Get out your homework and have it ready to check. Quiz on Monday!
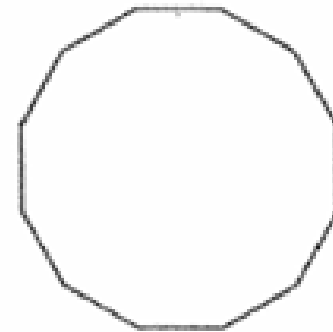
Interior Angle Sum = $180(n-2)$

Classwork - Angles of Polygons

1) Use one of our equations to answer the following questions about a regular dodecagon (12 sided polygon).

A) What is the sum of all the angle measures?

$180(12-2)$

$180(10) = 1800°$

B) What is the measure of each angle?

$$\frac{1800}{12} = 150°$$

2) Kellen claims he drew a polygon with an angle sum of 1660°. Can he be correct? Explain.

$180(n-2) = 1660$

$180n - 360 = 1660$

$\underline{\qquad +360 \quad +360 \qquad}$

$\dfrac{180n}{180} = \dfrac{2020}{180}$
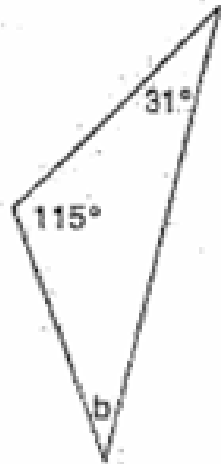
$n = 11.\overline{2}$

No, you can't have a 11.$\overline{2}$ sided polygon

Find the missing angle measure for the following shapes. Remember, before you can solve for the missing angle measure, you need to know what the angle sum is, which is based on how many sides the shape has. SHOW ALL WORK.
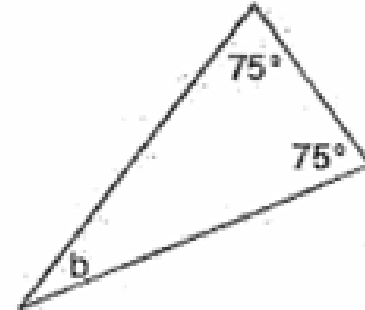
) Angle Sum: $180°$

$b + 115 + 31 = 180$

Missing angle: $34°$

31°

115°

b

4) Angle Sum: $180°$

$b + 75 + 75 = 180$

75°

75°

b

Missing angle: $30°$

5) Angle Sum: $360°$

103°   97°

77°   b

$b + 103 + 97 + 77 = 360$

Missing angle: $83°$

6) Angle Sum: 360

105° 75°

b

$b + 90 + 75 + 105 = 360$

Missing angle: $90°$

7) Angle Sum: __540°__

68°
X
121°
103° 85°
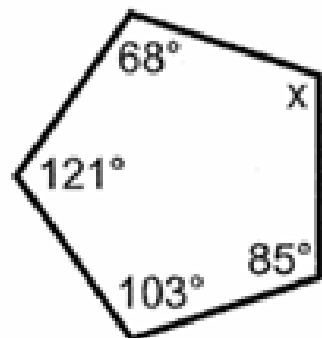
X+377=540

Missing angle: __163°__

8) Angle Sum: __720°__

121°
125°
112°
113° 149°
x°
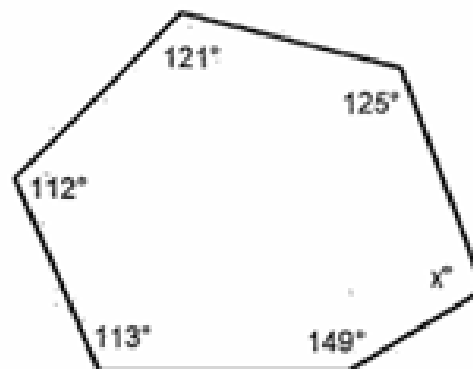
X+620=720

Missing angle: __100°__

SHOW ALL WORK

9)
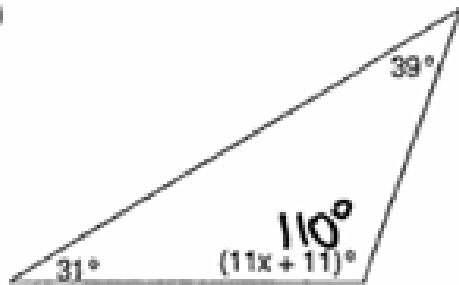
39°

110°

31°   (11x + 11)°

$(31)(+39)+11x(+11) = 180$

$11x + 81 = 180$

$-81 \quad -81$

$\dfrac{11x}{11} = \dfrac{99}{11}$ $x = 9$

10)

$(2x + 3)°$
61

119°

90°
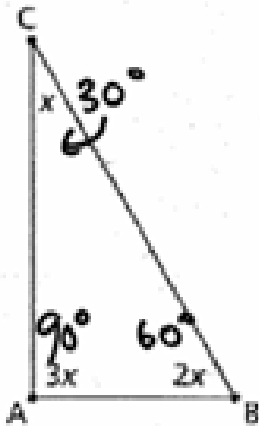
90°
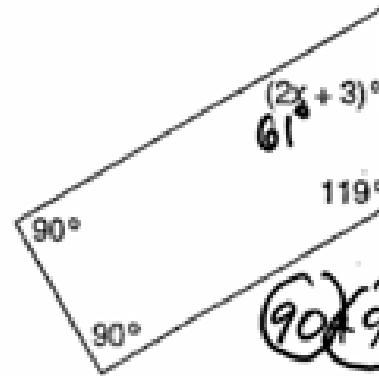
$(90)(+90)(+119)+2x(+3) = 360$

$2x + 302 = 360$
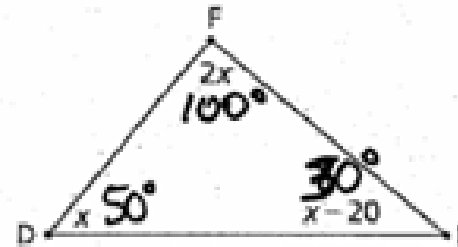
$-302 \quad -302$

$\dfrac{2x}{2} = \dfrac{58}{2}$

$x = 29$

11)

C

x   30°

90°   60°
3x   2x
A   B

$x + 3x + 2x = 180$

$\dfrac{6x}{6} = \dfrac{180}{6}$

$x = 30$

12)

F
2x
100°

30°
x   50°   x-20
D   E

$(50)(+2x)(+x)-20 = 180$

$4x - 20 = 180$

$+20 \quad +20$

$\dfrac{4x}{4} = \dfrac{200}{4}$ $x = 50$

A **polygon** is a simple closed figure formed by three or more line segments. The segments intersect only at their endpoints.

P. 397

State	Number of Segments

A map of the United States is shown. List the states that are in the shape of a polygon. Then list the number of segments that form the polygon.

Interior Angle Sum of a Polygon

Words   The sum of the measures of the interior angles of a polygon is $(n - 2)180$, where n represents the number of sides.

Symbols $S = (n - 2)180$

You can use the sum of the angle measures of a triangle to find the sum of the interior angle measures of various polygons. A polygon that is equilateral (all sides are the same length) and **equiangular** (all angles have the same measure) is called a **regular polygon**.

Number of Sides	Sketch of Figure	Number of Triangles	Sum of Angle Measures
3		1	$1(180°) = 180°$
4		2	$2(180°) = 360°$
5		3	$3(180°) = 540°$
6		4	$4(180°) = 720°$

1. Find the sum of the measures of the interior angles of a decagon.

   $S = (n - 2)\,180$ Write an equation.

   $S = (10 - 2)\,180$ A decagon has 10 sides. Replace n with 10.

   $S = (8)180$ or $1{,}440$ Simplify.

   The sum of the measures of the interior angles of a decagon is 1,440°.

Got It? Do these problems to find out.

Find the sum of the interior angle measures of each polygon.

a. hexagon

$$(6-2)\cdot 180$$
$$4\cdot 180$$
$$= 720°$$

b. octagon

$$(8-2)\cdot 180$$
$$6\cdot 180$$
$$= 1080°$$

c. 15-gon

$$(15-2)\cdot 180$$
$$13\cdot 180$$
$$= 2340°$$

Example

2. Each chamber of a bee honeycomb is a regular hexagon. Find the measure of an interior angle of a regular hexagon.

Step 1 Find the sum of the measures of the angles.

$S = (n - 2)180$ Write an equation.

$S = (6 - 2)180$ Replace n with 6.

$S = (4)180$ or 720   Simplify.

The sum of the measures of the interior angles is 720°.

Step 2 Divide 720 by 6, the number of interior angles, to find the measure of one interior angle. So, the measure of one interior angle of a regular hexagon is 720° ÷ 6 or 120°.

Got It? Do these problems to find out.

Find the measure of one interior angle in each regular polygon. Round to the nearest tenth if necessary.

d. octagon

$$(8-2) \cdot 180$$
$$6 \cdot 180$$
$$= \frac{1080°}{8}$$
$$\boxed{135°}$$

e. heptagon

$$(7-2) \cdot 180$$
$$5 \cdot 180$$
$$= \frac{900°}{7}$$
$$\boxed{= 128.6°}$$

f. 20-gon

$$(20-2) \cdot 180$$
$$18 \cdot 180$$
$$= \frac{3240°}{20}$$
$$\boxed{= 162°}$$
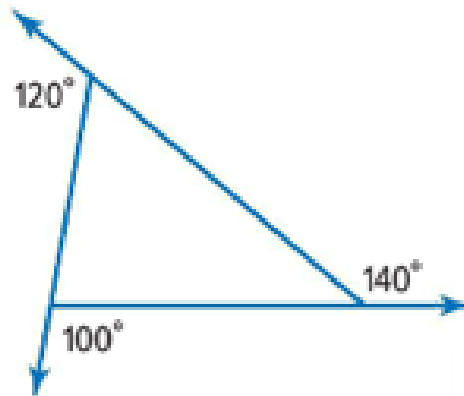
Exterior Angles of a Polygon

Words   In a polygon, the sum of the measures of the exterior angles, one at each vertex, is 360°.

Model

Symbols $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 = 360°$
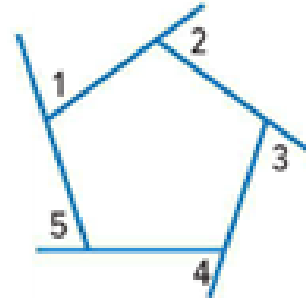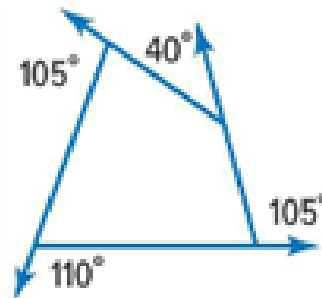
Regardless of the number of sides in a polygon, the sum of the exterior angle measures is equal to 360°.

$120 + 100 + 140 = 360°$

$105 + 110 + 105 + 40 = 360°$

3. Find the measure of an exterior angle in a regular hexagon.

Let x represent the measure of each exterior angle.

$6x = 360$ Write an equation. A hexagon has 6 exterior angles.

$x = 60$ Division Property of Equality

So, each exterior angle of a regular hexagon measures 60°.

Got It? Do these problems to find out.

Find the measure of an exterior angle of each regular polygon.

g. triangle   **h.** quadrilateral   **i.** octagon

$$\frac{3x}{3} = \frac{360}{3}$$

$$x = 120°$$

$$\frac{4x}{4} = \frac{360}{4}$$

$$x = 90°$$

$$\frac{8x}{8} = \frac{360}{8}$$

$$x = 45°$$

Extra Practice: #10 and 11 on page 401

Find the value of x in each figure.

10. _____

95°

$x°$

$180 - 110 \; ?$
$= 70°$

110°

115°

$x + 70 + 115 + 95 = 360$

$x + 280 = 360$
$-280 \quad -280$
$x = 80°$

11. _____

$x°$

100°

150°

$x + 80 + 150 = 360$

$x + 230 = 360$
$-230 \quad -230$
$x = 130°$