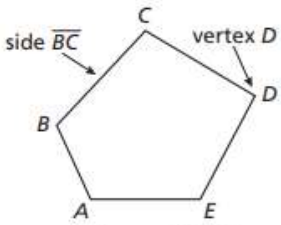
What You Will Learn

- Classify polygons.
- Find perimeters and areas of polygons in the coordinate plane.

Polygons

In geometry, a figure that lies in a plane is called a plane figure. Recall that a *polygon* is a closed plane figure formed by three or more line segments called *sides*. Each side intersects exactly two sides, one at each *vertex*, so that no two sides with a common vertex are collinear. You can name a polygon by listing the vertices in consecutive order.



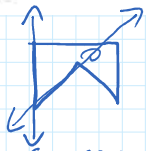
polygon *ABCDE*

CBAED

Naming Polygons

A polygon is *convex* when no line that contains a side of the polygon contains a point in the interior of the polygon. A polygon that is not convex is *concave*.


Convex

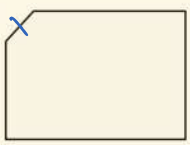

Concave

Number of sides	Type of polygon
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
12	Dodecagon
n	*n*-gon

9-gon
10-gon
1,372-gon

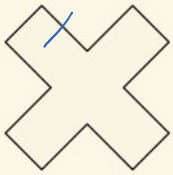
Classify each polygon by the number of sides. Tell whether it is *convex* or *concave*.

a.



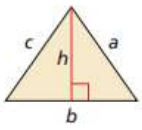
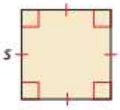
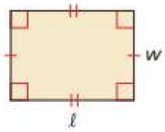
convex pentagon

b.



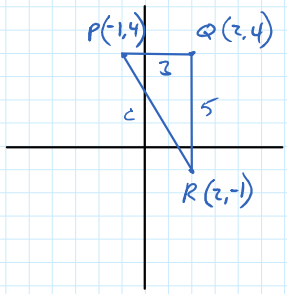
Concave 12-gon

Perimeter and Area

Triangle	Square	Rectangle
		
$P = a + b + c$	$P = 4s = a+b+c+d$	$P = 2\ell + 2w$
$A = \frac{1}{2}bh = \frac{bh}{2}$	$A = s^2 = lw$	$A = \ell w$

$5 \cdot 5 = 5^2$

Find the perimeter of $\triangle PQR$ with vertices $P(-1, 4)$, $Q(2, 4)$, and $R(2, -1)$.



$PQ = |-1-2|$

$|-3|$

3

$QR = |4+1|$

$|5|$

5

$PR =$

$c^2 = 3^2 + 5^2$

$c^2 = 9 + 25$

$\sqrt{c^2} = \sqrt{34}$

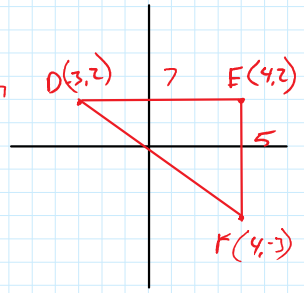
$c = \sqrt{34} \approx 5.8$

$P_t = 3 + 5 + c$

$= 8 + \sqrt{34} \approx 13.8$

Find the perimeter of the polygon with the following vertices.

3. $D(-3, 2)$, $E(4, 2)$, $F(4, -3)$



$DE = |-3-4|$

$|-7|$

7

$EF = |2+-3|$

$|5|$

5

$DF = \sqrt{(-3-4)^2 + (2-(-3))^2}$

$\sqrt{(-7)^2 + 5^2}$

$\sqrt{49+25}$

$\sqrt{74} \approx 8.6$

$P = 7 + 5 + \sqrt{74}$

$12 + \sqrt{74} \approx 20.6$

$P = 7 + 5 + \sqrt{74}$

$12 + \sqrt{74} \approx 20.6$

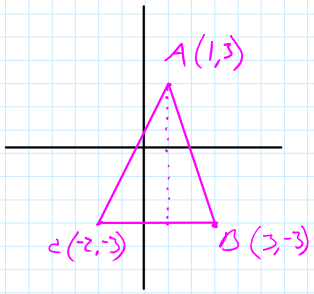
Find the area of $\triangle ABC$ with vertices $A(1, 3)$, $B(3, -3)$, and $C(-2, -3)$.

$A_{ABC} = bh\,\frac{1}{2} = \frac{1}{2}bh = \frac{bh}{2}$

$A_{ABC} = \frac{1}{2} \cdot 5 \cdot 6$

$\frac{1}{2} \cdot 30$

$A_{ABC} = 15$ units^2



$b = 5$

$h = 6$

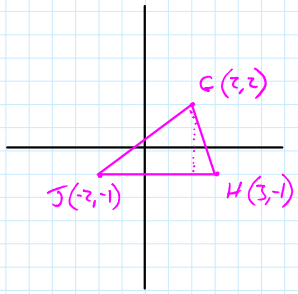
Find the area of the polygon with the following vertices.

7. $G(2, 2), H(3, -1), J(-2, -1)$

$A_{GHJ} = \frac{1}{2} \cdot 5 \cdot 3$

$\frac{1}{2} \cdot 15$

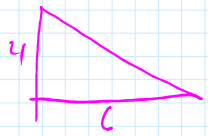
$A_{GHJ} = \frac{15}{2} = 7.5$



$b = 5$

$h = 3$

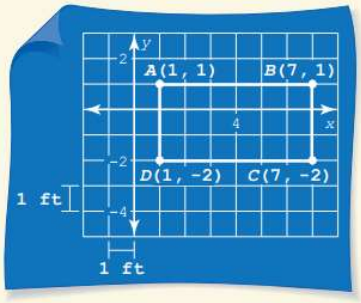
?



$4 + 6 +$ side 3

Side 3 needs distance formula

You are making a banner for the school basketball game. The diagram shows the four vertices of the banner. Each unit in the coordinate plane represents 1 foot. Find the area of the banner.



Practice sec 1.4

pg. 34: 1-6A, 7-23EOO

$AC = 4$

$CB = 4$

$AB = \sqrt{(-2-2)^2 + (2-2)^2} = \sqrt{32} \approx 5.6$

$\sqrt{(-4)^2 + 4^2}$

$\sqrt{16+16}$

$\sqrt{32} \approx 5.6$

$P = 8 + \sqrt{32} \approx 13.6$