportion

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

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35 Use cross products to solve the proportion

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

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## Direct & Indirect Relationships in Tables & Graphs

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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.

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**Example.**

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	12	24	36	48	60

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

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**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 (\$)	11.50	13.00	14.50	16.00

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36 Is the relationship shown in the table proportional?

- Yes  
 No

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

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37 Is the relationship shown in the table proportional?

- Yes  
 No

x	2	5	6	9
y	7	17.5	21	34.5

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38 Is the relationship shown in the table proportional?

- Yes  
 No

x	1	2	6	9
y	5	11	31	46

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39 Is the relationship shown in the table proportional?

Yes

No

x	1	2	4	7
y	4	8	16	35

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40 Is the relationship shown in the table proportional?

Yes

No

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

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**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.

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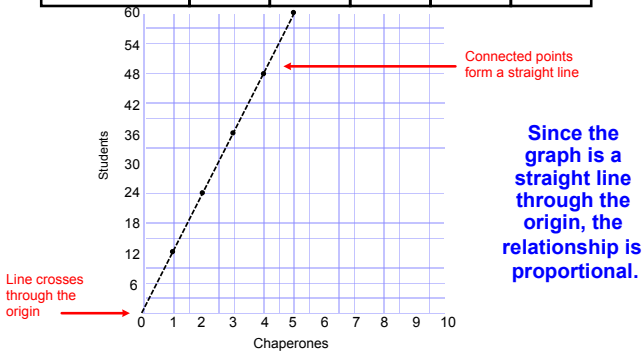
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**Example.**

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




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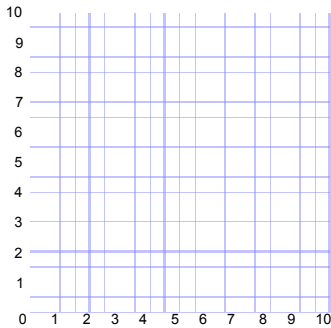
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**Example.**

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

X	Y
1	5.5
2	7
3	8.5
4	10




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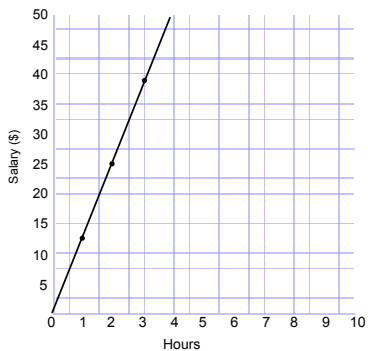
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41 Is the relationship shown in the graph proportional?

- Yes
- No




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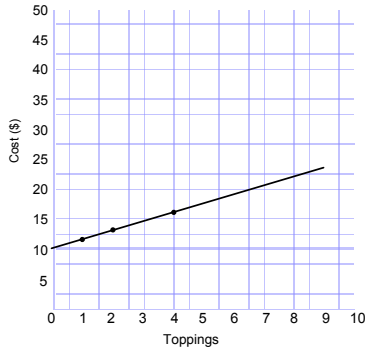
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42 Is the relationship shown in the graph proportional?

- Yes
- No



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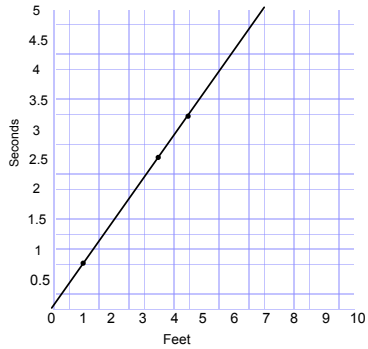
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43 Is the relationship shown in the graph proportional?

- Yes
- No



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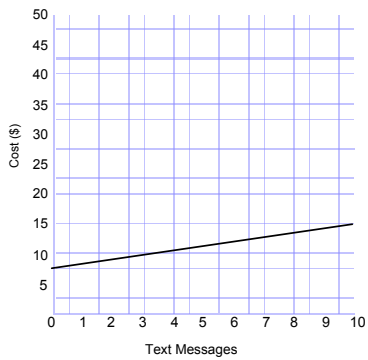
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44 Is the relationship shown in the graph proportional?

- Yes
- No



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45 Is the relationship shown in the graph proportional?

- Yes
- No



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## Constant of Proportionality

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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:

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

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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

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

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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

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Find the constant of proportionality:

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

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46 Find the constant of proportionality.

X	Y
2	1.5
5	3.75
10	7.5
12	9

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47 Find the constant of proportionality.

X	Y
2	2.5
3	3.75
4	5
9	11.25

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48 Find the constant of proportionality.

X	Y
50	3
75	4.5
100	6
140	8.4

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

Examples:

$$y = 5x$$

Click

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

Click

$$y = 3.5x$$

Click

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Find the constant of proportionality:

(click to reveal)

$$y = 3.6x$$

$$y = 53x$$

$$y = 0.38x$$

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

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

$$y = 1.85x$$

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49 Find the constant of proportionality.

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

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50 Find the constant of proportionality.

$$y = 12.9x$$

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51 Find the constant of proportionality.

$$y = 0.45x$$

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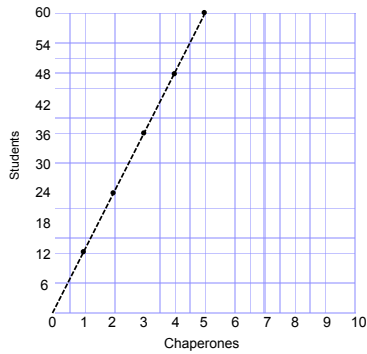
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In a graph, choose a point (x, y) to find and simplify the ratio.



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

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Find the constant of proportionality.



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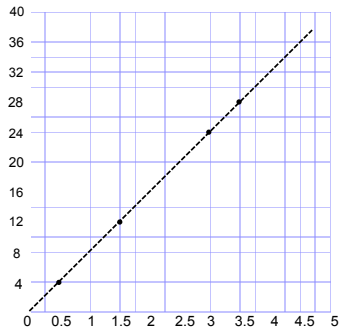
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52 Find the constant of proportionality.



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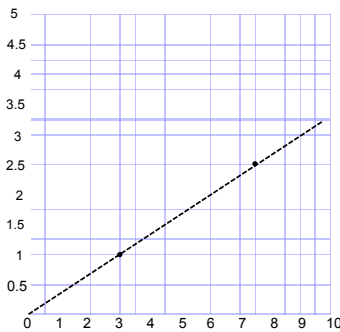
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53 Find the constant of proportionality.



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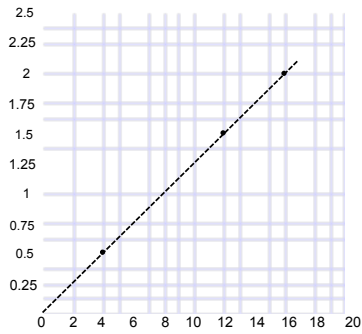
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54 Find the constant of proportionality.



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## Writing Equations For Proportions

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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:  $k = \frac{y}{x}$  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.

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**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
- Determine the unit rate:

$$k = \frac{3.98}{2} = \frac{1.99}{1}$$

$k$  = \$1.99 per pound

- Write an equation to relate the two quantities:  
 $c = kp$   
 $c = 1.99p$

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**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

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**TRY THIS:**

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

<b>Gallons</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>
<b>Miles</b>	<b>247</b>	<b>370.5</b>	<b>494</b>	<b>617.5</b>

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

Let  $g$  = gallons  
 $m$  = miles

click

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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  $p = 1.4c$

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56 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  $s = 0.09c$

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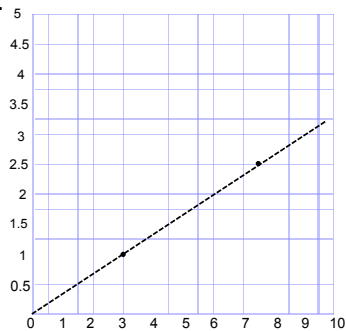
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57 Write an equation that represents the proportional relationship.

- A  $y = \frac{1}{3}x$   
 B  $y = 3x$   
 C  $y = 2.5x$   
 D  $y = 7.5x$




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- 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  $c = 7.25m$

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- 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  $d = \frac{2}{17}h$   
 C  $h = \frac{2}{17}d$   
 D  $h = 8.5d$

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## Understanding Graphs of Proportions

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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.

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**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

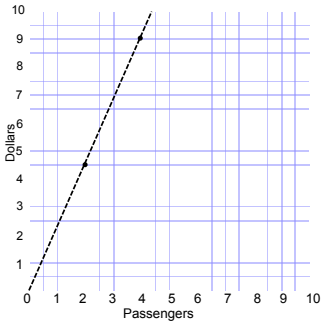
*click*

- What does the unit rate represent?

*click*

- What coordinate pair represents the unit rate?

*click*



- Does the line run through the unit rate?

*click*

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**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

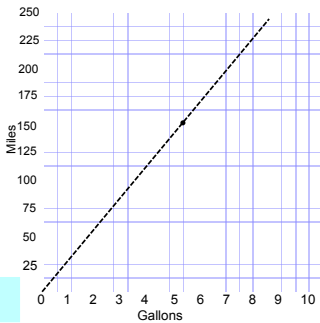
*click*

- What does the unit rate represent?

*click*

- What coordinate pair represents the unit rate?

*click*



- Does the line run through the unit rate?

*click*

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**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

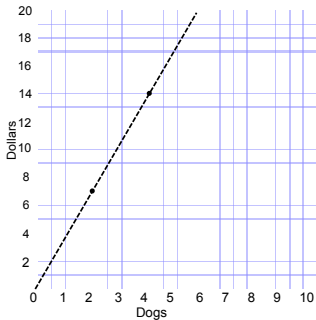
click

- What does the unit rate represent?

click

- What coordinate pair represents the unit rate?

click



- Does the line run through the unit rate?

click

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**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

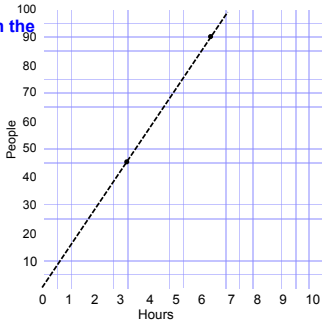
click

- What does the unit rate represent?

click

- What coordinate pair represents the unit rate?

click



- Does the line run through the unit rate?

click

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**Problem Solving**

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

Solution:

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

(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

$$\frac{3}{1} = \frac{\quad}{\quad} \quad \text{Where does the 570 go?}$$

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

$$3 \cdot 570 = 1x$$

$$x = 1,710 \text{ books}$$

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:

Girls  
People

How did we determine this ratio?

$$\frac{5}{9} = \frac{\quad}{\quad} \quad \text{Where does the 135 go?}$$

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

$$5 \cdot 135 = 9x$$

$$675 = 9x$$

$$x = 75$$

75 girls



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

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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

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

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**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?**

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

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**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?**

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

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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)

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### 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?

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**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.**

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**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.**

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**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.**

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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.**

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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.**

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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

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## Scale Drawings

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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:  $\frac{\text{drawing}}{\text{real life (actual)}}$

When solving a problem involving scale drawings you should:

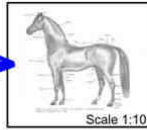
- Write the scale as a ratio
- Write the second ratio by putting the provided information in the correct location (drawing on top & real life on the bottom)
- Solve the proportion

**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

**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

**Try This:**

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.

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

- A 3000 miles
- B 2,727 miles
- C 3,300 miles
- D 1,650 miles

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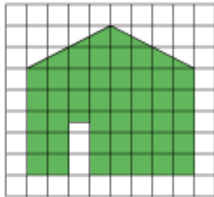
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76 The figure is a scale of the east side of a house. In the drawing, the side of each square represents 4 feet. Find the width and height of the door.

- A 4 ft by 9 ft
- B 4 ft by 12 ft
- C 4 ft by 8 ft
- D 4 ft by 10 ft




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**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?

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**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?

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**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?

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**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?

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

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**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?

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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?

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## Similar Figures

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

In similar objects:

- corresponding angles are congruent
- corresponding sides are proportional

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To check for similarity:

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

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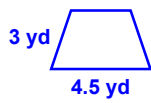
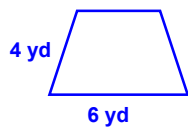
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Example:

Is the pair of polygons similar? Explain your answer.



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

$$4(4.5) = 6(3)$$

$$18 = 18$$

YES

OR

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

$$4(4.5) = 6(3)$$

$$18 = 18$$

YES

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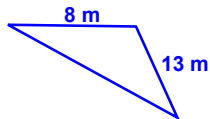
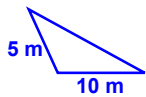
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Example:

Is the pair of polygons similar? Explain your answer.



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

$$5(13) = 10(8)$$

$$65 = 80$$

NO

OR

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

$$5(13) = 8(10)$$

$$65 = 80$$

NO

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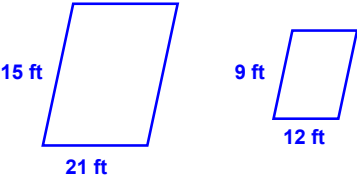
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84 Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)

- Yes
- No



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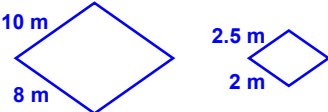
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85 Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)

- Yes
- No



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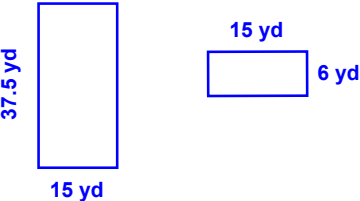
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86 Are the polygons similar? You must be able to justify your answer. (Shapes not drawn to scale.)

- Yes
- No



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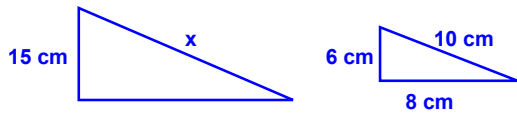
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**Example:**

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



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

$$15(10) = 6x$$

$$150 = 6x$$

$$25 \text{ cm} = x$$

OR

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

$$15(10) = 6x$$

$$150 = 6x$$

$$25 \text{ cm} = x$$

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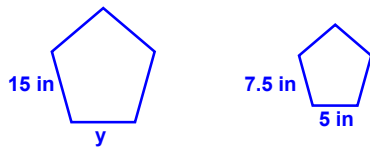
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**Try This:**

Find the value of  $y$  in the pair of similar polygons.




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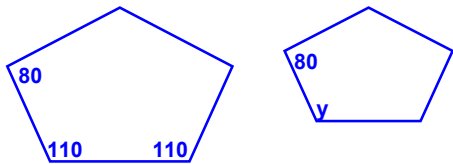
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**87** Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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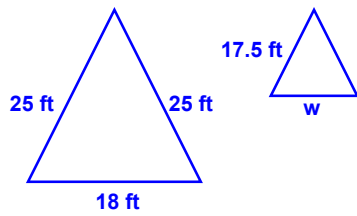
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88 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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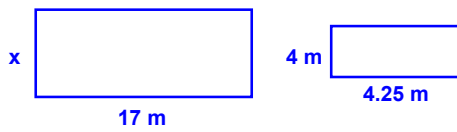
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89 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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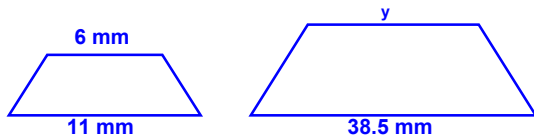
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90 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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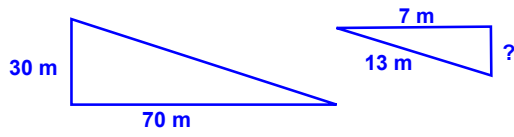
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91 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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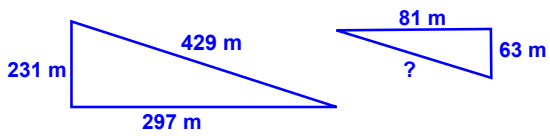


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92 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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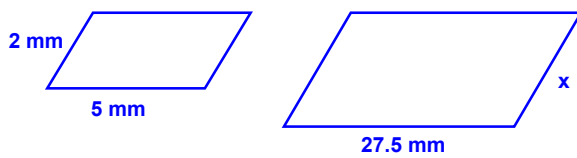


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93 Find the measure of the missing value in the pair of similar polygons. (Shapes not drawn to scale.)




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