Unit Rates (7.RP.1)

1. **This diagram shows how much apple juice is mixed with carrot juice for a recipe.**

    Apple Juice: | 1 cup | 1 cup | 1 cup |

    Carrot Juice: | 1 cup | 1 cup |

    How many cups of apple juice are used for 1 cup of carrot juice? Show your work to find this unit rate and include units.

2. **For a drink recipe, there is a ratio of 3 gallons mango juice to 12 gallons of peach juice.**

    How many gallons of mango juice are used for 1 gallons of peach juice? Show your work to find this unit rate and include units.

3. **The train ride at the zoo covers a distance of $3\frac{1}{4}$ miles in $\frac{1}{3}$ of an hour.**

    How many miles per hour does the train go? Show your work to find this unit rate and include units.

Unit Rates (7.RP.1)

Definition:	Unit Rate A rate where the second number or denominator is 1.

Finding unit rates with <u>Proportions</u> (using scale factor):

- Set up a proportion where the first fraction is the original ratio of information, and the second fraction is x over 1—make sure the denominator is the unit being reduced to 1
- Find a scale factor from the denominator, and apply it to the numerator
- Include units with your unit rate, and make sure 1 is the second number

Example:

Ⓐ FreshFoods has oranges on sale at 10 for $2. For each part, find the unit rate. Be sure to label your answers with the proper units.

1. What is the cost per orange?

$$\frac{\$2}{10 \text{ oranges}} = \frac{x}{1 \text{ orange}} \qquad x = 2 \cdot 0.1 = \$0.20 \text{ per } 1 \text{ orange}$$

0.1

2. How many oranges can you buy for $1?

$$\frac{10 \text{ oranges}}{\$2} = \frac{x}{\$1} \qquad x = 10 \cdot 0.5 = 5 \text{ oranges per } \$1$$

0.5

Finding unit rates with <u>Division</u>:

- Set up a division problem where the second number is the unit being reduced to 1
- Include units with your unit rate, and make sure 1 is the second number

Example:

3. At FreshFoods, pasta is on sale at 6 boxes for $5. Gus decides he needs to divide. What value does the quotient $6 \div 5$ describe? What value does the quotient $5 \div 6$ describe?

$$6 \text{ boxes} \div \$5 = 1.2 \text{ boxes per } \$1$$

$$\$5 \div 6 \text{ boxes} = \$0.83 \text{ per } 1 \text{ box}$$

Name _____

Date _____   Period _____

Proportional Relationships (7.RP.2a)

1. Circle <u>ALL</u> the tables below that represent a proportional relationship between x and y.

A.

x	y
1	4
2	7
3	10
4	13

B.

x	y
1	4
2	8
3	12
4	16

C.

x	y
1	6
2	7
3	8
4	9

D.

x	y
5	−2
7	0
9	2
11	4

E.

x	y
3	12
5	20
2	8
8	32

2. <u>Explain</u> how you know if a TABLE represents a proportional relationship.

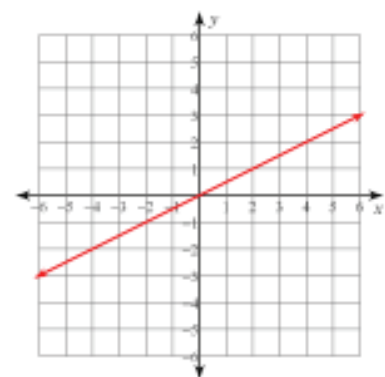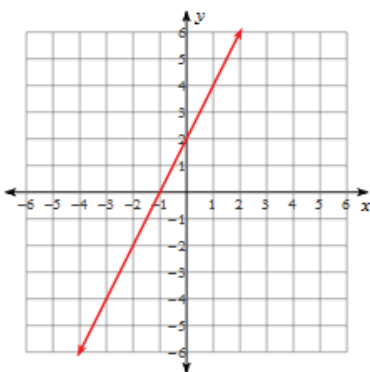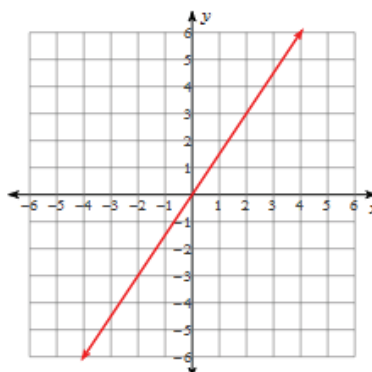3. Circle <u>ALL</u> the graphs below that show a proportional relationship between x and y.
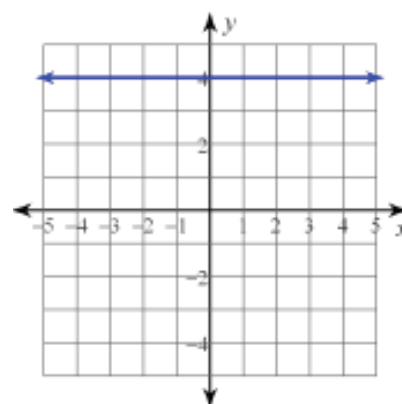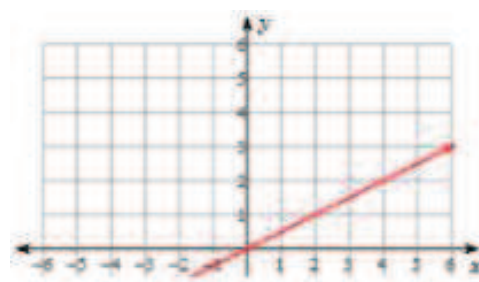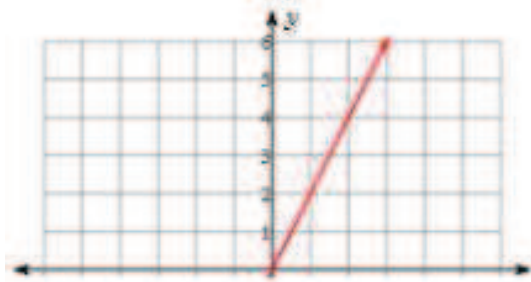
A.
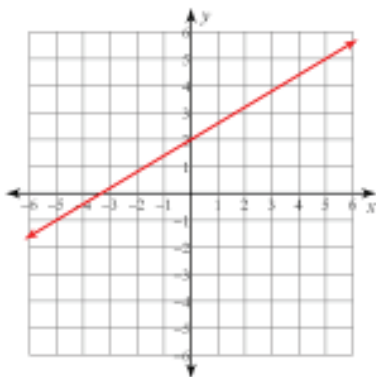
B.
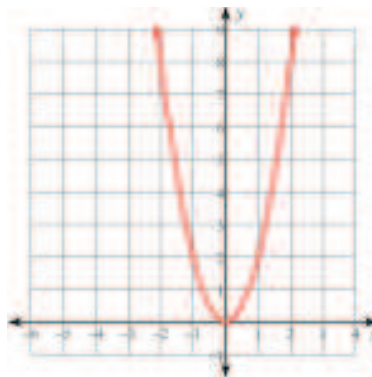
C.

D.

E.

F.

4. <u>Explain</u> how you know if a GRAPH represents a proportional relationship.

Proportional Relationships (7.RP.2a)

Proportional Relationships in a <u>GRAPH</u>:
- are a straight line
- go through (0, 0)

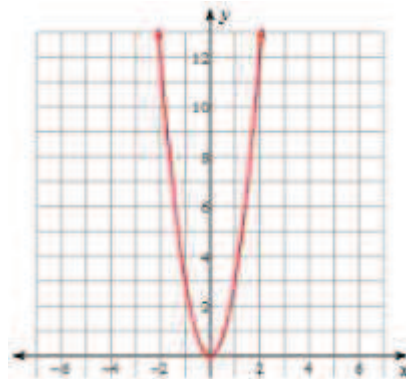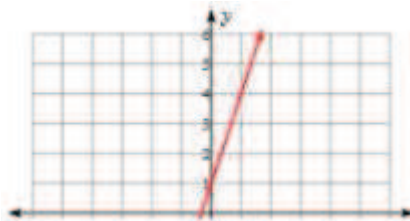**Examples:**

Proportional Relationships in a <u>TABLE</u>:
- have equivalent ratios between the values

Example:

Number of Pizzas	1	2	3	4	5	10	15
Price for Pick Up	$13	$26	$39	$52	$65	$130	$195

$$\frac{1}{13} = \frac{2}{26}$$

NON-Examples: These are NOT proportional relationships:

Number of Pizzas	1	2	3	4	5	10	15
Price if Howdy's Delivers	$18	$31	$44	$57	$70	$135	$200

$$\frac{1}{18} \neq \frac{2}{31}$$

Name _____

Date _____   Period _____

Constant of Proportionality (7.RP.2b)

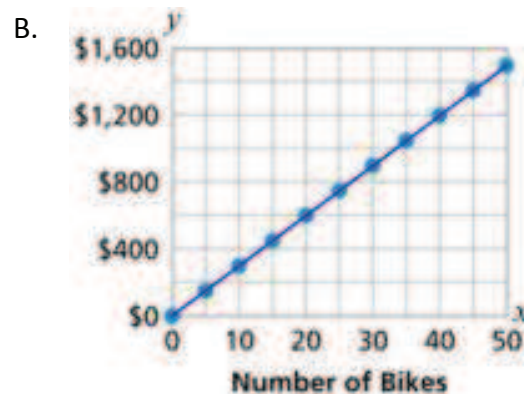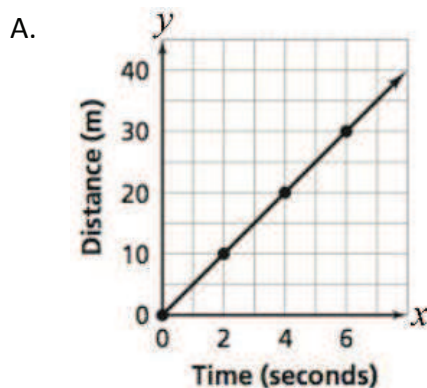1. **The following tables show a proportional relationship between x and y.**

A.

x	y
1	4
2	8
3	12
4	16

B.

x	y
3	12
5	20
2	8
8	32

    a. What is the constant of proportionality for table A? _____

    b. What is the constant of proportionality for table B? _____

2. **The following graphs show a proportional relationship between x and y.**

    a. What is the constant of proportionality for graph A? _____

    b. What is the constant of proportionality for graph B? _____

3. **The following equations show a proportional relationship between x and y.**

    A. $y = 3.7x$ B. $y = \dfrac{4}{9}x$

    a. What is the constant of proportionality for equation A? _____

    b. What is the constant of proportionality for equation B? _____

Constant of Proportionality (7.RP.2b)

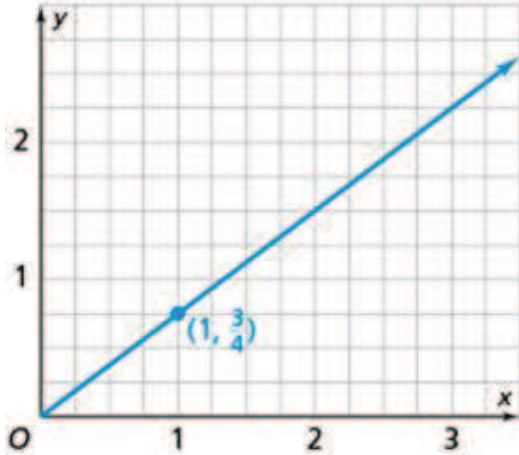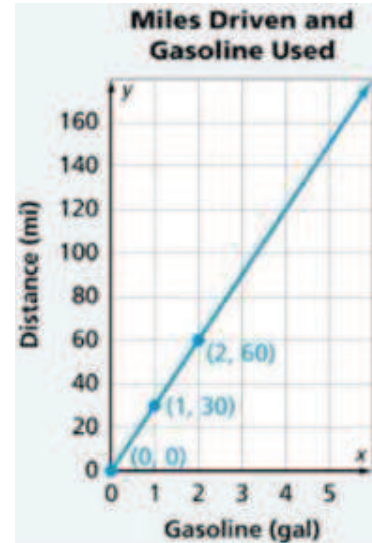| |
|---|
| **Definition:**
constant of proportionality: a constant ratio of two numbers |

Finding constant of proportionality (unit rate) from a TABLE:

- Can set up a proportion or use division to calculate the constant of proportionality (unit rate)

Examples:

constant of proportionality: $\dfrac{3}{4}$

Miles Driven and Gasoline Used

constant of proportionality: 30

Finding constant of proportionality (unit rate) from a GRAPH:

- Find the point (1, r), where r is the constant of proportionality (unit rate) OR
- Can set up a proportion or use division to calculate the constant of proportionality (unit rate)

Examples:

x		y
4	•12 =	48
5	•12 =	60
8	•12 =	96

constant of proportionality: 12

Time (hours)	8.₂₆	6.₂₆	9.₂₆
Pages Lucas Read	208	156	234

constant of proportionality __26__

Finding constant of proportionality (unit rate) from an EQUATION:

$$C = 13n$$

↑

constant of
proportionality

Example:

$$y = \frac{7}{9}x$$ constant of proportionality __$\frac{7}{9}$__

Name _____

Date _____   Period _____

Proportional Relationship Equations (7.RP.2c)

1. **The following tables show a proportional relationship between x and y.**
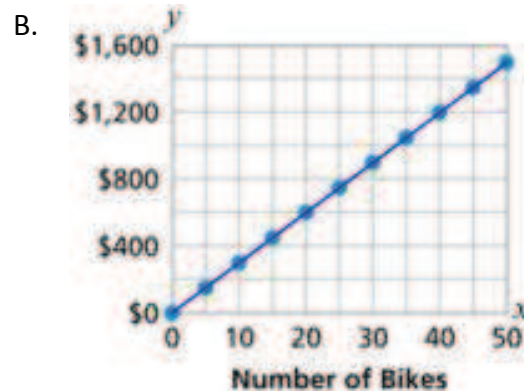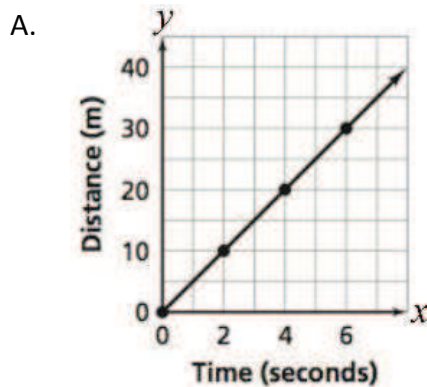
A.

x	y
1	4
2	8
3	12
4	16

B.

x	y
3	12
5	20
2	8
8	32

a. Write an equation of the form $y = rx$ to represent table A. _____

b. Write an equation of the form $y = rx$ to represent table B. _____

2. **The following graphs show a proportional relationship between x and y.**

A.

B.

a. Write an equation of the form $y = rx$ to represent graph A. _____

b. Write an equation of the form $y = rx$ to represent graph B. _____

Proportional Relationship Equations (7.RP.2c)

Notes:

- Proportional equations should be of the form $y = rx$, where r is the constant of proportionality (unit rate)

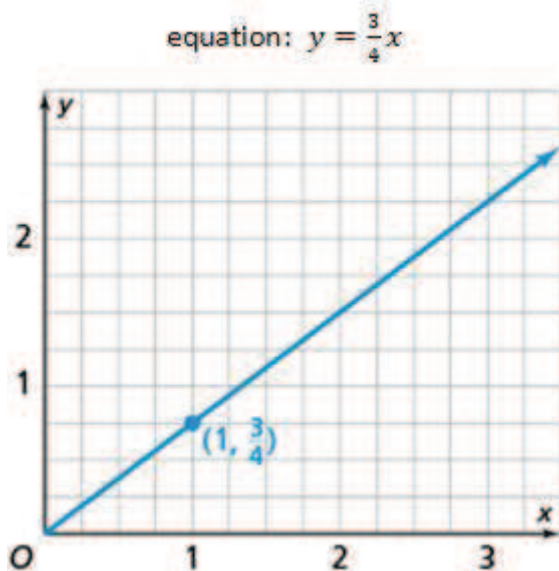$$C = 13n$$
$$\uparrow$$
constant of
proportionality

Finding constant of proportionality (unit rate) from a <u>TABLE</u>:

- Can set up a proportion or use division to calculate the constant of proportionality (unit rate)

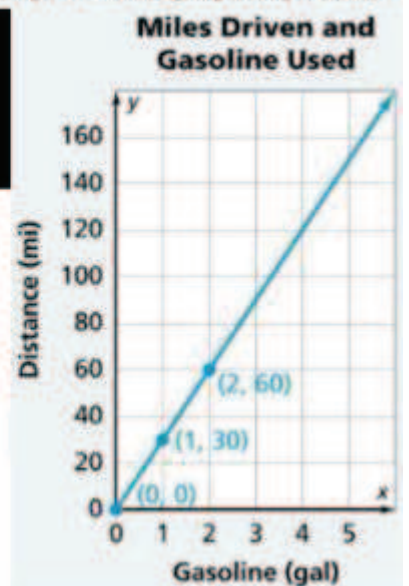**Finding constant of proportionality (unit rate) from a <u>GRAPH</u>:**

- Find the point (1, r), where r is the constant of proportionality (unit rate) <u>OR</u>
- Can set up a proportion or use division to calculate the constant of proportionality (unit rate)

Examples:

equation: $y = \frac{3}{4}x$

$(1, \frac{3}{4})$

3. What equation relating d and g does the graph represent?

$$d = 30g$$

Miles Driven and Gasoline Used

Distance (mi)

(2, 60)
(1, 30)
(0, 0)

Gasoline (gal)

B   m
30 bottles of water for $4.80

$\dfrac{30 \text{ bottles}}{\$4.80} = \dfrac{}{\$1}$

$\dfrac{\$4.80}{30 \text{ bottles}} = \dfrac{}{1 \text{ bottle}}$

6.25 bottles per $1

B = 6.25 m

$0.16 per 1 bottle

m = 0.16 B

Name _____

Date _____   Period _____

Explaining Coordinate Points (7.RP.2d)

1. **The graph at right shows a proportional relationship between** x **and** y.

   What do the following points represent <u>in terms of the situation</u>?

   (0, 0)
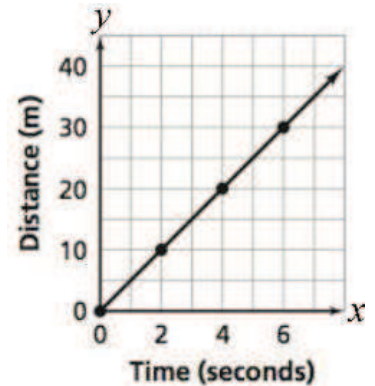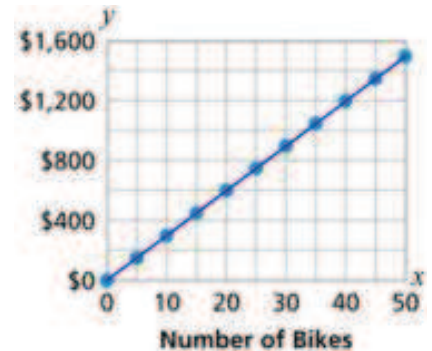
   (1, 5)

   (6, 30)

2. **The graph at right shows a proportional relationship between** x **and** y.

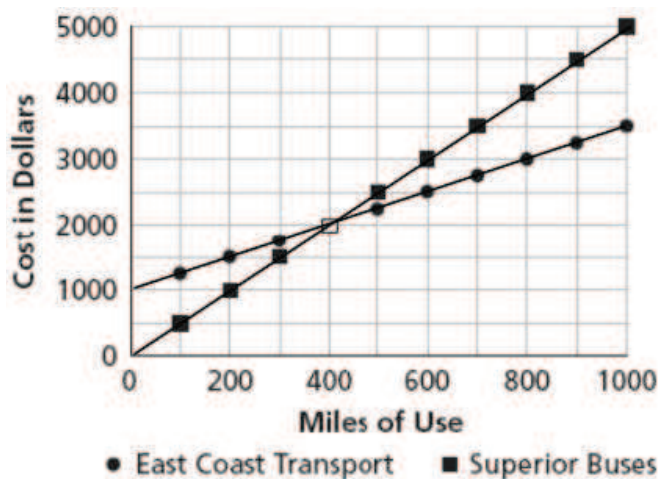   **What do the following points represent <u>in terms of the situation</u>?**

   (0, 0)

   (1, 30)

   (40, 1200)

3. **The following graph for Superior Buses shows a proportional relationship between** x **and** y.

   Select True or False for each statement about the graph.

Statement	True	False
Point ☐ represents the total cost of travel when traveling for 400 miles.		
The total cost of travel is $5 when traveling for 1 mile.		
The total cost of travel is $600 when traveling for 3000 miles.		

Explaining Coordinate Points (7.RP.2d)
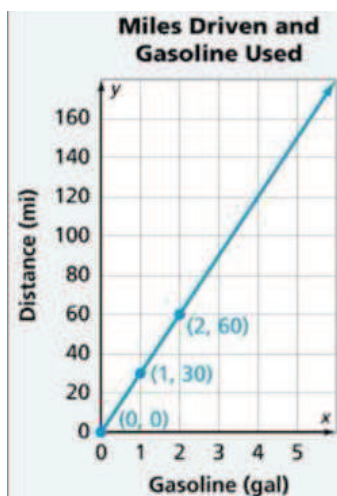
Examples:

Howdy's Pizza Prices
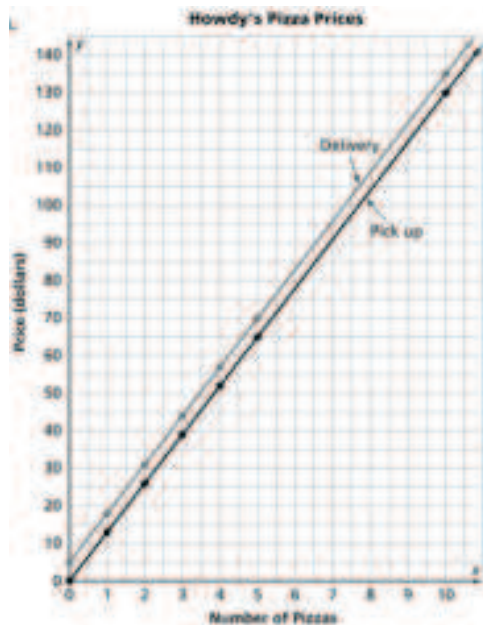
pick up

$(1,13)$: one pizza costs $13

$(0,0)$: zero pizzas cost $0

delivery

$(1,18)$: one pizza costs $18

$(0,5)$: zero pizzas cost $5

Miles Driven and Gasoline Used

(2, 60)
(1, 30)
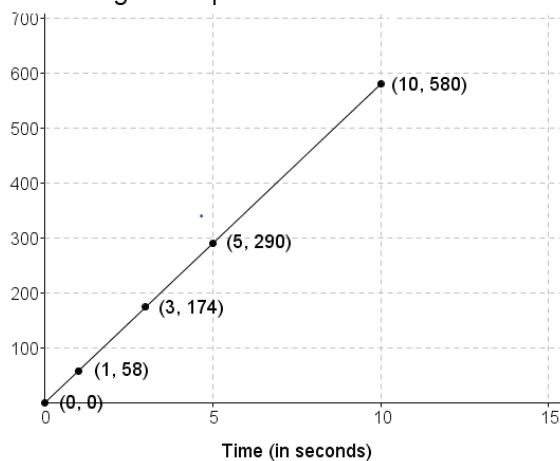(0, 0)

$(1,30)$ = 1 gallon takes us 30 miles

$(0,0)$ = 0 gallons takes us 0 miles

Jaguar's Speed: Time and Distance

(10, 580)
(5, 290)
(3, 174)
(1, 58)
(0, 0)

What do the following points represent in the context of the situation?

a. (0,0) A jaguar runs 0 feet in 0 seconds.

b. (1,58) A jaguar runs 58 feet in 1 second.

c. (5,290) A jaguar runs 290 feet in 5 seconds.

Multi-Step Proportion Problems (7.RP.3)

1. **The ratio of blueberries to mango in a fruit smoothie drink is 5 to 15. What percent of the drink is mango? Write and solve a proportion to find the answer, and include units.**

2. **Bill has a paper route in his neighborhood. It takes him 45 minutes to deliver newspapers to the 30 customers on his route. How long will it take Bill to complete his route if he adds 25 more customers in his neighborhood? Write and solve a proportion to find the answer, and include units.**

3. **You have lunch at a Thai restaurant with your friends. The bill before tax is $54.75, and the sales tax is 7%. You decide to leave a 20% tip for the waitress based on the pre-tax amount. What will be the amount of the total bill, including tax and tip? Write and solve proportions to find the answer, and include units.**

4. **Shirts Galore sells a Batman shirt for $24.49, but is having a sale for 25% off. Rainbow Shirts sells the same Batman shirt for $21.99, but is having a sale for 15% off. Which store offers the better price, after the discount? Write and solve proportions to find the answer, and include units with your answer.**

Multi-Step Proportion Problems (7.RP.3)

Definition:
proportion: an equation stating that two ratios are equal.
Examples:

Suppose that among American doctors, men outnumbered women by a ratioof 12 to 5. If about 600,000 American doctors are men, about how many are women? Thre are four ways to write this as a proportion:

Write the known ratio of men to women doctors. Complete the proportion with the ratio of actual numbers of doctors.

$$\frac{12 \text{ men}}{5 \text{ women}} = \frac{600,000 \text{ men}}{x \text{ women}}$$

Write a ratio of men to men data. Complete the proportion with women to women data.

$$\frac{12 \text{ men}}{600,000 \text{ men}} = \frac{5 \text{ women}}{x \text{ women}}$$

Write the known ratio of women to men doctors. Complete the proportion with the ratio of actual numbers of doctors.

$$\frac{5 \text{ women}}{12 \text{ men}} = \frac{x \text{ women}}{600,000 \text{ men}}$$

Write a different ratio of men to men data. Complete the proportion with women to women data.

$$\frac{600,000 \text{ men}}{12 \text{ men}} = \frac{x \text{ women}}{5 \text{ women}}$$

Bill's bike shop has a sale where the bike shop pays the customer's tax. By law, Bill has to charge a 6% sales tax, so he finds a different way to take the tax off the bill. Bill decides to give each customer a 6% discount. Bill sells a bike that originally costs $100.

Write and solve a proportion to find the cost with sales tax. Then, write and solve a proportion to find the amount of the discount. Then, calculate the final cost.

$$\frac{\$100}{100\%} = \frac{\$x}{106\%} \qquad x = 100 \cdot 1.06 = \$106$$

$\cdot 1.06$

$$\frac{\$106}{100\%} = \frac{\$x}{6\%} \qquad x = 106 \cdot 0.06 = \$6.36$$

$\cdot 0.06$

$\$106.00$
$-\ \$6.36$
$\$99.64$ final price

The Sports Depot is having a sale. Mike buys a pair of gloves that originally cost $24, but are on sale for 25% off. He also buys a pair of skis that originally cost $250, but are on sale for 15% off. What is the total amount that Mike pays for his new gear?

$$\frac{\$24}{100\%} = \frac{\$x}{25\%} \qquad x = 24 \cdot 0.25 = \$6$$

0.25

$24 - 6 = \$18$ gloves

$$\frac{\$250}{100\%} = \frac{\$x}{15\%} \qquad x = 250 \cdot 0.15 = \$37.50$$

0.15

$250 - 37.50$
$= \$212.50$ skis

$18 + 212.50 = \boxed{\$230.50 \text{ total}}$