Scaling Figures and Scale Factor

GUIDED SKILL SUPPORT

Overview

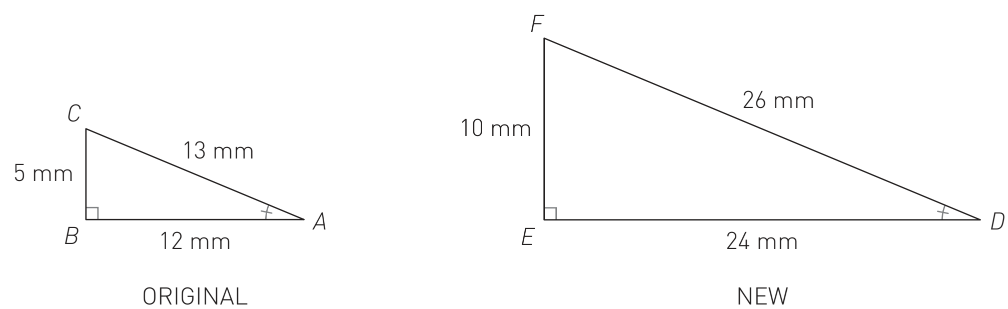
Geometric figures can be reduced or enlarged so that every length of the figure is reduced or enlarged by multiplying by the same number (proportionally), and the measures of the corresponding angles stay the same.

The ratio of any two corresponding sides of the original and new figures is called the scale factor. The ratio of every pair of corresponding sides is the same. It is common to represent the scale factor as a fraction with the new figure measurements over the original figure measurements, that is, $\frac{\text{new}}{\text{original}}$.

For additional information, see the Methods & Meanings box in Lesson 4.1.2 of the *Core Connections Course 2* text.

Examples

1. The original triangle was enlarged to create the new triangle. What is the scale factor?



The ratios of the corresponding side lengths are $\frac{DE}{AB} = \frac{24}{12} = \frac{2}{1}$, $\frac{FD}{CA} = \frac{26}{13} = \frac{2}{1}$, and $\frac{FE}{CB} = \frac{10}{5} = \frac{2}{1}$. The scale factor for length is 2 to 1 or $\frac{2}{1}$ or 200%.

2. Figures A and B are scaled copies. Assuming that Figure A is the original figure, determine the scale factor and the lengths of the missing sides of Figure B.

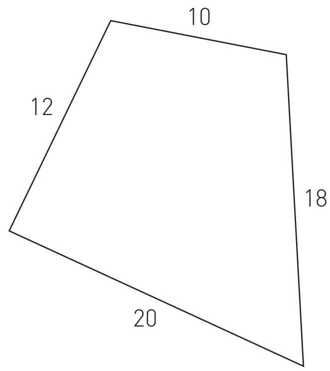


FIGURE A

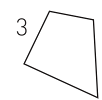


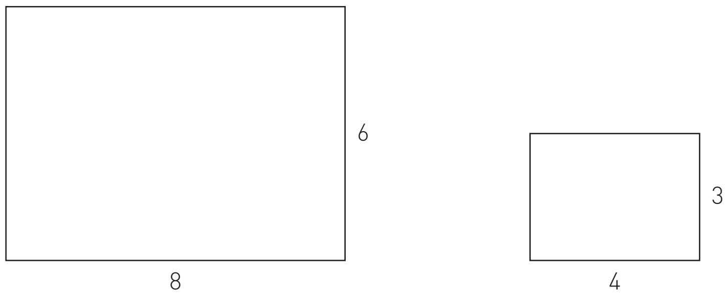
FIGURE B

Choose a pair of corresponding sides and write a ratio in the order $\frac{\text{new}}{\text{original}}$ to determine the scale factor. The scale factor can be written as $\frac{3}{12} = \frac{1}{4}$. The lengths of the missing sides of Figure B can be determined by multiplying the side lengths of Figure A by the scale factor: $\frac{1}{4}(10) = 2.5$, $\frac{1}{4}(18) = 4.5$, and $\frac{1}{4}(20) = 5$.

Practice

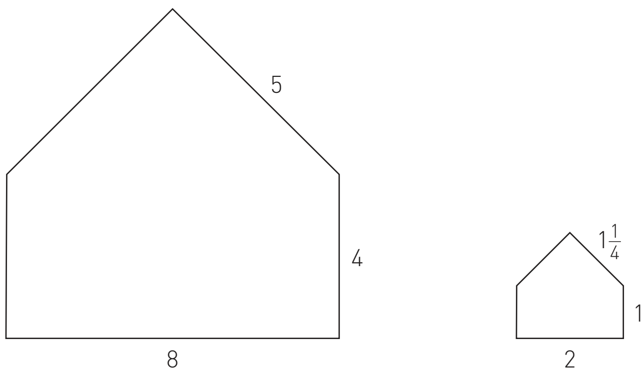
Determine the scale factor for each pair of enlarged or reduced figures in problems 1 through 4.

1.



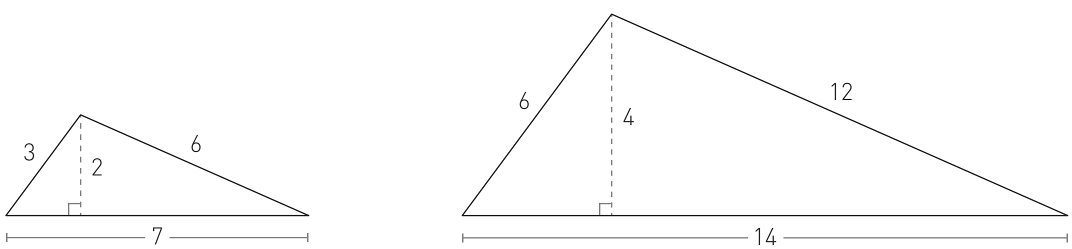
ORIGINAL NEW

2.



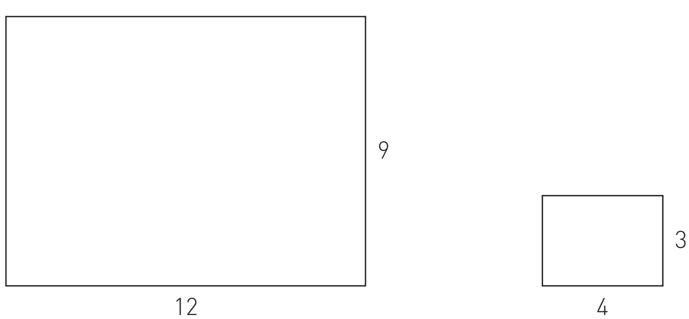
ORIGINAL NEW

3.



ORIGINAL NEW

4.



ORIGINAL NEW

5. A triangle has side lengths of 5, 12, and 13 units. The triangle was enlarged by a scale factor of 300%.

a. What are the lengths of the sides of the new triangle?

b. What is the ratio of the perimeter of the new triangle to the perimeter of the original triangle?

6. A rectangle has a length of 60 cm and a width of 40 cm. A scale factor of 25% is used to create the dimensions of a new rectangle.

a. What are the dimensions of the new rectangle?

b. What is the ratio of the perimeter of the new rectangle to the perimeter of the original rectangle?

Answers

1. $\frac{4}{8}=\frac{1}{2}$

2. $\frac{2}{8}=\frac{1}{4}$

3. $\frac{2}{1}$

4. $\frac{1}{3}$

5. a. 15, 36, 39

b. $\frac{3}{1}$

6. a. 15 cm and 10 cm

b. $\frac{1}{4}$

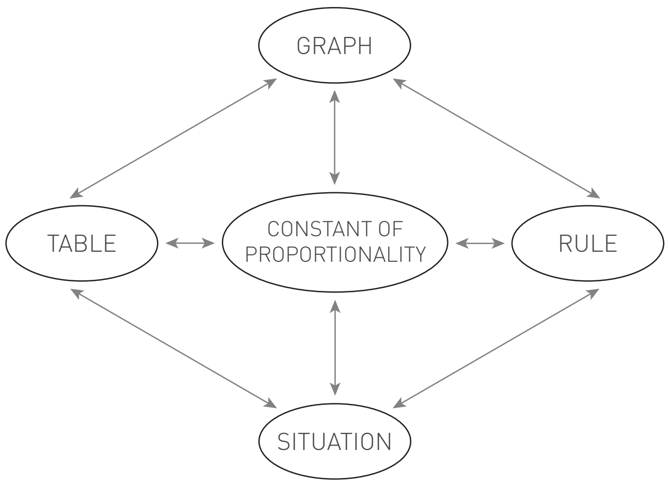
Proportional Relationships

GUIDED SKILL SUPPORT

Overview

A proportion is an equation stating that two ratios are equal. For example, $\frac{a}{b} = \frac{c}{d}$, where *b* and *d* are not zero.

A relationship is a proportional relationship if, for every ordered pair (x, y), the ratio $\frac{y}{x}$ is constant (the same value). Proportional relationships can be represented with situations, graphs, tables, and equations.



Situation: Describes a relationship between two quantities as a ratio.

Table: Equivalent ratios of $\frac{y}{x}$ (or $\frac{x}{y}$) can be seen in a table.

Graph: A straight line through the origin.

Equation: An equation of the form $y = kx$, where k is the **constant of proportionality**.

For more information, see the Methods & Meanings boxes in Lessons 4.2.4 and 7.2.2 of the *Core Connections Course 2* text. For additional examples and practice, see the *Core Connections Course 2* Checkpoint 9 materials.

Examples

Determine whether each relationship in problems 1 through 4 is proportional.

1. $\frac{4}{48}$ and $\frac{6}{72}$

$\frac{4}{48} \cdot \frac{\frac{1}{4}}{\frac{1}{4}} = \frac{1}{12}$ $\qquad$ $\frac{6}{72} \cdot \frac{\frac{1}{6}}{\frac{1}{6}} = \frac{1}{12}$

Both fractions are equivalent to $\frac{1}{12}$, so the relationship is proportional.

2. (6, 15), (2, 5), (7, 17.5)

$\frac{15}{6} = 2.5$ $\qquad$ $\frac{5}{2} = 2.5$ $\qquad$ $\frac{17.5}{7} = 2.5$

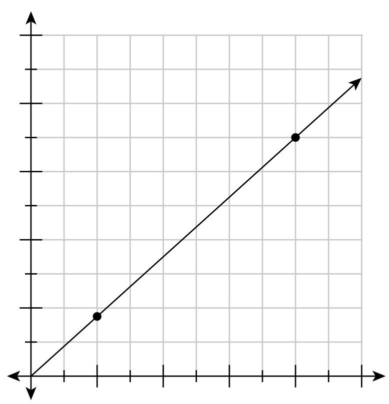
The ratio $\frac{y}{x}$ is the same for each point, so the relationship is proportional.

3.

x	10	20	30
y	4	8	12

The ratio $\frac{y}{x}$ is $\frac{5}{2}$ for each point, so the relationship is proportional.

4.

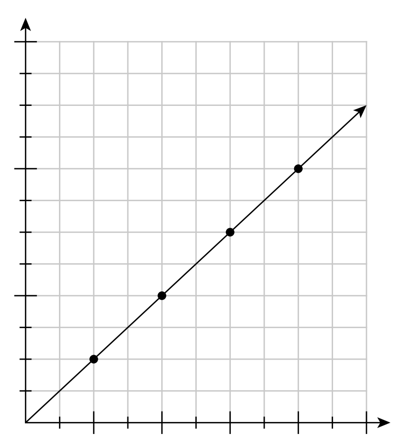


The graph is linear and goes through the origin, so it represents a proportional relationship. In addition, the ratio $\frac{y}{x}$ is the same for each point: $\frac{7}{8} = \frac{1.75}{2}$.

5. A milkshake recipe calls for 2 cups of ice cream for four servings. Determine the unit rate and create a table, graph, and equation to represent the situation.

unit rate $= \frac{\text{2 cups of ice cream}}{\text{4 servings}} = \frac{\text{½ cups of ice cream}}{\text{1 serving}} = \frac{1}{2}$

Number of Servings	1	2	3	4
Ice Cream (cups)	$\frac{1}{2}$	1	$1\frac{1}{2}$	2



$y = \frac{1}{2}x$, where x is the number of servings and y is the amount of ice cream (in cups)

Practice

Determine whether each relationship shown in problems 1 through 8 is proportional. How can you tell?

1.

Number of Cars Waxed	8	16	24	32
Time (hours)	3	6	9	12

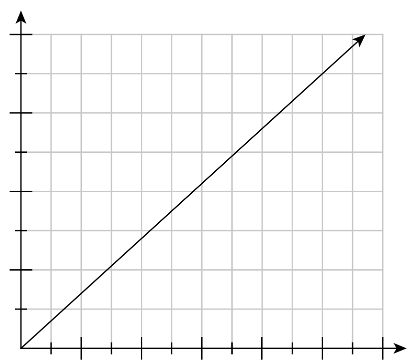
2.

Time (weeks)	1	2	4	6
Savings ($)	20	40	50	60

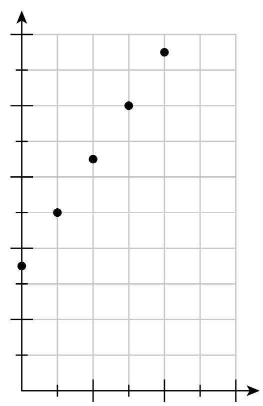
3.

Weight (pounds)	2	4	10	12
Cost ($)	6.50	13.00	32.50	39.00

4.



5.



6. Hailee earns $20 each week doing chores.

7. Ama can buy one audiobook for $4.00 and three audiobooks for $10.00.

8. A cookie recipe calls for 1½ cups of sugar for one batch of cookies.

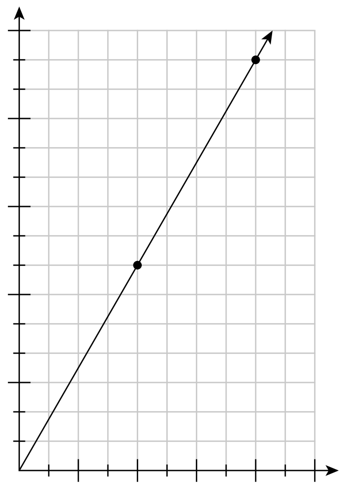
9. The ratio of cups of milk to the number of servings for a milkshake recipe is shown in the table.

Number of Servings	4	8	12	16
Milk (cups)	1	2	3	4

a. What is the unit rate or number of cups of milk per serving?

b. Create a graph and write an equation for this situation.

10. The same milkshake recipe also uses ice cream. The ratio of cups of ice cream to the number of servings is shown in the graph.



a. What is the constant of proportionality (unit rate)?

b. Create a table for this situation.

c. Write an equation for this situation, where *x* represents the number of servings and *y* represents the amount of ice cream (in cups).

11. To make a vanilla flavored milkshake, the recipe calls for 2 teaspoons of vanilla extract for 8 servings.

a. Complete a table, graph, and rule for this situation.

b. What is the constant of proportionality (unit rate)?

Answers

Reasoning may vary.

1. yes, all ratios = $\frac{8}{3}$

2. no, $\frac{40}{2} \neq \frac{50}{4}$

3. yes, all ratios = $\frac{\$3.25}{1}$

4. yes, it is a line that includes the origin

5. no, it does not include the origin

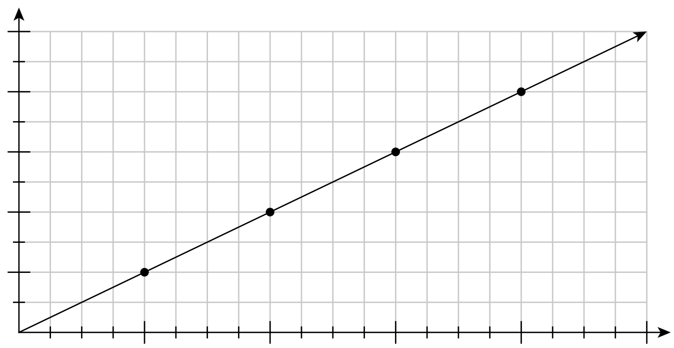
6. yes, there is a constant rate of $\frac{\$20}{1 \text{ week}}$

7. no, $\frac{\$4.00}{1} \neq \frac{\$10.00}{3}$

8. yes, every batch needs the same amount

9. a. $\frac{1}{4}$ cup of milk per serving

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



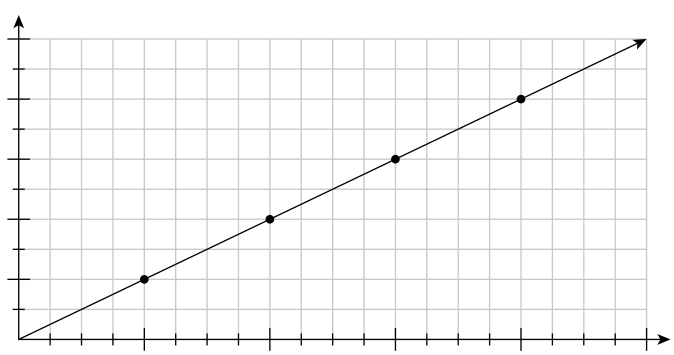
10. a. $\frac{7}{4}$ or $1\frac{3}{4}$ cups of ice cream per serving

b. Responses may vary.

Number of Servings	2	4	6	8
Ice Cream (cups)	3.5	7	10.5	14

c. $y = 1\frac{3}{4}x$

11. a. $y = \frac{1}{4}x$



Number of Servings	2	4	6	8
Vanilla Extract (tsp)	0.5	1	1.5	2

b. $\frac{1}{4}$; $\frac{1}{4}$ teaspoon of vanilla extract per serving

Rates and Unit Rates

GUIDED SKILL SUPPORT

Overview

A rate is a ratio that describes how one quantity changes with respect to another quantity. Unit rate is a rate that compares the change in one quantity to a 1-unit change in another quantity.

Unit rates can be seen in situations, graphs, tables, and equations. In a proportional relationship, the unit rate is also called the "constant of proportionality."

- In a situation, compute a unit rate through division.
- In the graph of a proportional relationship, the unit rate is equivalent to r in the point (1, *r*).
- In a table for a proportional relationship, the unit rate is equivalent to the ratio $\frac{y}{x}$ for every (x, y) pair.
- In the equation for a proportional relationship, the unit rate is equivalent to the constant of proportionality, k, in the equation $y = kx$.

For additional information, see the Methods & Meanings box in Lesson 4.2.3 of the *Core Connections Course 2* text. For additional examples and practice, see the *Core Connections Course 2* Checkpoint 9 materials.

Examples

1. If 2 pounds of bananas cost $1.68, what is the unit rate (cost per pound)?

Unit rate means the denominator needs to be 1 pound, so $\frac{\$1.68}{2 \text{ lb}} = \frac{x}{1 \text{ lb}}$. Solving by using a Giant One of $\frac{\frac{1}{2}}{\frac{1}{2}}$ or division by 2 yields x = $0.84 per pound.

2. A train in France traveled 932 miles in 5 hours. What is the unit rate in miles per hour?

Unit rate means the denominator needs to be 1 hour, so $\frac{932 \text{ mi}}{5 \text{ hr}} = \frac{x}{1 \text{ hr}}$. Solving by using a Giant One of $\frac{0.2}{0.2}$ or division by 5 yields x = 186.4 miles per hour.

3. Based on the table, what is the unit growth rate (meters per year)?

Height (m)	15	17	19	21
Time (years)	75	85	95	105

+ 2 + 2 + 2

Height (m)	15	17	19	21
Time (years)	75	85	95	105

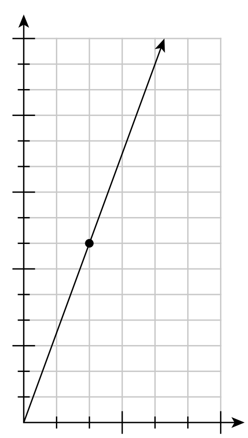
+ 10 + 10 + 10

One method is to write a ratio for the rate from the table, and then write a proportion to determine the unit rate.

$$\frac{2 \text{ meters}}{10 \text{ years}} = \frac{x \text{ meters}}{1 \text{ year}}$$

Then multiply by a Giant One of $\frac{0.1}{0.1}$ or $\frac{\frac{1}{10}}{\frac{1}{10}}$ or divide by 10. The unit growth rate is $\frac{0.2 \text{ meters}}{1 \text{ year}}$ or $\frac{\frac{1}{5} \text{ meters}}{1 \text{ year}}$.

4. The graph shows the amount of rice eaten by a family after a number of weeks. How much rice did this family eat in 1 week?



The graph represents a proportional relationship. The line goes through (2, 7), so it must also pass through the point (1, 3.5) on this line. Therefore, this family ate 3.5 cups of rice in 1 week. In other words, the unit rate is 3.5 cups per week.

5. A rice recipe uses 6 cups of rice for 15 people. At the same rate, how much rice is needed for 40 people?

The rate is $\frac{6 \text{ cups}}{15 \text{ people}}$, so we can write $\frac{6}{15} = \frac{x}{40}$ to represent this situation.

The multiplier needed for the Giant One is $\frac{40}{15}$ or $2\frac{2}{3}$.

Using that multiplier yields $\frac{6}{15} \cdot \frac{2\frac{2}{3}}{2\frac{2}{3}} = \frac{16}{40}$, so 16 cups of rice is needed.

6. Arrange these rates from least to greatest:

Rate A: 30 miles in 25 minutes   Rate B: 60 miles in one hour   Rate C: 70 miles in $1\frac{2}{3}$ hour

Change each rate to the same units. Here a common denominator of 60 minutes is shown.

Rate A: $\frac{30 \text{ mi}}{25 \text{ min}} \cdot \frac{2.4}{2.4} = \frac{72 \text{ mi}}{60 \text{ min}}$ Rate B: $\frac{60 \text{ mi}}{1 \text{ hr}} = \frac{60 \text{ mi}}{60 \text{ min}}$ Rate C: $\frac{70 \text{ mi}}{1\frac{2}{3} \text{ hr}} = \frac{70 \text{ mi}}{100 \text{ min}} \cdot \frac{0.6}{0.6} = \frac{42 \text{ mi}}{60 \text{ min}}$

So the order from least to greatest is Rate C < Rate B < Rate A. By using 60 minutes (one hour) for the common unit to compare speeds, each rate can be expressed as a unit rate: Rate C = 42 mph, Rate B = 60 mph, and Rate C = 72 mph.

Practice

Determine the unit rate for each situation in problems 1 through 6.

1. Scoring 98 points in a 40-minute game (points per minute)

2. Buying $\frac{2}{3}$ pounds of peanuts for $2.25 (cost per pound)

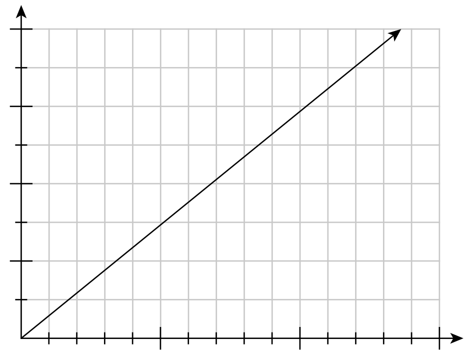
3. Mowing $1\frac{1}{2}$ acres of lawn in $\frac{3}{4}$ of a hour (acres per hour)

4. Paying $3.89 for 1.7 pounds of chicken (cost per pound)

5. For the table shown, what is the weight per centimeter?

Weight (g)	6	8	12	20
Length (cm)	15	20	30	50

6. For the graph shown, what is the rate in miles per hour?



Solve each rate problem. Explain your method.

7. Elaine knows that 6 cups of rice will make enough Spanish rice to feed 15 people. How many cups of rice will be needed to feed 135 people?

8. Balvina can plant 6 flowers in 15 minutes. How long will it take her to plant 30 flowers at the same rate?

9. A plane travels 3,400 miles in 8 hours. How far would it travel in 6 hours at this rate?

10. Shane rode his bike for 2 hours and traveled 12 miles. At this rate, how long would it take him to travel 22 miles?

11. Selina's car used 15.6 gallons of gas to go 234 miles. At this rate, how many gallons would it take her to go 480 miles?

12. Arrange these readers from fastest to slowest: Abel read 50 pages in 45 minutes, Brian read 90 pages in 75 minutes, and Charlie read 175 pages in 2 hours.

13. Arrange these lunch buyers by how much they spend, from most to least, assuming they all buy lunch five days per week: Ali spends $3 per day, Bo spends $25 every two weeks, and Cai spends $75 per month (4 weeks per month).

14. An ice skater covered 1,500 meters in 106 seconds. What is his unit rate in meters per second?

15. A car traveled 200 miles on 8 gallons of gas. Determine the unit rate of miles per gallon and the unit rate of gallons per mile.

16. Lee's paper clip chain is 32 feet long. He is going to add paper clips continually for the next eight hours. At the end of eight hours, the chain is 80 feet long. Determine the unit rate of growth in feet per hour.

Answers

1. 2.45 points/min

2. ≈ $3.38/lb

3. 2 acres/hr

4. ≈ $2.29/lb

5. 0.4 or $\frac{2}{5}$ g/cm

6. 30 mph

7. 54 cups

8. 75 minutes

9. 2,550 miles

10. $3\frac{2}{3}$ hours

11. 32 gallons

12. Charlie, Brian, Abel

13. Cai, Ali, Bo

14. ≈ 14.15 m/s

15. 25 mi/g, $\frac{1}{25}$ or 0.4 g/mi

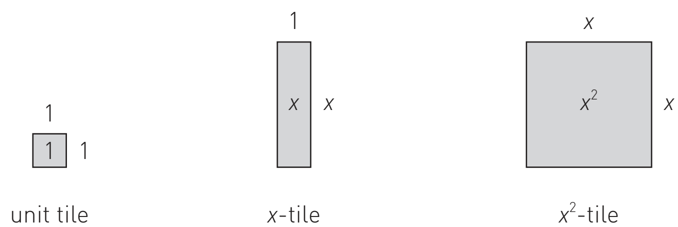
16. 6 ft/hour

Perimeter and Area With Algebra Tiles

GUIDED SKILL SUPPORT

Overview

Algebra tiles help you represent unknown quantities in a concrete way. Algebraic expressions can be represented by the perimeters of algebra tiles (rectangles and squares) and combinations of algebra tiles. The dimensions of each tile are shown along its sides, and the tile is named by its area, as shown on the tile itself in the following figures.

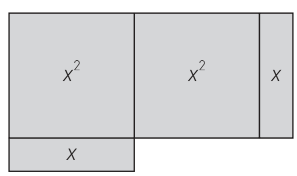


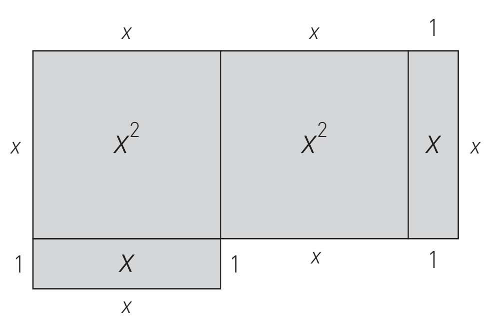
When using the tiles, the perimeter is the distance around the exterior of a tile figure.

For additional information, see the Methods & Meanings box in Lesson 4.3.1 of the *Core Connections Course 2* text.

Examples

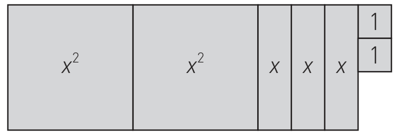
1. Write an algebraic expression to represent the perimeter of the shape.

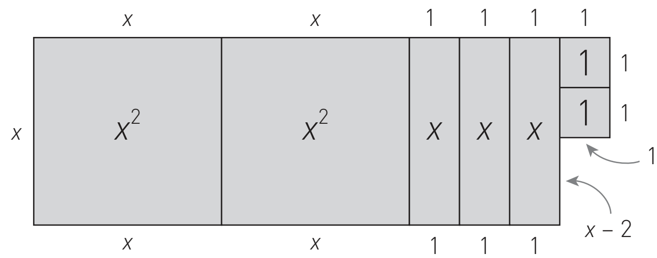




Perimeter = $x + x + 1 + x + 1 + x + 1 + x + 1 + x = 6x + 4$ units

2. Write an algebraic expression to represent the perimeter of the shape.



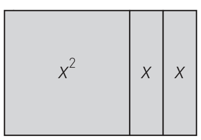


Perimeter = $x + x + 1 + 1 + 1 + 1 + 1 + 1 + 1 + (x - 2) + 1 + 1 + 1 + x + x + x + x = 6x + 8$ units

Practice

Determine the perimeter of each shape. Assume $x \geq 1$.

1.



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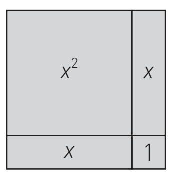

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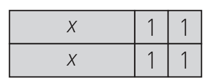

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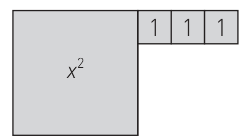

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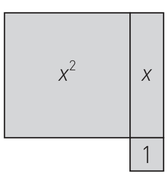

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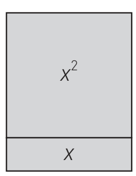

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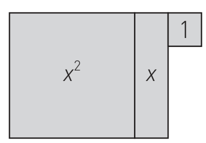

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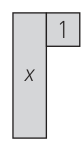


Answers

1. $4x + 4$ units

2. $4x + 4$ units

3. $2x + 8$ units

4. $4x + 6$ units

5. $4x + 4$ units

6. $4x + 2$ units

7. $4x + 4$ units

8. $2x + 4$ units

Combining Like Terms

GUIDED SKILL SUPPORT

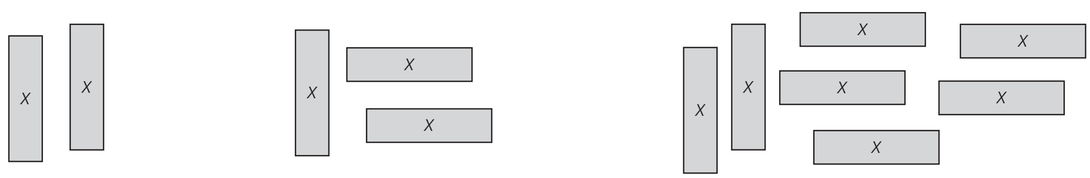
Overview

Algebraic expressions can contain variables, numbers, and operations (e.g., addition, division, exponents, etc.). Algebraic expressions can be rewritten into equivalent forms. To combine like terms, identify the terms that have the same variable(s) raised to the same power(s). Then, combine the like terms into one term by adding or subtracting. Algebra tiles can be used to model algebraic expressions.

For additional information, see the Methods & Meanings box in Lesson 4.3.2 of the *Core Connections Course 2* text. For additional examples and practice, see the *Core Connections Course 2* Checkpoint 7A materials.

Examples

1. Write an algebraic expression to represent the sum of the three sets of algebra tiles shown and then combine like terms.

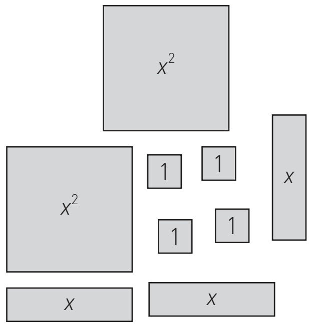


Use symbols to represent the x-tiles shown in each set: $2x + 3x + 7x$.

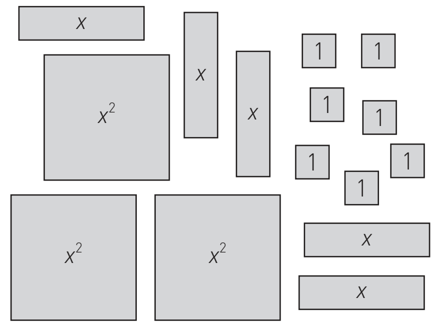
All these terms have x as the variable, so they are combined into one term, $12x$.

2. Represent $2x^2 + 3x + 4$ and $3x^2 + 5x + 7$ using algebra tiles, then combine like terms.

Build or sketch the algebra tiles to represent each expression.

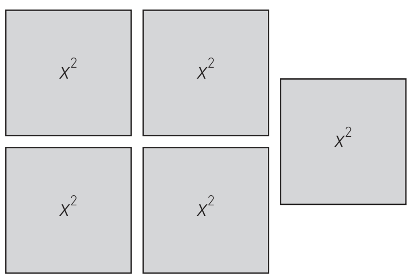


$2x^2 + 3x + 4$

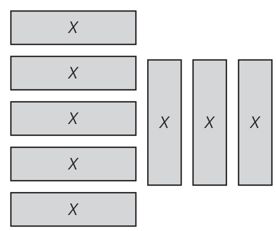


$3x^2 + 5x + 7$

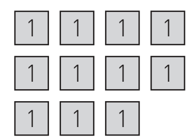
Next, combine like terms.



$5x^2$



$8x$



11

The sum of the two sets of tiles, written algebraically, is $5x^2 + 8x + 11$.

3. Rewrite the expression by combining like terms.

$$3x + 12 + 7x + 5$$

The x-terms can be combined. The terms without variables (the constants) can also be combined. The solution is shown using symbols.

$$\begin{aligned} &3x + 12 + 7x + 5 \\ &= 3x + 7x + 12 + 5 \\ &= 10x + 17 \end{aligned}$$

When writing variable expressions, the convention is that the term with the variable is listed before the constant term.

Practice

1. $(2x^2 + 6x + 10) + (4x^2 + 2x + 3)$
2. $(3x^2 + x + 4) + (x^2 + 4x + 7)$
3. $(8x^2 + 3) + (4x^2 + 5x + 4)$
4. $(4x^2 + 6x + 5) + (3x^2 + 2x + 4)$
5. $(4x^2 + 7x + 3) + (2x^2 + 2x + 5)$
6. $(3x^2 + 7x) + (x^2 + 3x + 9)$
7. $(5x + 6) + (5x^2 + 6x + 2)$
8. $2x^2 + 3x + x^2 + x + x^2 + 2$
9. $3c^2 + 4c + 7x + 12 + 4c^2 + 9 + 6x$
10. $2a^2 + 3a^3 + 4a^2 + 6a + 12 + 4a + 2$

Answers

1. $6x^2 + 8x + 13$
2. $4x^2 + 5x + 11$
3. $12x^2 + 5x + 7$
4. $7x^2 + 8x + 9$
5. $6x^2 + 9x + 8$
6. $4x^2 + 10x + 9$
7. $5x^2 + 11x + 8$
8. $4x^2 + 4x + 2$
9. $7c^2 + 4c + 13x + 21$
10. $3a^3 + 6a^2 + 10a + 14$

Distributive Property With Variables

GUIDED SKILL SUPPORT

Overview

The Distributive Property shows how to express sums and products in two ways: $a(b + c) = ab + ac$. This can also be written $(b + c)a = ab + ac$.

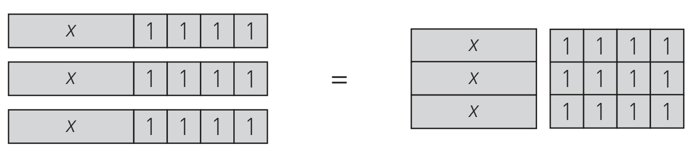
To rewrite the product, $a(b + c)$, as a sum, $ab + ac$, "distribute" the multiplier, a, by multiplying it by each term in the parentheses. To rewrite the sum as a product, divide each term by a common factor, a, and write the factor outside the parentheses. This can be represented as $ab + ac = a(b + c)$.

For additional information, see the Methods & Meanings boxes in Lessons 4.1.1 and 4.3.3 of the *Core Connections Course 2* text.

Examples

1. Represent $3(x + 4)$ using algebra tiles and then use the Distributive Property to rewrite the expression as a sum.

$3(x + 4)$ can be read as 3 sets of $(x + 4)$ or as 3 sets of x and 3 sets of 4.

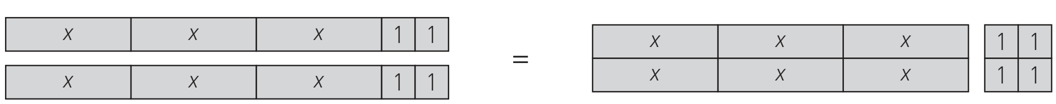


$3(x + 4)$ $\quad$ $(3 \cdot x) + (3 \cdot 4)$

The expression as a sum is $3x + 12$.

2. Represent $2(3x + 2)$ using algebra tiles and then use the Distributive Property to rewrite the expression as a sum.

$2(3x + 2)$ can be read as 2 sets of $(3x + 2)$ or as 2 sets of $3x$ and 2 sets of 2.

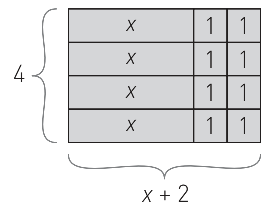


$2(3x + 2)$ $\quad$ $2(3x) + 2(2)$

The expression as a sum is $6x + 4$.

3. Build $4x + 8$ using algebra tiles and then rewrite the expression as a product using the Distributive Property.

Use algebra tiles to build a rectangle with the greatest number of rows possible. The number of rows represents the greatest common factor of the terms $4x$ and 8.



The factored form of the expression is represented as $4(x + 2)$, the dimensions of the rectangle.

Practice

Rewrite each expression using the Distributive Property.

1. $3(x + 6)$	**2.** $2(x + 4)$	**3.** $(8 + x)4$	**4.** $(2 + x)5$
5. $4(y + 3)$	**6.** $3(2y + 1)$	**7.** $2(x + 7)$	**8.** $\frac{1}{2}(x + 4)$
9. $6x + 12$	**10.** $8x + 20$	**11.** $x + xy$	**12.** $8m + 2$
13. $25y + 10$	**14.** $2(x + 10)$	**15.** $21 + 63x$	**16.** $4x + 4y + 4z$
17. $49x + 28$	**18.** $y + xy$		

Answers

1. $3x + 18$	**2.** $2x + 8$	**3.** $4x + 32$	**4.** $5x + 10$
5. $4y + 12$	**6.** $6y + 3$	**7.** $2x + 14$	**8.** $\frac{1}{2}x + 2$
9. $6(x + 2)$	**10.** $4(2x + 5)$	**11.** $x(y + 1)$	**12.** $2(4m + 1)$
13. $5(5y + 2)$	**14.** $2x + 20$	**15.** $21(3x + 1)$	**16.** $4(x + y + z)$
17. $7(7x + 4)$	**18.** $y(1 + x)$		

Algebraic Expressions and Zero Pairs

GUIDED SKILL SUPPORT

Overview

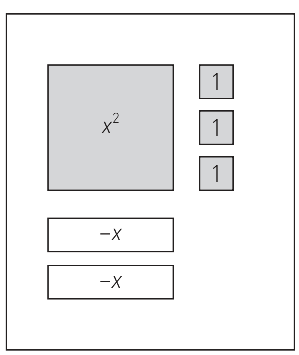
Algebra tiles and Expression Mats are concrete organizational tools that can be used to represent algebraic expressions. Positive tiles are shaded, and negative tiles are unshaded. A matching pair of tiles with one tile shaded and the other one unshaded represents zero (0), as shown in the following examples. These pairs are referred to as “zero pairs.”

When dealing with variable terms, $-x$, for example, is read as “the opposite of x,” since the variable x could represent a negative or positive number.

The concept of zero can be modeled using algebra tiles to make sense of combining like terms in algebraic expressions involving negatives.

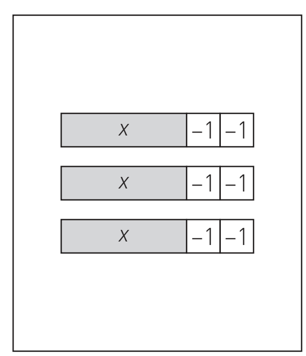
Examples

1. Represent $x^2 - 2x + 3$ using algebra tiles.



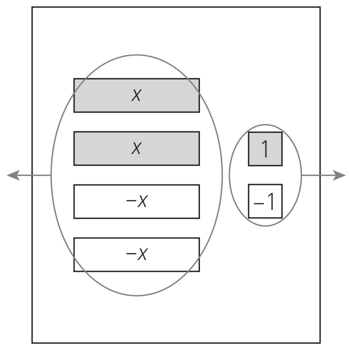
2. Represent $3(x - 2)$ using algebra tiles and then use the Distributive Property to rewrite the expression as a sum.

Build 3 sets of $(x - 2)$.



As a sum, $3(x - 2) = 3x - 6$.

3. Represent the algebra tiles shown with an expression. What value is represented?

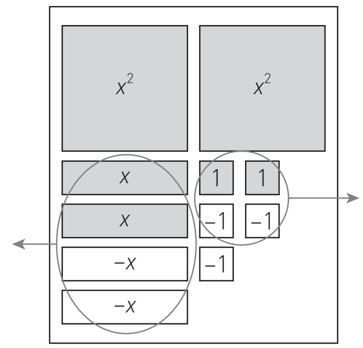


$2x + (-2x) + 1 + (-1) = 0$

4. Combine like terms for the following expression.

$$2x^2 + 2x + 2 + (-2x) + (-3).$$

Build each term with algebra tiles.



After removing zero pairs, $2x^2 - 1$ remains.

5. Determine the sum.

$$(2x^2 - 5x + 6) + (3x^2 + 4x - 9)$$

Another strategy to combine algebraic expressions is to take an expression that is written horizontally, circle the terms with their signs, and rewrite *like* terms in vertical columns before you combine them.

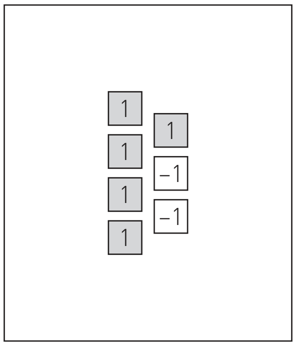
$$\boxed{2x^2}\boxed{-5x}\boxed{+6}\boxed{+3x^2}\boxed{+4x}\boxed{-9} \Longrightarrow \begin{array}{r} 2x^2 - 5x + 6 \\ +\ 3x^2 + 4x - 9 \\ \hline 5x^2 \quad - x - 3 \end{array}$$

The sum is $5x^2 - x - 3$.

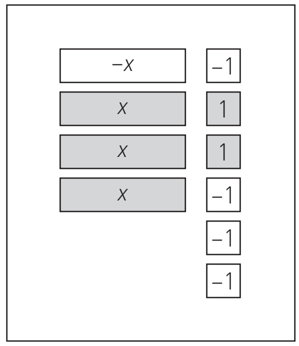
Practice

For each set of algebra tiles, remove zero pairs and write an expression.

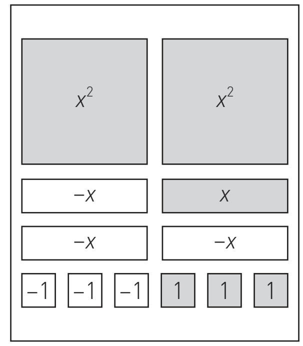
1.



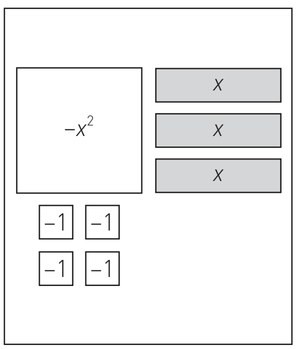
2.



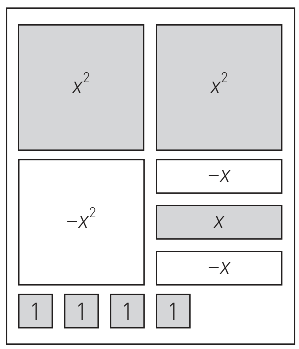
3.



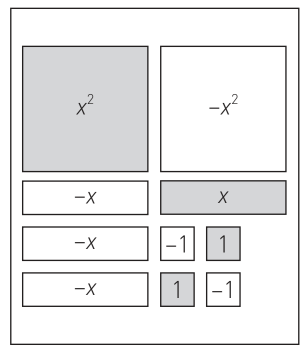
4.



5.



6.



For each expression, combine like terms and write a new expression.

1. $2x - 3 + x + 1$

2. $-3x + 2x + 4$

3. $x^2 - 2x + 3 + 3x - 1$

4. $x + (-3) + 5 - 2x$

5. $-3 + 2x + (-1) - 4x$

6. $3(x + 3) - 2x$

7. $x^2 - 2x + 3 - 2x^2 + 1$

8. $2(x - 2) + 3 - x$

9. $2(x^2 + 3) + 2x - 1$

Answers

1. 3

2. $2x - 2$

3. $2x^2 - 2x$

4. $-x^2 + 3x - 4$

5. $x^2 - x + 4$

6. $-2x$

7. $3x - 2$

8. $-x + 4$

9. $x^2 + x + 2$

10. $-x + 2$

11. $-2x - 4$

12. $x + 9$

13. $-x^2 - 2x + 4$

14. $x - 1$

15. $2x^2 + 2x + 5$