Lesson 6-1
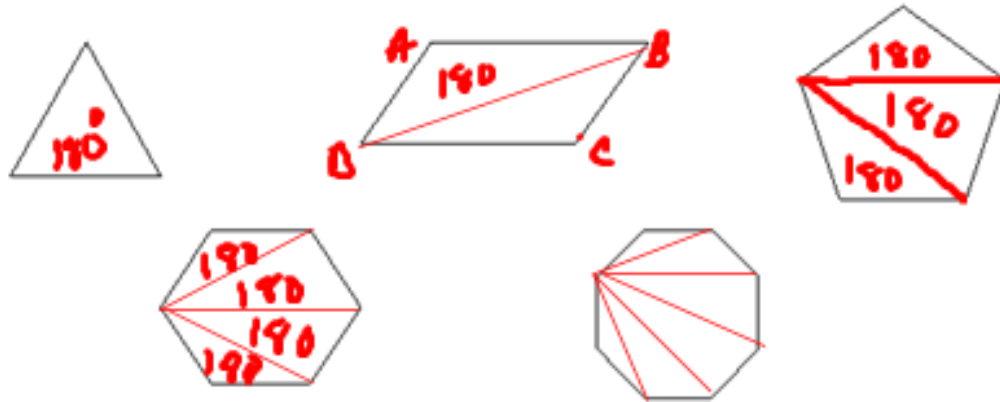# Angles of Polygons

You will use the
Interior Angle Sum Theorem
and the
Exterior Angle Sum Theorem
of a polygon

6.1 Angles of Polygons

180°

A —— 180 —— B
D ———————— C

180
180
180

180
180
190
190

Diagonal connects any two nonconsecutive vertices

Convex Polygon	# of sides	# of Δ's	Sum of angle measures	Measure of 1 angle in Regular Polygon
Triangle	3	1	180	$180 \div 3 = 60°$
Quadrilateral	4	2	$180(2) = 360$	$360 \div 4 = 90°$
Pentagon	5	3	$180(3) = 540$	$540 \div 5 = 108°$
Hexagon	6	4	$180(4) = 720$	$720 \div 6 = 120°$
→ Heptagon	7	5	$180(5) = 900°$	$900 \div 7 = 128.57°$
Octagon	8	6	$180(6) = 1080$	$1080 \div 8 = 135°$
n-gon	n	n-2	$180(n-2)$	$\dfrac{180(n-2)}{n}$

Interior Angle Sum Theorem
(to find the sum of the interior ∠'s)

$$S = 180(n-2)$$

↳ # of sides

To find ONE Interior ∠

$$\dfrac{180(n-2)}{n}$$ ← # of sides

A. Find the sum of the measures of the interior angles of a convex nonagon ↳ 9 sides
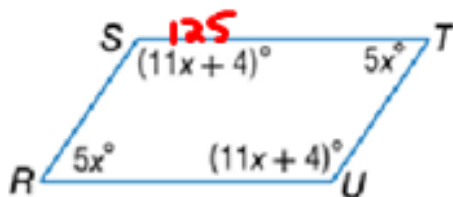
$$180(n-2)$$
$$180(9-2)$$
$$180(7)$$
$$1260°$$

B. Find the measure of each interior angle of parallelogram *RSTU*

Diagram: parallelogram with S (top left), T (top right), R (bottom left), U (bottom right). Angles: at S $(11x+4)°$ labeled 125, at T $5x°$, at R $5x°$, at U $(11x+4)°$.

$$11x+4 + 11x+4 + 5x + 5x = 360$$
$$32x + 8 = 360$$
$$\;\; -8 \quad -8$$
$$\frac{32x}{32} = \frac{352}{32}$$
$$x = 11$$

$\angle S = 125°$
$\angle U = 125°$
$\angle T = 55°$
$\angle R = 55°$

C. The measure of an interior angle of a regular polygon is 150. Find the number of sides in the polygon. →One angle

One Angle → $\dfrac{180(n-2)}{n} = 150 \cdot n$

$180(n-2) = 150n$

$180n - 360 = 150n$
$\;\; -180n \qquad -180n$

$$\frac{-360}{-30} = \frac{-30n}{-30}$$

$$\boxed{12 = n}$$

→**A. Find the sum of the measures of the interior angles of a convex octagon.**

$$180(n-2)$$
$$180(8-2)$$
$$180(6)$$
$$1080°$$

B. Find the value of *x*.

X≈ (sketch)
38° 10x° 150
6x° 90°   90 / Y

30°
(3x − 15)°
W 150°
6x° 90
Z 70°

$$3x-15+10x +6x +6x = 360$$
$$.X = 15$$
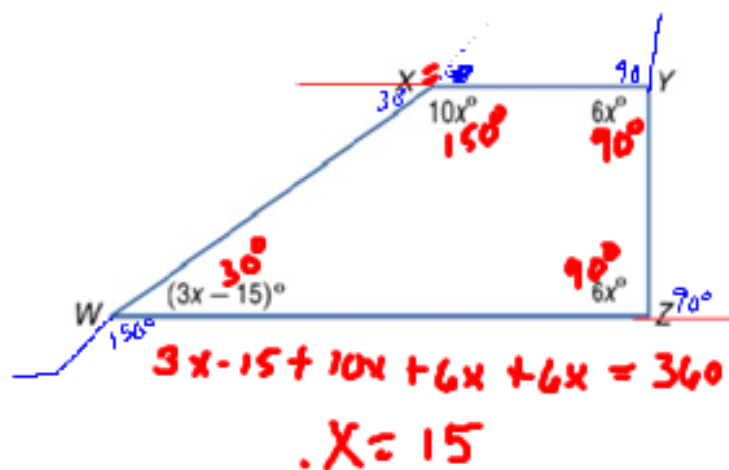
C. A pottery mold makes bowls that are in the shape of a regular heptagon. Find the measure of one of the interior angles of the bowl.
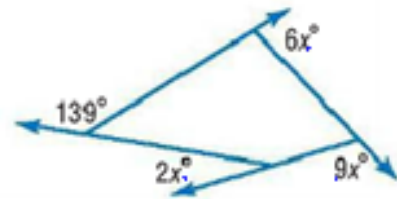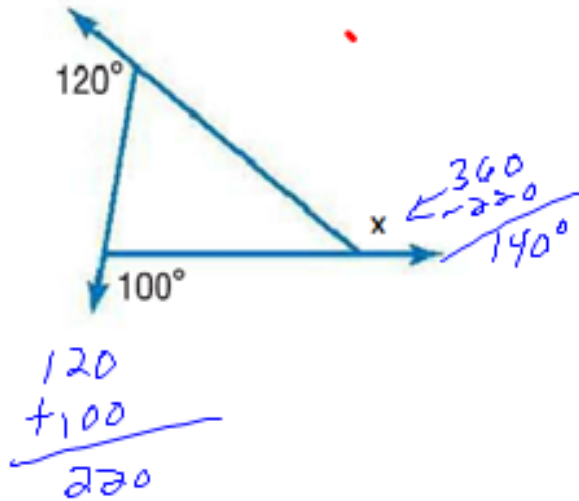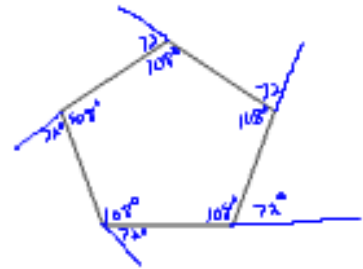
A. 130°

B. 128.57°

C. 140°

D. 125.5°

Exterior Angle Sum Thm:

The sum of the exterior angles is __$360°$__

One Exterior → $\dfrac{360}{n}$ ← # sides

120°

360
-220
140°

x

100°

120
+100
———
220

139°

6x°

2x°

9x°

$139 + 6x + 9x + 2x = 360$

$139 + 17x = 360$

$-139 \qquad\qquad -139$

$17x = 221$

$\dfrac{17x}{17} \quad \dfrac{221}{17}$

$x = 13$

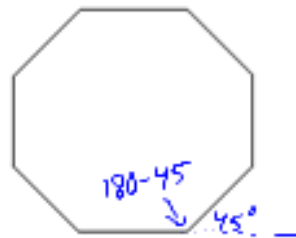**D.** Find the measure of each exterior angle of a regular octagon

one

$\dfrac{360}{n} = \dfrac{360}{8} = 45°$

E. Find the measures of an exterior angle and an interior angle of convex regular octagon.

$\dfrac{360}{8} = 45°$ ← Exterior ∠

Interior → $180 - 45 = 135°$

$180 - 45$

↓ 45°

Shortcut to find One Interior ∠

180 — one exterior ∠