Geometry 1.6
Identify and name polygons*
Find perimeter, circumference, and area*
polygon
vertex

*MS standard

convex

concave

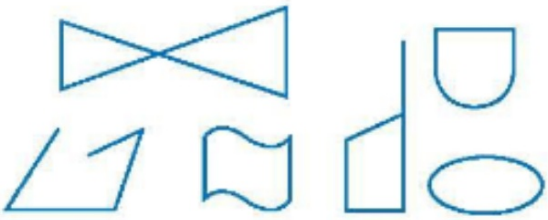
equilateral

equiangular

perimeter = distance around

circumference = $\pi \cdot d$

The table below shows some additional examples of polygons and some examples of figures that are not polygons.

Polygons	Not Polygons
	

closed
must at ends
straight

HJKLMG

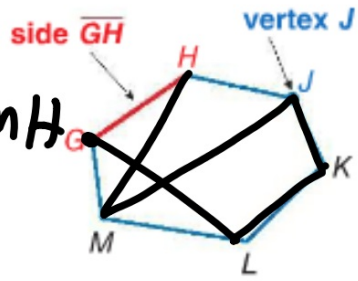
KeyConcept Polygons

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 noncollinear, and
- each side intersects exactly two other sides, but only at their endpoints.

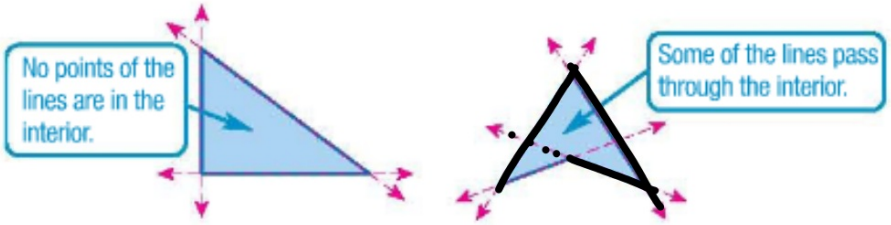
The vertex of each angle is a **vertex of the polygon**. A polygon is named by the letters of its vertices, written in order of consecutive vertices.

GLKJMH



polygon *GHJKLM*

Polygons can be **concave** or **convex**. Suppose the line containing each side is drawn. If any of the lines contain any point in the interior of the polygon, then it is concave. Otherwise it is convex.



convex polygon concave polygon

Pixoi Ltd/Alamy

Extend the sides
Do any go through interior?

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

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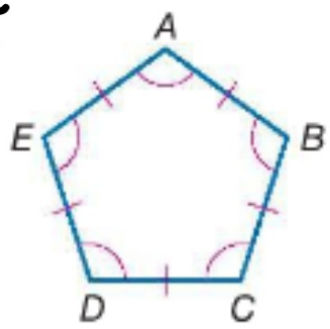
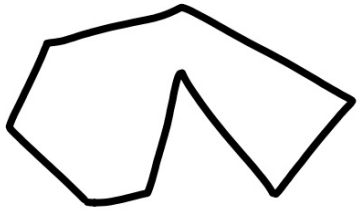
all sides ≅
∠'s ≅

Regular
Irregular



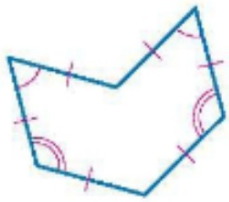


You are responsible for names of side 3-10

Example 1 Name and Classify Polygons

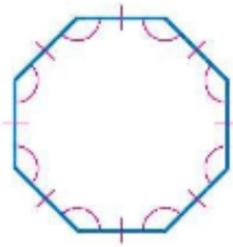
Name each polygon by its number of sides. Then classify it as *convex* or *concave* and *regular* or *irregular*.

a.



hexagon
Concave
irreg

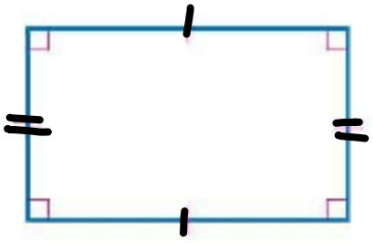
b.



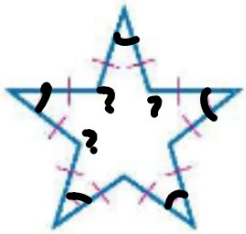
Octagon
convex
reg.

GuidedPractice

1A.

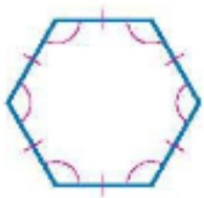


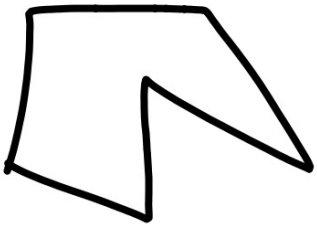
1B.



decagon

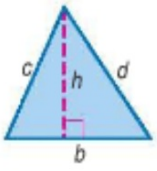
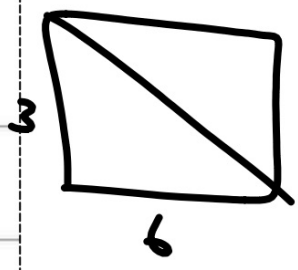
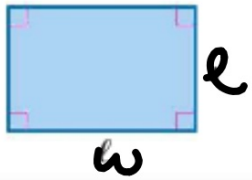
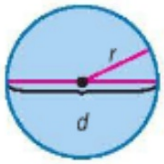
1C.





Middle School Standard

Key Concept: Perimeter, Circumference, and Area

Triangle	Square	Rectangle	Circle
			
$P = b + c + d$		$P = \ell + w + \ell + w$ $= 2\ell + 2w$	$C = 2\pi r$ or $C = \pi d$
$A = \frac{1}{2}bh$		$A = \ell w$	$A = \pi r^2$

P = perimeter of polygon; A = area of figure; C = circumference

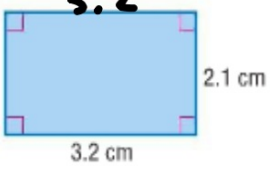
b = base, h = height; ℓ = length, w = width; r = radius, d = diameter

Know these formulas
Circle song

Example 2 Find Perimeter and Area

Find the perimeter or circumference and area of each figure.

a.



b.

GemA

$P = 10.6$ cm

$A = (2.1)(3.2)$

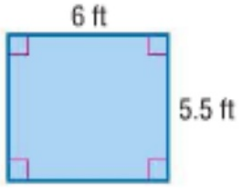
$= 6.72 \text{ cm}^2$

$C = \pi \cdot d = 3.14 \cdot 6 = 18.84 \text{ in}$

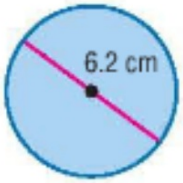
$A = \pi r^2 = 3.14 \cdot 3^2 = 28.26 \text{ in}^2$

GuidedPractice

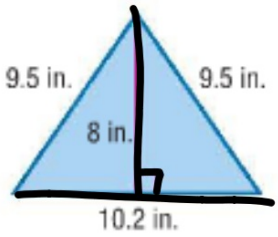
2A.



2B.



2C.



$A = \frac{1}{2} 10.2 \cdot 8$

$= 40.8 \text{ in}^2$

Standardized Test Example 3 Largest Area

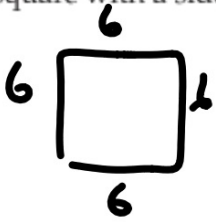
Yolanda has 26 centimeters of cording to frame a photograph in her scrapbook. Which of these shapes would use *most* or all of the cording and enclose the *largest* area?

A right triangle with each leg about 7 centimeters long

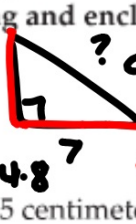
B circle with a radius of about 4 centimeters

C rectangle with a length of 8 centimeters and a width of 4.5 centimeters

D square with a side length of 6 centimeters



6·6 = 36



$\frac{1}{2} \cdot 7 \cdot 7 = 24.5$

5.14·16 50.24

8·4.5 36

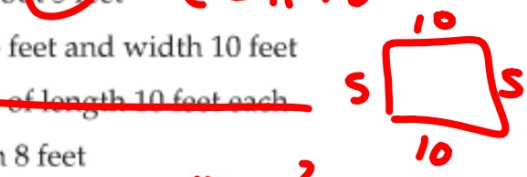
GuidedPractice

3. Dasan has 32 feet of fencing to fence in a play area for his dog. Which shape of play area uses *most* or all of the fencing and encloses the *largest* area?

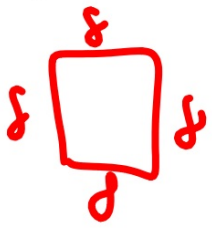
- **F** circle with radius of about 5 feet
- **G** rectangle with length 5 feet and width 10 feet
- ~~**H** right triangle with legs of length 10 feet each~~
- **J** square with side length 8 feet

$C = \pi \cdot 10$

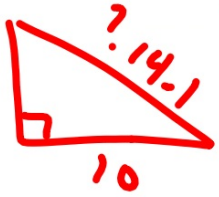
$\pi \cdot 5^2 \approx 78.5$



$5 \cdot 10 = 50$



$8 \cdot 8 = 64$

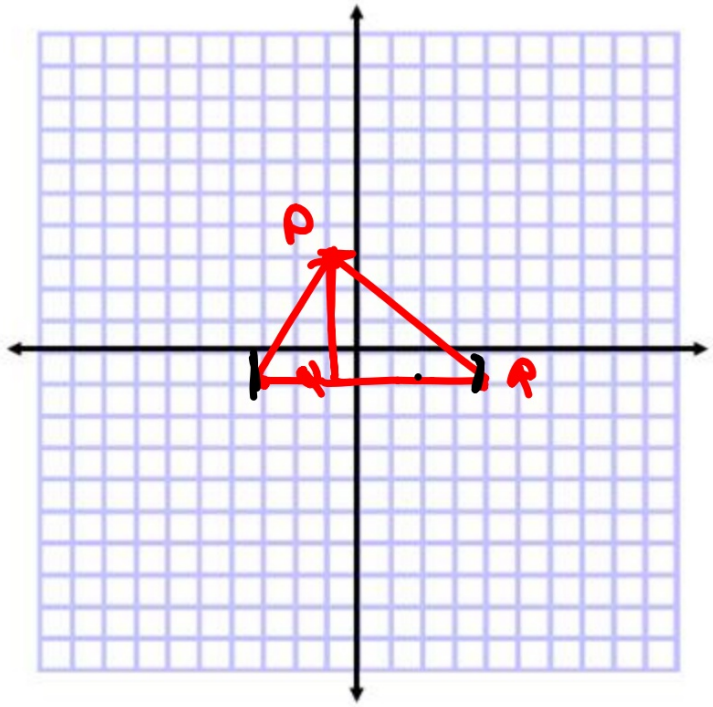


Example 4 Perimeter and Area on the Coordinate Plane

COORDINATE GEOMETRY Find the perimeter and area of $\triangle PQR$ with vertices $P(-1, 3)$, $Q(-3, -1)$, and $R(4, -1)$.

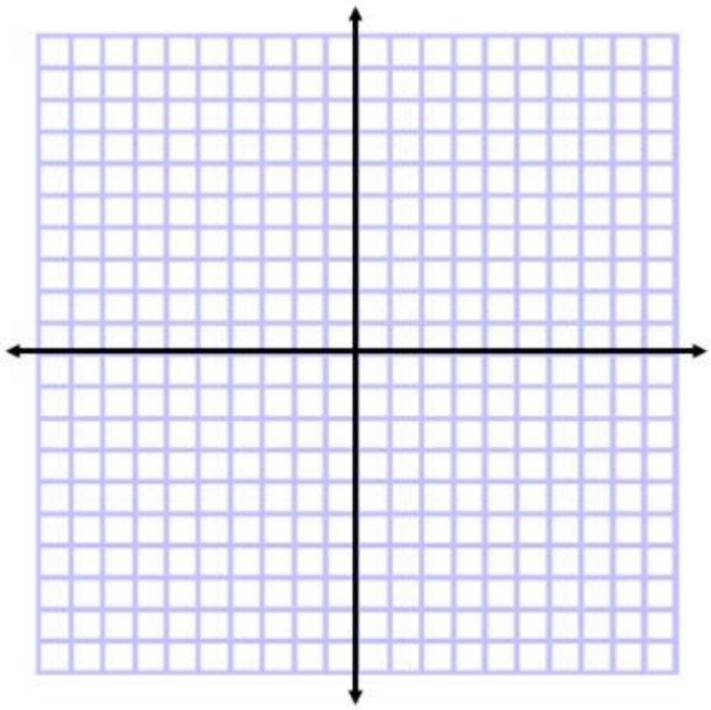
$A = \frac{1}{2}bh$

$= \frac{1}{2} \cdot 7 \cdot 4$



GuidedPractice

4. Find the perimeter and area of $\triangle ABC$ with vertices $A(-1, 4)$, $B(-1, -1)$, and $C(6, -1)$.



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11-27 all