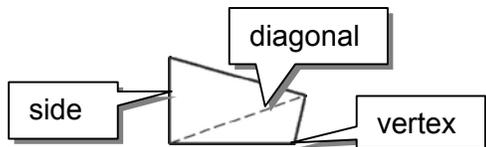**LESSON**
6-1

Reteach

Properties and Attributes of Polygons

The parts of a polygon are named on the quadrilateral below.

diagonal

side

vertex

You can name a polygon by the number of its sides.

A **regular polygon** has all sides congruent and all angles congruent. A polygon is **convex** if all its diagonals lie in the interior of the polygon. A polygon is **concave** if all or part of at least one diagonal lies outside the polygon.
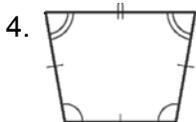
Number of Sides	Polygon
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon
n	n-gon

Types of Polygons		
regular, convex	**irregular, convex**	**irregular, concave**

Tell whether each figure is a polygon. If it is a polygon, name it by the number of sides.

1.

2.

3.

_____   _____   _____

Tell whether each polygon is regular or irregular. Then tell whether it is concave or convex.

4.

5.

6.

_____   _____   _____

LESSON 6-1

Reteach

Properties and Attributes of Polygons continued

The **Polygon Angle Sum Theorem** states that the sum of the interior angle measures of a convex polygon with n sides is $(n - 2)180°$.

| Convex Polygon	Number of Sides	Sum of Interior Angle Measures: $(n - 2)180°$
quadrilateral	4	$(4 - 2)180° = 360°$
hexagon	6	$(6 - 2)180° = 720°$
decagon	10	$(10 - 2)180° = 1440°$

If a polygon is a regular polygon, then you can divide the sum of the interior angle measures by the number of sides to find the measure of each interior angle.

Regular Polygon	Number of Sides	Sum of Interior Angle Measures	Measure of Each Interior Angle
quadrilateral	4	360°	$360° ÷ 4 = 90°$
hexagon	6	720°	$720° ÷ 6 = 120°$
decagon	10	1440°	$1440° ÷ 10 = 144°$

The **Polygon External Angle Sum Theorem** states that the sum of the exterior angle measures, one angle at each vertex, of a convex polygon is 360°.

The measure of each exterior angle of a regular polygon with n exterior angles is $360° ÷ n$. So the measure of each exterior angle of a regular decagon is $360° ÷ 10 = 36°$.

$152° + 63° + 145° = 360°$
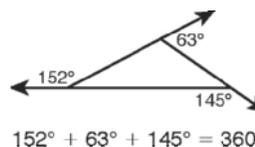
Find the sum of the interior angle measures of each convex polygon.

7. pentagon

8. octagon

9. nonagon

_____   _____   _____

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

10. pentagon

11. heptagon

12. 15-gon

_____   _____   _____

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

13. quadrilateral

14. octagon

_____   _____

7. $x = 12\sqrt{3}$; $y = 36$

8. $x = 11\sqrt{3}$; $y = 22\sqrt{3}$

Challenge

1. $7\sqrt{2}$ 2. $18 + 6\sqrt{3}$

3. $86 + 18\sqrt{2}$ 4. $72 + 36\sqrt{6}$

5. $a = 7$, $b = 4\sqrt{3}$, $c = 11$, $d = 0$

6. $w = 13$, $x = 13$, $y = 20$, $z = 20 + 13\sqrt{3}$

Problem Solving

1. $12\sqrt{3}$ in. or about 20.8 in.

2. $32\sqrt{3}$ in. or about 55.4 in.

3. $3\sqrt{2}$ in. or about 4.2 in.
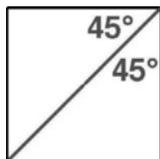
4. $\dfrac{8\sqrt{3}}{3}$ in. or about 4.6 in.

5. $14\sqrt{3}$ in.   6. $19\sqrt{2}$ cm
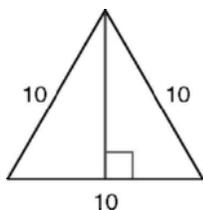
7. B   8. F

Reading Strategies

10^2; 10^2; 200; 10

1. $s\sqrt{2}$

2. 60°

3.

4. Students should say that they have created two 30°–60°–90° triangles.

5. The altitude is $5\sqrt{3}$.

LESSON 6-1

Practice A

1. B   2. C

3. A   4. not a polygon

5. polygon; octagon   6. not a polygon

7. regular; convex

8. irregular; concave

9. irregular; convex   10. 720°

11. 120°   12. 120°

13. 60°

Practice B

1. polygon; nonagon   2. not a polygon

3. not a polygon   4. triangle

5. irregular; concave   6. regular; convex

7. irregular; convex   8. 2160°

9. m∠A = 60°; m∠B = m∠D = m∠F = 150°; m∠C = 120°; m∠E = 90°

10. 24   11. 135°

12. 45°

Practice C

1. 90008

2. 18,0008

3. 180,0008

4. Possible answer: No; a convex polygon may have any number of sides. As the number of sides increases, so does the sum of the interior angle measures. So the sum has no upper limit.

5. Possible answer: A polygon is convex if each interior angle and the interior of the polygon together contain all points of the polygon.

6. $r\sqrt{2}$

7. $r\sqrt{2 - \sqrt{2}}$

8. r

9. $r\sqrt{2 - \sqrt{3}}$

Reteach

1. polygon; pentagon

2. polygon; heptagon   3. not a polygon

4. irregular; convex   5. regular; convex

6. irregular; concave   7. 540°

8. 1080°   9. 1260°

10. 108°   11. 128.6°

12. 156°   13. 90°

14. 45°