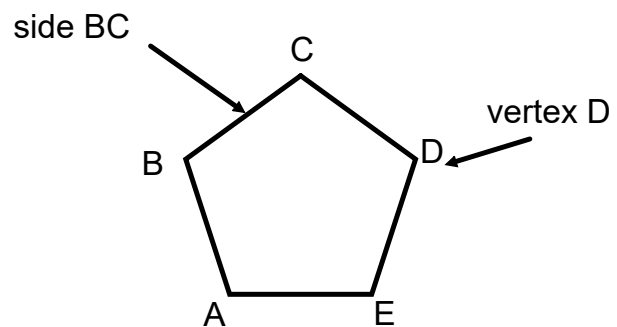




Section 1.6 Two-Dimensional Figures

A **Polygon** is a closed figure formed by a finite number of coplanar segments called **sides** such that:

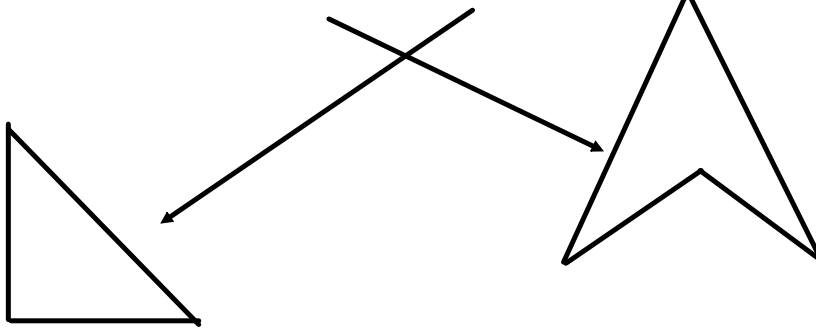
- the sides that have a common endpoint are non-collinear
- each side intersects exactly two other sides, but only at their endpoints.



A polygon is named by the letters of its vertices, written in order of consecutive vertices.

Polygons	Not Polygons
	

Polygons can either be concave or convex



Polygons are classified by its number of sides.

Number of Sides	Polygon
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon
11	hendecagon
12	dodecagon
n	n -gon

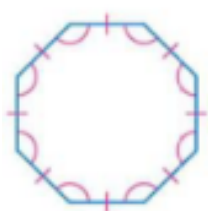
An **equilateral** polygon is a polygon in which all sides are congruent.

An **equiangular** polygon is a polygon in which all angles are congruent.

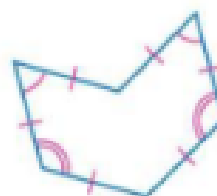
A polygon that is both equilateral and equiangular is called a **regular polygon**.

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

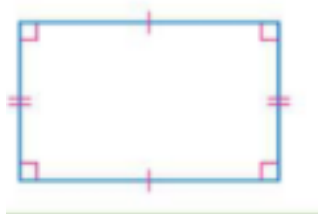
a.



b.



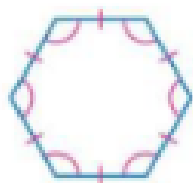
c.



d.



e.

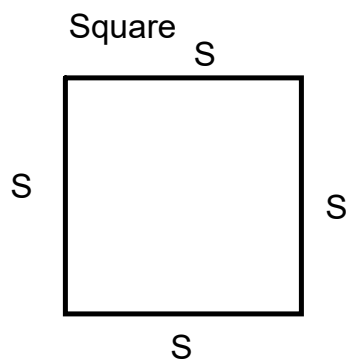


The **perimeter** of an object is the sum of the lengths of its sides.

The **area** of a object is the number of square units it encloses.

The **circumference** of a circle is the distance around the circle.

Formulas for Perimeter, Circuference and Area

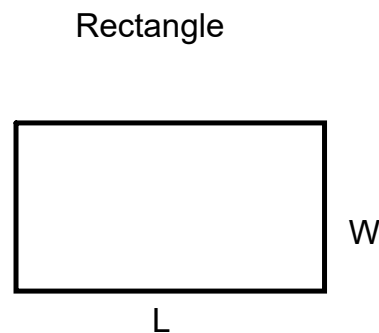


$$P = s + s + s + s$$

or

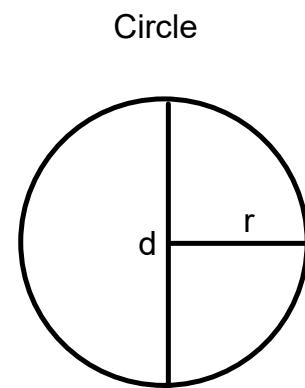
$$P = 4s$$

$$A = s^2$$



$$P = 2L + 2W$$

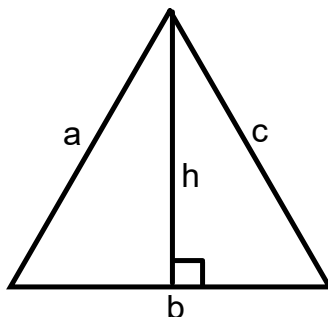
$$A = b \times h$$



$$C = d\pi$$

$$A = r^2\pi$$

Triangle



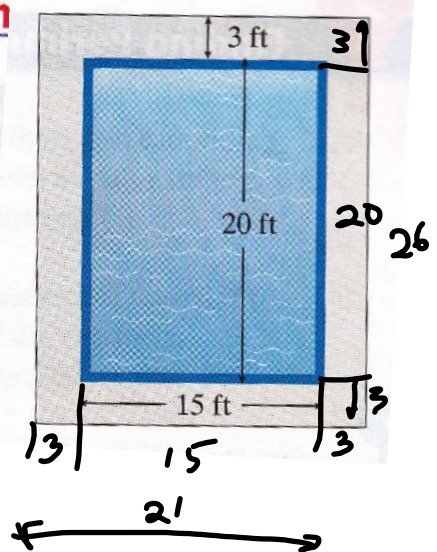
$$\text{Perimeter: } a + b + c$$

$$\text{Area: } \frac{b \times h}{2}$$

1 EXAMPLE **Real-World Connection**

Fencing Your pool is 15 ft wide and 20 ft long with a 3-ft wide deck surrounding it. You want to build a fence around the deck. How much fencing will you need?

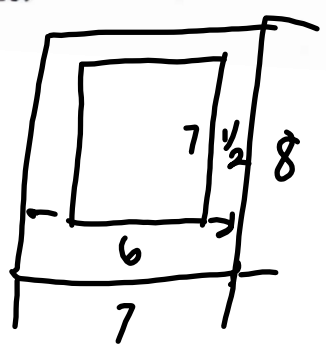
$$P = 2(21) + 2(26) = 42 + 52 = 94 \text{ ft}$$



- 1 Suppose you want to frame a picture that is 6 in. by 7 in. with a $\frac{1}{2}$ -in. wide frame.
- Find the perimeter of the picture.
 - Find the perimeter of the outside edge of the frame.

a. $P = 2(6) + 2(7) = 26 \text{ in}$

b. $P = 2(7) + 2(8) = 30 \text{ in}$



2 EXAMPLE Finding Circumference

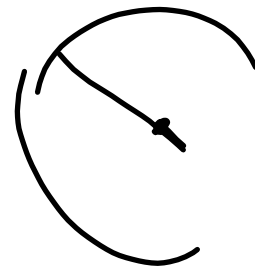
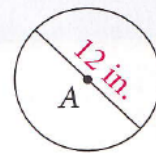
Find the circumference of $\odot A$ in terms of π . Then find the circumference to the nearest tenth.

$$C = 12\pi \text{ in}$$

$$C = 12(3.14) = 37.7 \text{ in}$$

Find the area of the circle in terms of π .

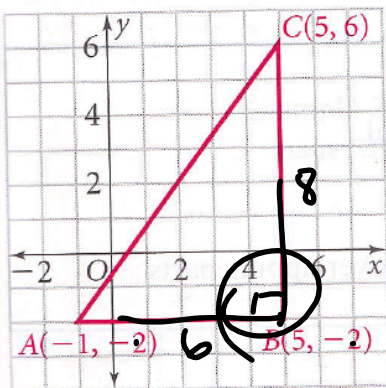
$$6^2\pi = 36\pi \text{ in}^2$$



3 EXAMPLE Finding Perimeter in the Coordinate Plane

Algebra Find the perimeter of $\triangle ABC$.

Find the length of each side. Add the lengths to find the perimeter.



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$AB = |-1 - 5| = 6$$

$$CB = |-2 - 6| = 8$$

$$AC = \sqrt{(5 - (-1))^2 + (6 - (-2))^2}$$

$$A = \frac{6 \cdot 8}{2} = 24 \text{ units}^2$$

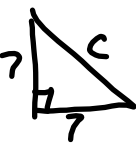
$$\sqrt{36 + 64} = \sqrt{100} = 10$$

$$P = 6 + 8 + 10 = 24$$


Example:

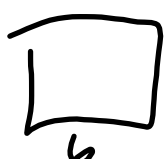
Yolanda has 26 centimeters of cording to frame a photograph. Which of these shapes would use most or all of the cording and enclose the largest area.

- right triangle with each leg about 7 centimeters long
- circle with a radius of 4 centimeters
- rectangle with a length of 8 centimeters and a width of 4.5 centimeters
- square with a side length of 6 centimeters.

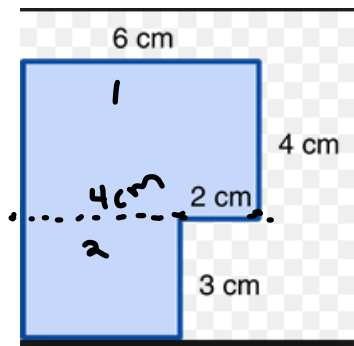
a.  $c^2 = 7^2 + 7^2 =$
 $\sqrt{c^2} = \sqrt{98} = 9.9$ $P = 7 + 7 + 9.9 = 23.9 \text{ in}$

b. $C = 8(3.14) = 25.12 \text{ in}$

c.  $P = 2(8) + 2(4.5) = 25 \text{ in}$

d.  $P = 4(6) = 24 \text{ in}$

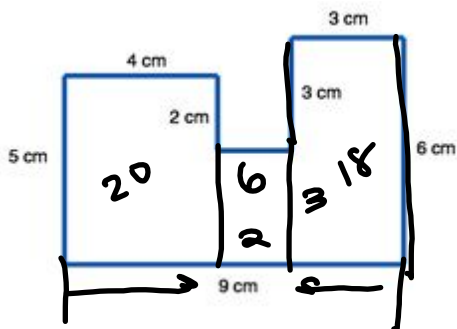
Find the area of the irregular shapes.



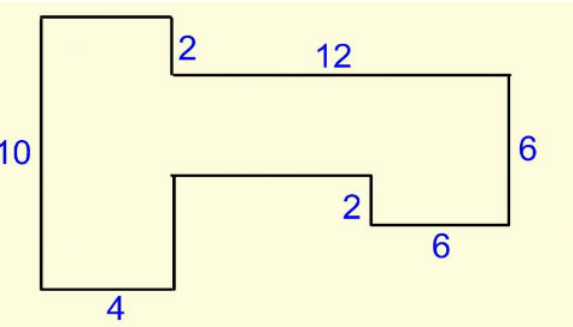
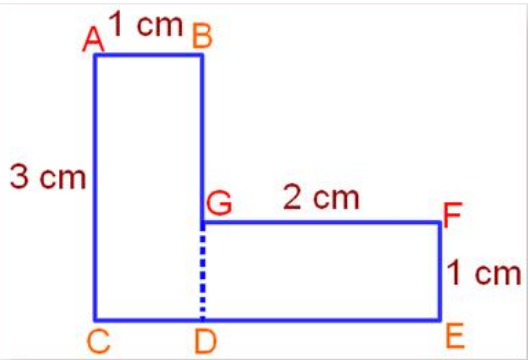
$$A_1 = 6 \cdot 4 = 24 \text{ cm}^2$$

$$A_2 = 3 \cdot 4 = 12 \text{ cm}^2$$

$$36 \text{ cm}^2$$



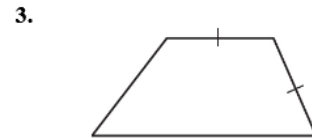
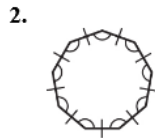
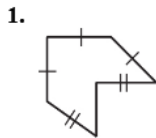
$$20 + 6 + 18 = 44 \text{ cm}^2$$



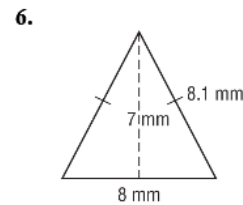
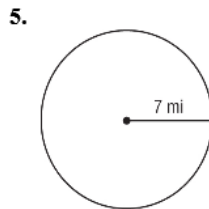
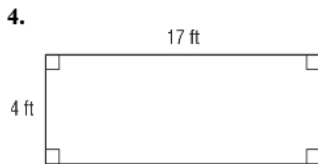
NAME _____ DATE _____ PERIOD _____

1-6 Practice Two-Dimensional Figures

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

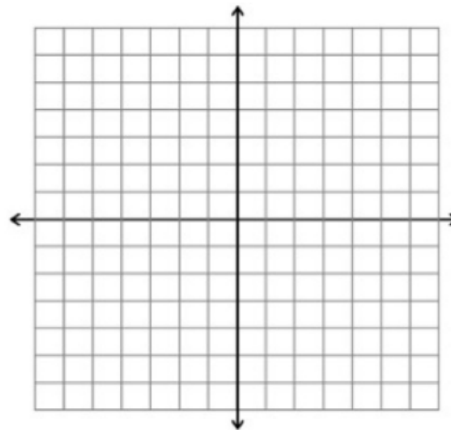


Find the perimeter or circumference and area of each figure. Round to the nearest tenth.

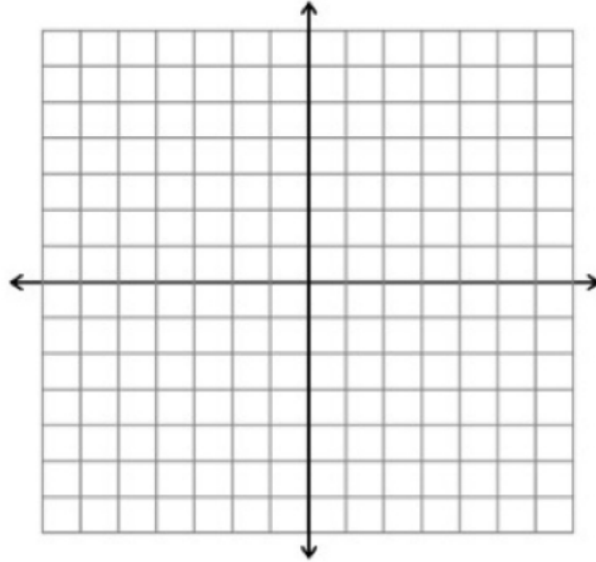


COORDINATE GEOMETRY Graph each figure with the given vertices and identify the figure. Then find the perimeter and area of the figure.

7. $O(3, 2)$, $P(1, 2)$, $Q(1, -4)$, $R(3, -4)$



NAME _____ DATE _____ PERIOD _____

8. $S(0, 0)$, $T(3, -2)$, $U(8, 0)$ **CHANGING DIMENSIONS** Use the rectangle from Exercise 4.

9. Suppose the length and width of the rectangle are doubled. What effect would this have on the perimeter? Justify your answer.
10. Suppose the length and width of the rectangle are doubled. What effect would this have on the area? Justify your answer.
11. **SEWING** Jasmine plans to sew fringe around the circular pillow shown in the diagram.
- How many inches of fringe does she need to purchase?
 - If Jasmine doubles the radius of the pillow, what is the new area of the top of the pillow?

