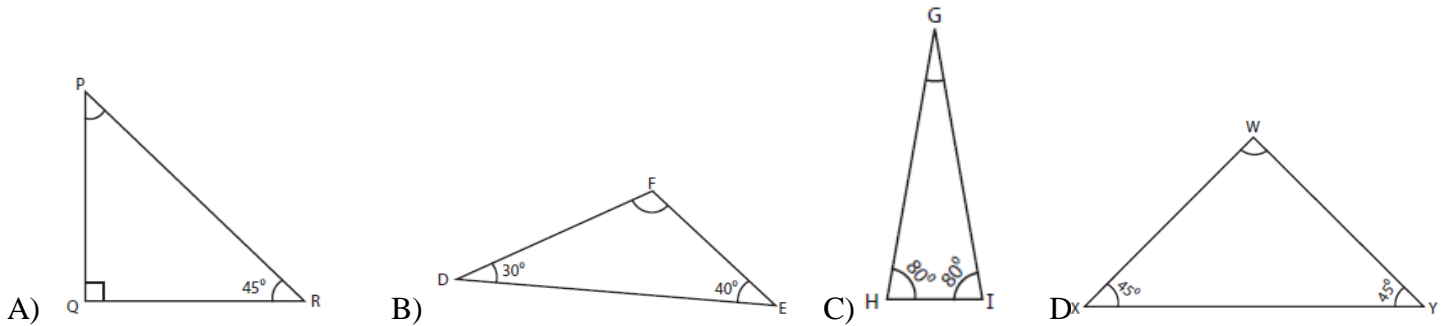Main Ideas: Apply the Triangle Sum Theorem and the Exterior Angle Theorem
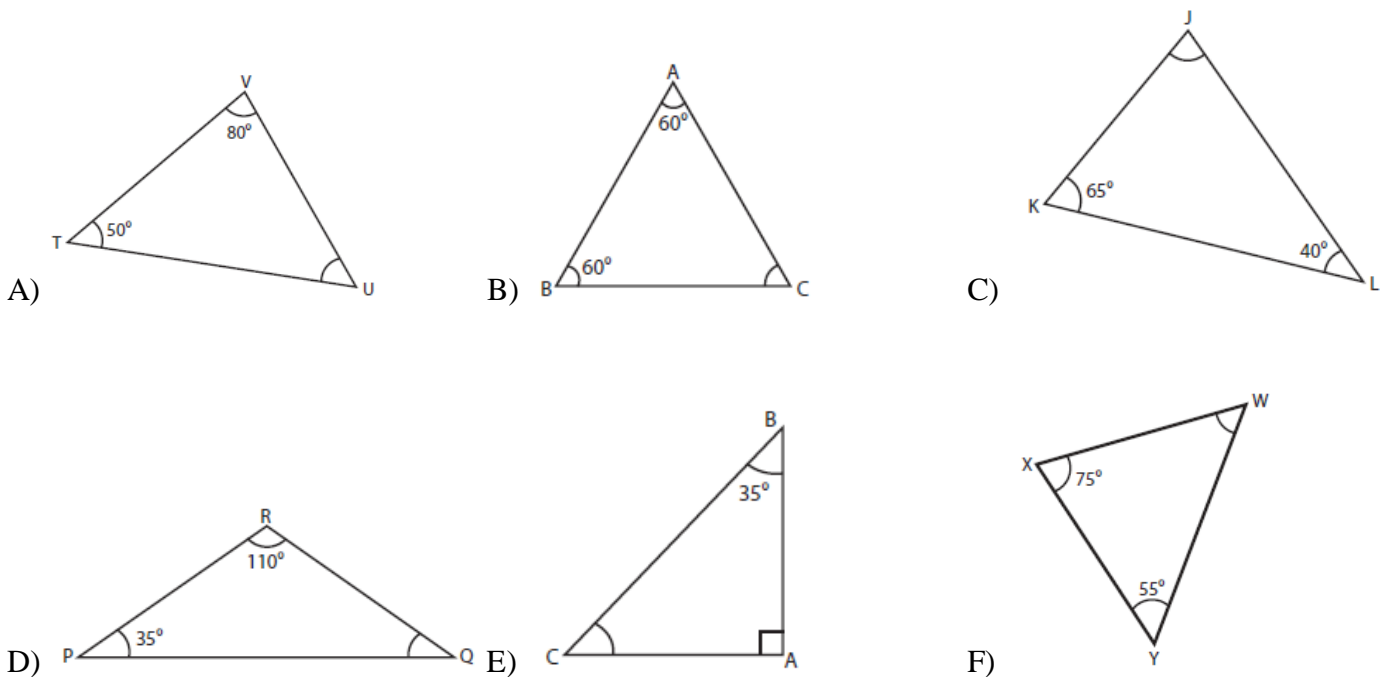

Triangle Sum Theorem

The sum of the measures of the angles in a triangle is _____. Therefore, if we know the measure of two of the angles, we can find the third angle by _____ the first two angles together, and _____ from 180.

**Example 1:** Find the unknown angle in each triangle.

A)   B)   C)   D)

Practice 1: Find the unknown angle in each triangle.

A)   B)   C)

D)   E)   F)

Triangle Sum Theorem with Algebra

Whenever we have variables as angle measures in a triangle, we have to _____ all the angles together, set them equal to _____, and _____ for the variable. If we need to find the exact measure of an angle, we have to plug in the value of the variable in the algebraic expression that represents the value of that angle, and simplify.

Example 2: Find x.

A)
B)
C)
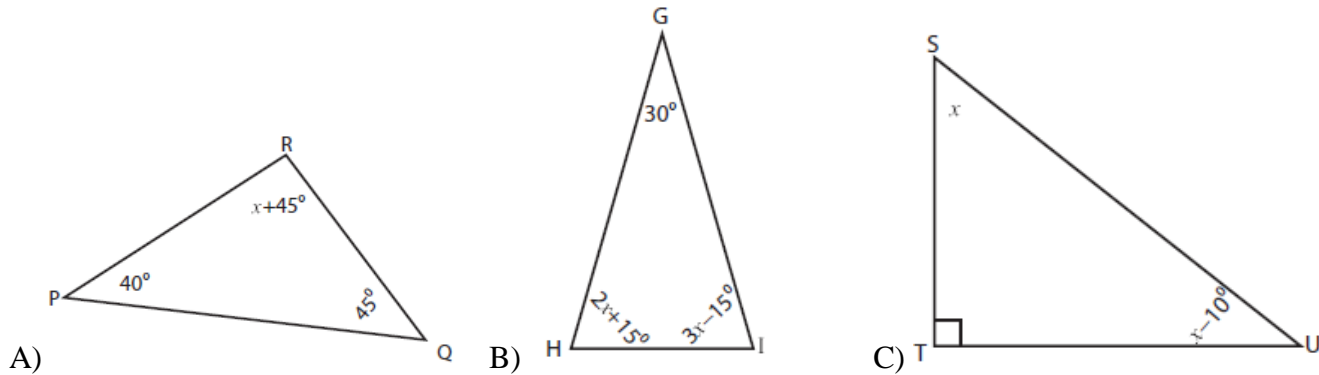
D) Given: $\triangle ABC$ with $m\angle A = (x + 25)°$, $m\angle B = (4x + 50)°$, $m\angle C = (x + 45)°$. Find x.
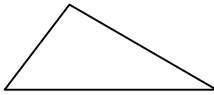
Practice 2: Find x.

A)
B)
C)
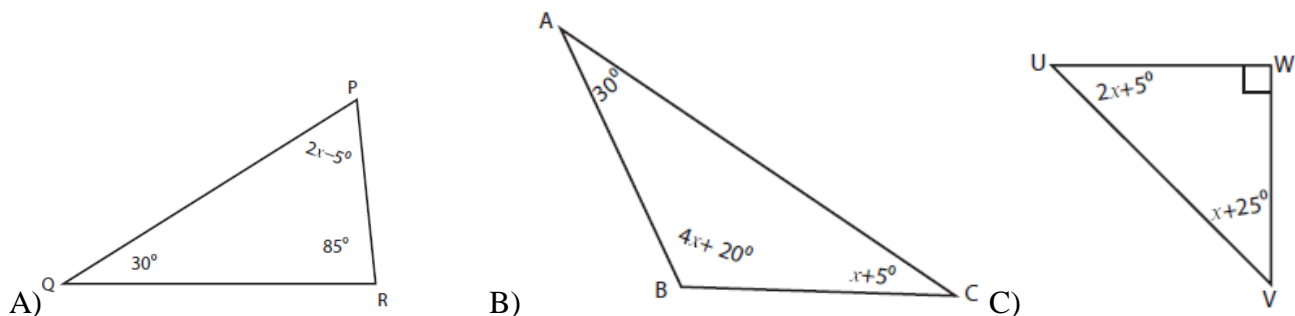
D) Given: $\triangle ABC$ with $m\angle A = (2x + 15)°$, $m\angle B = (5x + 5)°$, $m\angle C = (10x - 10)°$. Find x.

Exterior Angles of a Triangle

They are formed by extending a side of a triangle.

Example 3: Circle the exterior angles listed.

A)   B)   C)

Practice 3: Circle the exterior angles listed:

A)   B)   C)

D)   E)   F)

Recall that any two angles that form a line together are _____ to each other; therefore, they add up to _____. Remember also that all interior angles in a triangle add up to _____.
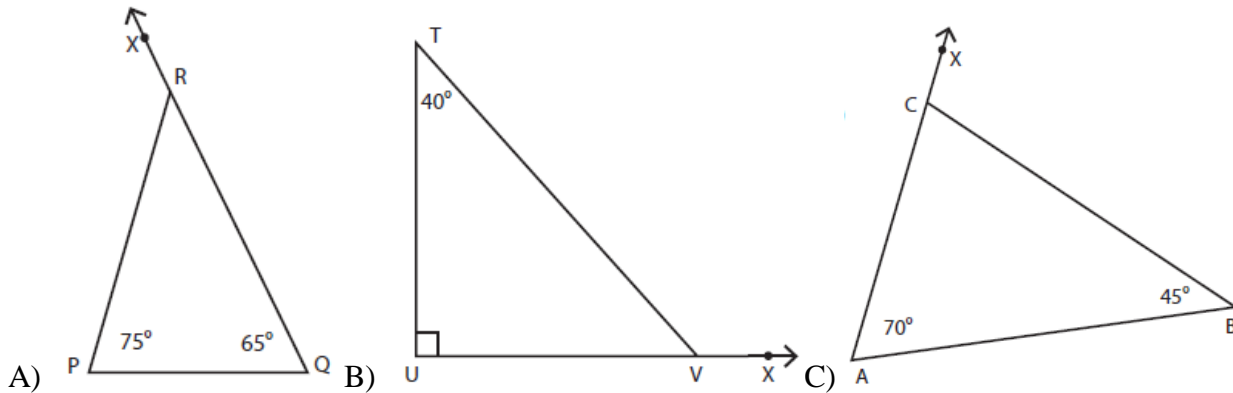
Exterior Angle Theorem

The measure of an exterior angle of a triangle is equal to the _____ of the measures of the 2 _____ _____ angles.

Examples: Find the value of the exterior angle shown.

A)   B)   C)

**Practice 4:** Find the value fo the remote interior angle shown.

A)

B)

C)

Exterior Angles with Algebra

Whenever we have to deal with exterior angles in a triangle and variables, we have to _____ the measure or the algebraic expression that represents the value of the two _____ _____ angles, and set it equal to the measure or the algebraic expression that represents the value of the _____ angle. Then, we solve for the variable. If we need to find the measure of any or all of the angles with unknown value, we just need to plug in the value of the variable into the original algebraic expression.

Example 5: Solve for the variable.

A)

B)

C)
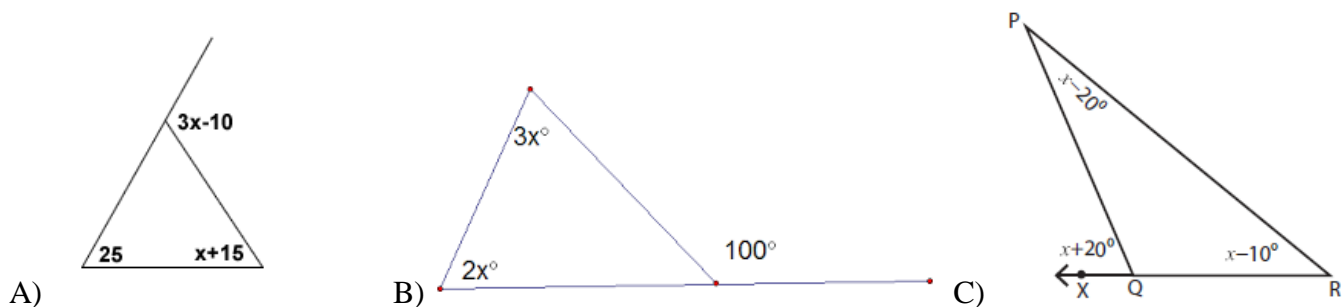
Practice 5: Solve for the variable.

A)

B)

C)
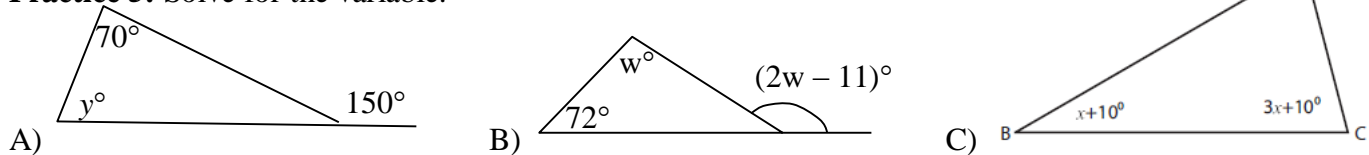
A statement that can be easily proved using a theorem is called a <mark>corollary</mark> of that theorem. Like theorems, corollaries can be used as reasons in a proof. Here are two corollaries of the Triangle Sum Theorem:

- o Corollary 4.1 – The acute angles of a right triangle are complementary.

- o Corollary 4.2 – There can only be one right or obtuse angle in a triangle.