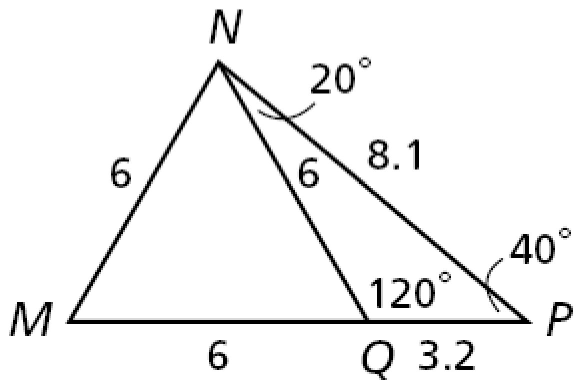
Classify each triangle by its angles <u>and</u> sides.

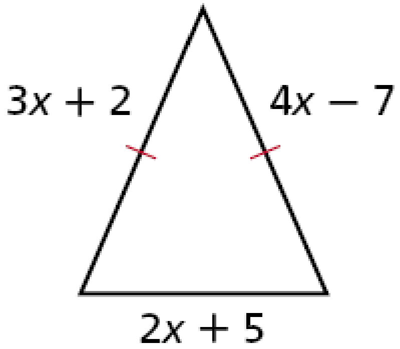
1. $\triangle MNQ$ acute; equilateral

2. $\triangle NQP$ obtuse; scalene

3. $\triangle MNP$ acute; scalene



4. Find the side lengths of the triangle.



29; 29; 23

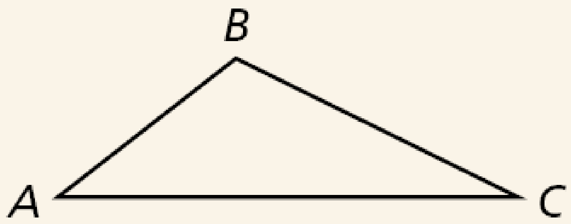
Objectives

Find the measures of interior and exterior angles of triangles.

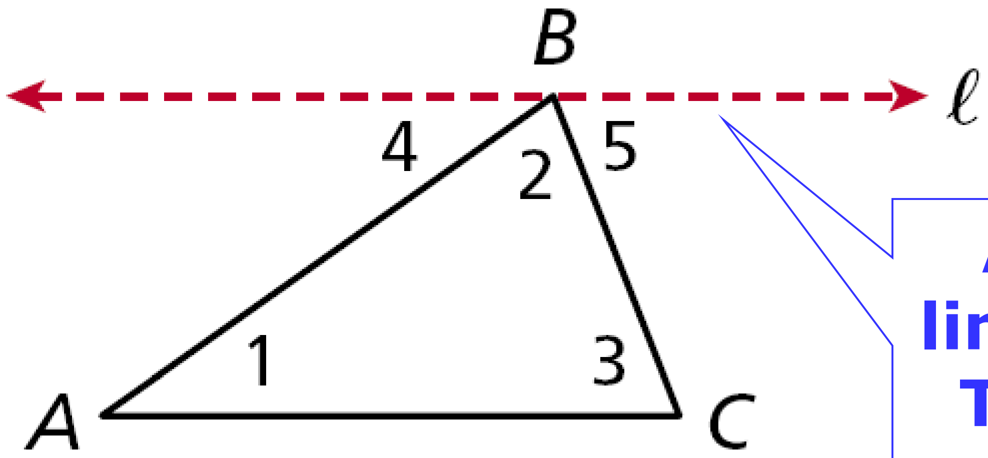
Triangle Sum Theorem:

The sum of the angle measures of a triangle is 180°.

$$m\angle A + m\angle B + m\angle C = 180^\circ$$



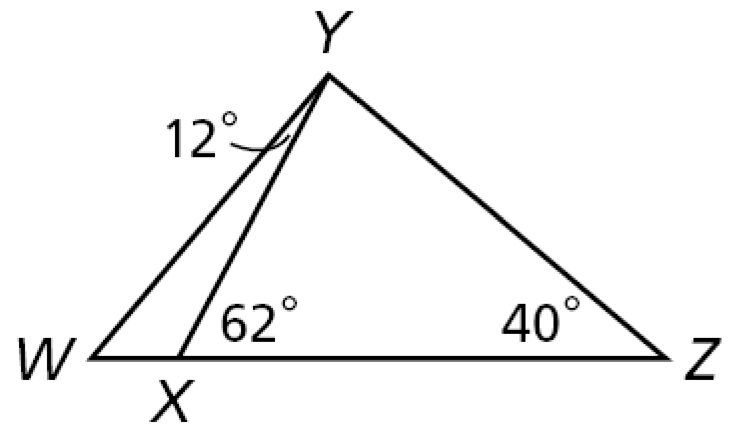
An **auxiliary line** is a line that is added to a figure to aid in a proof.



An auxiliary line used in the Triangle Sum Theorem

Example 1A: Application

After an accident, the positions of cars are measured by law enforcement to investigate the collision. Use the diagram drawn from the information collected to find m∠*XYZ*.



m∠*XYZ* + m∠*YZX* + m∠*ZXY* = 180°   △ *Sum. Thm*

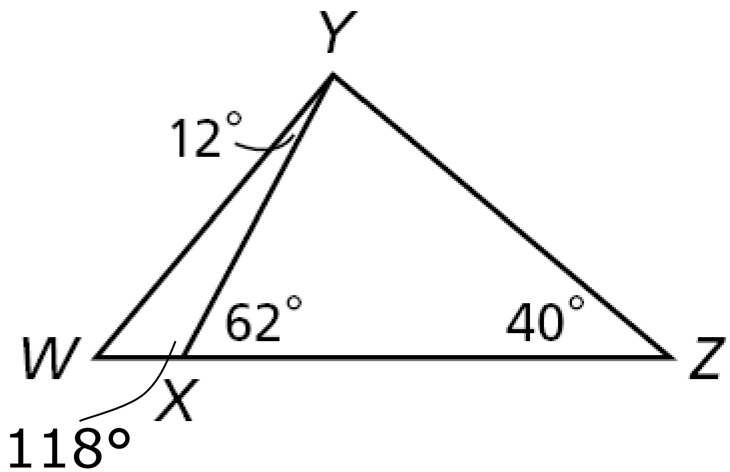
m∠*XYZ* + 40 + 62 = 180   *Substitute 40 for m∠YZX and 62 for m∠ZXY.*

m∠*XYZ* + 102 = 180   *Simplify.*

m∠*XYZ* = 78°   *Subtract 102 from both sides.*

Example 1B: Application

After an accident, the positions of cars are measured by law enforcement to investigate the collision. Use the diagram drawn from the information collected to find m∠*YWZ*.



Step 1 Find m∠*WXY*.

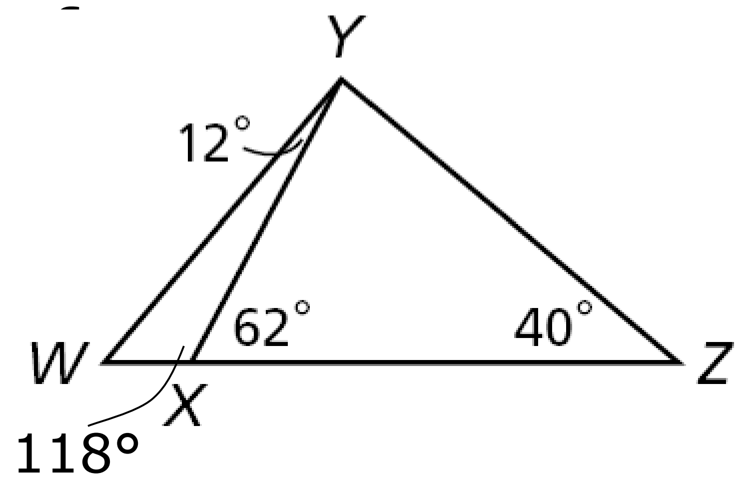
$m\angle YXZ + m\angle WXY = 180°$ *Lin. Pair Thm. and ∠ Add. Post.*

$62 + m\angle WXY = 180$ *Substitute 62 for m∠YXZ.*

$m\angle WXY = 118°$ *Subtract 62 from both sides.*

Example 1B: Application Continued

After an accident, the positions cars are measured by law enforcement to investigate the collision. Use the diagram draw from the information collected to find m∠*YWZ*.



Step 2 Find m∠*YWZ*.

m∠*YWX* + m∠*WXY* + m∠*XYW* = 180° *△ Sum. Thm*

m∠*YWX* + 118 + 12 = 180 *Substitute 118 for m∠WXY and 12 for m∠XYW.*

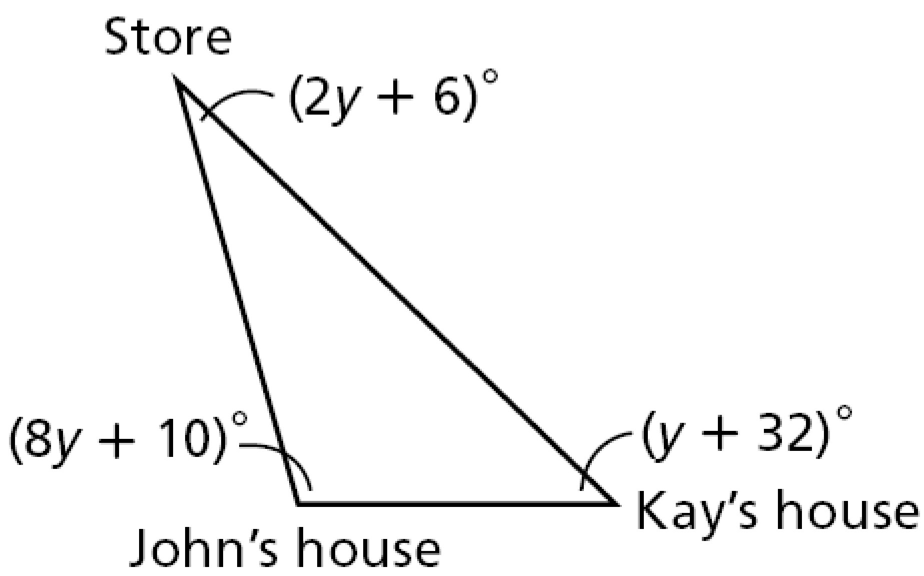
m∠*YWX* + 130 = 180 *Simplify.*

m∠*YWX* = 50° *Subtract 130 from both sides.*

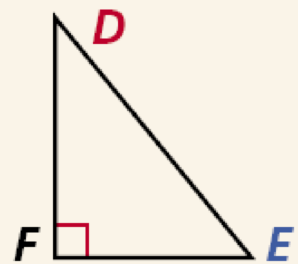
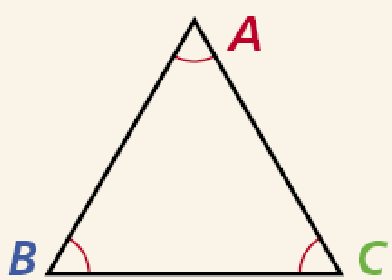
Lesson Quiz: Part II

4. The diagram is a map showing John's house, Kay's house, and the grocery store. What is the angle the two houses make with the store?

30°



A **corollary** is a theorem whose proof follows directly from another theorem. Here are two corollaries to the Triangle Sum Theorem.

COROLLARY	HYPOTHESIS	CONCLUSION
The acute angles of a right triangle are complementary.		$\angle D$ and $\angle E$ are complementary. $m\angle D + m\angle E = 90°$
The measure of each angle of an equiangular triangle is 60°.		$m\angle A = m\angle B = m\angle C = 60°$

Example 2: Finding Angle Measures in Right Triangles

One of the acute angles in a right triangle measures 2*x*°. What is the measure of the other acute angle?

Let the acute angles be $\angle A$ and $\angle B$, with $m\angle A = 2x°$.

$m\angle A + m\angle B = 90°$	*Acute $\angle$s of rt. $\triangle$ are comp.*
$2x + m\angle B = 90$	*Substitute 2x for $m\angle A$.*
$m\angle B = (90 - 2x)°$	*Subtract 2x from both sides.*

Check It Out! Example 2a

The measure of one of the acute angles in a right triangle is 63.7°. What is the measure of the other acute angle?

Let the acute angles be $\angle A$ and $\angle B$, with $m\angle A = 63.7°$.

$m\angle A + m\angle B = 90°$	*Acute $\angle$s of rt. $\triangle$ are comp.*
$63.7 + m\angle B = 90$	*Substitute 63.7 for $m\angle A$.*
$m\angle B = 26.3°$	*Subtract 63.7 from both sides.*

Check It Out! Example 2b

The measure of one of the acute angles in a right triangle is $(4x - 5)°$. What is the measure of the other acute angle?

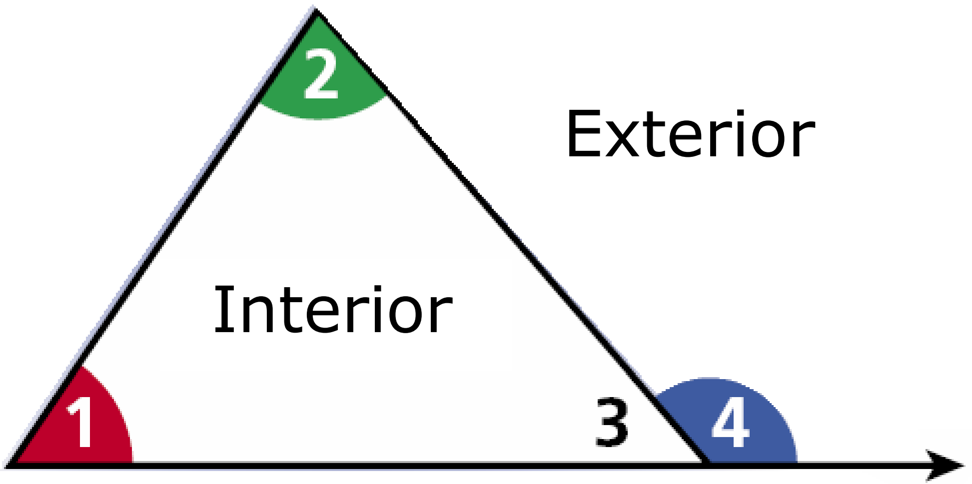
Let the acute angles be $\angle A$ and $\angle B$, with $m\angle A = x°$.

$m\angle A + m\angle B = 90°$	*Acute $\angle$s of rt. $\triangle$ are comp.*
$4x - 5 + m\angle B = 90$	*Substitute x for $m\angle A$.*
$m\angle B = (95 - 4x)°$	*Subtract x from both sides.*

Not Needed in Notes…

The **interior** is the set of all points inside the figure.

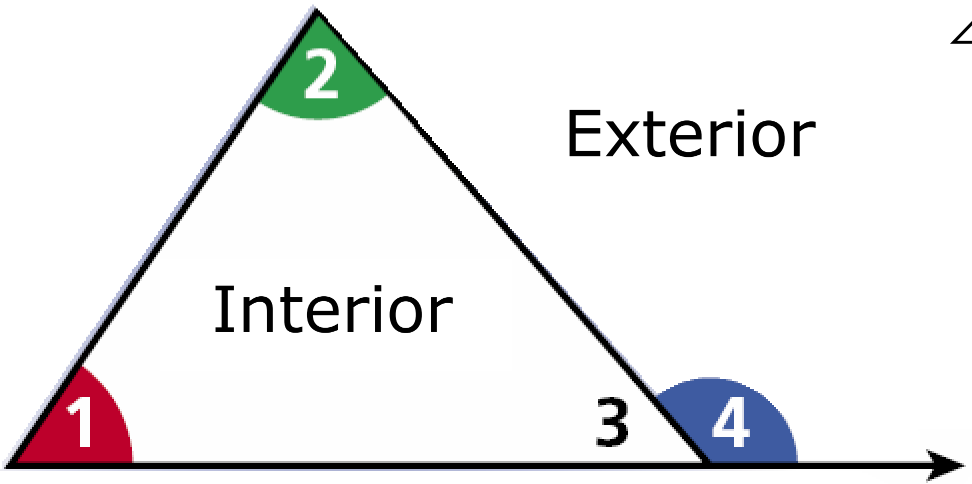
The **exterior** is the set of all points outside the figure.



An **interior angle** is formed by two sides of a triangle.

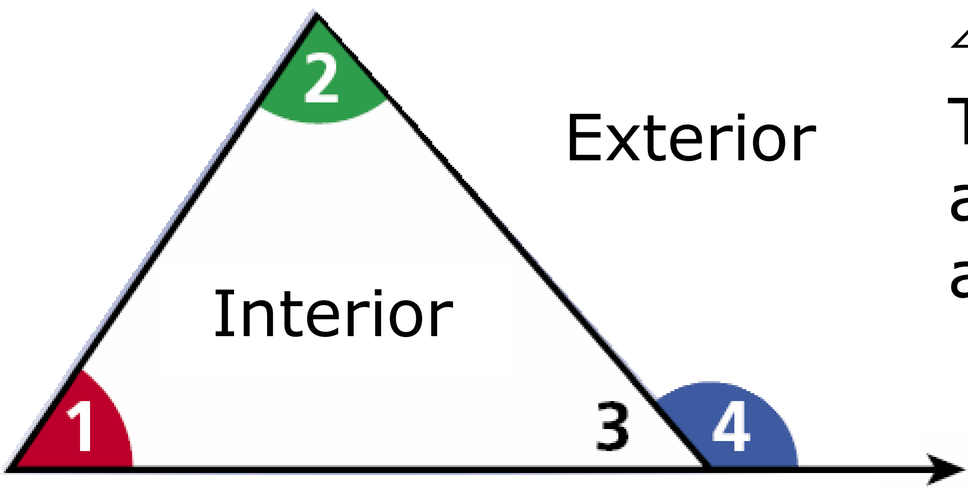
An **exterior angle** is formed by one side of the triangle and extension of an adjacent side.

$\angle 4$ is an exterior angle.



$\angle 3$ is an interior angle.

A **remote interior angle** is an interior angle that is not adjacent to the exterior angle. Each exterior angle has 2 remote interior angles.



$\angle 4$ is an exterior angle.

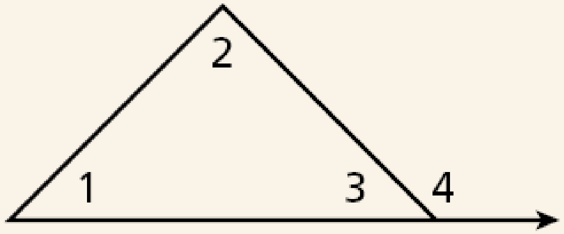
The remote interior angles of $\angle 4$ are $\angle 1$ and $\angle 2$.

$\angle 3$ is an interior angle.

Exterior Angle Theorem:

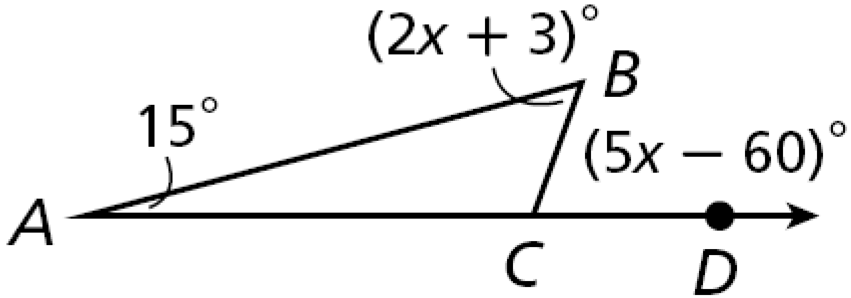
The measure of an exterior angle of a triangle is equal to the sum of the measures of its remote interior angles.

$m\angle 4 = m\angle 1 + m\angle 2$



Example 3: Applying the Exterior Angle Theorem

Find m∠*B*.



$m\angle A + m\angle B = m\angle BCD$ — *Ext. ∠ Thm.*

$15 + 2x + 3 = 5x - 60$ — *Substitute 15 for m∠A, 2x + 3 for m∠B, and 5x – 60 for m∠BCD.*

$2x + 18 = 5x - 60$ — *Simplify.*

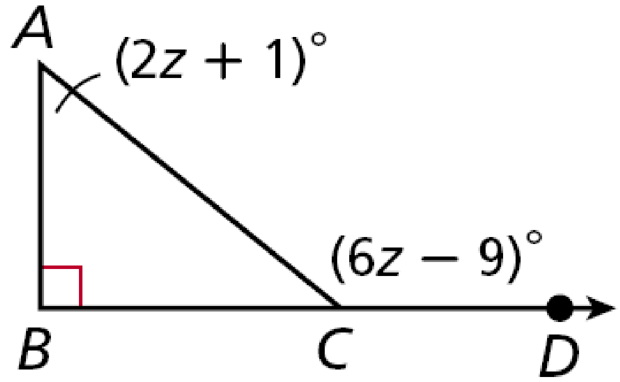
$78 = 3x$ — *Subtract 2x and add 60 to both sides.*

$26 = x$ — *Divide by 3.*

$m\angle B = 2x + 3 = 2(26) + 3 = 55°$

Check It Out! Example 3

Find m∠*ACD*.



m∠*ACD* = m∠*A* + m∠*B* — *Ext. ∠ Thm.*

$6z - 9 = 2z + 1 + 90$ — *Substitute 6z – 9 for m∠ACD, 2z + 1 for m∠A, and 90 for m∠B.*

$6z - 9 = 2z + 91$ — *Simplify.*

$4z = 100$ — *Subtract 2z and add 9 to both sides.*

$z = 25$ — *Divide by 4.*

m∠*ACD* = $6z - 9 = 6(25) - 9 = 141°$

HOMEWORK:

Pg. 227 #4-10, 15-20, 29-32