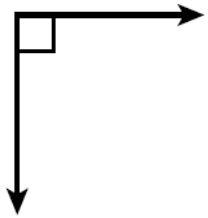
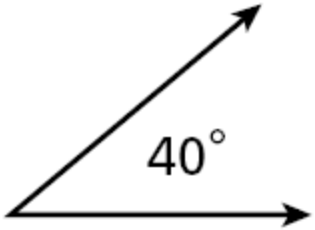
Warm Up

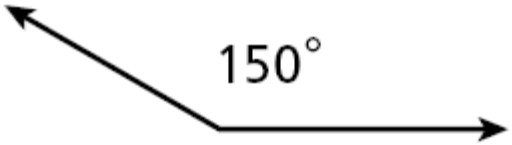
Classify each angle as acute, obtuse, or right.

1. 

right

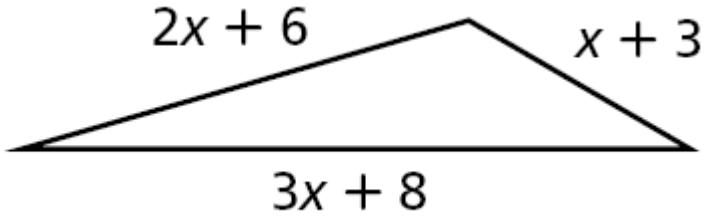
2. 

acute

3. 

obtuse

4. If the perimeter is 47, find *x* and the lengths of the three sides.



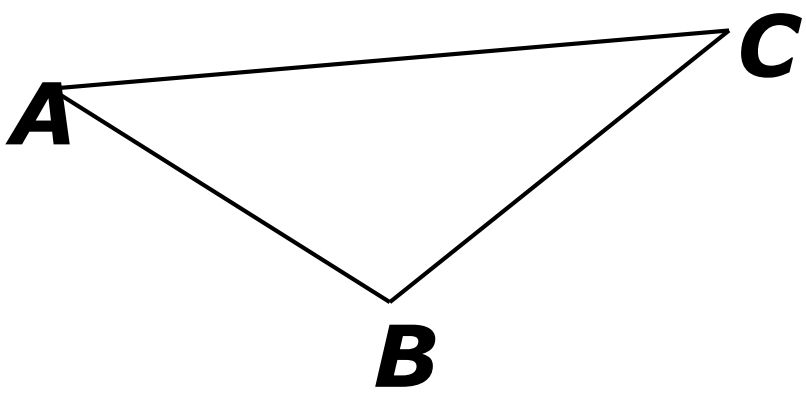
$x = 5; 8; 16; 23$

Objectives

Classify triangles by their angle measures and side lengths.

Use triangle classification to find angle measures and side lengths.

4-1 Classifying Triangles



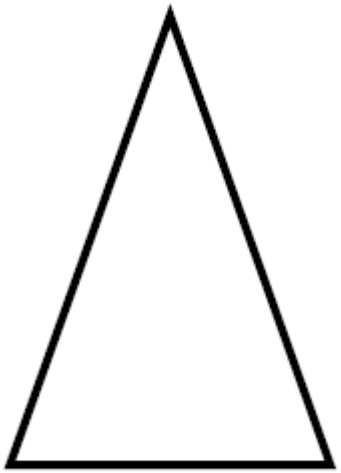
$\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are the sides of $\triangle ABC$.

A, *B*, *C* are the triangle's *vertices*.

Triangles can be classified by their angle measures or by their side lengths.

Triangle Classification By Angle Measures

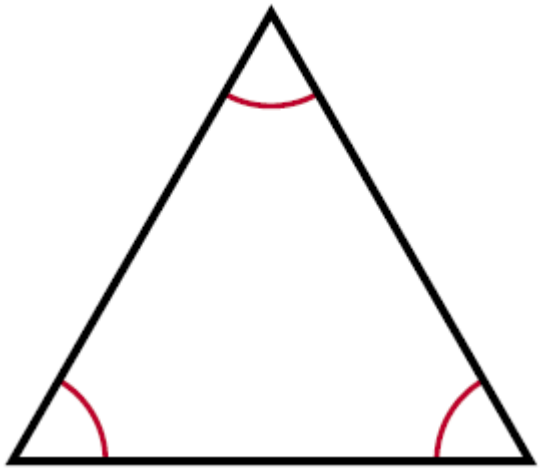
Acute Triangle



Three acute angles

Triangle Classification By Angle Measures

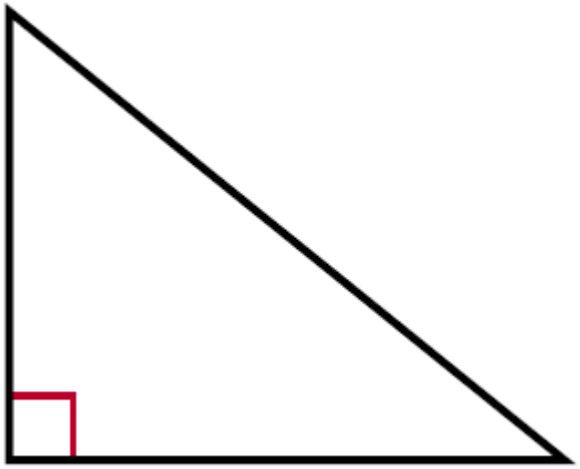
Equiangular Triangle



Three congruent acute angles

Triangle Classification By Angle Measures

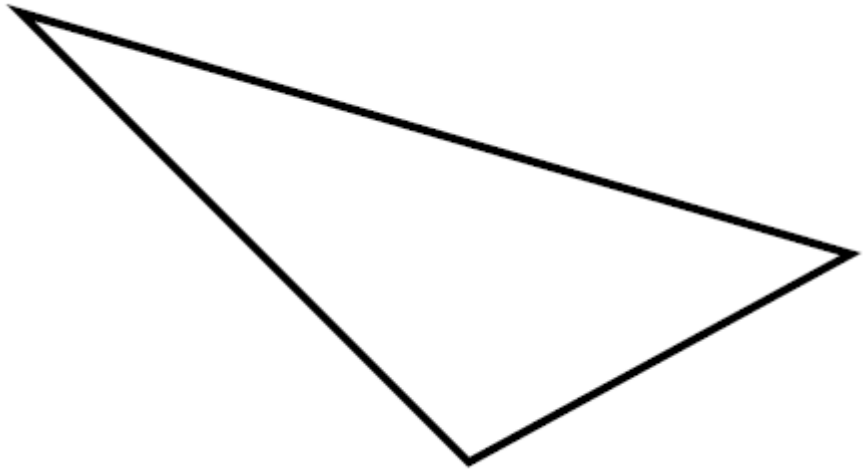
Right Triangle



One right angle

Triangle Classification By Angle Measures

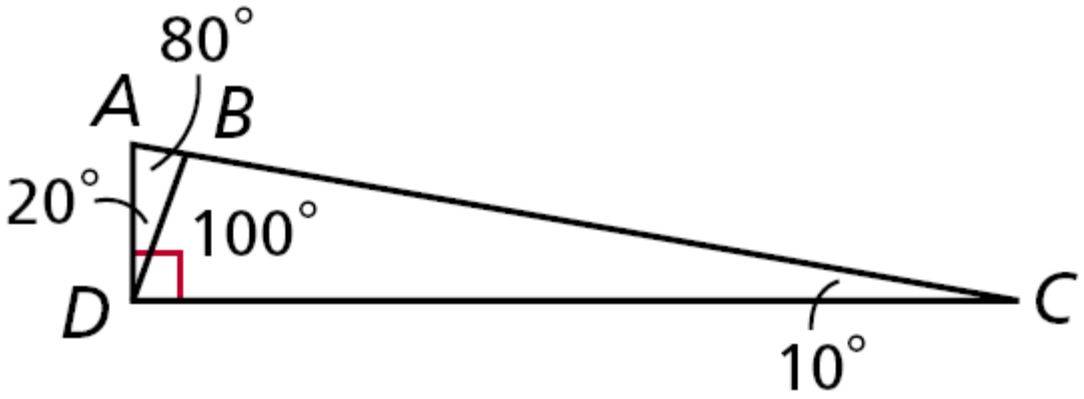
Obtuse Triangle



One obtuse angle

Example 1A: Classifying Triangles by Angle Measures

Classify $\triangle BDC$ by its angle measures.

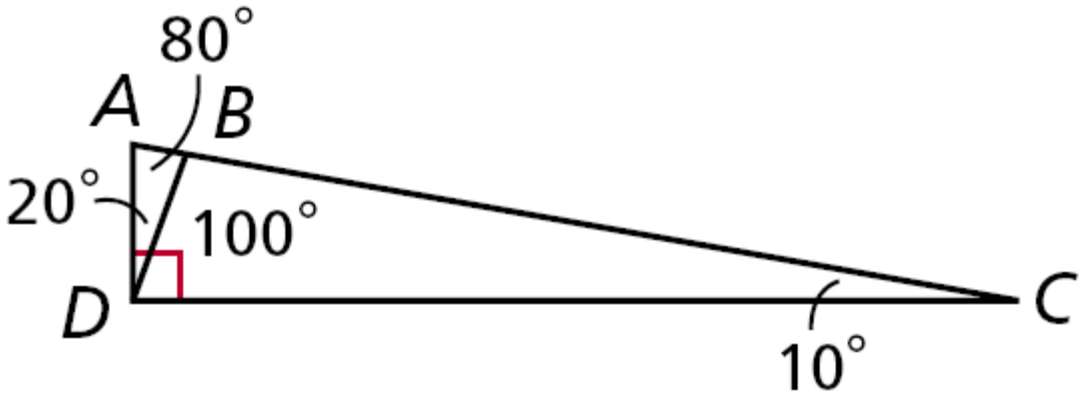


$\angle B$ is an obtuse angle.

$\angle B$ is an obtuse angle. So $\triangle BDC$ is an obtuse triangle.

Example 1B: Classifying Triangles by Angle Measures

Classify $\triangle ABD$ by its angle measures.

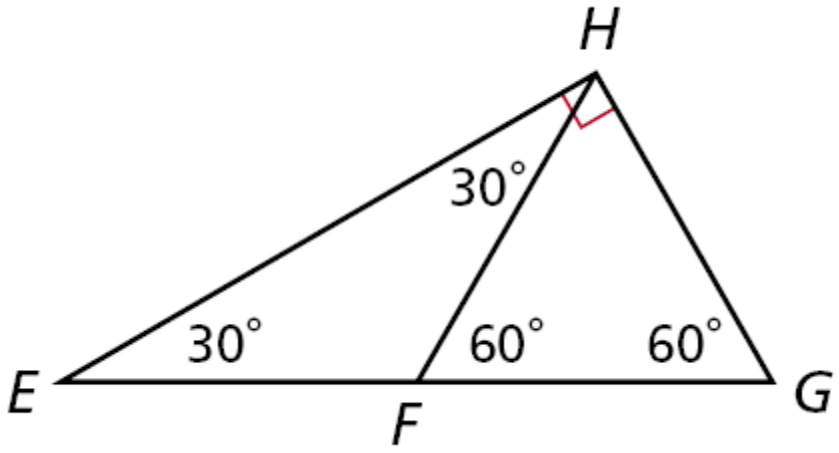


$\angle ABD$ and $\angle CBD$ form a linear pair, so they are supplementary.

Therefore $m\angle ABD + m\angle CBD = 180°$. By substitution, $m\angle ABD + 100° = 180°$. So $m\angle ABD = 80°$. $\triangle ABD$ is an acute triangle by definition.

Check It Out! Example 1

Classify △*FHG* by its angle measures.

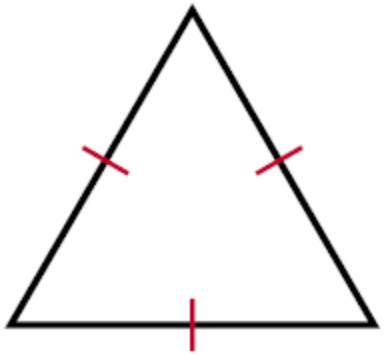


∠*EHG* is a right angle. Therefore m∠*EHF* +m∠*FHG* = 90°. By substitution, 30°+ m∠*FHG* = 90°. So m∠*FHG* = 60°.

△*FHG* is an equiangular triangle by definition.

Triangle Classification By Side Lengths

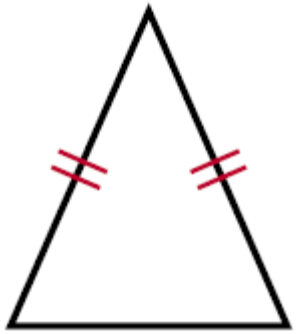
Equilateral Triangle



Three congruent sides

Triangle Classification By Side Lengths

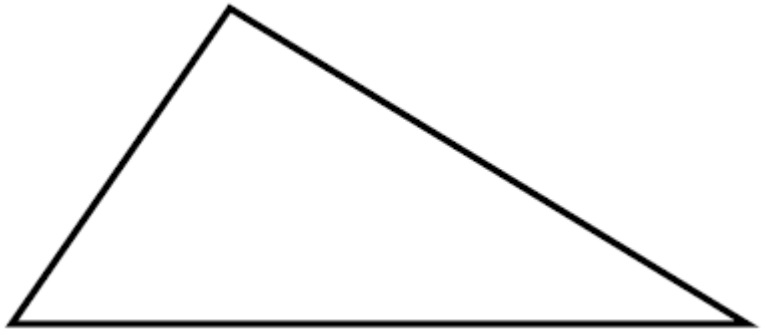
Isosceles Triangle



At least two congruent sides

Triangle Classification By Side Lengths

Scalene Triangle



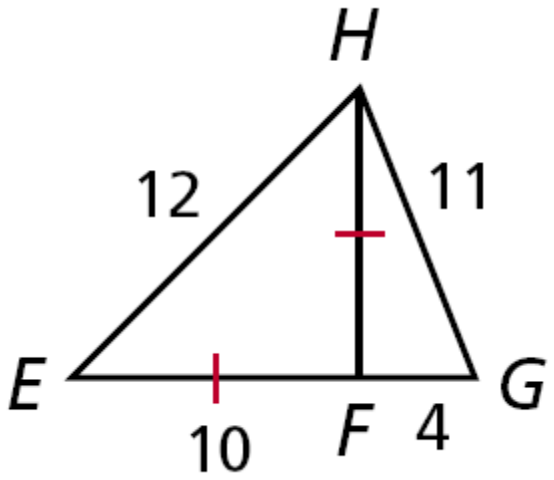
No congruent sides

Remember!

When you look at a figure, you cannot assume segments are congruent based on appearance. They must be marked as congruent. Same goes for right angles.

Example 2A: Classifying Triangles by Side Lengths

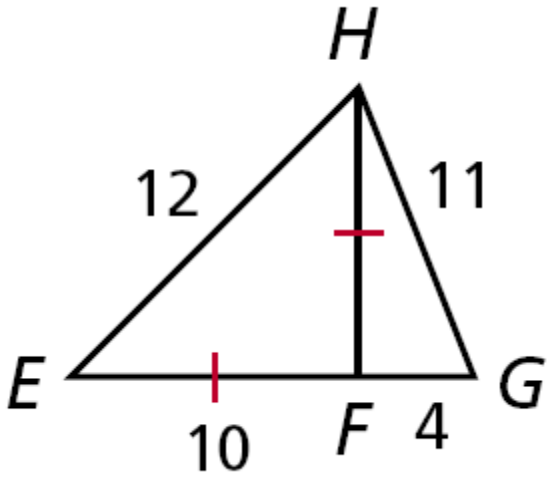
Classify $\triangle EHF$ by its side lengths.



From the figure, $\overline{EF} \cong \overline{HF}$. So $HF = 10$, and $\triangle EHF$ is isosceles.

Example 2B: Classifying Triangles by Side Lengths

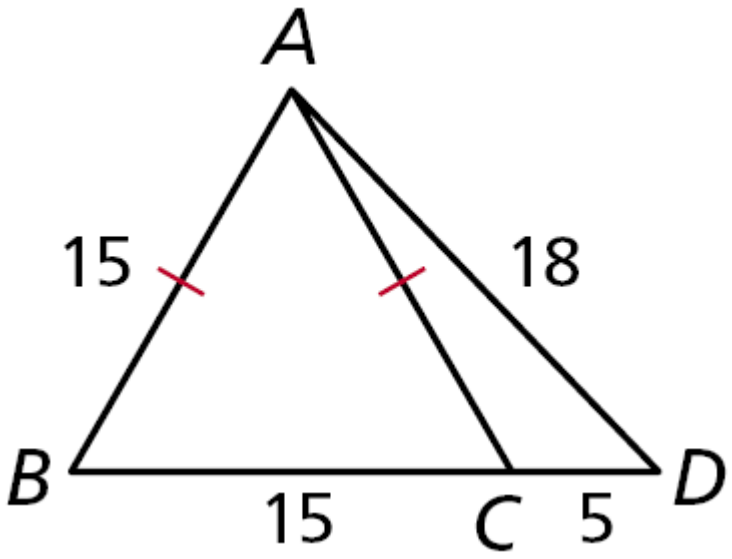
Classify $\triangle EHG$ by its side lengths.



By the Segment Addition Postulate, $EG = EF + FG = 10 + 4 = 14$. Since no sides are congruent, $\triangle EHG$ is scalene.

Check It Out! Example 2

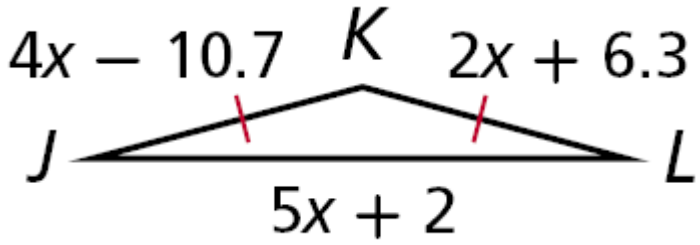
Classify △ABC by its side lengths.



From the figure, $\overline{AB} \cong \overline{AC}$. So $AC = 15$, and $\triangle ACD$ is isosceles.

Example 3: Using Triangle Classification

Find the side lengths of $\triangle JKL$.

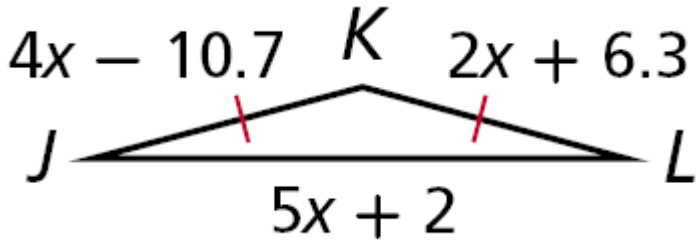


Step 1 Find the value of x.

$\overline{JK} \cong \overline{KL}$	*Given.*
$JK = KL$	*Def. of $\cong$ segs.*
$4x - 10.7 = 2x + 6.3$	*Substitute $(4x - 10.7)$ for JK and $(2x + 6.3)$ for KL.*
$2x = 17.0$	*Add 10.7 and subtract $2x$ from both sides.*
$x = 8.5$	*Divide both sides by 2.*

Example 3 Continued

Find the side lengths of △*JKL*.



Step 2 Substitute 8.5 into the expressions to find the side lengths.

$JK = 4x - 10.7$

$= 4(8.5) - 10.7 = 23.3$

$KL = 2x + 6.3$

$= 2(8.5) + 6.3 = 23.3$

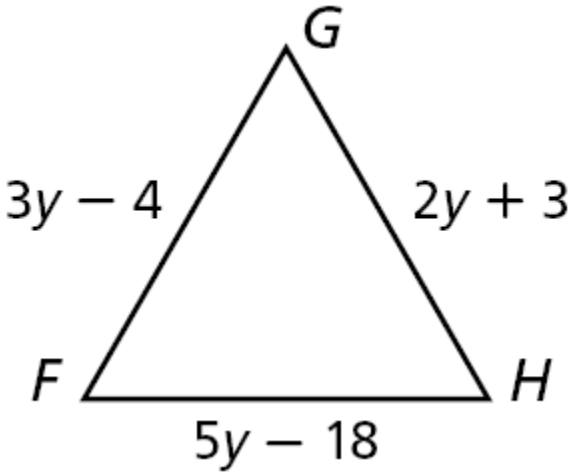
$JL = 5x + 2$

$= 5(8.5) + 2 = 44.5$

Check It Out! Example 3

Find the side lengths of equilateral $\triangle FGH$.

Step 1 Find the value of y.

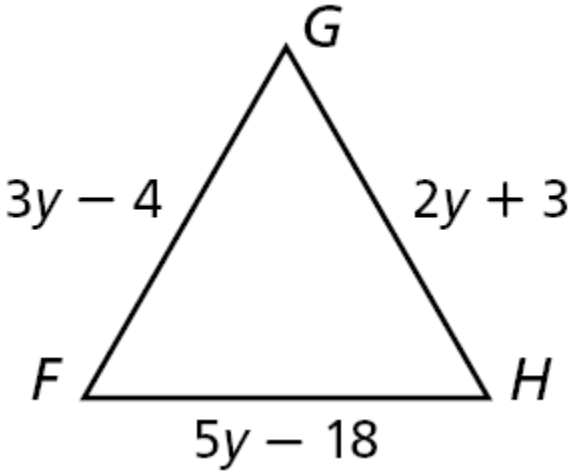


$\overline{FG} \cong \overline{GH} \cong \overline{FH}$	*Given.*
$FG = GH = FH$	*Def. of ≅ segs.*
$3y - 4 = 2y + 3$	*Substitute (3y − 4) for FG and (2y + 3) for GH.*
$y = 7$	*Add 4 and subtract 2y from both sides.*

Check It Out! Example 3 Continued

Find the side lengths of equilateral $\triangle FGH$.

Step 2 Substitute 7 into the expressions to find the side lengths.



$FG = 3y - 4$

$= 3(7) - 4 = 17$

$GH = 2y + 3$

$= 2(7) + 3 = 17$

$FH = 5y - 18$

$= 5(7) - 18 = 17$

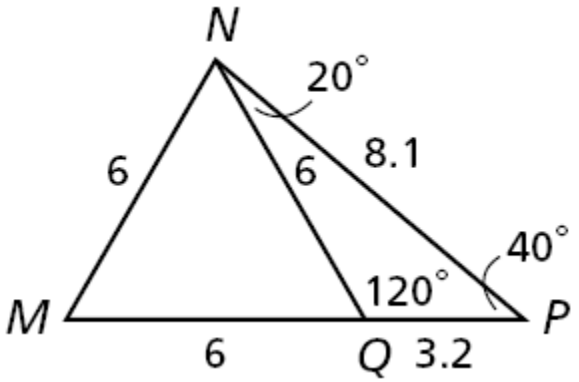
Lesson Quiz

Classify each triangle by its angles and sides.

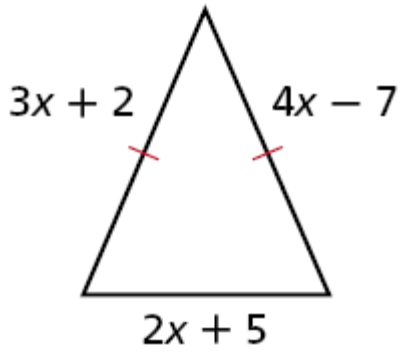
1. $\triangle MNQ$ acute; equilateral

2. $\triangle NQP$ obtuse; scalene

3. $\triangle MNP$ acute; scalene



4. Find the side lengths of the triangle.



29; 29; 23

Homework:

Page 219 #1-19 odd