

Study Guide and Review

Study Guide

Key Concepts

Proportions (Lesson 7-1)

- For any numbers a and c and any nonzero numbers b and d , $\frac{a}{b} = \frac{c}{d}$ if and only if $ad = bc$.

Similar Polygons and Triangles (Lessons 7-2 and 7-3)

- Two polygons are similar if and only if their corresponding angles are congruent and the measures of their corresponding sides are proportional.
- Two triangles are similar if:
 - AA: Two angles of one triangle are congruent to two angles of the other triangle.
 - SSS: The measures of the corresponding sides of the two triangles are proportional.
 - SAS: The measures of two sides of one triangle are proportional to the measures of two corresponding sides of another triangle and their included angles are congruent.

Proportional Parts (Lessons 7-4 and 7-5)

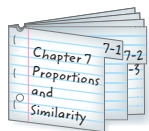
- If a line is parallel to one side of a triangle and intersects the other two sides in two distinct points, then it separates these sides into segments of proportional length.
- A midsegment of a triangle is parallel to one side of the triangle and its length is one-half the length of that side.
- Two triangles are similar when each of the following are proportional in measure: their perimeters, their corresponding altitudes, their corresponding angle bisectors, and their corresponding medians.

Similarity Transformations and Scale Drawings and Models (Lessons 7-6 and 7-7)

- A scale model or scale drawing has lengths that are proportional to the corresponding lengths in the object it represents.

FOLDABLES® Study Organizer

Be sure the Key Concepts are noted in your Foldable.



Key Vocabulary



- | | |
|-----------------------------------|------------------------------------|
| cross products (p. 462) | reduction (p. 511) |
| dilation (p. 511) | scale (p. 518) |
| enlargement (p. 511) | scale drawing (p. 518) |
| extremes (p. 462) | scale factor (p. 470) |
| means (p. 462) | scale model (p. 518) |
| midsegment of a triangle (p. 491) | similar polygons (p. 469) |
| proportion (p. 462) | similarity transformation (p. 511) |
| ratio (p. 461) | |

Vocabulary Check

Choose the letter of the word or phrase that best completes each statement.

- | | |
|------------------------|---------------------------|
| a. ratio | h. SSS Similarity Theorem |
| b. proportion | i. SAS Similarity Theorem |
| c. means | j. midsegment |
| d. extremes | k. dilation |
| e. similar | l. enlargement |
| f. scale factor | m. reduction |
| g. AA Similarity Post. | |
- A(n) _____ of a triangle has endpoints that are the midpoints of two sides of the triangle.
 - A(n) _____ is a comparison of two quantities using division.
 - If $\angle A \cong \angle X$ and $\angle C \cong \angle Z$, then $\triangle ABC \sim \triangle XYZ$ by the _____.
 - A(n) _____ is an example of a similarity transformation.
 - If $\frac{a}{b} = \frac{c}{d}$, then a and d are the _____.
 - The ratio of the lengths of two corresponding sides of two similar polygons is the _____.
 - A(n) _____ is an equation stating that two ratios are equivalent.
 - A dilation with a scale factor of $\frac{2}{5}$ will result in a(n) _____.



Lesson-by-Lesson Review

7-1 Ratios and Proportions

Solve each proportion.

9. $\frac{x+8}{6} = \frac{2x-3}{10}$ 10. $\frac{3x+9}{x} = \frac{12}{5}$
 11. $\frac{x}{12} = \frac{50}{6x}$ 12. $\frac{7}{x} = \frac{14}{9}$
13. The ratio of the lengths of the three sides of a triangle is 5:8:10. If its perimeter is 276 inches, find the length of the longest side of the triangle.
14. **CARPENTRY** A board that is 12 feet long must be cut into two pieces that have lengths in a ratio of 3 to 2. Find the lengths of the two pieces.

Example 1

Solve $\frac{2x-3}{4} = \frac{x+9}{3}$.

$$\frac{2x-3}{4} = \frac{x+9}{3}$$

Original proportion

$$3(2x-3) = 4(x+9)$$

Cross Products Property

$$6x-9 = 4x+36$$

Simplify.

$$2x-9 = 36$$

Subtract.

$$2x = 45$$

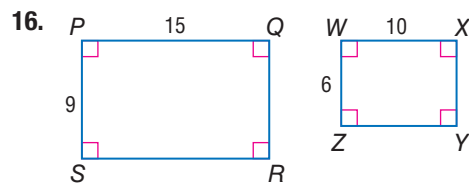
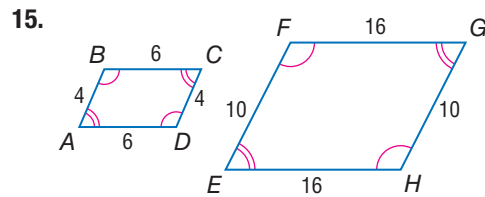
Add 9 to each side.

$$x = 22.5$$

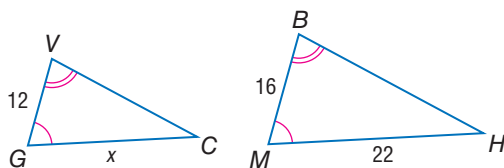
Divide each side by 2.

7-2 Similar Polygons

Determine whether each pair of figures is similar. If so, write the similarity statement and scale factor. If not, explain your reasoning.



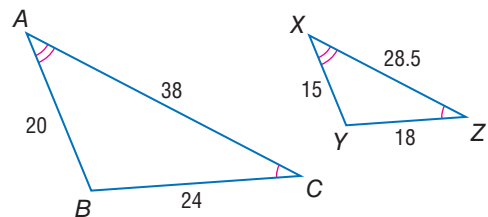
17. The two triangles in the figure below are similar. Find the value of x .



18. **PHOTOS** If the dimensions of a photo are 2 inches by 3 inches and the dimensions of a poster are 8 inches by 12 inches, are the photo and poster similar? Explain.

Example 2

Determine whether the pair of triangles is similar. If so, write the similarity statement and scale factor. If not, explain your reasoning.



$\angle A \cong \angle X$ and $\angle C \cong \angle Z$, so by the Third Angle Theorem, $\angle B \cong \angle Y$. All of the corresponding angles are therefore congruent.

Similar polygons must also have proportional side lengths. Check the ratios of corresponding side lengths.

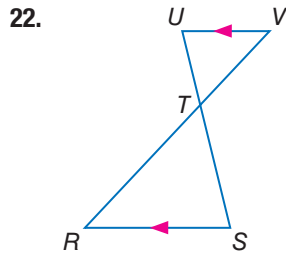
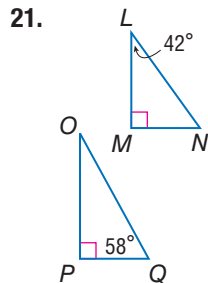
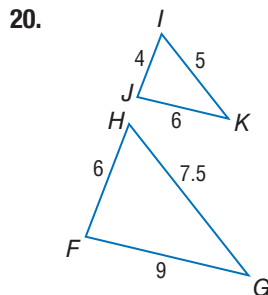
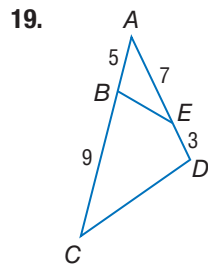
$$\frac{AB}{XY} = \frac{20}{15} \text{ or } \frac{4}{3} \quad \frac{BC}{YZ} = \frac{24}{18} \text{ or } \frac{4}{3} \quad \frac{AC}{XZ} = \frac{38}{28.5} \text{ or } \frac{4}{3}$$

Since corresponding sides are proportional, $\triangle ABC \sim \triangle XYZ$. So, the triangles are similar with a scale factor of $\frac{4}{3}$.

Study Guide and Review *Continued*

7-3 Similar Triangles

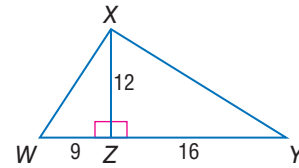
Determine whether the triangles are similar. If so, write a similarity statement. Explain your reasoning.



23. **TREES** To estimate the height of a tree, Dave stands in the shadow of the tree so that his shadow and the tree's shadow end at the same point. Dave is 6 feet 4 inches tall and his shadow is 15 feet long. If he is standing 66 feet away from the tree, what is the height of the tree?

Example 3

Determine whether the triangles are similar. If so, write a similarity statement. Explain your reasoning.



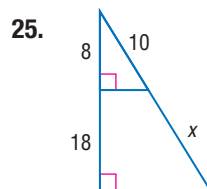
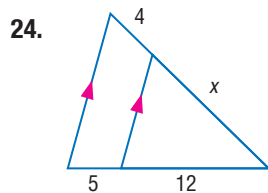
$\angle WZX \cong \angle XZY$ because they are both right angles. Now compare the ratios of the legs of the right triangles.

$$\frac{WZ}{XZ} = \frac{9}{12} = \frac{3}{4} \quad \frac{XZ}{YZ} = \frac{12}{16} = \frac{3}{4}$$

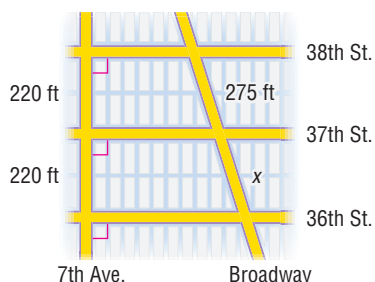
Since two pairs of sides are proportional with the included angles congruent, $\triangle WZX \sim \triangle XZY$ by SAS Similarity.

7-4 Parallel Lines and Proportional Parts

Find x .



26. **STREETS** Find the distance along Broadway between 37th Street and 36th Street.



Example 4

ALGEBRA Find x and y .

$$\begin{aligned} FK &= KG \\ 3x + 7 &= 4x - 1 \\ -x &= -8 \\ x &= 8 \end{aligned}$$

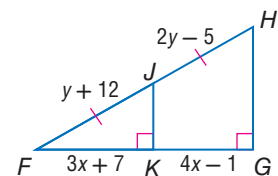
$$\begin{aligned} FJ &= JH \\ y + 12 &= 2y - 5 \\ -y &= -17 \\ y &= 17 \end{aligned}$$

Definition of congruence

Substitution

Subtract.

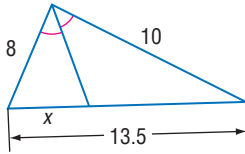
Simplify.



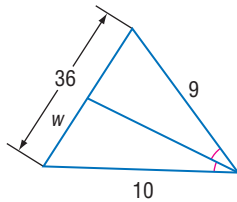
7-5 Parts of Similar Triangles

Find the value of each variable.

27.



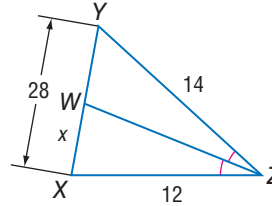
28.



29. **MAPS** The scale given on a map of the state of Missouri indicates that 3 inches represents 50 miles. The cities of St. Louis, Springfield, and Kansas City form a triangle. If the measurements of the lengths of the sides of this triangle on the map are 15 inches, 10 inches, and 13 inches, find the perimeter of the actual triangle formed by these cities to the nearest mile.

Example 5

Find x .



Use the Triangle Angle Bisector Theorem to write a proportion.

$$\frac{WX}{YW} = \frac{XZ}{YZ}$$

Triangle Angle Bisector Thm.

$$\frac{x}{28 - x} = \frac{12}{14}$$

Substitution

$$(28 - x)(12) = x \cdot 14$$

Cross Products Property

$$336 - 12x = 14x$$

Simplify.

$$336 = 26x$$

Add.

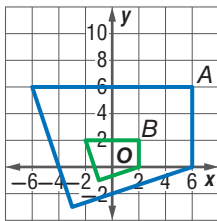
$$12.9 = x$$

Simplify.

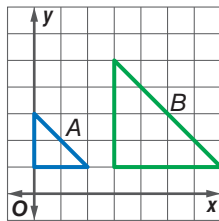
7-6 Similarity Transformations

Determine whether the dilation from A to B is an *enlargement* or a *reduction*. Then find the scale factor of the dilation.

30.



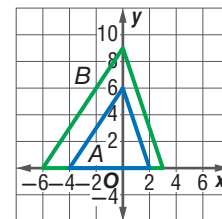
31.



32. **GRAPHIC DESIGN** Jamie wants to use a photocopier to enlarge her design for the Honors Program at her school. She sets the copier to 250%. If the original drawing was 6 inches by 9 inches, find the dimensions of the enlargement.

Example 6

Determine whether the dilation from A to B is an *enlargement* or a *reduction*. Then find the scale factor of the dilation.



B is larger than A , so the dilation is an enlargement. The distance between the vertices at $(-4, 0)$ and $(2, 0)$ for A is 6 and the distance between the vertices at $(-6, 0)$ and $(3, 0)$ for B is 9. So the scale factor is $\frac{9}{6}$ or $\frac{3}{2}$.

Study Guide and Review *Continued*

7-7 Scale Drawings and Models

33. **BUILDING PLANS** In a scale drawing of a school's floor plan, 6 inches represents 100 feet. If the distance from one end of the main hallway to the other is 175 feet, find the corresponding length in the scale drawing.
34. **MODEL TRAINS** A popular scale for model trains is the 1 : 48 scale. If the actual train car had a length of 72 feet, find the corresponding length of the model in inches.
35. **MAPS** A map of the eastern United States has a scale where 3 inches = 25 miles. If the distance on the map between Columbia, South Carolina, and Charlotte, North Carolina, is 11.5 inches what is the actual distance between the cities?

Example 7

In the scale of a map of the Pacific Northwest 1 inch = 20 miles. The distance on the map between Portland, Oregon, and Seattle, Washington, is 8.75 inches. Find the distance between the two cities.

$$\frac{1}{20} = \frac{8.75}{x}$$

Write a proportion.

$$x = 20(8.75)$$

Cross Products Property

$$x = 175$$

Simplify.

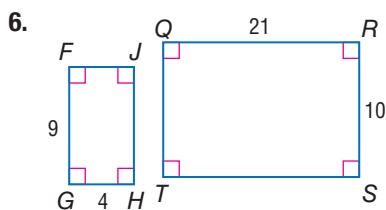
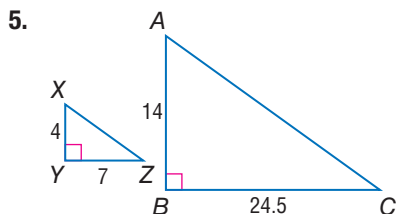
The distance between the two cities is 175 miles.

Practice Test

Solve each proportion.

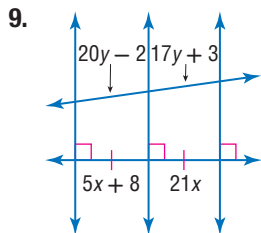
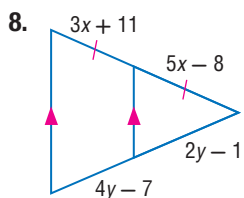
- $\frac{3}{7} = \frac{12}{x}$
- $\frac{2x}{5} = \frac{x+3}{3}$
- $\frac{4x}{15} = \frac{60}{x}$
- $\frac{5x-4}{4x+7} = \frac{13}{11}$

Determine whether each pair of figures is similar. If so, write the similarity statement and scale factor. If not, explain your reasoning.



7. **CURRENCY** Jane is traveling to Europe this summer with the French Club. She plans to bring \$300 to spend while she is there. If \$90 in U.S. currency is equivalent to 63 euros, how many euros will she receive when she exchanges her money?

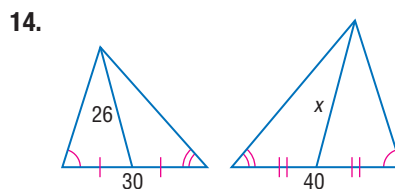
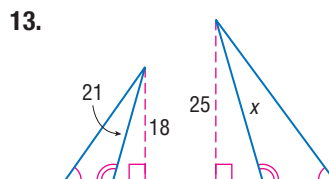
ALGEBRA Find x and y . Round to the nearest tenth if necessary.



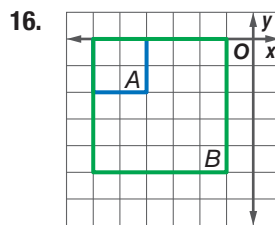
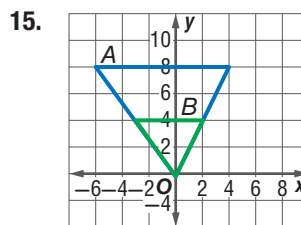
10. **ALGEBRA** Equilateral $\triangle MNP$ has perimeter $12a + 18b$. \overline{QR} is a midsegment. What is QR ?
11. **ALGEBRA** Right isosceles $\triangle ABC$ has hypotenuse length h . \overline{DE} is a midsegment with length $4x$ that is not parallel to the hypotenuse. What is the perimeter of $\triangle ABC$?

12. **SHORT RESPONSE** Jimmy has a diecast metal car that is a scale model of an actual race car. If the actual length of the car is 10 feet and 6 inches and the model has a length of 7 inches, what is the scale factor of model to actual car?

Find x .



Determine whether the dilation from A to B is an enlargement or a reduction. Then find the scale factor of the dilation.



17. **ALGEBRA** Identify the similar triangles. Find WZ and UZ .

