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OVERVIEW

This lesson summarizes some important relationships from your study of Geometry that you should already know.

ANGLES AND LINES

When two lines intersect, vertical angles (opposite angles) have the same measure. See Figure 6.1.
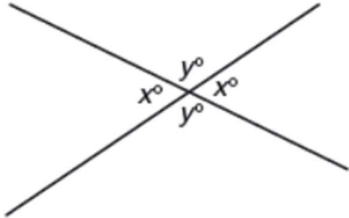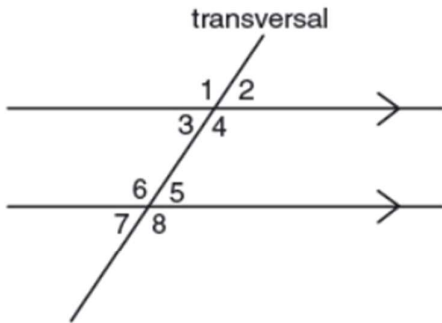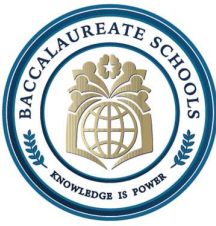

Vertical Angles	Parallel Lines
• Vertical angles are equal in measure. • The sum of the measures of the angles about a point is 360.	Pairs of angles formed by parallel lines either have the same measure or their measures add up to 180.

Figure 6.1 Angle relationships for intersecting and parallel lines

When two parallel lines are cut by another line, called a *transversal*, every pair of angles formed are either congruent (have the same measure) or are supplementary (have measures that add up to 180). In Figure 6.1, since the lines are parallel,

■ Alternate interior angles 3 and 5 are equal in measure as are alternate interior angles 4 and 6.

■ Corresponding pairs of angles 1 and 2, 3 and 7, 2 and 5, as well as 4 and 8 have equal measures.

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TRIANGLES AND POLYGONS

For triangles (see Figure 6.2),

- The sum of the measures of the three angles is 180.
- The measure of an exterior angle is equal to the sum of the two nonadjacent interior angles of the triangle.
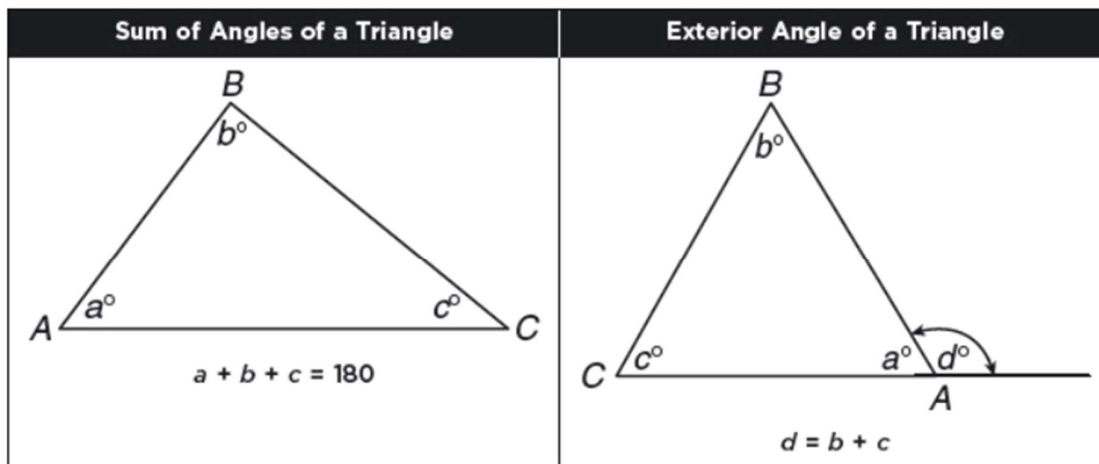
Sum of Angles of a Triangle	Exterior Angle of a Triangle
$a + b + c = 180$	$d = b + c$

Figure 6.2 Angle relationships in a triangle

For any polygon with n sides (see Figure 6.3),

- The sum of the measures of the interior angles is $(n - 2) \cdot 180$. The sum of the measures of the four angles of a quadrilateral is $(4 - 2) \cdot 180 = 2 \cdot 180 = 360$.
- The sum of the exterior angles, one angle at each vertex, is 360.

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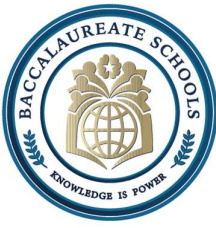
MATH REFERENCE FACT

In a **regular polygon**, all of the sides have the same length and all of the angles have the same measure. For a *regular* polygon with n sides,

- The measure of each exterior angle is $\frac{360}{n}$.

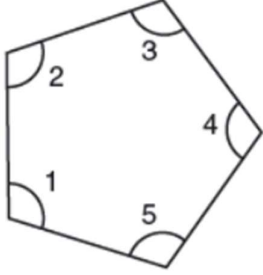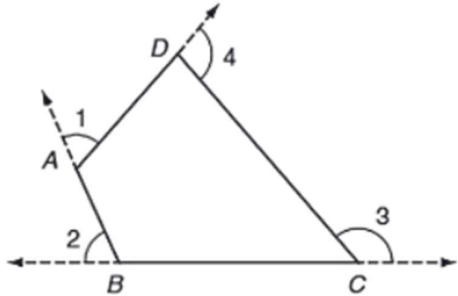- The measure of each interior angle is $180 - \frac{360}{n}$.

Sum of Interior Angles of a Polygon Sum = $(n - 2)180$	Sum of Exterior Angles of a Polygon Sum = 360
$m\angle 1 + m\angle 2 + \cdots + m\angle 5 = (n - 2) \cdot 180$ $= (5 - 2) \cdot 180$ $= 540$	$m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 360$

Figure 6.3 Angle relationships for polygons

ISOSCELES, EQUILATERAL, AND RIGHT TRIANGLES

If two sides of a triangle have the same length, then the angles that face these sides have the same measures. If all 3 sides of a triangle have the same length, then the three angles of the triangle have the same measure. See Figure 6.4.
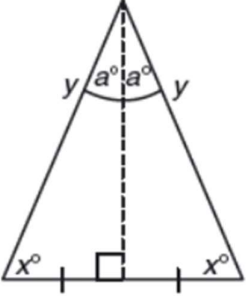
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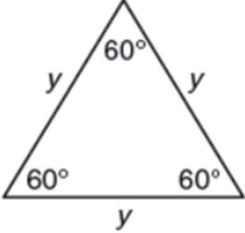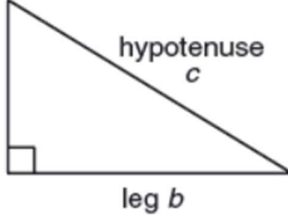BACCALAUREATE SCHOOLS
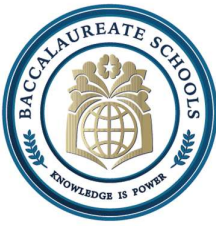
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Isosceles Triangle (Angles facing equal sides have equal measures)	Equilateral Triangle (Three sides have the same length)	Right Triangle (Side facing the 90° angle is the hypotenuse)
Altitude to base bisects the base and the vertex angle	An equilateral triangle is also equiangular	leg a, hypotenuse c, leg b $a^2 + b^2 = c^2$ Common Side Length Triples 3-4-5 5-12-13 8-15-17

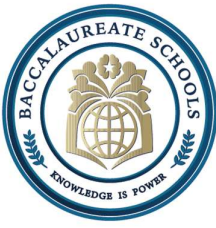**Figure 6.4** Relationships in isosceles, equilateral, and right triangles

Exercises:
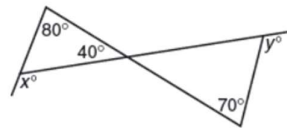
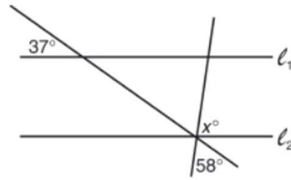1. In the figure above, $x + y =$
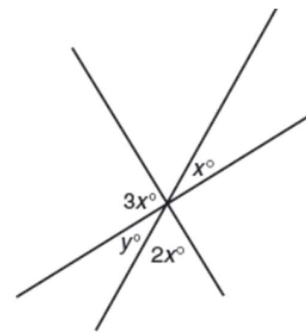
In the figure above, what is the value of y?

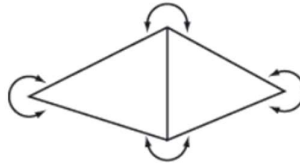Student's Name: _____
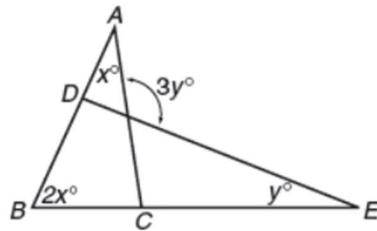
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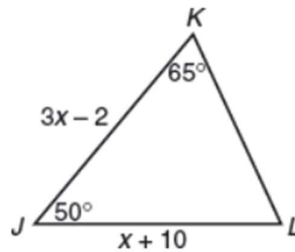
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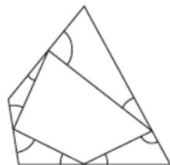3. In the figure above, if $\ell_1 \parallel \ell_2$, what is the value of x?

4. In the figure above, what is the sum of the degree measures of all of the angles marked?
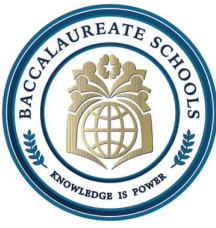

In the figure above, what is y in terms of x?

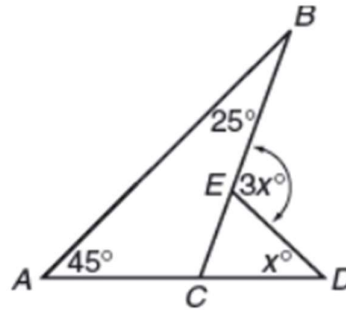In $\triangle JKL$ above, what is the value of x?

In the figure above, what is the sum of the degree measures of the marked angles?

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In the figure above, what is the value of x?