

Geometry

**8.1 & 8.2: Classifying Polygons
& Finding Angles in Polygons**

Name: _____



Students will classify polygons according to different categories and find the interior and exterior angle measures of polygons.

☆Polygon:

plane figure formed by 3 or more segments.

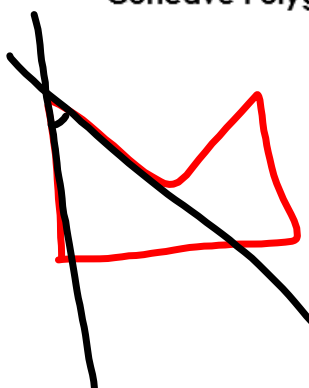
Convex Polygon:

all angles point out



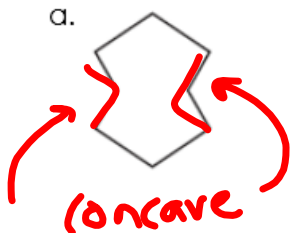
Concave Polygon:

"caves in"
at least
one extended
side goes
through
polygon



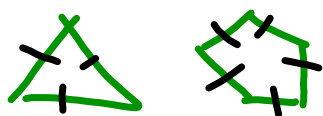
Example 1: Decide whether the polygon is convex or concave.

a.



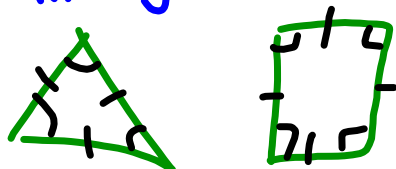
★ Equilateral polygon:

all sides $\cong$



★ Regular polygon:

all angles and sides $\cong$



b.



convex

c.



convex

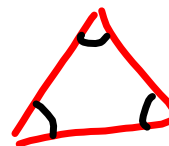
d.



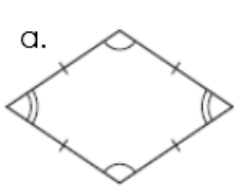
concave

★ Equiangular polygon:

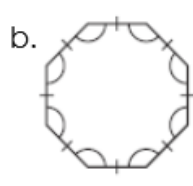
all angles $\cong$



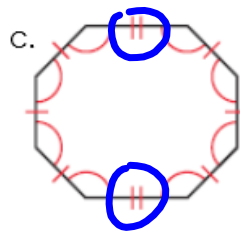
Example 2: Decide whether the polygon is regular. Explain.



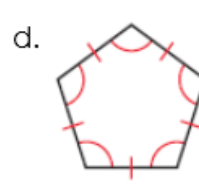
no, not
all angles
are $\cong$



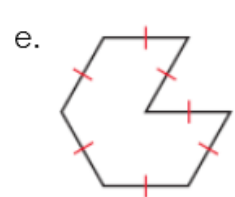
yes



no, not all
sides are
 $\cong$



yes

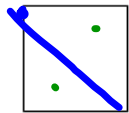
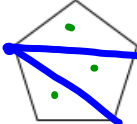
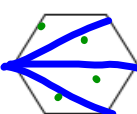
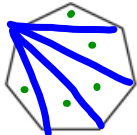


no not
all angles
are $\cong$

Investigate Angle Sums in Polygons

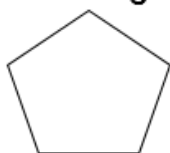
Step 1: In each polygon in the chart below, pick a vertex and draw the diagonals from that ONE vertex.

Step 2: Look for a pattern in the last column of the table.

Picture	Polygon	Number of Sides	Number of Triangles	Sum of measures of Interior Angles
	Triangle	3	1	$1 \cdot 180^\circ = 180^\circ$
	quadrilateral	4	2	$2 \cdot 180 = 360^\circ$
	pentagon	5	3	$3 \cdot 180 = 540^\circ$
	hexagon	6	4	$4 \cdot 180 = 720^\circ$
	heptagon	7	5	$5 \cdot 180 = 900^\circ$
	octagon	8	6	$6 \cdot 180 = 1080^\circ$
	N - gon	N	$N - 2$	$(n-2)180^\circ$

Write an expression for the sum of the measures of the interior angles of a convex n -gon.

☆Interior Angles



$$\text{Sum} = (n-2)180^\circ$$

where n is the number
of sides

7. sides
 $\underline{\underline{\underline{=}}}$

Example 3: Find the sum of the measures of the interior angles of a convex heptagon.

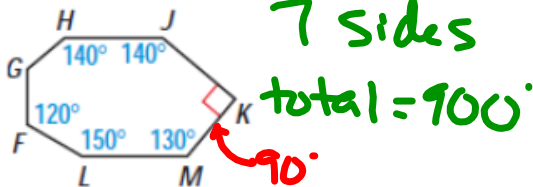
$$n = 7$$

$$(7-2) 180^\circ$$

$$5 \cdot 180 = \boxed{900}$$

Example 4: Find the measure of $\angle G$ in each diagram below.

a.



7 sides

$$\text{total} = 900^\circ$$

$$140^\circ + 140^\circ + 90^\circ + 130^\circ + 150^\circ + 120^\circ + G = 900^\circ$$

$$770^\circ + G = 900^\circ$$

$$\underline{-770}$$

$$m\angle G = 130^\circ$$

Try:

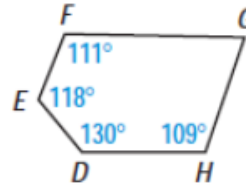
a) Find the sum of the measures of the interior angles of a convex 30-gon.

$$(30-2)180$$

$$28 \cdot 180$$

$$5040^\circ$$

b.



5 sides

$$(5-2)180$$

$$3 \cdot 180$$

$$\text{total} = 540$$

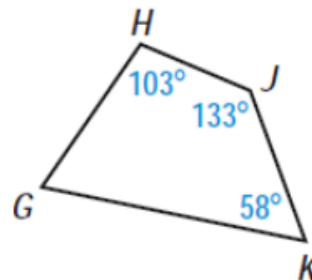
$$111 + 118 + 130 + 109 + E = 540$$

$$468 + E = 540$$

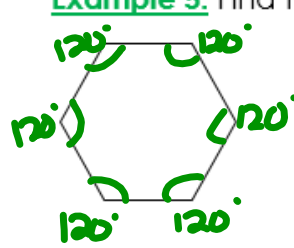
$$\underline{-468}$$

$$m\angle E = 72^\circ$$

b) Find the measure of $\angle G$.



Example 5: Find the measure of an interior angle of a regular hexagon. 6-sides



$n = 6$

$$(6-2)180$$

$$4 \cdot 180 = 720^\circ$$

$$\text{an angle} = \frac{720^\circ}{6} = 120^\circ$$

Example 6: Find the measure of an interior angle of a regular decagon. 10-sides

$n = 10$

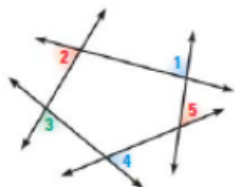
$$(10-2)180$$

$$8 \cdot 180 = 1440^\circ$$

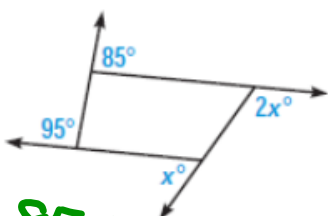
$$\text{an angle} : \frac{1440^\circ}{10} =$$

144°

☆Exterior Angles:

angles outside polygonsum of exterior = 360° Example 7: Find the value of x .

a.



$$85 + 95 + x + 2x = 360$$

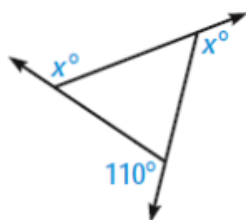
$$\begin{array}{r} 180 + 3x = 360 \\ -180 \quad -180 \\ \hline 3x = 180 \end{array}$$

Irv:

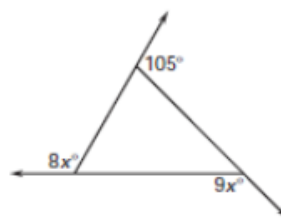
$$\frac{3x}{3} = \frac{180}{3}$$

$$x = 60$$

a)



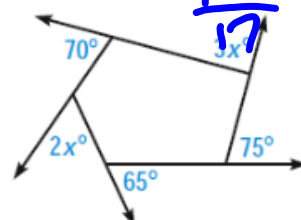
b.



$$8x + 105 + 9x = 360$$

$$\begin{array}{r} 17x + 105 = 360 \\ -105 \quad -105 \\ \hline 17x = 255 \end{array}$$

b)



$$\begin{array}{r} 17x = 255 \\ \frac{17x}{17} = \frac{255}{17} \\ x = 15 \end{array}$$

Homework: Worksheet 8.1/8.2