$\dfrac{6}{2}$ $\dfrac{15}{5}$

Area and Perimeter of Similar Figures

What You'll Learn

Scan the lesson. Predict two things you will learn about the perimeter and area of similar figures. **Sample answers:**

- **The perimeters of similar figures are related by the scale factor.**

- **The areas of similar figures are related by the square of the scale factor.**

Essential Question

HOW can you determine congruence and similarity?

CCSS Common Core State Standards

Content Standards
Extension of 8.G.4

Mathematical Practices
1, 2, 3, 4

Watch

1. Two rectangles are similar. One has a length of 6 inches and a perimeter of 24 inches. The other has a length of 7 inches. What is the perimeter of this rectangle?

The scale factor is $\frac{7}{6}$. The perimeter of the original is 24 inches.

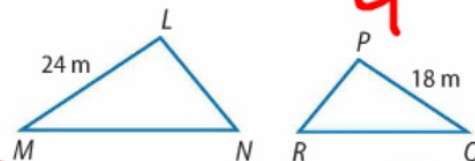$x = 24\left(\frac{7}{6}\right)$ Multiply by the scale factor.

$x = \frac{\overset{4}{24}}{1}\left(\frac{7}{\underset{1}{6}}\right)$ Divide out common factors.

$x = 28$ Simplify.

So, the perimeter of the new rectangle is 28 inches.

Got It? Do this problem to find out.

Show your work.

a. Triangle *LMN* is similar to triangle *PQR*. If the perimeter of △*LMN* is 64 meters, what is the perimeter of △*PQR*?

a. **48 m**

L
24 m
M   N
P
18 m
R   Q

Handwritten work:
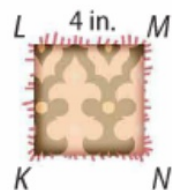$\frac{24}{18} = \frac{64}{x}$
$\frac{3}{4}$
$\frac{4x}{4} = \frac{192}{4}$

$P = 64 \cdot 9$ or 576 Substitute. Then simplify.

The perimeter of the actual garden is 576 inches or 48 feet.

Got It? Do this problem to find out.

b. Two quilting squares are shown. The scale factor is 3:2. What is the perimeter of square *TUVW*?

L ——— 4 in. ——— M

K ——————— N   T ——————— W

U ——————— V

b. **24 in.**

(handwritten)

$x = 6$

$\dfrac{3}{2} = \dfrac{x}{4}$

$2x = 12$ $x = 6$

Real World

Example

Tutor

Guided Practice

Check ☑

For each pair of similar figures, find the perimeter of the second figure.
(Example 1)

1.

P = ? cm

P = 18 cm

3 cm   4 cm

24 cm

2.

P = 21 ft

P = ? ft

5 ft   2 ft
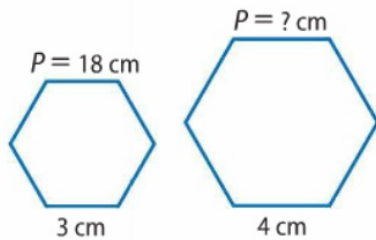
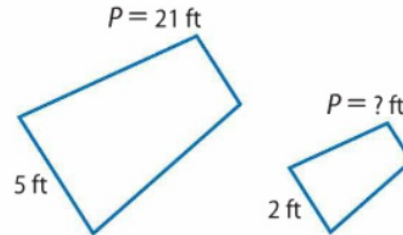**8.4 ft**

3. Julie is enlarging a digital photograph on her computer. The original photograph is 5 inches by 7 inches. If she enlarges the dimensions 1.5 times, what will be the perimeter and area of the new image? (Examples 2 and 3)

36 in.; 78.75 in²

15
+21
——
36

5×7
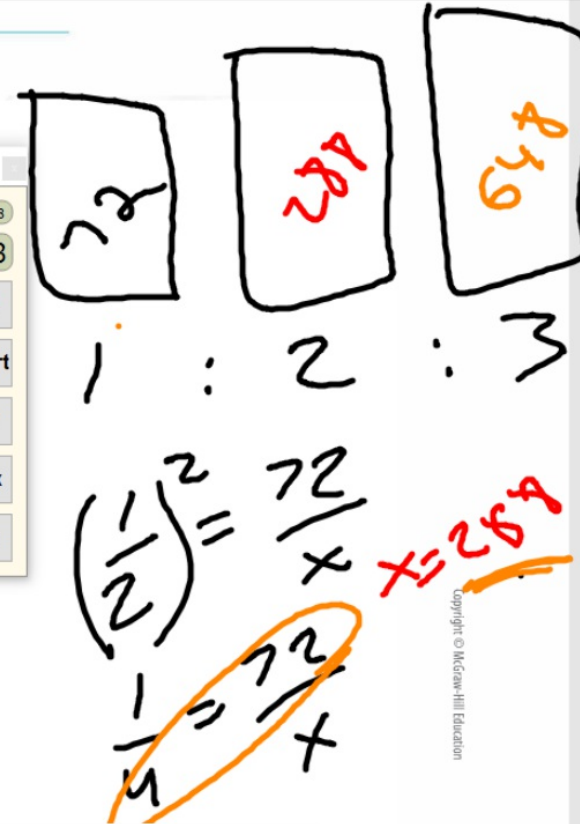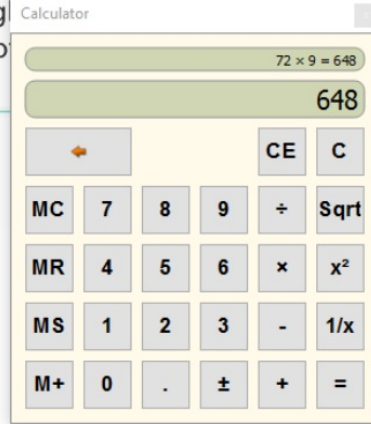
7.5 × 10.5

4. Logan is flying a kite that is made up of three similar rectangles. The sides of the three rectangles are in the ratio 1:2:3. If the area of the smallest rectangle is 72 square inches, what are the areas of the other rectangles? *(Example 3)* **288 in^2; 648 in^2**

$$\left(\frac{1}{3}\right)^2 = \frac{72}{x}$$

$$\frac{1}{9} = \frac{72}{x}$$

$$x = 648$$

Calculator

72 × 9 = 648

648

				CE	C
MC	7	8	9	÷	Sqrt
MR	4	5	6	×	x²
MS	1	2	3	-	1/x
M+	0	.	±	+	=

288

648

1 : 2 : 3

$$\left(\frac{1}{2}\right)^2 = \frac{72}{x}$$

$$\frac{1}{4} = \frac{72}{x}$$

$$x = 288$$

5. ⓔ **Building on the Essential Question** If you know two figures are similar and you are given the area of both figures, how can you determine the scale factor of the similarity?

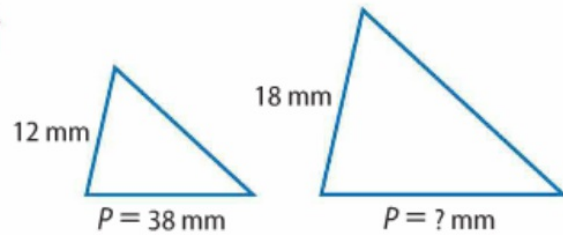**Sample answer: Write the ratio of the two areas and then take the square root of the ratio.**

eHelp

For each pair of similar figures, find the perimeter of the second figure.

(Example 1)

1

18 mm

12 mm

P = 38 mm

P = ? mm

57 mm

2.

8.4 in.

6.3 in.

P = 19.4 in.
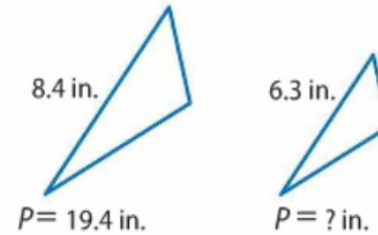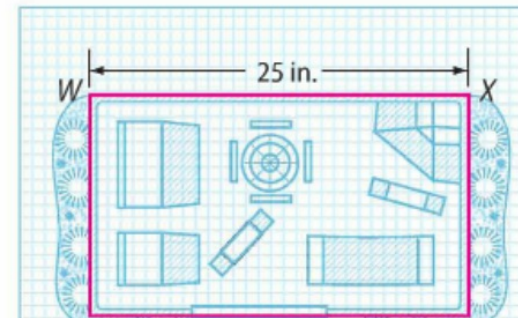
P = ? in.

14.55 in.

now your work.

3. The city of Brice is planning to build a skate park. An architect designed the area shown at the right. In the plan, the perimeter of the park is 80 inches. If the actual length of $\overline{WX}$ is 50 feet, what will be the perimeter of the actual skate park? (Example 2) **160 ft**

25 in.

W

X

4. A child's desk is made so that the dimensions are two-thirds the dimensions of a full-size adult desk. Suppose the top of the full-size desk measures 54 inches long by 36 inches wide. What is the perimeter and area of the top of the child's desk? (Examples 2 and 3)

120 in.; 864 in^2

5 Theo is constructing a miniature putting green in his backyard. He wants it to be similar to a putting green at the local golf course, but one third the dimensions. The area of the putting green at the golf course is 1,134 square feet. What will be the area of the putting green Theo constructs?

126 ft^2

6. Craig is making a model version of his neighborhood that uses model trains. The ratio of the model train to the actual train is 1:64. His neighborhood covers an area of 200,704 square feet. What will be the area of the model neighborhood?

49 ft^2

7. **CCSS** **Identify Structure** Complete the graphic organizer to compare how the scale factor affects the side lengths, perimeter, and area of similar rectangles.

If the scale factor is...	Multiply the ...			
	Length by	Width by	Perimeter by	Area by
2	2	2	2	4
4	4	4	4	16
0.5	0.5	0.5	0.5	0.25
$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{4}{9}$
k	k	k	k	k^2

🔥 H.O.T. Problems Higher Order Thinking

8. **CCSS** **Persevere with Problems** Two circles have circumferences of π and 3π. What is the ratio of the area of the circles? the diameters? the radii?

   1:9; 1:3; 1:3

9. **CCSS** **Justify Conclusions** A company wants to reduce the dimensions of its logo from 6 inches by 4 inches to 3 inches by 2 inches to use on business cards. Robert thinks that the new logo is $\frac{1}{4}$ the size of the original logo. Denise thinks that is $\frac{1}{2}$ of the original size. Explain their thinking to a classmate. **Robert is thinking of size in terms of area and Denise is thinking of size in terms of perimeter.**

10. **CCSS** **Use Math Tools** Use the coordinate plane to draw a rectangle. Dilate the rectangle and draw the dilation. Then determine the perimeter and area of each rectangle to model the effect of the dilation. **See students' work.**