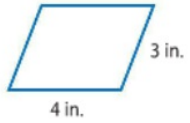
1. **Suppose the side lengths of the parallelogram at the right are tripled. What effect would this have on the perimeter? Justify your answer.**

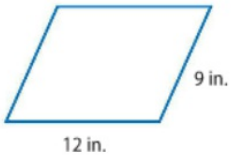


The dimensions are 3 times greater.

original perimeter: $2(4) + 2(3) = 14$ in.

new perimeter: $2(12) + 2(9) = 42$ in.

compare perimeters: $42 \text{ in.} \div 14 \text{ in.} = 3$



So, the perimeter is 3 times the perimeter of the original figure.

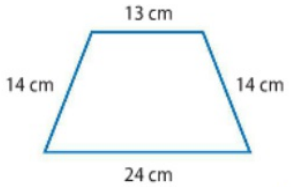
Show your work.

The perimeter is $\frac{1}{2}$ the original perimeter. The perimeter of the original figure is ___ cm and the perimeter of the new figure is 32.5 cm; $65 \text{ cm} \div 32.5 \text{ cm} = \frac{1}{2}$

a.

Got It? **Do this problem to find out.**

a. Suppose the side lengths of the trapezoid at the right are multiplied by $\frac{1}{2}$. What effect would this have on the perimeter? Justify your answer.

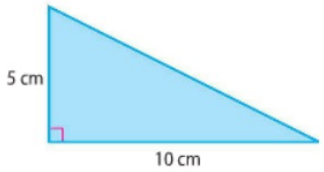


2. **The side lengths of the triangle at the right are multiplied by 5. What effect would this have on the area? Justify your answer.**

The dimensions are 5 times greater.

original area: $\frac{1}{2} \cdot 2 \cdot 1 = 1 \text{ cm}^2$

new area: $\frac{1}{2} \cdot 10 \cdot 5 = 25 \text{ cm}^2$



compare areas:
$25 \text{ cm}^2 \div 1 \text{ cm}^2 = 25$ or 5^2

So, the area is 5^2 or 25 times the area of the original figure.

Show your work.

The area is 2.5^2 or 6.25 times greater. The area of the original figure is 8 ft^2 and the area of the new figure is 50 ft^2; $50 \text{ ft}^2 \div 8 \text{ ft}^2 = 6.25$

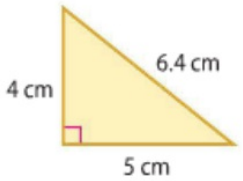
b.

Got It? **Do this problem to find out.**

b. A rectangle measures 2 feet by 4 feet. Suppose the side lengths are multiplied by 2.5. What effect would this have on the area? Justify your answer.

Guided Practice

Refer to the figure at the right for Exercises 1 and 2. Justify your answers. (Examples 1–2)



1. Each side length is doubled. Describe the change in the perimeter.

   The perimeter is doubled. The perimeter of the original figure is 15.4 cm and the perimeter of the new figure is 30.8 cm; 30.8 cm ÷ 15.4 cm = 2.

2. Each side length is tripled. Describe the change in the area.

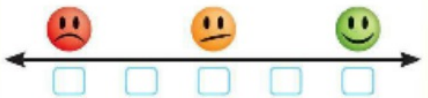
   The area is 3^2 or 9 times greater. The area of the original figure is 10 cm^2 and the area of the new figure is 90 cm^2; 90 cm^2 ÷ 10 cm^2 = 9.

3. Different sizes of regular hexagons are used in a quilt. Each small hexagon has side lengths of 4 inches and an area of 41.6 square inches. Each large hexagon has side lengths of 8 inches. What is the area of each large hexagon? (Example 3) **166.4 in^2**

4. **Building on the Essential Question** How can exponents help you find the area of a rectangle if each side length is multiplied by x? **Sample answer: The original area is multiplied by x^2 to find the new area.**

Rate Yourself!

How confident are you about changes in dimension? Check the box that applies.



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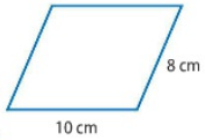
Independent Practice

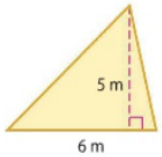
Go online for Step-by-Step Solutions eHelp

1. Each side length of the parallelogram at the right is multiplied by 4. Describe the change in the perimeter. Justify your answer. (Example 1)



The perimeter is 4 times greater. The perimeter of the original figure is 36 cm and the perimeter of the new figure is 144 cm; 144 cm ÷ 36 cm = 4.

2. The base and height of the triangle at the right are multiplied by 4. Describe the change in the area. Justify your answer. (Example 2)

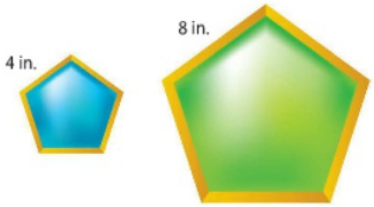


The area is 4^2 or 16 times greater. The area of the original figure is $15\ m^2$ and the area of the new figure is $240\ m^2$; $240\ m^2 \div 15\ m^2 = 16$.

3. Each side length of the rectangle is multiplied by $\frac{1}{3}$. Describe the change in the area. Justify your answer. (Example 2)

The area is multiplied by $\frac{1}{3} \cdot \frac{1}{3}$ or $\frac{1}{9}$ the original area. The area of the original figure is $315\ yd^2$ and the area of the new figure is $35\ yd^2$; $35\ yd^2 \div 315\ yd^2 = \frac{1}{9}$.

4. Different sizes of regular pentagons are used in a stained glass window. Each small pentagon has side lengths of 4 inches and an area of 27.5 square inches. Each large pentagon has side lengths of 8 inches. What is the area of each large pentagon? (Example 3)

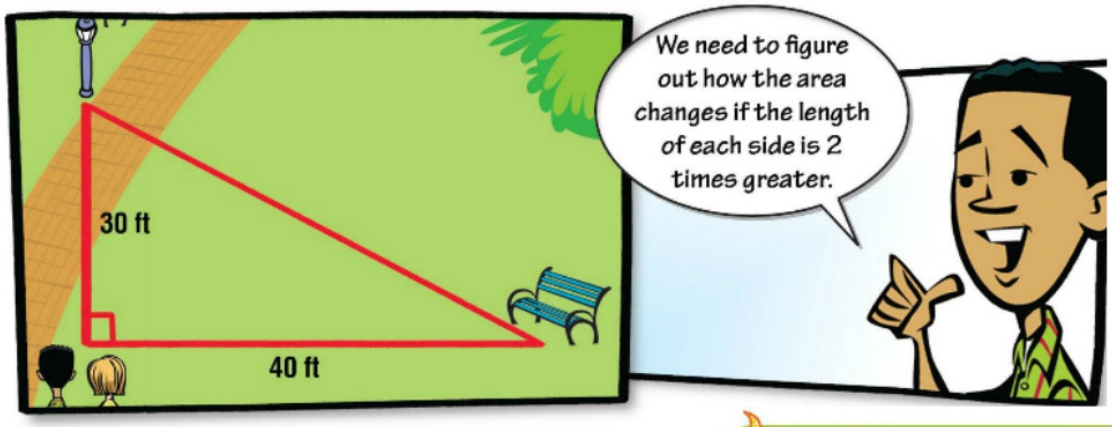


$110\ in^2$

5. CCSS **Justify Conclusions** A dollhouse has a bed with dimensions $\frac{1}{12}$ the size of a queen-size bed. A queen-size bed has an area of 4,800 square inches, and a length of 80 inches. What are the side lengths of the dollhouse bed? Justify your answer.

Use the area and the length to find the width of the queen-size bed. The width of the bed is 4,800 ÷ 80, or 60 inches. So, the width of the dollhouse bed is $60 \cdot \frac{1}{12}$, or 5 inches. The length of the dollhouse bed is $80 \cdot \frac{1}{12}$ or $6\frac{2}{3}$ inches.

6. **Reason Abstractly** Refer to the graphic novel frame below for Exercises a–b.



a. What is the original area of the triangle? 600 ft²

b. What is the new area if the sides are all two times longer? 2,400 ft²

H.O.T. Problems Higher Order Thinking

7. **Identify Structure** Sketch a triangle with the side lengths labeled. Sketch and label another triangle that has a perimeter two times greater than the perimeter of the first triangle.

Sample answer:

Show your work.

8. **Persevere with Problems** The corresponding side lengths of two figures have a ratio of $\frac{a}{b}$. What is the ratio of the perimeters? the ratio of the areas?

$\frac{a}{b}$; $\frac{a^2}{b^2}$

9. **Reason Inductively** The larger square shown has a perimeter of 48 units. The smaller square inside has a perimeter that is 2 times smaller. What are the side lengths of the larger and smaller square? Explain. larger square: 12 units; smaller square: 6 units; Sample answer: The length of the sides for squares are equal. Divide 48 by 4 to get a side length of 12. The side length of the smaller square is half as big, so 6 units.