Lesson 12.8

Chapter Review

Similarity has more applications than just about any geometry topic. Any scale drawing or model, anything that is reduced or enlarged, is governed by properties of similar figures. Think of as many applications as you can in the movie-making industry alone. How many can you list? Similarity is also useful in indirect measurement. Can you describe at least two indirect measurement methods? How are distance ratios in similar figures related to ratios of area and volume? How can similar figures be used to misrepresent data in graphs?

Exercise Set 12.8

For Exercises 1–12, identify each statement as true or false. If possible, sketch a counterexample for each false statement or explain why it is false.

1. If the three sides of one triangle are proportional to the three sides of another triangle, then the two triangles are similar.
2. If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.
3. If two sides of one triangle are proportional to the sides of another triangle, then the two triangles are similar.
4. If the four angles of one quadrilateral are congruent to the four corresponding angles of another quadrilateral, then the two quadrilaterals are similar.
5. An angle bisector in a triangle divides the opposite side into two segments whose lengths are in the same ratio as the corresponding adjacent sides.
6. If two triangles are similar, then their corresponding altitudes, corresponding medians, and corresponding angle bisectors are proportional to their corresponding sides.
7. If two similar polygons (or circles) have corresponding sides (or radii) in the ratio of m/n, then their areas are in the ratio of m/n.
8. If two similar solids have corresponding dimensions in the ratio of m/n, then their volumes are in the ratio of m/n.
9. If a line parallel to one side of a triangle passes through the other two sides, then it divides them proportionally.
10. If a line cuts two sides of a triangle proportionally, then it is parallel to the third side.
11. If two or more lines pass through two sides of a triangle parallel to the third side, then they divide the two sides equally.
12. Six statements in Exercises 1–12 are false.

For Exercises 13–16, solve each proportion.

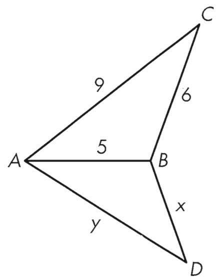
13. $\frac{x}{15} = \frac{8}{5}$ **14.** $\frac{4}{11} = \frac{24}{x}$ **15.** $\frac{4}{x} = \frac{x}{9}$ **16.** $\frac{x}{x+3} = \frac{34}{40}$

17. The rate at which countries exchange currency is called the exchange rate. On Sunday, January 1, 1995, 1 U.S. dollar bought 4.75 Mexican pesos. However, by the following Sunday, January 8, $1.00 could be exchanged for 5.72 pesos. What was the exchange rate for pesos to dollars on January 1? (One peso bought what decimal fraction of a dollar?) If you owned 10,000 pesos, how much would they have been worth in U.S. dollars on January 1? How much would they have been worth in U.S. dollars on January 8?

In Exercises 18–21, measurements are given in centimeters.

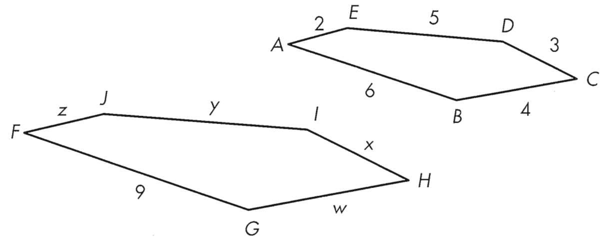
18.* $\triangle ABC \sim \triangle DBA$

$x = $ -?- $\quad y = $ -?-



19. $ABCDE \sim FGHIJ$

$w = $ -?- $\quad x = $ -?- $\quad y = $ -?- $\quad z = $ -?-



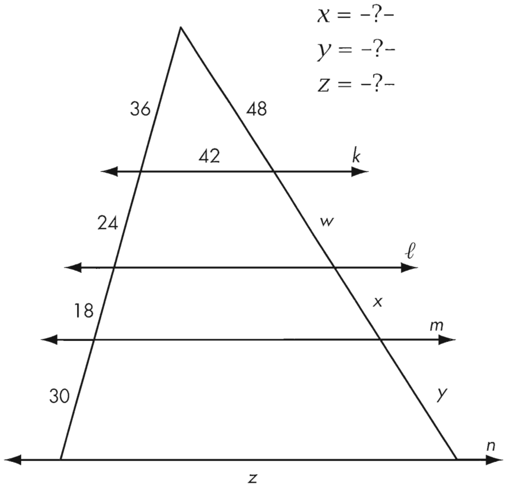
20. $k \parallel \ell \parallel m \parallel n$

$w = $ -?-

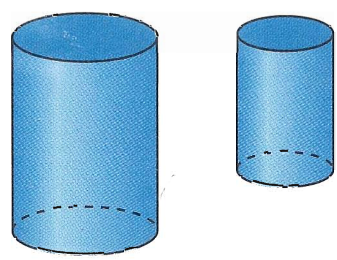
$x = $ -?-

$y = $ -?-

$z = $ -?-



21.* The dimensions of the smaller cylinder are two thirds of the larger. The volume of the larger cylinder is 2160π cm^3. Find the volume of the smaller cylinder.



22. Diane is 5′8″ tall and wants to find the height of an oak tree in her front yard. She walks along the shadow of the tree until her head is in a position where the end of her shadow exactly overlaps the end of the treetop's shadow. She is now 11′3″ from the foot of the tree and 8′6″ from the end of the shadow. How tall is her oak tree?

23. After building a rectangular box home for his pet python, Monty, Charlie learns that Lucy has also built a home for Monty but with dimensions twice as great. If it takes one half of a gallon of paint to cover the surface of Charlie's home for Monty, how many gallons of paint would be needed to paint the python home that Lucy built? How many times as much volume will Lucy's box hold as Charlie's?

24.* The Jones family paid \$150 to a painting contractor to stain their 12-ft-by-15-ft back deck. The Smiths, their neighbors, have a similar deck that measures 16 ft by 20 ft. If the Smiths wish to "keep up with the Joneses," what is a proportional price the Smith family should expect to pay to have their deck stained by the contractor?

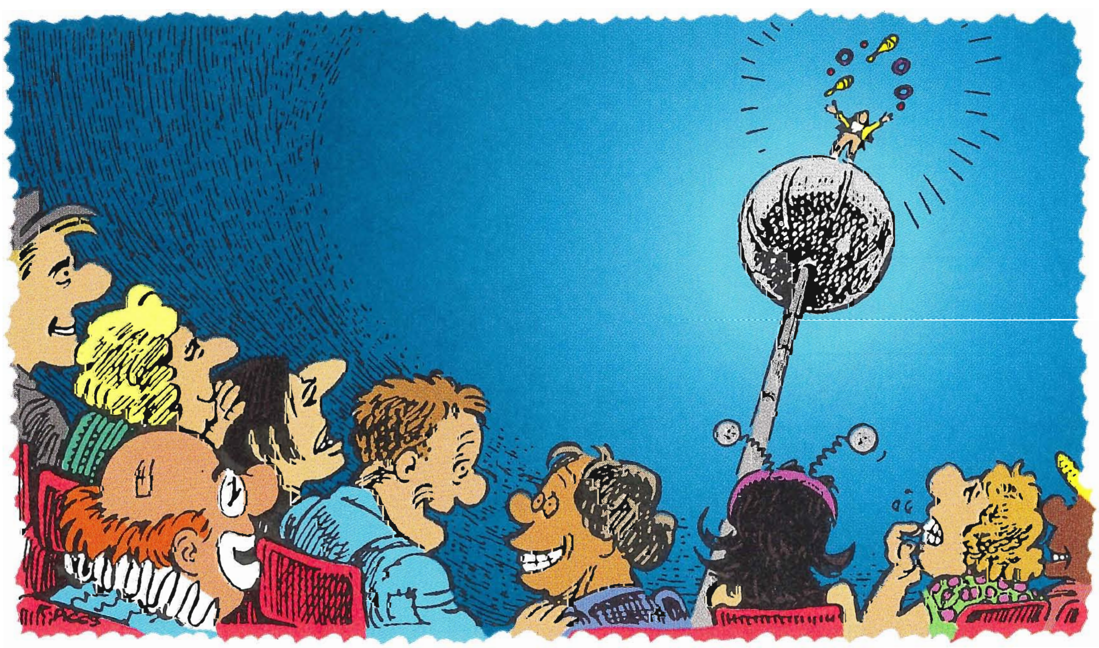
25. The ratio of the perimeters of two similar parallelograms is 3:7. What is the ratio of their areas?

26. The areas of two circles are in the ratio of 25:16. What is the ratio of their radii?

27. Would 15 pounds of ice cubes that each measure one inch on an edge melt faster than a 15-pound block of ice? Explain.

28.* Construct $\overline{KL}$. Then find a point P that divides KL into the ratio of 2:3.

29.* The Ring-a-Ding Sisters Circus has come to town. P. T. Barnone is the star of the show. She does a juggling act atop a stool that sits on top of a rotating ball that spins at the top of a 20-meter pole. The diameter of the ball is 4 meters, and P. T.'s eye is 2 meters above the ball. The circus manager needs to know the radius of the circular region beneath the ball in which spectators would be unable to see eye to eye with P. T. Find the radius to the nearest tenth meter for the manager so that he can put in the seats for the show. (Use 1.7 for $\sqrt{3}$.)



The Ring-a-Ding Sisters Circus

30. Many fanciful movies, books, and stories have been written about people who are accidentally shrunk to a small fraction of their original height. This change in size creates a variety of changes in their needs. If a person's height were decreased to one twentieth his original size, how would that change the amount of food he'd require, or the amount of material needed to clothe him, or the time he'd need to get to different places? Explain.