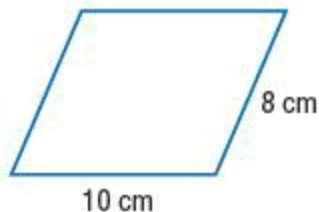


## 9-4 Changes in Dimensions

1. Each side length of the parallelogram is multiplied by 4. Describe the change in the perimeter. Justify your answer.



**SOLUTION:**

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;

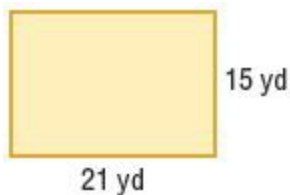
$$144 \text{ cm} \div 36 \text{ cm} = 4.$$

**ANSWER:**

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;

$$144 \text{ cm} \div 36 \text{ cm} = 4.$$

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



**SOLUTION:**

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  $\text{yd}^2$  and the area of the new figure is 35  $\text{yd}^2$ ;

$$35 \text{ yd}^2 \div 315 \text{ yd}^2 = \frac{1}{9}.$$

**ANSWER:**

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  $\text{yd}^2$  and the area of the new figure is 35  $\text{yd}^2$ ;

$$35 \text{ yd}^2 \div 315 \text{ yd}^2 = \frac{1}{9}.$$

## 9-4 Changes in Dimensions

5. **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.

**SOLUTION:**

Use the area and the length to find the width of the queen-size bed. The width of the bed is  $4,800 \div 80$ , 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.

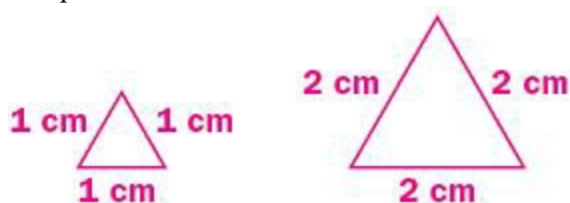
**ANSWER:**

Use the area and the length to find the width of the queen-size bed. The width of the bed is  $4,800 \div 80$ , 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.

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.

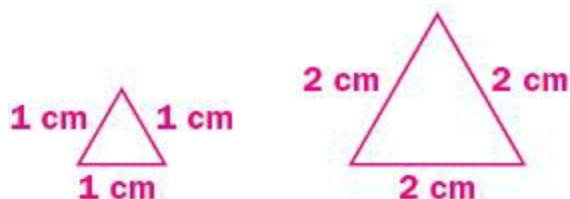
**SOLUTION:**

Sample answer:



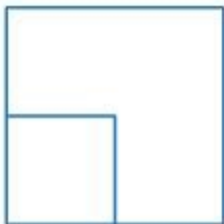
**ANSWER:**

Sample answer:



## 9-4 Changes in Dimensions

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.



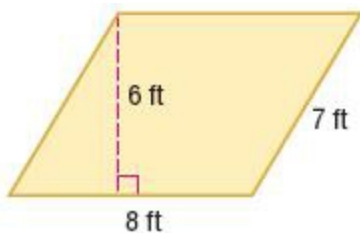
**SOLUTION:**

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.

**ANSWER:**

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.

**Refer to the parallelogram for Exercises 10-12. Justify your answers.**



11. Suppose the side lengths are multiplied by 6. Describe the change in the perimeter.

**SOLUTION:**

The original perimeter is  $8 + 7 + 8 + 7$  or 30 feet.

The new side lengths are 48 feet and 42 feet.

The new perimeter is  $48 + 42 + 48 + 42$  or 180 feet.

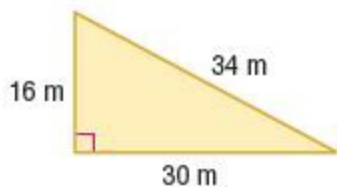
The perimeter is  $180 \div 30$  or 6 times greater.

**ANSWER:**

The perimeter is 6 times greater. The perimeter of the original figure is 30 ft and the perimeter of the new figure is 180 ft;  $180 \text{ ft} \div 30 \text{ ft} = 6$ .

## 9-4 Changes in Dimensions

13. Refer to the triangle. Suppose the side lengths and height of the triangle were divided by 4. What effect would this have on the perimeter? the area? Justify your answer.



### SOLUTION:

The perimeter of the original triangle is  $16 + 30 + 34$  or 80 meters.

If the measurements of the original triangle are divided by 4, then the new perimeter is  $\frac{1}{4}$  of the original. The original perimeter is 80 meters, so the new perimeter is  $80 \cdot \frac{1}{4}$  or 20 meters.

The area of the original triangle is  $\frac{1}{2}(30)(16)$  or 240 square meters.

The area is  $\frac{1}{4} \cdot \frac{1}{4}$  or  $\frac{1}{16}$  the original area. The area of the new triangle is  $240 \cdot \frac{1}{16}$  or 15 square meters.

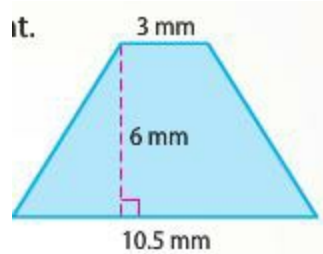
### ANSWER:

The perimeter is  $\frac{1}{4}$  the original perimeter. The perimeter of the original figure is 80 m and the perimeter of the new figure is 20 m;

$\frac{1}{4} \cdot 80 \text{ m} = 20 \text{ m}$ . The area is  $\frac{1}{4} \cdot \frac{1}{4}$  or  $\frac{1}{16}$  the original area. The area of the original figure is  $240 \text{ m}^2$  and the area of the new figure is  $15 \text{ m}^2$ ;  $15 \text{ m}^2 \div 240 \text{ m}^2 = \frac{1}{16}$ .

## 9-4 Changes in Dimensions

15. Fill in the boxes to complete each statement about the trapezoid at the right.



a. When the dimensions of the trapezoid are multiplied by 2, the area is  times greater.

b. When the dimensions of the trapezoid are multiplied by , the area is 16 times greater.

c. When the dimensions of the trapezoid are multiplied by 5, the area is  times greater.

### SOLUTION:

If the dimensions of a polygon are multiplied by  $x$ , then the area of the polygon changes by  $x \cdot x$  or  $x^2$ .

a. If the dimensions of a polygon are multiplied by 2, then the area of the polygon changes by  $2 \times 2$  or 4. So, the area will be 4 times greater.

b. If the area is 16 times greater, the polygon would be multiplied by  $\sqrt{16}$  or 4.

c. If the dimensions of a polygon are multiplied by 5, then the area of the polygon changes by  $5 \cdot 5$  or 25.

### ANSWER:

a. 4

b. 4

c. 25

## 9-4 Changes in Dimensions

Graph the opposite of the number on a number line.

17. 0



**SOLUTION:**

The opposite of 0 is 0.



**ANSWER:**



19. 5



**SOLUTION:**

The opposite of 5 is  $-5$ .



**ANSWER:**



21. John and his dad are playing catch on the football field. John is standing on the 10-yard line. His dad is standing on the 25-yard line. How far is John from his dad? If his dad moves to the 20-yard line, what is the distance between them now?

**SOLUTION:**

The distance between John and his dad is  $25 - 10$  or 15 yards. If his dad moves to the 20-yard line, then the distance between them is  $20 - 10$  or 10 yards.

**ANSWER:**

15 yd; 10 yd