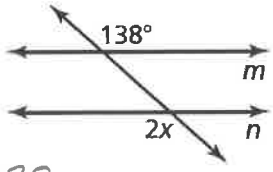
5.1 - Angles of Triangles

Bellwork

Find the value of x that makes $m \parallel n$.

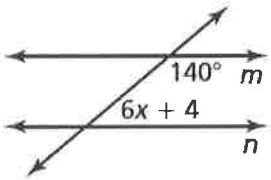
1.



$\frac{2x}{2} = \frac{138}{2}$

$x = 69$

2.



$6x + 4 + 140 = 180$

$6x + 144 = 180$

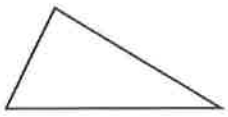
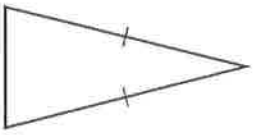
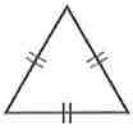
$-144 \quad -144$

$\frac{6x}{6} = \frac{36}{6}$

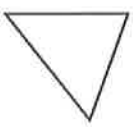
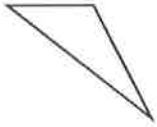
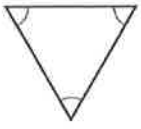
$x = 6$

Cumulative Warm Up

Classifying Triangles by Sides

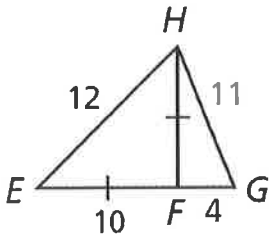
Scalene Triangle	Isosceles Triangle	Equilateral Triangle
		
no congruent sides	at least 2 congruent sides	3 congruent sides

Classifying Triangles by Angles

Acute Triangle	Right Triangle	Obtuse Triangle	Equiangular Triangle
			
3 acute angles	1 right angle	1 obtuse angle	3 congruent angles

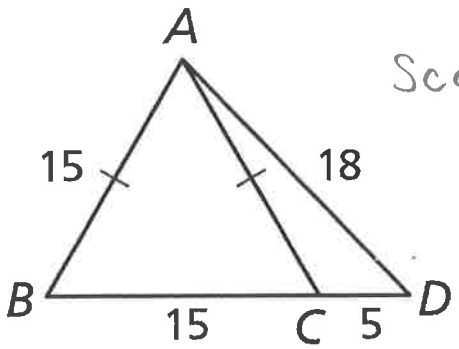
Core Concept

Classify △ *EHF* by its side lengths.



Isosceles

Classify △ACD by its side lengths.



Scalene

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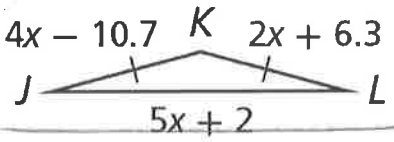
Find the side lengths of △ *JKL*.

$4x - 10.7 = 2x + 6.3$

$-2x \quad +10.7 \quad -2x \quad +10.7$

$\frac{2x}{2} = \frac{17}{2}$

$x = 8.5$



$JK = 4(8.5) - 10.7 = 23.3$

$KL = 23.3$

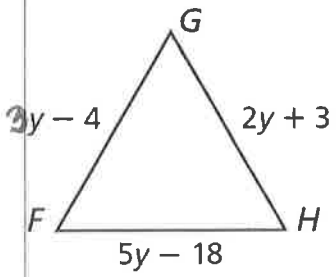
$JL = 5(8.5) + 2 = 44.5$

Find the side lengths of equilateral △ *FGH*.

$3y - 4 = 2y + 3$

$-2y + 4 \quad -2y + 4$

$y = 7$



$HG = 2(7) + 3 = 17$

$FH = 17$

$GF = 17$

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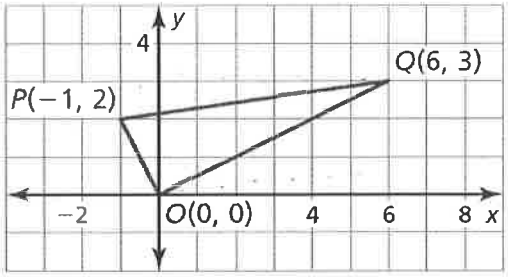
Classify $\triangle OPQ$ by its sides. Then determine whether it is a right triangle.



$1^2+2^2=c^2$

$1+4=c^2$

$5=c^2$

$\sqrt{5}=c$

$3^2+6^2=c^2$

$9+36=c^2$

$\sqrt{45}=\sqrt{c^2}$

$3\sqrt{5}=c$

$1^2+7^2=c^2$

$1+49=c^2$

$\sqrt{50}=\sqrt{c^2}$

$5\sqrt{2}=c$

slope of $\overline{OP} = -\frac{2}{1}$

slope of $OQ = \frac{3}{6} = \frac{1}{2}$

Scalene $\triangle$, Yes it is a right $\triangle$

2. $\triangle ABC$ has vertices $A(0, 0)$, $B(3, 3)$, and $C(-3, 3)$. Classify the triangle by its sides. Then determine whether it is a right triangle.

AB: $3^2+3^2=c^2$

$9+9=c^2$

$\sqrt{18}=\sqrt{c^2}$

$3\sqrt{2}=c$

AC: $3^2+3^2=c^2$

$9+9=c^2$

$\sqrt{18}=\sqrt{c^2}$

$3\sqrt{2}=c$

$BC = \sqrt{(-6)^2+(0)^2}$

$= \sqrt{36}$

$= 6$

Scalene $\triangle$

Slope of $AB = \frac{3}{3} = 1$

Slope of $BC = \frac{0}{-6} = 0$

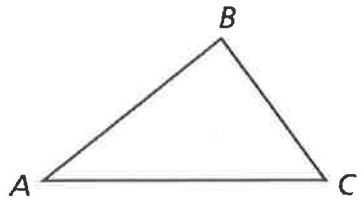
Slope of $AC = \frac{3}{-3} = -1$

Yes, it is a right $\triangle$

Example 2

Theorem 5.1 Triangle Sum Theorem

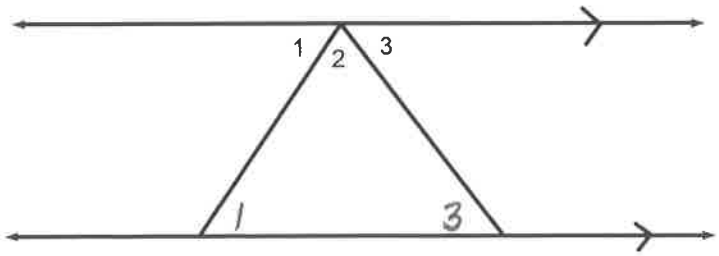
The sum of the measures of the interior angles of a triangle is 180°.



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

Proof p. 234; Ex. 53, p. 238

Proof:

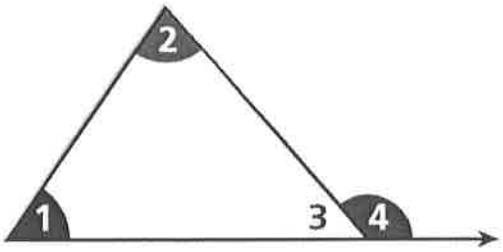


Theorem 1

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.



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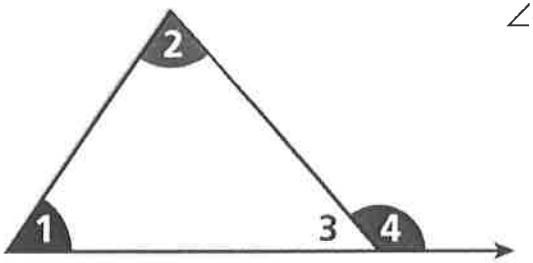
An **interior angle** is formed by two sides of a triangle.

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.

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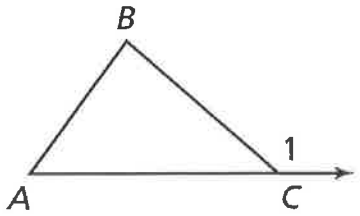
Theorem 5.2 Exterior Angle Theorem

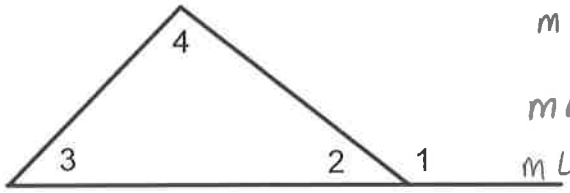
The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.



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

Proof Ex. 42, p. 237

Proof:



$m\angle 1 + m\angle 2 = 180$

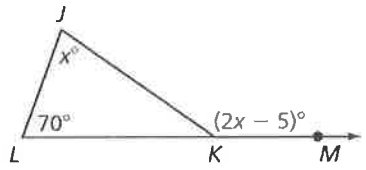
$m\angle 2 + m\angle 3 + m\angle 4 = 180$

$m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3 + m\angle 4$

$m\angle 1 = m\angle 3 + m\angle 4$

Theorem 2

Find $m\angle JKM$.

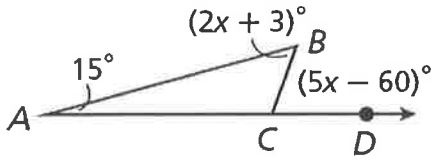


$2x - 5 = x + 70$

$x = 75$

$m\angle JKM = 2(75) - 5 = 145°$

Find $m\angle B$.



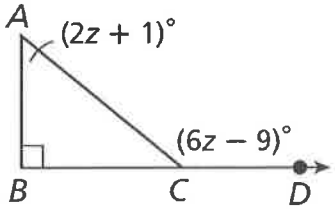
$5x - 60 = 2x + 3 + 15$

$\frac{3x}{3} = \frac{78}{3}$

$x = 26$

$m\angle B = 2(26) + 3 = 55°$

Find $m\angle ACD$.



$6z - 9 = 2z + 1 + 90$

$6z - 9 = 2z + 91$

$4z = 100$

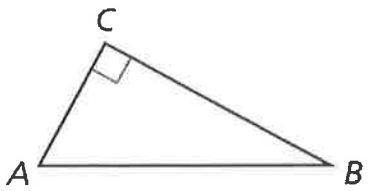
$z = 25$

$m\angle ACD = 6(25) - 9 = 141°$

Example 3

Corollary 5.1 Corollary to the Triangle Sum Theorem

The acute angles of a right triangle are complementary.

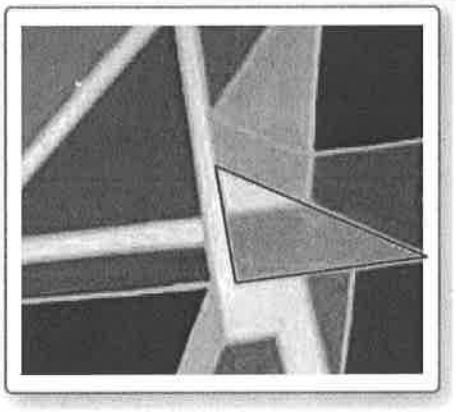


$m\angle A + m\angle B = 90°$

Proof Ex. 41, p. 237

Corrolary

The red triangle is a right triangle. The measure of one acute angle in the triangle is twice the measure of the other. Find the measure of each acute angle.



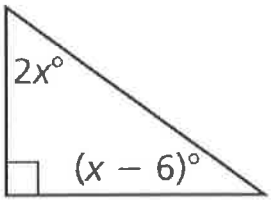
$x + 2x = 90$

$3x = 90$

$x = 30$ and $2x = 60$

Example 4

Find the measure of each acute angle.



$2x + x - 6 = 90$

$3x - 6 = 90$

$3x = 96$

$x = 32$

$2(32) = 64°$

$32 - 6 = 26°$

Monitoring Progress 3-4

Homework

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Closure