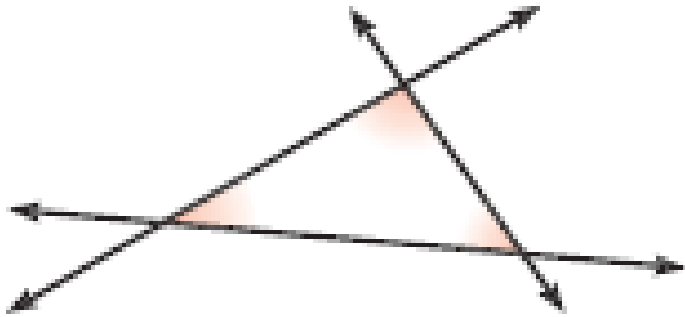
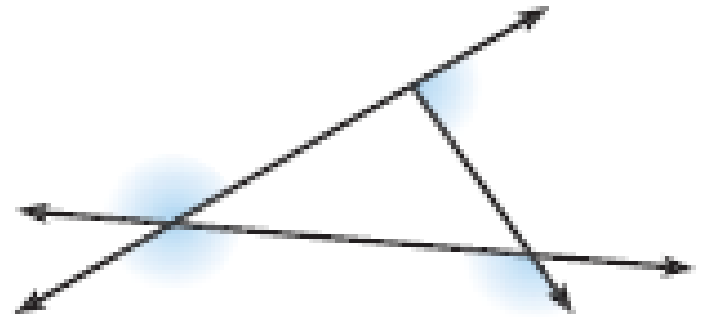


REFRESHER



interior angles



exterior angles

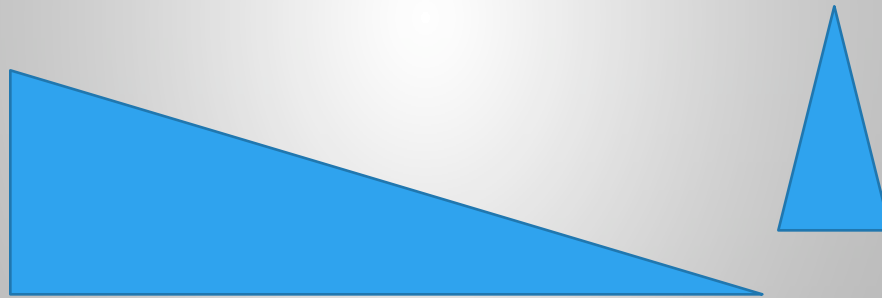


4.1

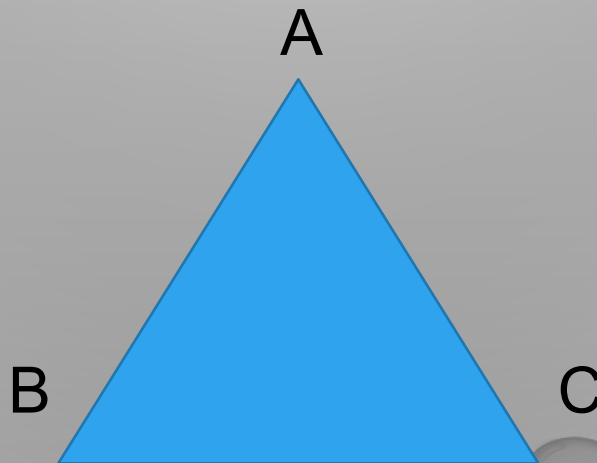
Triangle Sum Properties

Classify triangles and find measures of their angles.

A TRIANGLE IS A POLYGON WITH THREE SIDES.



A TRIANGLE WITH VERTICES A, B, AND C IS CALLED “TRIANGLE ABC” OR “ ΔABC .”



CLASSIFYING TRIANGLES BY SIDES

- A SCALENE TRIANGLE IS A TRIANGLE WITH **NO** CONGRUENT SIDES.
- AN ISOSCELES TRIANGLE IS A TRIANGLE WITH **AT LEAST TWO** CONGRUENT SIDES.
- AN EQUILATERAL TRIANGLE IS A TRIANGLE WITH **THREE** CONGRUENT SIDES.

Classifying Triangles by Angles

- An acute triangle is a triangle with three acute angles.
- A right triangle is a triangle with one right angle, and two acute angles.
- An obtuse triangle is a triangle with one obtuse angle, and two acute angles.
- An equiangular triangle is a triangle with three congruent angles.

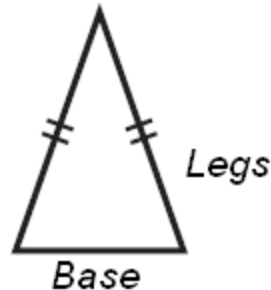
CLASSIFICATION BY SIDES

Equilateral



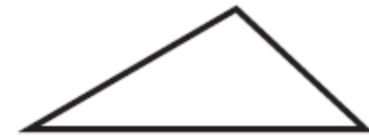
3 congruent sides

Isosceles



At least 2 congruent sides

Scalene



No congruent sides

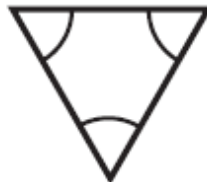
Classification By Angles

Acute



3 acute angles

Equiangular



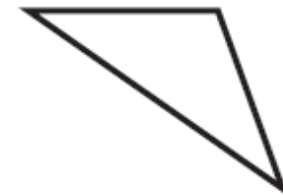
3 congruent

Right



1 right angle

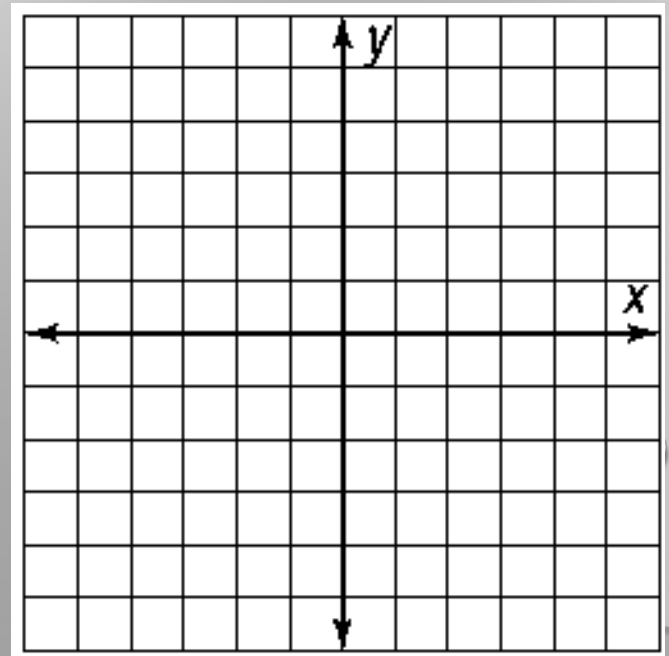
Obtuse



1 obtuse angle

Classify $\triangle ABC$ by its sides. Then determine if the triangle is a right triangle. The vertices are $A(0,0)$, $B(3,3)$ and $C(-3,3)$.

Step 1: Plot the points
in the coordinate plane.



- $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(3-0)^2 + (3-0)^2} = \sqrt{9+9} = \sqrt{18} \approx 4.2$

- $AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-3-0)^2 + (3-0)^2} = \sqrt{9+9} = \sqrt{18} \approx 4.2$

- $BC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-3-3)^2 + (3-3)^2} = \sqrt{36+0} = \sqrt{36} = 6$

- SLOPE: $AC = \frac{(3-0)}{(-3-0)} = \frac{3}{-3} = -1$ $AB: \frac{(3-0)}{(3-0)} = \frac{3}{3} = 1$

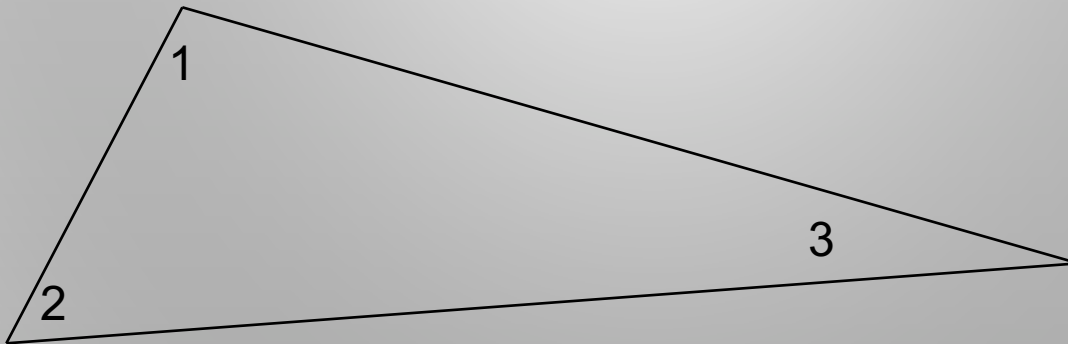
- $AC \perp AB \rightarrow \angle CAB$ IS A RIGHT ANGLE

- $AB = AC \rightarrow \triangle ABC$ IS ISOSCELES

- \hookrightarrow RIGHT ISOSCELES TRIANGLE

TRIANGLE SUM THEOREM

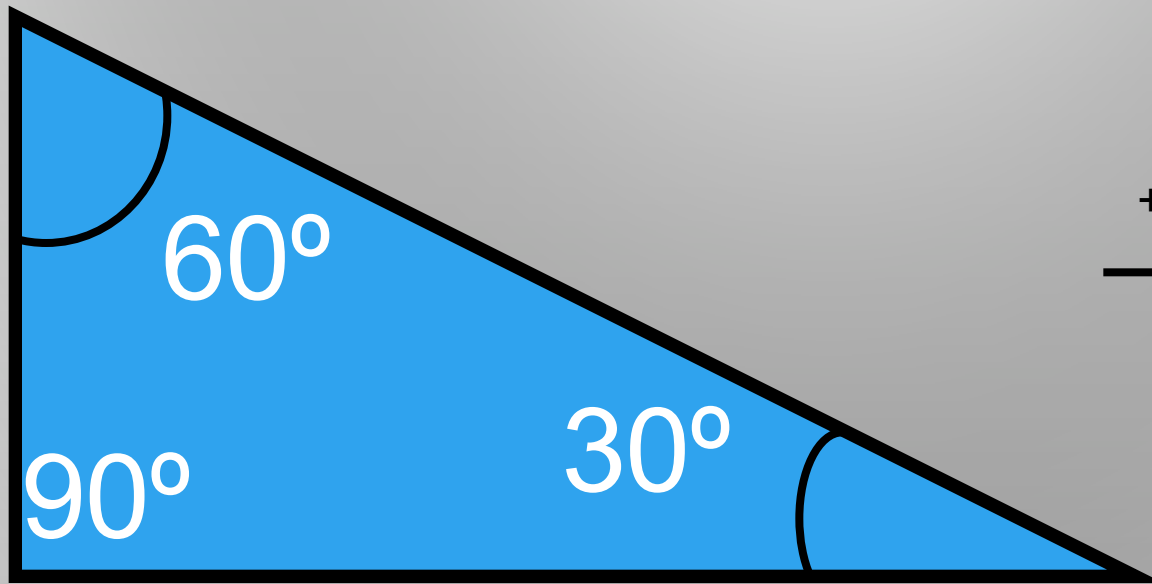
THE SUM OF THE MEASURES OF THE INTERIOR ANGLES OF A TRIANGLE IS 180° .



$$m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$$

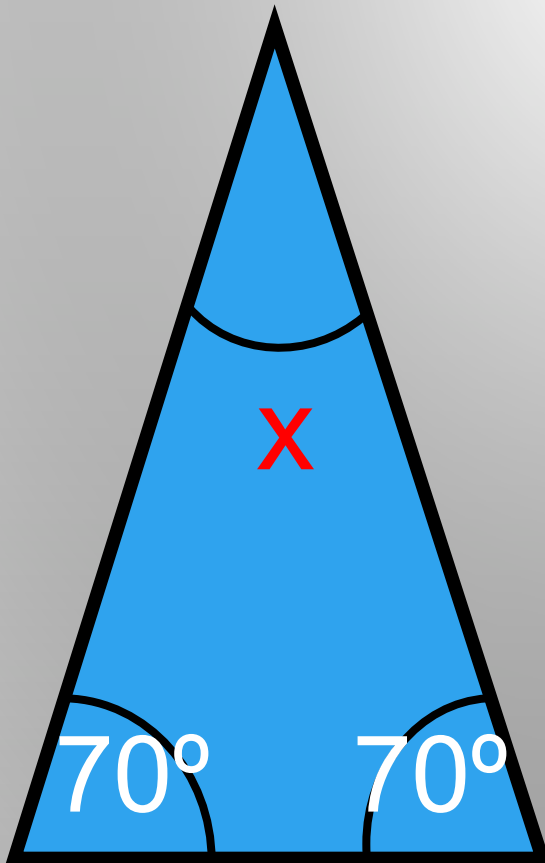
Property of triangles

**THE SUM OF ALL THE ANGLES
EQUALS 180° DEGREES.**



$$\begin{array}{r} 60^{\circ} \\ 90^{\circ} \\ + 30^{\circ} \\ \hline 180^{\circ} \end{array}$$

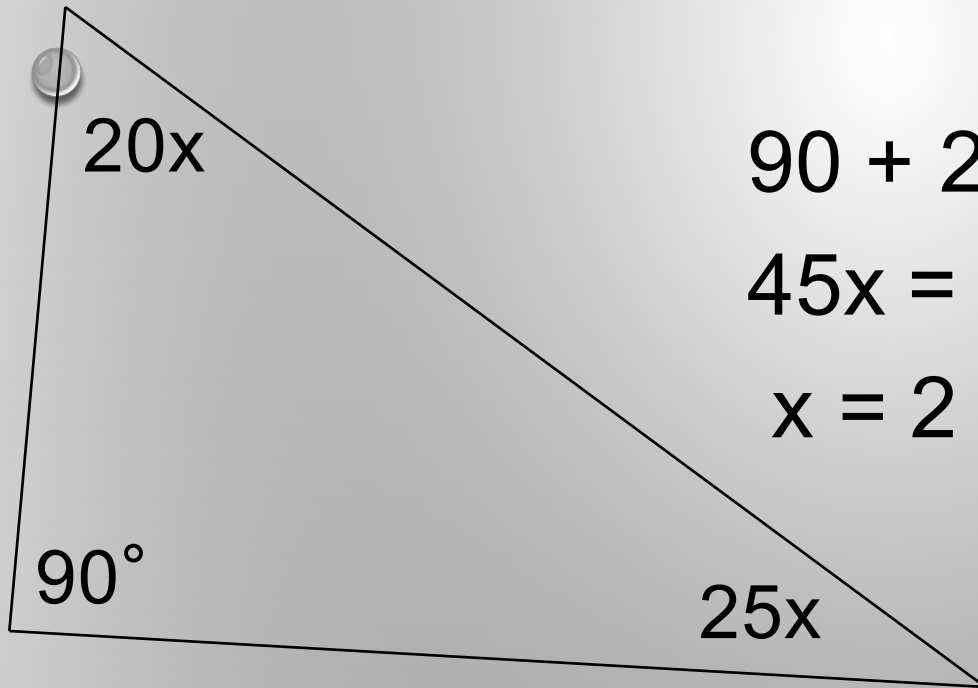
YOU TRY: WHAT IS THE MISSING ANGLE?



$$\begin{array}{r} 70^\circ \\ 70^\circ \\ + \quad X \\ \hline 180^\circ \end{array}$$

$$180 - 140 = 40^\circ$$

Find all the angle measures



$$90 + 25x + 20x = 180$$

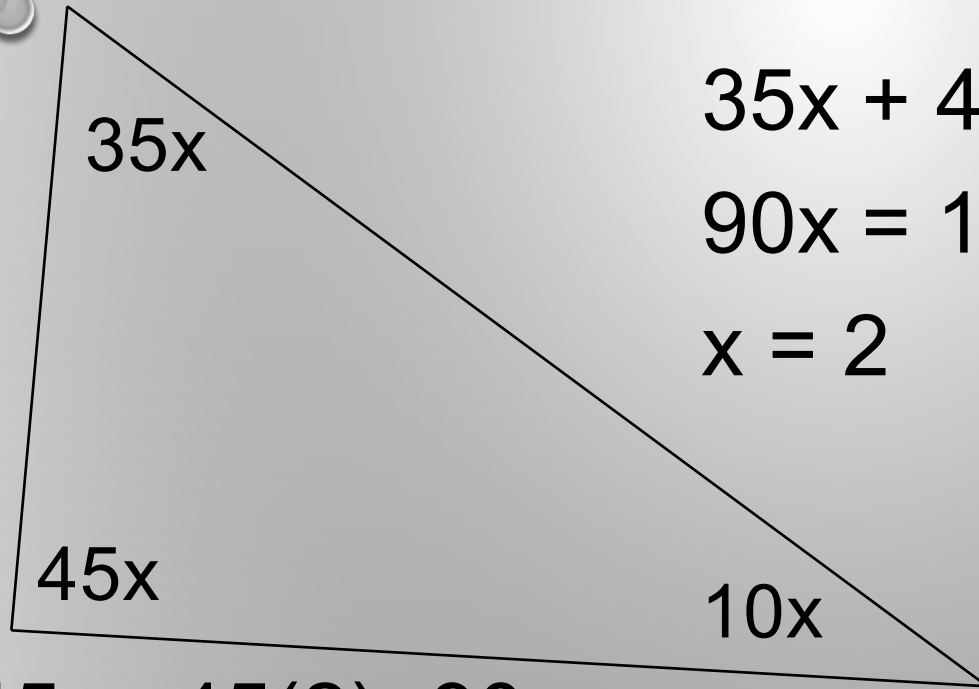
$$45x = 90$$

$$x = 2$$

$$20x = 20(2) = 40^\circ$$

$$25x = 25(2) = 50^\circ$$

You Try: Find all the angle measures



$$35x + 45x + 10x = 180$$

$$90x = 180$$

$$x = 2$$

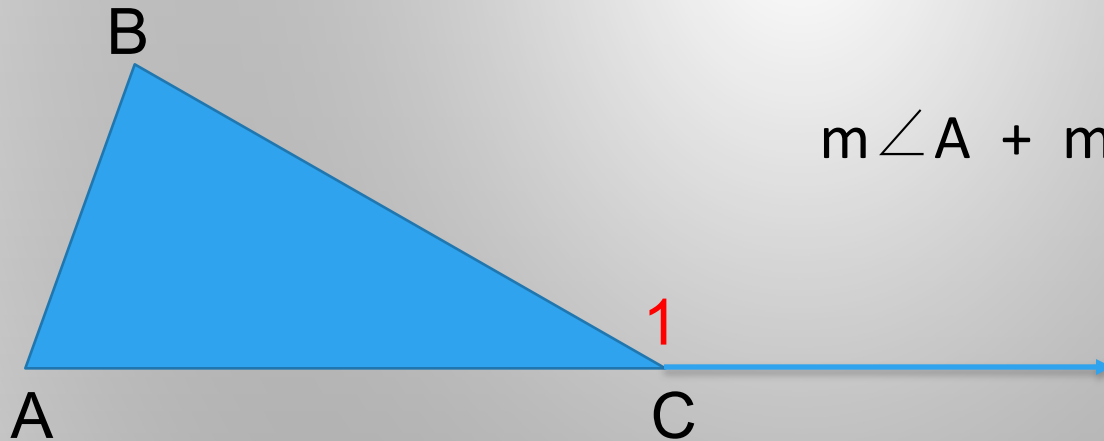
$$45x = 45(2) = 90$$

$$35x = 35(2) = 70$$

$$10x = 10(2) = 20$$

90° , 70° , 20°

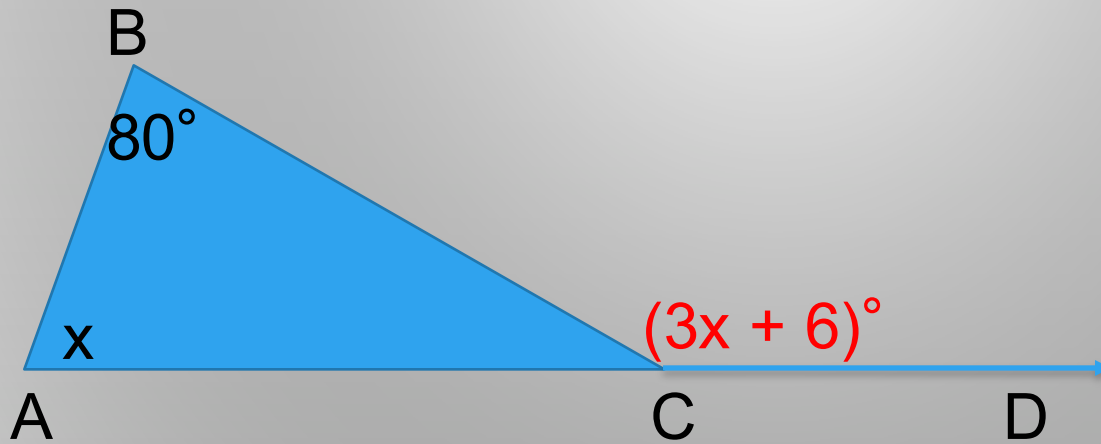
EXTERIOR ANGLE THEOREM



$$m\angle A + m\angle B = m\angle 1$$

- The measure of an exterior angle of a triangle is equal to the sum of the measure of the two nonadjacent interior angles

Find $m \angle BCD$



$$(3x + 6) = x + 80$$

$$3x - x = 80 - 6$$

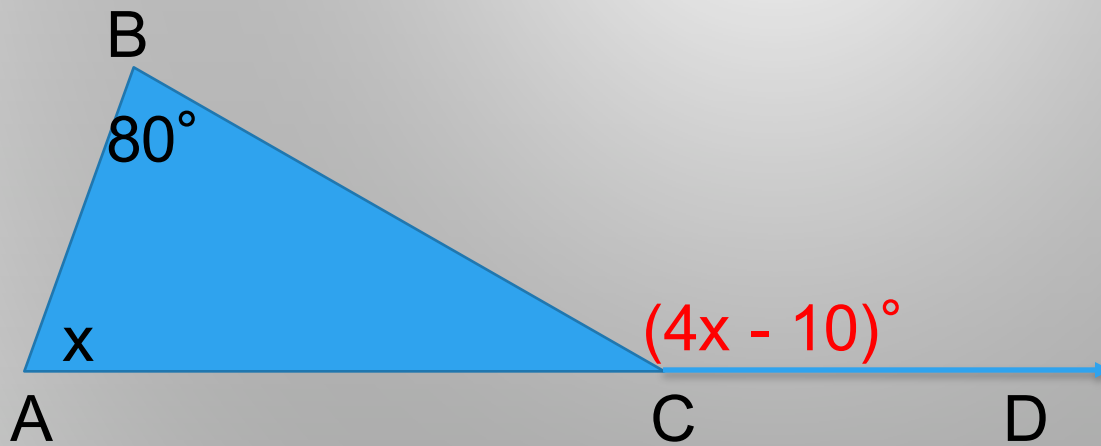
$$2x = 74$$

$$x = 37^\circ$$

$$3(37) + 6 = 117^\circ$$

You Try:

- Find $m \angle BCD$



$$(4x - 10) = x + 80$$

$$4x - x = 80 + 10$$

$$3x = 90$$

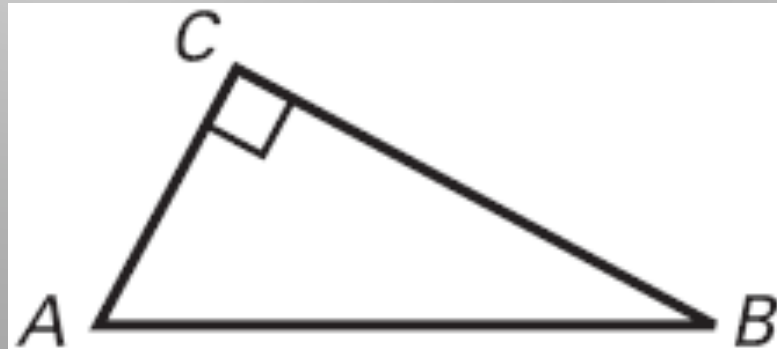
$$x = 30^\circ$$

$$4(30) - 10 = 110^\circ$$

EXTENTION TO TRIANGLE SUM THEOREM

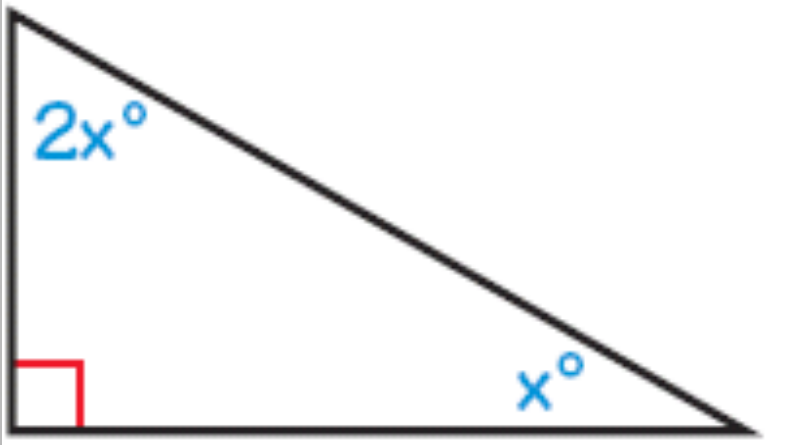
The *acute* angles of a right triangle are *complementary*.

$$m \angle A + m \angle B = 90^\circ$$



Find the missing angles.

SOLUTION:



$$2x + x = 90$$

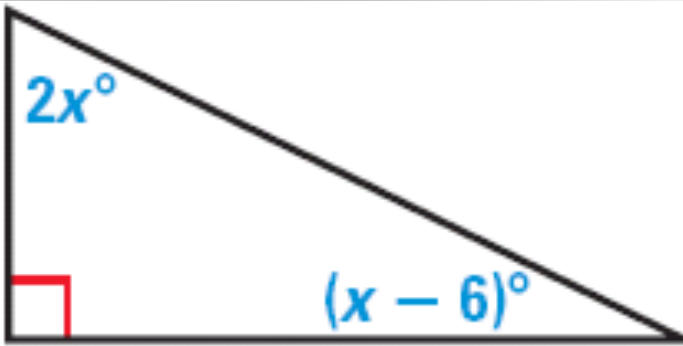
$$3x = 90$$

$$x = 30^\circ$$

$$2x = 2(30) = 60^\circ$$

You Try

Find the missing angles.



$$2x + (x - 6) = 90^\circ$$

$$3x - 6 = 90$$

$$3x = 96$$

$$x = 32$$

$$2x = 2(32) = 64^\circ$$

$$(x - 6) = 32 - 6 = 26^\circ$$