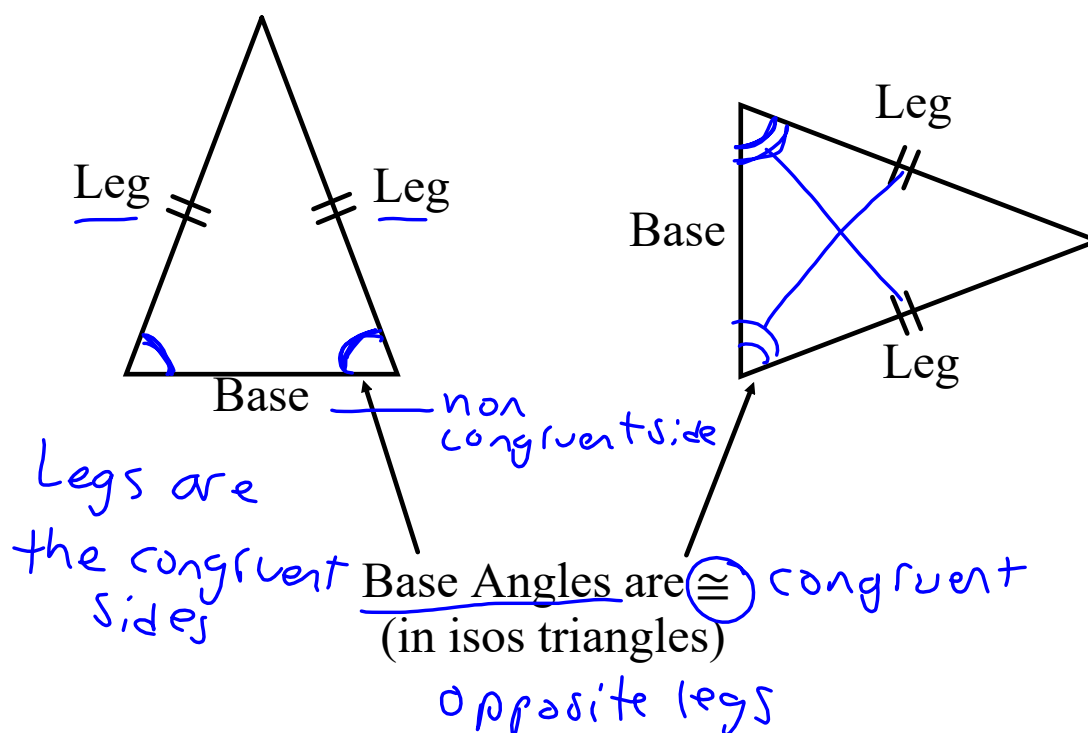


5.2 - Unit 05 - Section 02 - Angles in Triangles

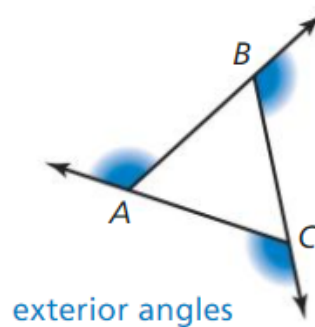
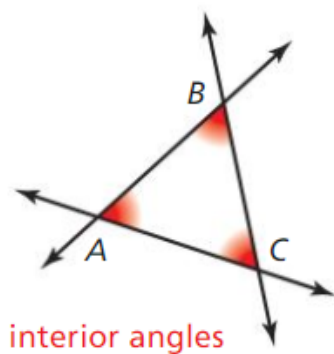
Lesson Objectives

- Find interior and exterior angles of triangles
- Utilize classifications of triangles from 5.1

Isosceles Triangles

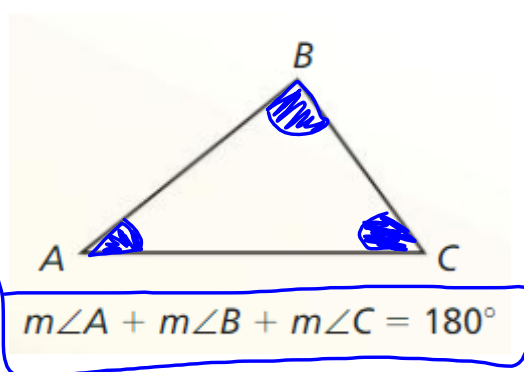


Angle Measures in Triangles



Triangle Sum Theorem

The sum of the measures of the interior angles of a triangle is 180°.



Exterior Angle Theorem

The measure of an exterior angle in a triangle is equal to the sum of the non-adjacent interior angles.
not next to

non-adjacent Angles

~~adjacent~~

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

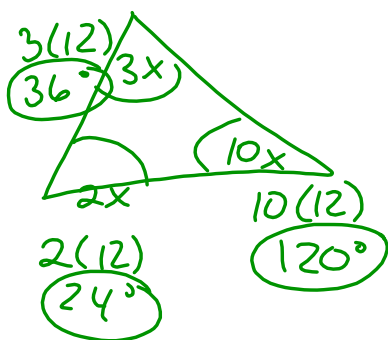
$55 + 65 + 60 = 180$

$60 + 120 = 180$

$55 + 65 + 60 = 60 + 120$
 $\quad \quad \quad -60 \quad -60$
 $\underline{55 + 65 = 120} \checkmark$

Example 1

The angles in a triangle are in a ratio of $2:3:10$. Find the measure of all 3 angles.
Multiply each part by x $2x:3x:10x$



Triangle Sum Theorem

angle + angle + angle = 180

$2x + 3x + 10x = 180$

$15x = 180$

$\frac{15x}{15} = \frac{180}{15}$

$x = 12$

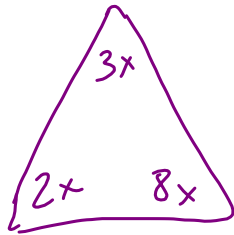
$24:36:120$

$2:3:10 \checkmark$

$\div 12$

Example 2

The three angles in a triangle are in a ratio of 2:3:8. Find the measure of the supplement of the largest angle, rounded to the nearest tenth of a degree.



$$2x + 3x + 8x = 180$$

$$13x = 180$$

$$x = 13.8$$

$2(13.8)$	$3(13.8)$	$8(13.8)$
27.7°	41.5°	110.8°
		largest

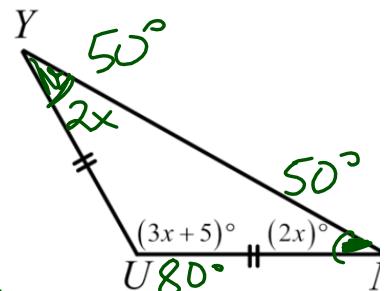
Supplement:

$$180 - 110.8 = \boxed{69.2^\circ}$$

Example 3

3.) $\triangle YUM$ is isosceles with base \overline{YM} . Find the measures of all 3 angles.

2 angles
opposite 2
congruent sides
are congruent



$$\underline{2x} + \underline{2x} + \underline{3x + 5} = 180$$

$$7x + 5 = 180$$

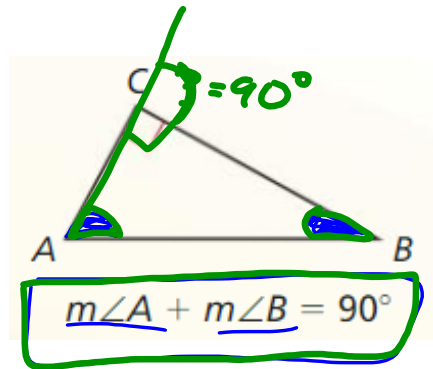
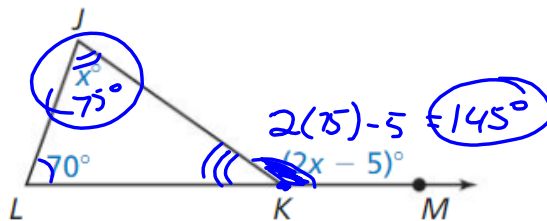
$$7x = 175$$

$$x = 25$$

$$3(25) + 5$$

Corollary to the Exterior Angle Theorem

The acute angles of a right triangle are complementary. *adds to 90*

**Example 4** Finding an Angle MeasureFind $m\angle JKM$.

add non adjacent angles = exterior Angle

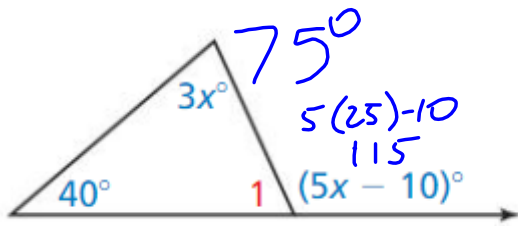
$$m\angle J + m\angle L = m\angle JKM$$

$$70^\circ + x = 2x - 5$$

$$70 = x - 5$$

$$75 = x$$

Example 5 Find the measure of $\angle 1$.

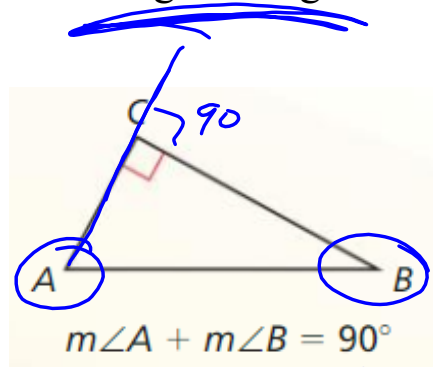


$$\begin{array}{r} 180 \\ - 115 \\ \hline m\angle 1 = 65 \end{array}$$

$$\begin{array}{l} 40 + 3x = 5x - 10 \\ 40 = 2x - 10 \\ 50 = 2x \quad x = 25 \end{array}$$

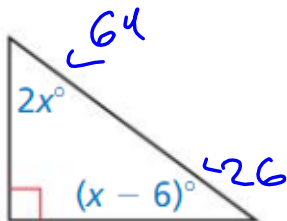
Corollary to the Exterior Angle Theorem

The acute angles of a right triangle are complementary.



$$\begin{array}{l} m\angle A + m\angle B + 90 = 180 \\ - 90 \quad - 90 \\ \hline m\angle A + m\angle B = 90 \end{array}$$

Example 6 Find the measure of each acute angle.



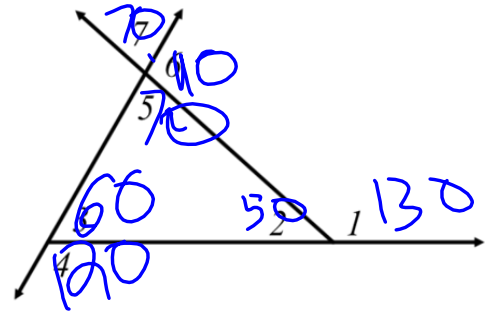
$$\begin{aligned}2x + x - 6 &= 90 \\3x &= 96 \\x &= 32\end{aligned}$$

Homework

Unit 05 - Section 02

#1,2,5,6,9,10,12,18

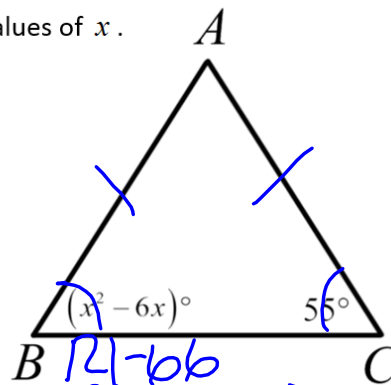
- 1.) Given: $\angle 1 = 130^\circ$ and $\angle 7 = 70^\circ$
 Find the measures of all the remaining angles (2-6).



- 6.) In the diagram, $\overline{AB} \cong \overline{AC}$. Find the possible values of x .

$$x^2 - 6x = 55$$

$$x^2 - 6x - 55 = 0$$



~~$$\begin{array}{r} ac \\ -55 \\ -11 \quad 5 \\ \hline -6 \\ b \end{array}$$~~

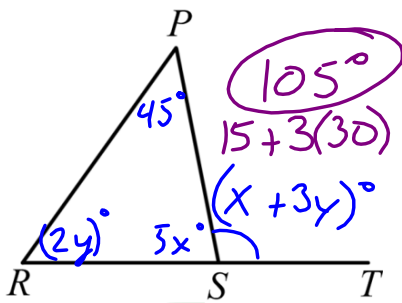
$$(x-11)(x+5) = 0$$

$$x-11=0 \quad x+5=0$$

$$x=11 \quad x=-5$$

7.) Given: $\angle PST = (x+3y)^\circ$, $\angle P = 45^\circ$, $\angle R = (2y)^\circ$, and $\angle PSR = (5x)^\circ$

Find: $m\angle PST$



Ext. Ang $\frac{x+3y}{-2y} = \frac{45+2y}{-2y}$

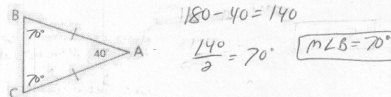
Triangle Sum $\frac{45+2y}{-45} + \frac{5x}{-45} = 180$

$$\begin{aligned}
 -2(x+y=45) &\rightarrow -2x-2y=-90 \\
 5x+2y=135 &\rightarrow 5x+2y=135 \\
 \hline
 3x &= 45 \\
 x &= 15
 \end{aligned}$$

$$\begin{aligned}
 x+y &= 45 \\
 15+y &= 45 \\
 y &= 30
 \end{aligned}$$

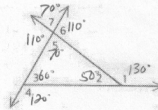
Unit 05 - Section 02

1 Given: Diagram as marked
Find: $m\angle B$



$$\begin{aligned}
 180 - 40 &= 140 \\
 \frac{140}{2} &= 70^\circ \\
 m\angle B &= 70^\circ
 \end{aligned}$$

2 Given: $\angle 1 = 130^\circ$, $\angle 7 = 70^\circ$
Find the measures of $\angle 2, \angle 3, \angle 4, \angle 5,$ and $\angle 6$.

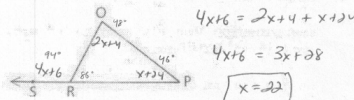


5 The measures of the three angles of a triangle are in the ratio 4:5:6. Find the measure of each.

$$\begin{aligned}
 4x+5x+6x &= 180 \\
 15x &= 180 \\
 x &= 12
 \end{aligned}$$



6 Given: $\angle ORS = (4x+6)^\circ$, $\angle P = (x+24)^\circ$, $\angle O = (2x+4)^\circ$
Find: $m\angle O$



$$\begin{aligned}
 4x+6 &= 2x+4+x+24 \\
 4x+6 &= 3x+28 \\
 x &= 22
 \end{aligned}$$

$$\begin{aligned}
 2(22)+4 &= 48 \\
 m\angle O &= 48^\circ
 \end{aligned}$$

9 Tell whether each statement is true Always, Sometimes, or Never (A, S, or N).

- a The acute angles of a right triangle are complementary. **A**
- b The supplement of one of the angles of a triangle is equal in measure to the sum of the other two angles of the triangle. **A**
- c A triangle contains two obtuse angles. **N**
- d If one of the angles of an isosceles triangle is 60° , the triangle is equilateral. **A**
- e If the sides of one triangle are doubled to form another triangle, each angle of the second triangle is twice as large as the corresponding angle of the first triangle. **N**

10 The vertex angle of an isosceles triangle is twice as large as one of the base angles. Find the measure of the vertex angle.



$$2x + x + x = 180$$

$$4x = 180$$

$$x = 45$$

$$2(45) = 90$$



12 In $\triangle DEF$, the sum of the measures of $\angle D$ and $\angle E$ is 110. The sum of the measures of $\angle E$ and $\angle F$ is 150. Find the sum of the measures of $\angle D$ and $\angle F$.

Handwritten solution for problem 12:

$$\angle D + \angle E = 110$$

$$\angle E + \angle F = 150$$

$$\angle D + \angle E + \angle F = 180$$

$$110 + \angle F = 180$$

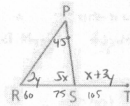
$$\angle F = 70$$

$$\angle D + 70 = 110$$

$$\angle D = 40$$

$$\angle D + \angle F = 40 + 70 = 110$$

18 Given: $\angle PST = (x + 3y)^\circ$,
 $\angle P = 45^\circ$, $\angle R = (2y)^\circ$,
 $\angle PSR = (5x)^\circ$



$$75 + 105 = 180$$

$$45 + 60 + 75 = 180$$

Find: $m\angle PST$

Handwritten solution for problem 18:

$$5x + 2y + 45 = 180$$

$$5x + 2y = 135$$

$$5x + x + 3y = 180$$

$$6x + 3y = 180 \div 3$$

$$2x + y = 60$$

$$x + 3y = 2y + 45$$

$$x + y = 45$$

Handwritten solution for problem 18 (continued):

$$2x + y = 60$$

$$x + y = 45$$

$$2x + y = 60$$

$$-x - y = -45$$

Handwritten solution for problem 18 (continued):

$$x = 15$$

$$15 + y = 45$$

$$y = 30$$

$$m\angle PST = 15 + 3(30)$$

$$m\angle PST = 105$$