

# Lesson 4-2

**Objective** – To find interior and exterior angles of a triangle.

Name the interior and exterior angles of the triangle and find their measure.

**Interior Angles**  
 $\angle b, \angle h, \angle j$   
 $m\angle b = 60^\circ, m\angle j = 55^\circ$   
 $m\angle h = 65^\circ$

**Exterior Angles**  
 $\angle a$  or  $\angle d, \angle f$  or  $\angle g, \angle n$  or  $\angle k$   
 $m\angle a$  or  $m\angle d = 120^\circ$   
 $m\angle f$  or  $m\angle g = 115^\circ$   
 $m\angle n$  or  $m\angle k = 125^\circ$

$m\angle c = 60^\circ$   
 $m\angle n = 125^\circ$

**Triangle Sum Theorem**  
 Every triangle has angles whose sum equals  $180^\circ$ .

$$m\angle a + m\angle b + m\angle c = 180^\circ$$

Solve for x.

$$m\angle x + 85^\circ + 65^\circ = 180^\circ$$

$$x + 150 = 180$$

$$\underline{-150 \quad -150}$$

$$x = 30$$

**Prove the Triangle Sum Theorem**

Given:  $\triangle ABC$   
 Prove:  $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$

Statement	Reasons
1) Draw auxiliary line P parallel to $\overline{AC}$ through B.	Parallel Line Postulate
2) $\angle 4 \cong \angle 1, \angle 5 \cong \angle 2$	Alt. Int. $\angle$ s Thm.
3) $m\angle 4 = m\angle 1, m\angle 5 = m\angle 2$	Def. of $\cong \angle$ s
4) $m\angle 4, m\angle 3, m\angle 5$ is straight angle	Angle Add. Post.
5) $m\angle 4 + m\angle 3 + m\angle 5 = 180^\circ$	Def. of Straight Angle
6) $m\angle 1 + m\angle 3 + m\angle 2 = 180^\circ$	Substitution (2 into 5)

**Corollary** - A theorem whose proof follows directly from another theorem.

**Complementary Angles of Right Triangle Corollary**  
 The acute angles of any right triangle are complementary.

**Angles of an Equilateral Triangle Corollary**  
 The measure of each angle of an equiangular triangle is  $60^\circ$ .

Name the following in the figure below.

Interior angles	Exterior angles	Remote Interior angles
$\angle a$	$\angle d$	$\angle a$
$\angle b$		$\angle b$
$\angle c$		

Find the unknown interior angles in the figure.

$m\angle x = 20^\circ$   
 $m\angle y = 70^\circ$

**Exterior Angle Theorem**  
 The measure of the exterior angle is equal to the sum of the measures of the remote interior angles.

$$m\angle d = m\angle a + m\angle b$$

Find the remote interior angles.

$$3x + 15 + 2x - 20 = 110$$

$$5x - 5 = 110$$

$$5x = 115$$

$$x = 23$$

$$3(23) + 15 = 84^\circ$$

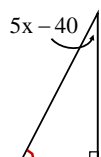
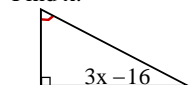
$$2(23) - 20 = 26^\circ$$

## Lesson 4-2

### Third Angles Theorem

If two angles of one triangle are congruent to two angles of another triangle, then the third angles of each triangle are congruent.

Find  $x$ .



$$\begin{aligned} 3x - 16 &= 5x - 40 \\ -3x &\quad -3x \\ \hline -16 &= 2x - 40 \\ 24 &= 2x \\ 12 &= x \end{aligned}$$