

11.3 Perimeter and Area of Similar Figures

THEOREM

For Your Notebook

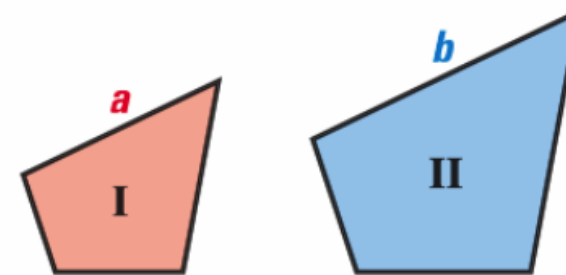
THEOREM 11.7 Areas of Similar Polygons

If two polygons are similar with the lengths of corresponding sides in the ratio of $a:b$, then the ratio of their areas is $a^2:b^2$.

$$\frac{\text{Side length of Polygon I}}{\text{Side length of Polygon II}} = \frac{a}{b}$$

$$\frac{\text{Area of Polygon I}}{\text{Area of Polygon II}} = \frac{a^2}{b^2}$$

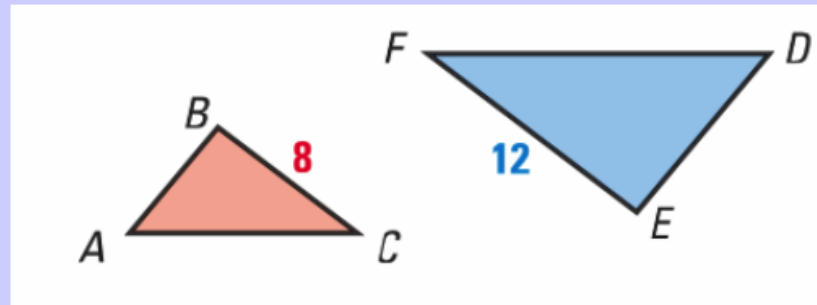
Justification: Ex. 30, p. 742



Polygon I ~ Polygon II

EXAMPLE 1 Find ratios of similar polygons

In the diagram, $\triangle ABC \sim \triangle DEF$. Find the indicated ratio.



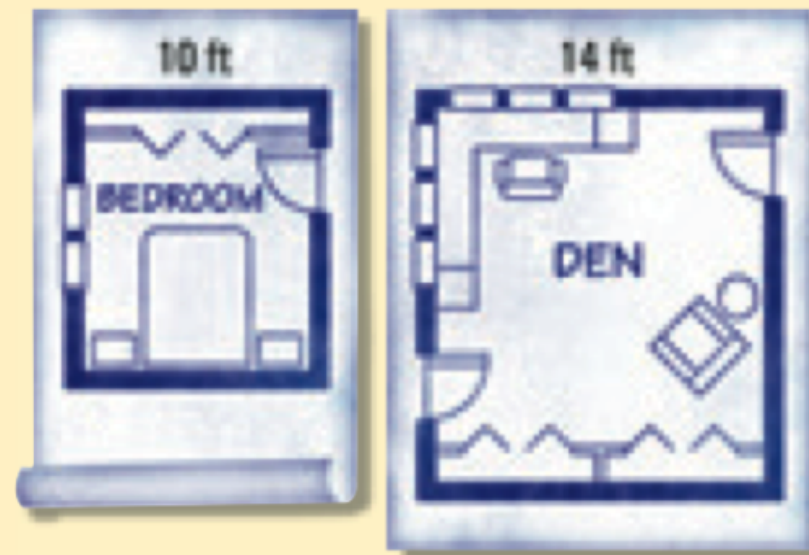
a. Ratio (red to blue) of the perimeters

b. Ratio (red to blue) of the areas

EXAMPLE 2 **Standardized Test Practice**

You are installing the same carpet in a bedroom and den. The floors of the rooms are similar. The carpet for the bedroom costs \$225. Carpet is sold by the square foot. How much does it cost to carpet the den?

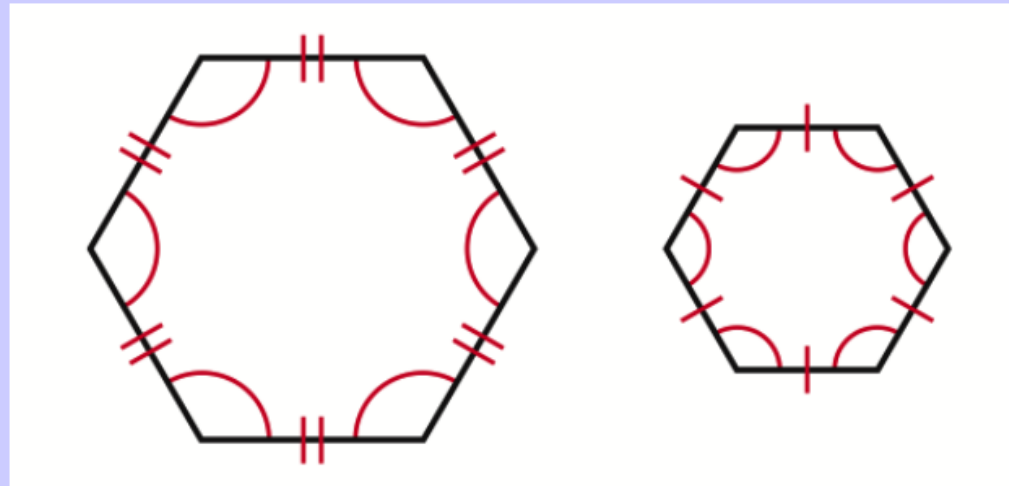
- (A) \$115 (B) \$161
(C) \$315 (D) \$441



EXAMPLE 3 Use a ratio of areas

COOKING A large rectangular baking pan is 15 inches long and 10 inches wide. A smaller pan is similar to the large pan. The area of the smaller pan is 96 square inches. Find the width of the smaller pan.

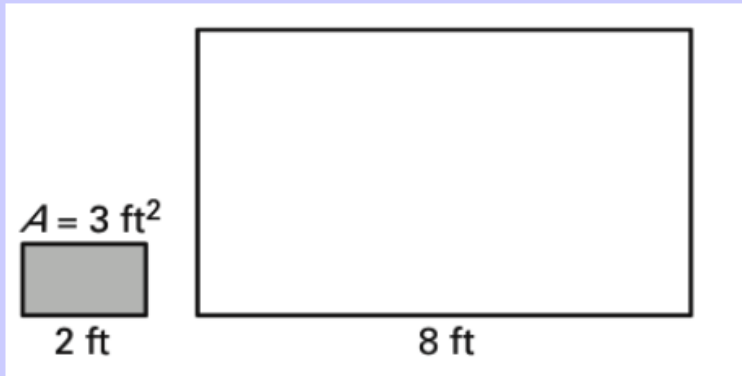
REGULAR POLYGONS Consider two regular polygons with the same number of sides. All of the angles are congruent. The lengths of all pairs of corresponding sides are in the same ratio. So, any two such polygons are similar. Also, any two circles are similar.



Complete the table of ratios for similar polygons.

	Ratio of corresponding side lengths	Ratio of perimeters	Ratio of areas
1.	2:3		
2.		3:5	
3.			36:25

The polygons are similar. Find the ratio (shaded to unshaded) of the perimeters and of the areas. Find the unknown area.

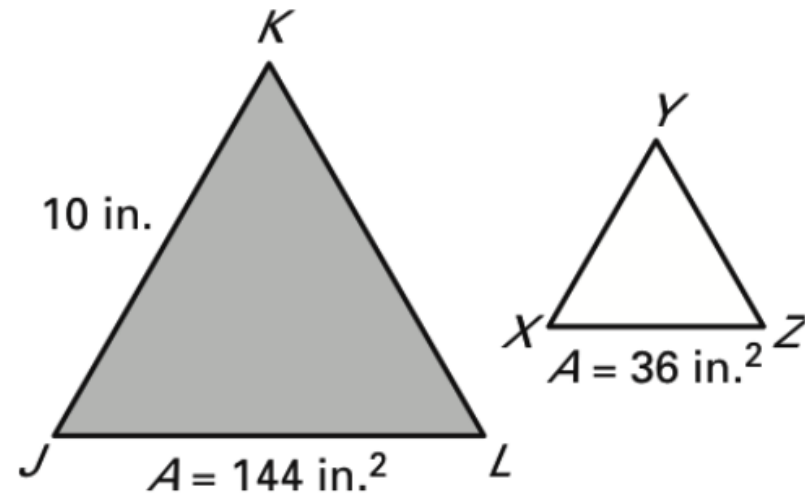


The ratio of the areas of two similar figures is given. Write the ratio of the lengths of corresponding sides.

Ratio of areas = 9 : 25

Use the given area to find XY .

$$JKL \sim XYZ$$



Complete the statement using *always*, *sometimes*, or *never*.

- 13.** Two similar quadrilaterals ? have the same perimeter.
- 14.** Two squares with the same perimeter are ? similar.
- 15.** Two regular hexagons are ? similar.
- 16.** Two right triangles with the same area are ? similar.

Assignment:

11.3 WS

LESSON
11.3**Practice B***For use with pages 737–743***Complete the table of ratios for similar polygons.**

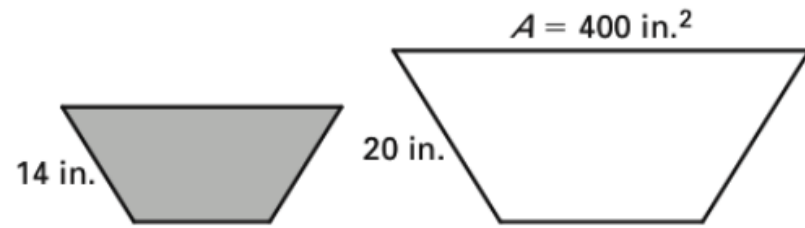
	Ratio of corresponding side lengths	Ratio of perimeters	Ratio of areas
1.	5 : 8		
2.		4 : 7	
3.			169 : 36
4.	66 : 18 = ?		

Corresponding lengths in similar figures are given. Find the ratios (shaded to unshaded) of the perimeters and areas. Find the unknown area.

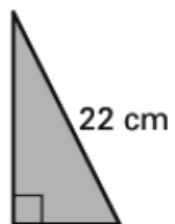
5.



6.



7.

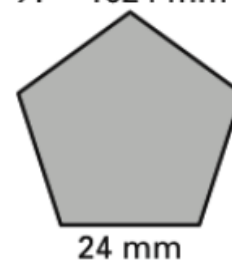


$$A = 162 \text{ cm}^2$$



8.

$$A = 1024 \text{ mm}^2$$



The ratio of the areas of two similar figures is given. Write the ratio of the lengths of corresponding sides.

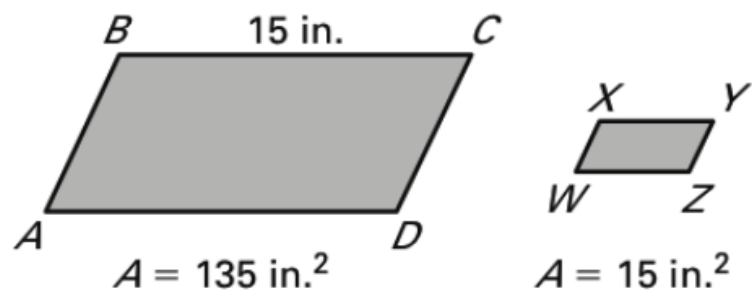
9. Ratio of areas = $16:81$

10. Ratio of areas = $25:196$

11. Ratio of areas = $144:49$

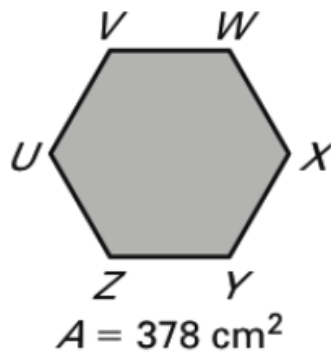
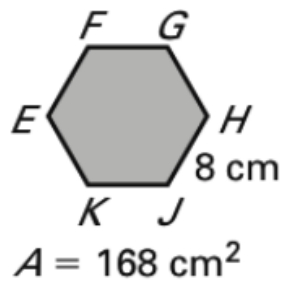
Use the given area to find XY .

12. $ABCD \sim WXYZ$



Use the given area to find XY .

13. $EFGHJK \sim UVWXYZ$



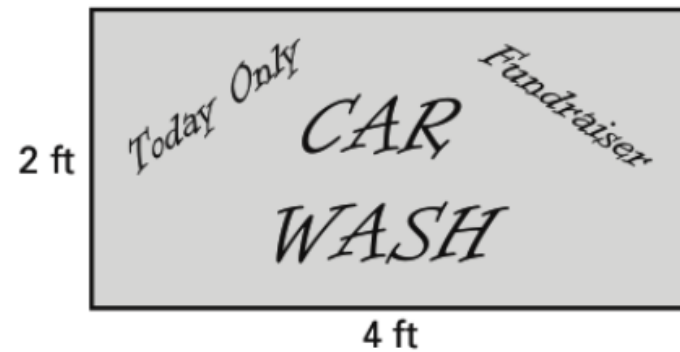
- 14.** Regular octagon $ABCDEFGH$ has a side length of 10 millimeters and an area of 160 square millimeters. Regular octagon $JKLMNO P Q$ has a perimeter of 200 millimeters. Find its area.

- 15.** Kites $RSTU$ and $VWXY$ are similar. The area of $RSTU$ is 162 square feet. The diagonals of $VWXY$ are 32 feet long and 18 feet long. Find the area of $VWXY$. Then use the ratio of the areas to find the lengths of the diagonals of $RSTU$.

- 16.** $\triangle ABC$ and $\triangle DEF$ are similar. The height of $\triangle ABC$ is 42 inches. The base of $\triangle DEF$ is 7 inches and the area is 42 square inches. Find the ratio of the area of $\triangle ABC$ to the area of $\triangle DEF$.

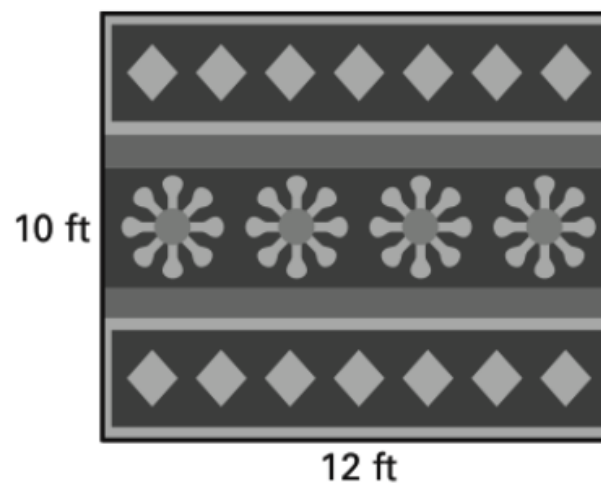
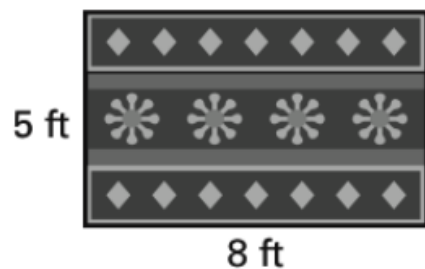
- 17.** Rectangles $ABCD$ and $EFGH$ are similar. The width of $ABCD$ is 18 centimeters and the perimeter is 120 centimeters. The length of $EFGH$ is 91 centimeters. Find the ratio of the side lengths of $ABCD$ to the side lengths of $EFGH$.

Posters Your school had a car wash to raise money. A poster that was used to attract customers is shown. You decide that you will have the car wash again next year. You will have a similar poster but you will increase the length to 6 feet to try to attract more customers. Find the area of the new poster.



Rug Costs You are comparing the two rugs shown below. You want to be sure that the large rug is priced fairly. The price of the small rug is \$84. The price of the large rug is \$210.

- What are the areas of the two rugs? What is the ratio of the area of the small rug to the area of the large rug?
- Compare the rug costs. Do you think the large rug is a good buy? *Explain.*



Assignment: 11.1-11.3
Review Worksheet