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Where excellence in education and character is the expectation.

Dear Students and Families,

Welcome to **10th grade Geometry!** I'm excited about the opportunity to get to know you, and I'm looking forward to a happy and productive school year.

My name is **Saniqua Eubanks**. This is my second year teaching at **Bradford Academy**. I love math and I am very excited about this upcoming school year. In my spare time, I enjoy hanging out with my family, dining out and going to the movies.

Curriculum areas we will focus on this year will be **logical thinking in mathematics through the use of geometric definitions, theorems, and proofs**. Geometric terms are combined with algebra skills in the study of lines, angles, triangles, and other polygons.

The purpose of this summer packet is to assess students' prior knowledge of geometry topics and for students/parents and teachers to prepare for success in the upcoming school year. The packet consists of 4 study guide assignments (which include notes and examples) and an assessment with answer key. On each study guide there are practice problems that need to be completed, and students should complete the assessment at the end and then check answers. An assessment will be given to students the first week they return based on the packet they received.

If you have any questions or concerns, you may contact the school office at **(248) 351-0000**.

Once again, welcome to **10th grade Geometry**. Let's work together to make this the best year ever!

Sincerely,
Saniqua Eubanks

LESSON
1.4**Study Guide**

For use with pages 24–34

GOAL Name, measure, and classify angles.**Vocabulary**

An **angle** consists of two different rays with the same endpoint. The rays are the **sides** of the angle. The endpoint is the **vertex** of the angle.

An **acute** angle has measure greater than 0° and less than 90° .

A **right** angle has measure equal to 90° .

An **obtuse** angle has measure greater than 90° and less than 180° .

A **straight** angle has measure equal to 180° .

Two angles are **congruent angles** if they have the same measure.

An **angle bisector** is a ray that divides an angle into two angles that are congruent.

Postulate 3 Protractor Postulate: Consider \overrightarrow{OB} and a point A on one side of \overrightarrow{OB} . The rays of the form \overrightarrow{OA} can be matched one to one with the real numbers from 0 to 180. The **measure** of $\angle AOB$ is equal to the **absolute value** of the difference between the real numbers for \overrightarrow{OA} and \overrightarrow{OB} .

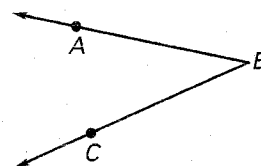
Postulate 4 Angle Addition Postulate: If P is in the interior of $\angle RST$, then $m\angle RST = m\angle RSP + m\angle PST$.

EXAMPLE 1**Name angles**

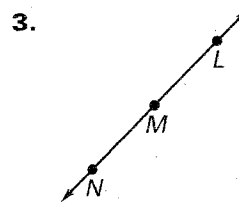
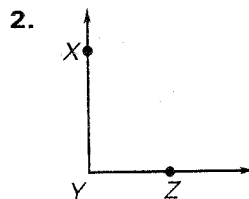
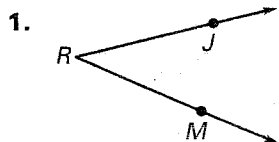
Write three names for the angle and name the vertex and sides of the angle.

Solution

Three names for the angle are $\angle ABC$, $\angle CBA$, or $\angle B$.
The vertex of the angle is point B . The sides of the angle are \overrightarrow{BA} and \overrightarrow{BC} .

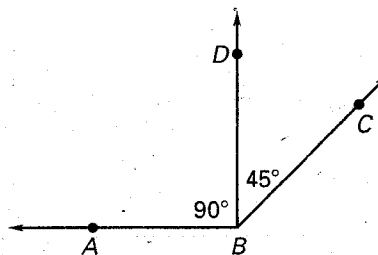
**Exercises for Example 1**

Write three names for the angle and name the vertex and sides of the angle.



LESSON
1.4**Study Guide** *continued*
For use with pages 24–34**EXAMPLE 2** Measure and classify angles

In the diagram, $m\angle ABD = 90^\circ$ and $m\angle DBC = 45^\circ$. Find $m\angle ABC$. Then classify each angle as *acute*, *right*, *obtuse*, or *straight*.

**Solution**

Use the Angle Addition Postulate to find $m\angle ABC$.

$$m\angle ABC = m\angle ABD + m\angle DBC \quad \text{Angle Addition Postulate}$$

$$m\angle ABC = 90^\circ + 45^\circ \quad \text{Substitute angle measures.}$$

$$m\angle ABC = 135^\circ \quad \text{Add.}$$

So, $m\angle ABC = 135^\circ$.

Because $m\angle ABD = 90^\circ$, $\angle ABD$ is a right angle.

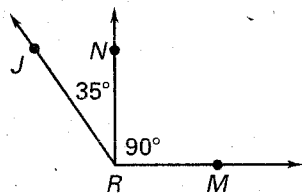
Because $m\angle DBC = 45^\circ$, $\angle DBC$ is an acute angle.

Because $m\angle ABC = 135^\circ$, $\angle ABC$ is an obtuse angle.

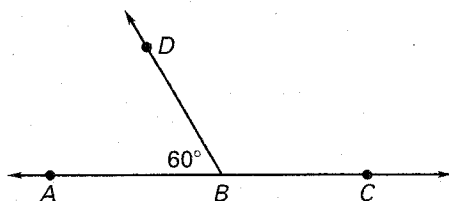
Exercises for Example 2

Find the indicated angle measure. Then classify each angle in the diagram as *acute*, *right*, *obtuse*, or *straight*.

4. $m\angle JRN = 35^\circ$ and $m\angle NRM = 90^\circ$.
Find $m\angle JRM$.



5. $m\angle ABD = 60^\circ$ and $m\angle ABC = 180^\circ$.
Find $m\angle DBC$.



LESSON
1.6**Study Guide**

For use with pages 42–47

GOAL Classify polygons.**Vocabulary**

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 endpoint, so that no two sides with a common endpoint are collinear. Each endpoint of a side is a **vertex** of the polygon.

A polygon is **convex** if 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 called nonconvex or **concave**.

The term **n -gon**, where n is the number of a polygon's sides, can be used to name a polygon.

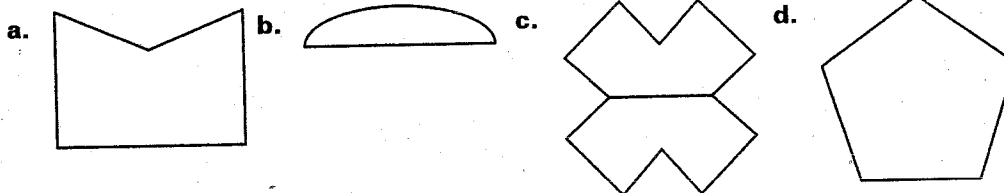
In an **equilateral** polygon, all sides are congruent.

In an **equiangular** polygon, all angles in the interior of the polygon are congruent.

A polygon is **regular** if all sides and all angles are congruent.

EXAMPLE 1 Identify polygons

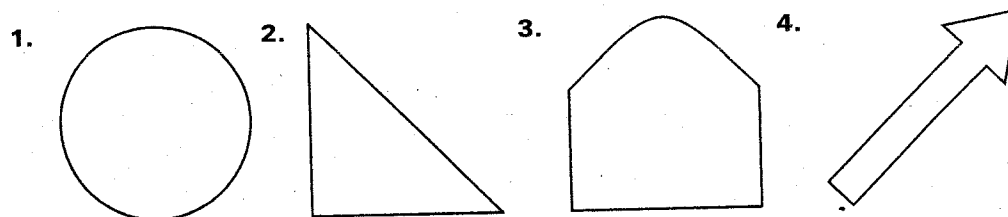
Tell whether the figure is a polygon and whether it is **convex** or **concave**.



- The figure is a concave polygon.
- Part of the figure is not a segment, so it is not a polygon.
- Some segments intersect more than two segments, so it is not a polygon.
- The figure is a convex polygon.

Exercises for Example 1

Tell whether the figure is a polygon and whether it is **convex** or **concave**.



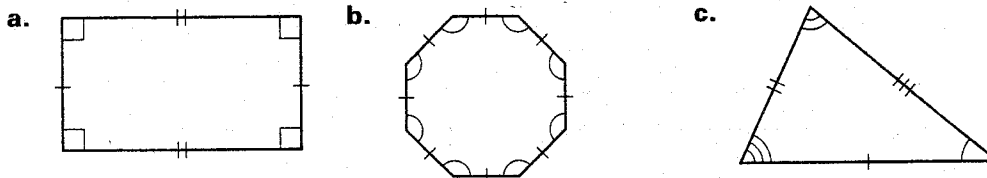
LESSON
1.6

Study Guide *continued*

For use with pages 42–47

EXAMPLE 2 **Classify polygons**

Classify the polygon by the number of sides. Tell whether the polygon is equilateral, equiangular, or regular. Explain your reasoning.

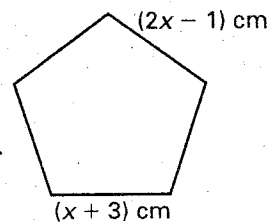


- a. The polygon has 4 sides, so it is a quadrilateral. The angles in the interior of the polygon are congruent, so it is equiangular. Not all of the sides are congruent, so it is not equilateral. So, the polygon is not regular.
- b. The polygon has 8 sides. It is equilateral and equiangular, so it is a regular octagon.
- c. The polygon has 3 sides, so it is a triangle. It is not equilateral or equiangular, so it is not regular.

EXAMPLE 3 **Find side lengths**

The figure shown at the right is a regular pentagon. Find the length of a side.

First, write and solve an equation to find the value of x .
Use the fact that the sides of a regular pentagon are congruent.



$2x - 1 = x + 3$ Write equation.
 $x - 1 = 3$ Subtract x from each side.
 $x = 4$ Add 1 to each side.

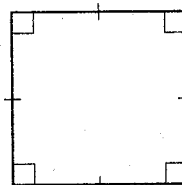
Then find a side length. Evaluate one of the expressions when $x = 4$.

$2x - 1 = 2(4) - 1 = 7$

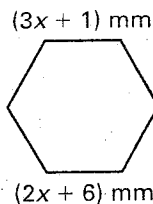
The length of a side of the pentagon is 7 centimeters.

Exercises for Examples 2 and 3

- 5. Classify the polygon by the number of sides. Tell whether the polygon is equilateral, equiangular, or regular. Explain your reasoning.



- 6. The figure shown at the right is a regular hexagon. Find the length of a side.



LESSON
1.7**Study Guide**

For use with pages 48–56

GOAL Find dimensions of polygons.**Vocabulary**

Formulas for the perimeter P , area A , and circumference C of some common plane figures are given below.

Squareside length s

$$P = 4s$$

$$A = s^2$$

Triangleside lengths a , b , and c ,base b , and height h

$$P = a + b + c$$

$$A = \frac{1}{2}bh$$

Rectanglelength l and width w

$$P = 2l + 2w$$

$$A = lw$$

Circlediameter d and radius r

$$C = \pi d = 2\pi r$$

$$A = \pi r^2$$

EXAMPLE 1 Find the perimeter and area of a square

Find the perimeter and area of the square shown at the right.

Solution

Perimeter

Area

$$P = 4s$$

$$A = s^2$$

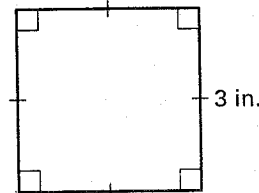
$$= 4(3)$$

$$= (3)^2$$

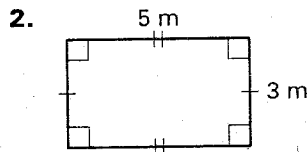
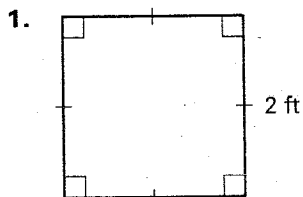
$$= 12$$

$$= 9$$

The perimeter is 12 inches and the area is 9 square inches.

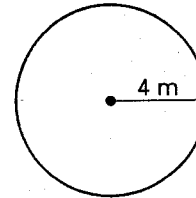
**Exercises for Example 1**

Find the perimeter and area of the figure. If necessary, round to the nearest tenth.



LESSON
1.7**Study Guide** *continued*
For use with pages 48–56**EXAMPLE 2** Find the circumference and area of a circle

Find the circumference and area of the circle shown at the right.

**Solution**

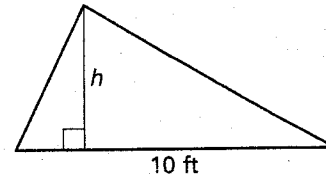
Use 3.14 to approximate the value of π .

Circumference	Area
$C = 2\pi r$	$A = \pi r^2$
$\approx 2(3.14)(4)$	$\approx 3.14(4)^2$
$= 25.12$	$= 50.24$

The circumference is about 25.1 meters and the area is about 50.2 square meters.

EXAMPLE 3 Find unknown length

The base of a triangle is 10 feet. Its area is 30 square feet. Find the height of the triangle.

**Solution**

$$A = \frac{1}{2}bh$$

Write formula for the area of a triangle.

$$30 = \frac{1}{2}(10)h$$

Substitute 30 for A and 10 for b .

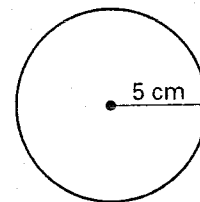
$$6 = h$$

Solve for h .

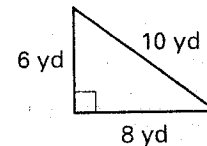
The height is 6 feet.

Exercises for Examples 2 and 3

3. Find the circumference and area of the circle. If necessary, round to the nearest tenth.



4. Find the perimeter and area of the triangle.



5. The base of a triangle is 12 meters. Its area is 42 square meters. Find the height of the triangle.

LESSON
4.1**Study Guide**

For use with pages 216–224

GOAL Classify triangles and find measures of their angles.**Vocabulary**A **triangle** is a polygon with three sides.A **scalene triangle** has no congruent sides.An **isosceles triangle** has at least two congruent sides.An **equilateral triangle** has three congruent sides.An **acute triangle** has three acute angles.A **right triangle** has one right angle.An **obtuse triangle** has one obtuse angle.An **equiangular triangle** has three congruent angles.

When the sides of a polygon are extended, other angles are formed. The original angles are the **interior angles**. The angles that form linear pairs with the interior angles are the **exterior angles**.

Theorem 4.1 Triangle Sum Theorem: The sum of the measures of the interior angles of a triangle is 180° .

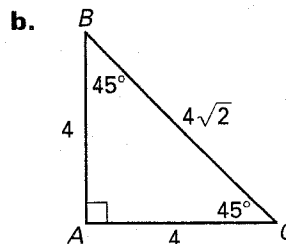
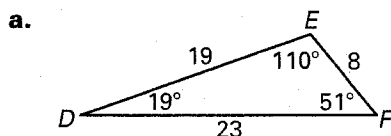
Theorem 4.2 Exterior Angle Theorem: The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

Corollary to the Triangle Sum Theorem: The acute angles of a right triangle are complementary.

LESSON 4.1

EXAMPLE 1 Classify triangles by sides and by angles

Classify the triangle by its sides and by its angles.

**Solution**

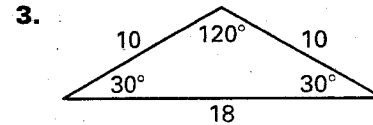
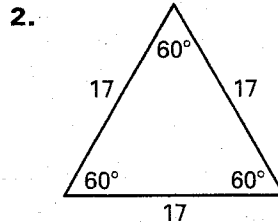
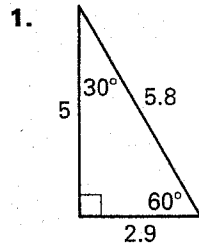
- a. Triangle DEF has one obtuse angle and no congruent sides. So, $\triangle DEF$ is an obtuse scalene triangle.
- b. Triangle ABC has one right angle and two congruent sides. So, $\triangle ABC$ is a right isosceles triangle.

LESSON
4.1

Study Guide *continued*
For use with pages 216–224

Exercises for Example 1

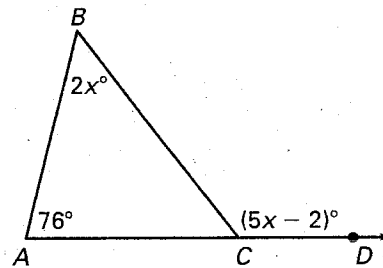
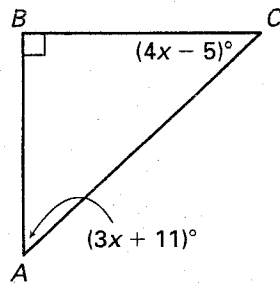
Classify the triangle by its sides and by its angles.



EXAMPLE 2 Find angle measures

a. Find $m\angle BAC$ and $m\angle BCA$.

b. Find $m\angle BCD$ and $m\angle ABC$.



Solution

a. $(4x - 5)^\circ + (3x + 11)^\circ = 90^\circ$ Use Corollary to the Triangle Sum Theorem.
 $x = 12$ Solve for x .

So, $m\angle BCA = (4x - 5)^\circ = (4 \cdot 12 - 5)^\circ = 43^\circ$ and
 $m\angle BAC = (3x + 11)^\circ = (3 \cdot 12 + 11)^\circ = 47^\circ$.

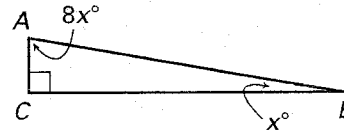
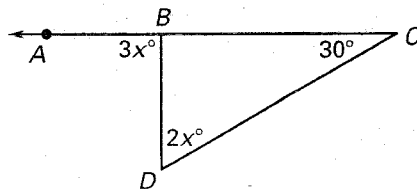
b. $(5x - 2)^\circ = 2x^\circ + 76^\circ$ Use Exterior Angle Theorem.
 $x = 26$ Solve for x .

So, $m\angle BCD = (5x - 2)^\circ = (5 \cdot 26 - 2)^\circ = 128^\circ$ and
 $m\angle ABC = 2x^\circ = 2(26)^\circ = 52^\circ$.

Exercises for Example 2

4. Find $m\angle ABD$ and $m\angle BDC$.

5. Find $m\angle CAB$ and $m\angle CBA$.



Geometry Pre-Test

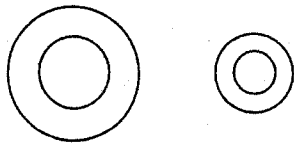
1. How many degrees in a triangle?

- a) 90°
- b) 180°
- c) 360°
- d) 270°

2. James has a right triangle that has another angle that measures 45. What is the missing angle measurement ?

- a) 45°
- b) 90°
- c) 180°
- d) 150°

3. Congruent or Similar ?



- a) congruent
- b) similar

4. Find the area of the circle : use 3.14 for Pi, round to the nearest hundredth.

The radius of the circle is 4 feet

- a) 8 ft^2
- b) 16 ft^2
- c) 50.24 ft^2
- d) 100.48 ft^2

5. This triangle has at least two sides congruent.

- a) acute triangle
- b) scalene triangle
- c) isosceles triangle
- d) equilateral triangle

6. A polygon that has 4 sides is called a(n)

- a) triangle
- b) quadrilateral
- c) pentagon
- d) hexagon

7. I am a quadrilateral with opposite sides congruent; all angles are right and opposite sides are parallel:

- a) diamond
- b) rectangle
- c) parallelogram
- d) rhombus

8. A polygon with six sides is called a(n):

- a) pentagon
- b) octagon
- c) heptagon
- d) hexagon

9. The movement of a figure is called a(n):

- a) form
- b) transformation
- c) horizontal
- d) vertical

10. What triangle has no sides or angles congruent?

- a) scalene triangle
- b) acute triangle
- c) isosceles triangle
- d) equilateral triangle

Geometry Pre-test Answer Key

1. b
2. a
3. b
4. c
5. c
6. b
7. c
8. d
9. b
10. a