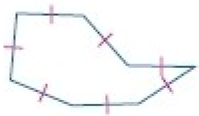
1-6 Two-Dimensional Figures

Name each polygon by its number of sides. Then classify it as *convex* or *concave* and *regular* or *irregular*.

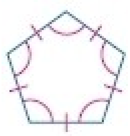
12. 

SOLUTION:

The polygon has 7 sides, so it is a heptagon.
Some of the lines containing the sides will have points in the interior of the polygon. So, the polygon is concave.
Since the polygon is concave, it is irregular.

ANSWER:

heptagon; concave; irregular

16. 

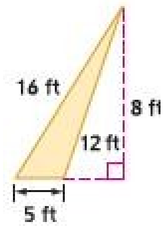
SOLUTION:

The polygon has 5 sides, so it is a pentagon.
None of the lines containing the sides will have points in the interior of the polygon. So, the polygon is convex.
All sides of the polygon are congruent and all angles are also congruent. So it is regular.

ANSWER:

pentagon; convex; regular

Find the perimeter or circumference and area of each figure. Round to the nearest tenth.

20. 

SOLUTION:

Add all the sides to find the perimeter of a triangle.

$$\begin{aligned} P &= b + c + d && \text{Perimeter Formula for a Triangle} \\ &= 16 + 12 + 5 && \text{Substitution.} \\ &= 33 && \text{Addition.} \end{aligned}$$

The perimeter of the triangle is 33 ft.
The area of a triangle with base *b* and height *h* is given by $A = \frac{1}{2}bh$.

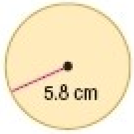
Here the base is 5 ft and height is 8 ft.

$$\begin{aligned} A &= \tfrac{1}{2}bh && \text{Area Formula for a Triangle} \\ &= \tfrac{1}{2} \cdot 8 \cdot 5 && \text{Substitution.} \\ &= 20 && \text{Multiply.} \end{aligned}$$

The area of the triangle is 20 ft^2.

ANSWER:

33 ft; 20 ft^2

22. 

SOLUTION:

Use the formula for circumference of a circle.

$C = 2\pi r$ Circumference Formula

$= 2\pi(5.8)$ Substitution.

≈ 36.4 Mutliply.

The circumference of the circle is about 36.4 cm.

Use the formula for area of a circle.

$A = \pi r^2$ Area Formula

$= \pi(5.8)^2$ Substitution.

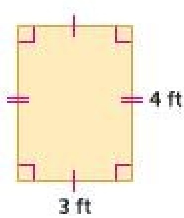
≈ 105.7 Square and Multiply.

The area of the circle is about 105.7 cm^2.

ANSWER:

≈36.4 cm; ≈105.7 cm^2

29. **CHANGING DIMENSIONS** Use the rectangle below.



a. Find the perimeter of the rectangle.
b. Find the area of the rectangle.
c. Suppose the 4-foot length of the rectangle is doubled. What effect would this have on the perimeter? the area? Justify your answer.
d. Suppose the length and width of the rectangle were doubled. What effect would this have on the perimeter? the area? Justify your answer.

SOLUTION:

a. Use the formula for the perimeter of a rectangle with length ℓ and *w*.

$P = 2\ell + 2w$ Perimeter

$= 2(3) + 2(4)$ Substitution

$= 6 + 8$ Simplify.

$= 14$ Add.

The perimeter of the rectangle is 14 ft.

b. Use the formula for the area of a rectangle with length ℓ and *w*.

$A = \ell w$ Area Formula

$A = 3 \cdot 4$ Substitution.

$= 12$ Multiply.

The area of the rectangle is 12 ft^2.

c. If the 4-foot length of the rectangle doubles, then the dimensions will be 3 ft and 8 ft. The perimeter of a rectangle with dimensions 3 ft and 8 ft is 22 ft. This is 8 feet more than the perimeter of the original figure since 8 + 14 ft = 22 ft.When the length is doubled, the perimeter increases by twice the length of the original rectangle.

The area of a rectangle with dimensions 3 ft and 8 ft is 24 ft^2 . This is twice the area of the original figure since 2 · 12 ft^2 = 24 ft^2. So, when the length is doubled, the area doubles.

d. If the length and width of the rectangle are each doubled, then the dimensions are 6 ft and 8 ft. The perimeter of this rectangle is 28 ft. This is double the perimeter of the original figure since $2 \cdot 14 = 28$. So the perimeter doubles when the dimensions are doubled.

The area of a rectangle with dimensions 6 ft and 8 ft is 48 ft^2 , which is 4 times the area of the original figure since $4 \cdot 12 = 48$. So the area quadruples when the dimensions are doubled.

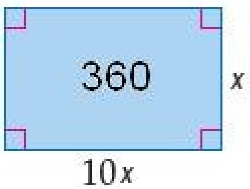
ANSWER:

a. 14 ft
b. 12 ft^2
c. The perimeter increases by twice the length of the original rectangle; the area doubles. The perimeter of a rectangle with dimensions 3 ft and 8 ft is 22 ft, which is 8 feet more than the perimeter of the original figure since 8 + 14 ft = 22 ft. The area of a rectangle with dimensions 3 ft and 8 ft is 24 ft^2 , which is twice the area of the original figure since 2 · 12 ft^2 = 24 ft^2.
d. The perimeter doubles; the area quadruples. The perimeter of a rectangle with dimensions 6 ft and 8

ft is 28 ft, which is twice the perimeter of the original figure 6 since 2 · 14 ft = 28 ft. The area of a rectangle with dimensions 6 ft and 8 ft is 48 ft^2, which is four times the area of the original figure since 4 · 12 ft^2 = 48 ft^2.

31. **ALGEBRA** A rectangle of area 360 square yards is 10 times as long as it is wide. Find its length and width.

SOLUTION:



Let x be the width. Then the length is $10x$.

Use the area formula for a rectangle.

$A = \ell w$	Area Formula
$360 = (10x)x$	Substitution.
$360 = 10x^2$	Simplify.
$\frac{360}{10} = \frac{10x^2}{10}$	Divide each side by 10.
$36 = x^2$	Simplify.
$\sqrt{36} = \sqrt{x^2}$	Square root of each side.
$\pm 6 = x$	Simplify.

Since width can never be negative, $x = 6$.

The length of the rectangle is $10x = 10(6) = 60$ yards and the width of the rectangle is 6 yards.

ANSWER:

60 yd, 6 yd

44. **ANALYZE RELATIONSHIPS** A triangle has a base of 4 inches and a height of 6 inches. Describe the change in area for each of the following.

a. The base is doubled.
b. The height is doubled.
c. The base is doubled and the height is tripled.

SOLUTION:

a. The area of the original triangle is $\frac{1}{2}bh = \frac{1}{2}(4)(6) = 12$.
The area of the triangle with the base doubled is $\frac{1}{2}bh = \frac{1}{2}(8)(6) = 24$.
The area with the base doubled is twice the area of the original triangle. So when the base doubles, the area doubles.

b. The area of the triangle with the height doubled is $\frac{1}{2}bh = \frac{1}{2}(4)(12) = 24$.
The area with the height doubled is twice the area of the original triangle. So when the height doubles, the area doubles.

c. The area of the triangle when the base doubled and the height tripled is $\frac{1}{2}bh = \frac{1}{2}(8)(18) = 72$.
So when the base is doubled and the height is tripled, the area is multiplied by 6.

ANSWER:

a. The area doubles.
b. The area doubles.
c. The area is multiplied by 6.