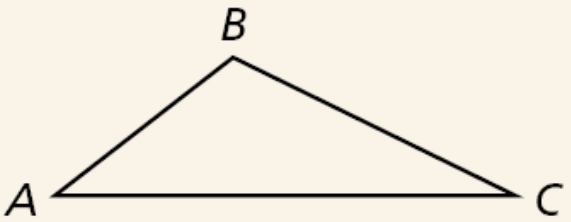
Angle Relationships in Triangles

Theorem 4-2-1 **Triangle Sum Theorem**

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

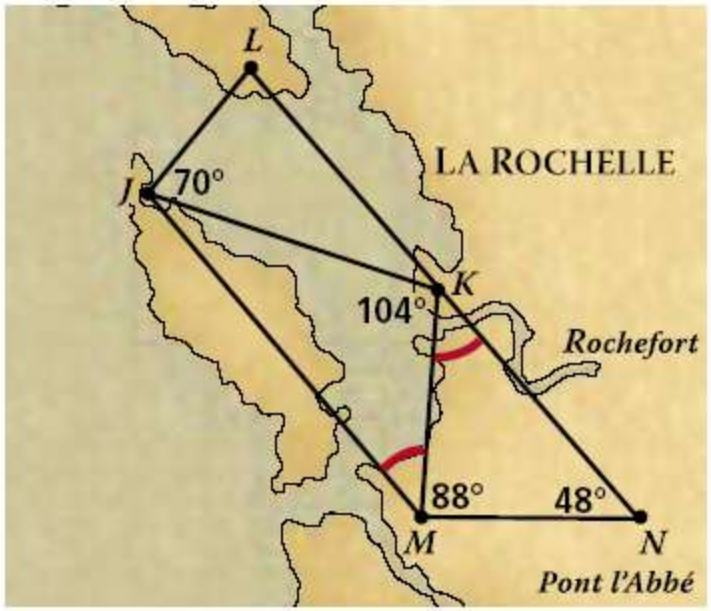
$$m\angle A + m\angle B + m\angle C = 180°$$



Angle Relationships in Triangles

Check It Out! Example 1

Use the diagram to find m∠*MJK*.



$m\angle MJK + m\angle JKM + m\angle KMJ = 180°$ △ *Sum. Thm*

$m\angle MJK + 104 + 44 = 180$ *Substitute 104 for m∠JKM and 44 for m∠KMJ.*

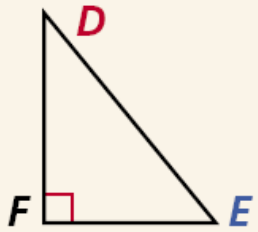
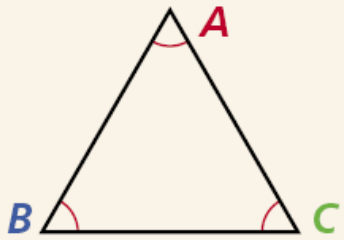
$m\angle MJK + 148 = 180$ *Simplify.*

$m\angle MJK = 32°$ *Subtract 148 from both sides.*

Angle Relationships in Triangles

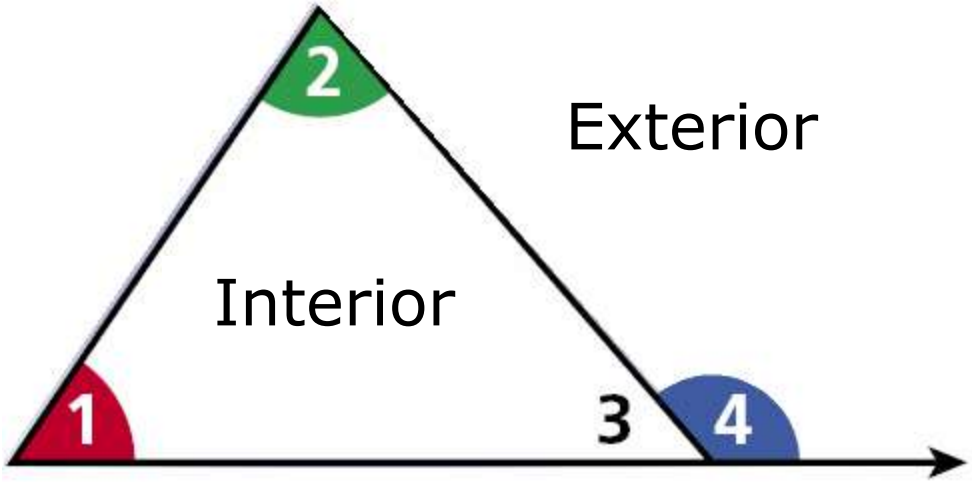
A **corollary** is a theorem whose proof follows directly from another theorem. Here are two corollaries to the Triangle Sum Theorem.

Corollaries

COROLLARY		HYPOTHESIS	CONCLUSION
4-2-2	The acute angles of a right triangle are complementary.		$\angle D$ and $\angle E$ are complementary. $m\angle D + m\angle E = 90°$
4-2-3	The measure of each angle of an equiangular triangle is 60°.		$m\angle A = m\angle B = m\angle C = 60°$

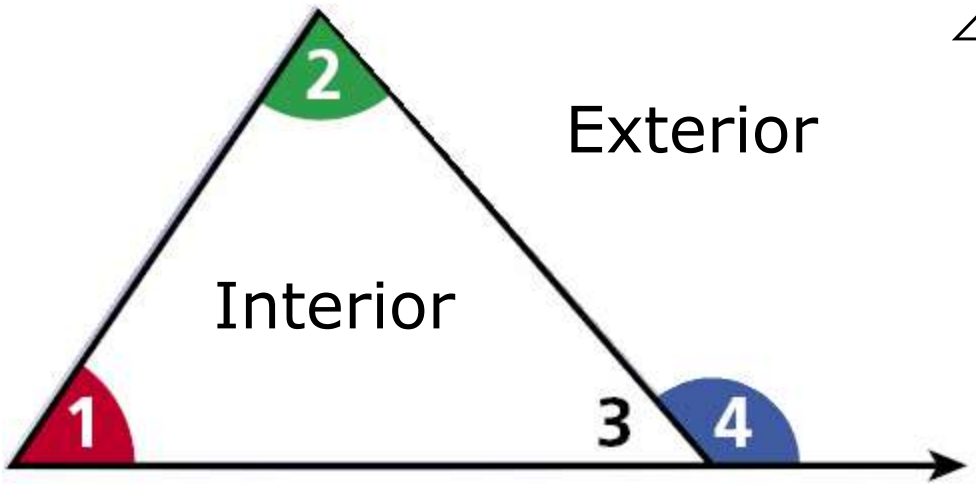
Angle Relationships in Triangles

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



Angle Relationships in Triangles

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.

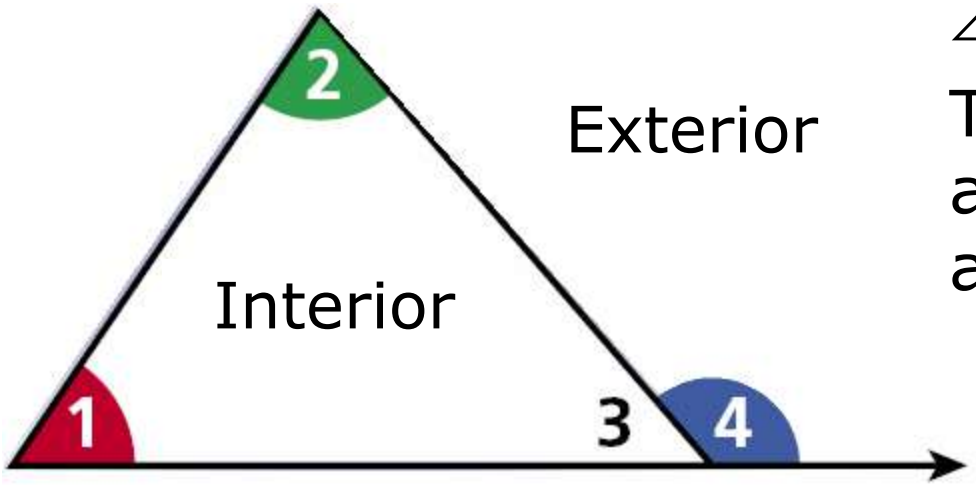


∠4 is an exterior angle.

∠3 is an interior angle.

Angle Relationships in Triangles

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



$\angle 4$ is an exterior angle.

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

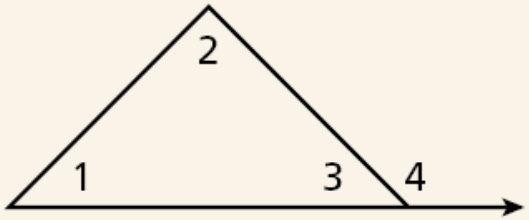
$\angle 3$ is an interior angle.

Angle Relationships in Triangles

Theorem 4-2-4 **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.

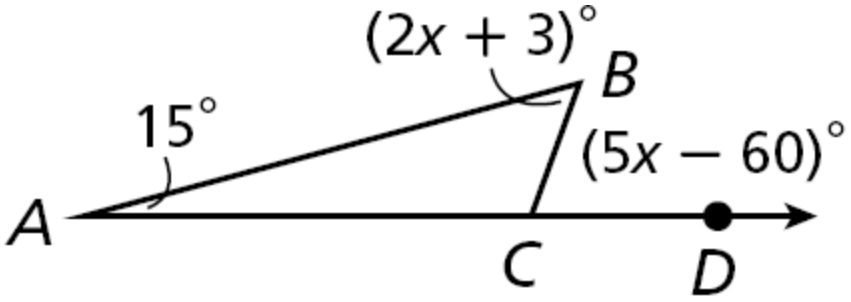
$m\angle 4 = m\angle 1 + m\angle 2$



Angle Relationships in Triangles

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.*

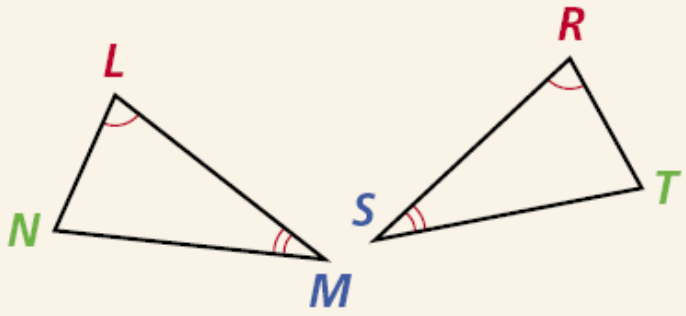
$78 = 3x$ — *Subtract 2x and add 60 to both sides.*

$26 = x$ — *Divide by 3.*

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

Angle Relationships in Triangles

Theorem 4-2-5 Third Angles Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If two angles of one triangle are congruent to two angles of another triangle, then the third pair of angles are congruent.		$\angle N \cong \angle T$

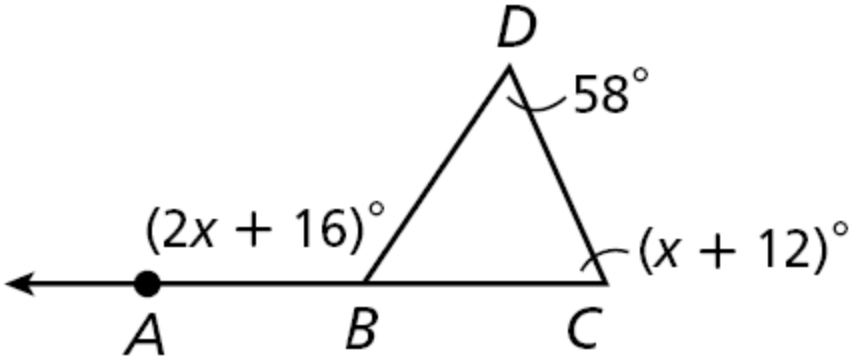
Angle Relationships in Triangles

Lesson Quiz: Part I

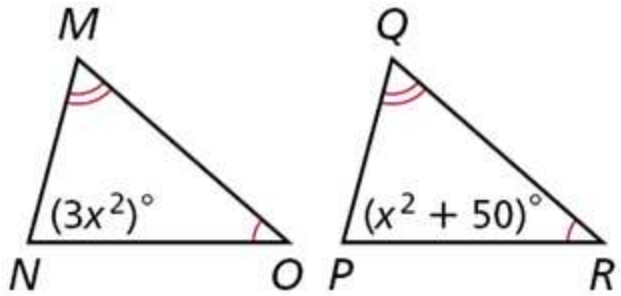
1. The measure of one of the acute angles in a right triangle is $56\frac{2}{3}°$. What is the measure of the other acute angle?

$33\frac{1}{3}°$

2. Find m∠*ABD*. **3.** Find m∠*N* and *m*∠P.



124°



75°; 75°

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°