LESSON 8

Glencoe Geometry Chapter 4.1, 4.2

Classifying Triangles & Angle Measure

BY THE END OF THIS LESSON, YOU SHOULD BE ABLE TO

1. Identify the different parts of a triangle
2. Classify triangles by their angle measures
3. Classify triangles by their side lengths
4. Find the measure of different types of angles of a triangle.

We encounter triangles everyday, in all shapes and sizes. As you know, all triangles have 3 sides and 3 angles.
We can classify them by the measure of the lengths of their sides.

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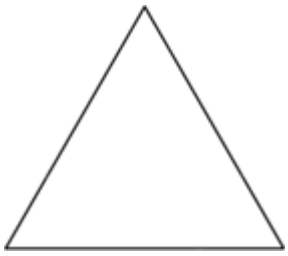
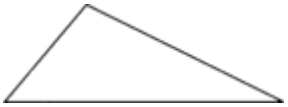
In an **EQUILATERAL TRIANGLE**, all three sides are the same length. An equilateral triangle is always equiangular.



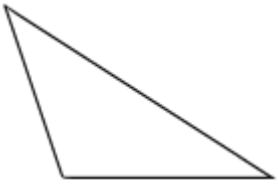
In an **ISOSCELES TRIANGLE**, two sides are the same length. An isosceles triangle may be right, obtuse, or acute.

In a **SCALENE TRIANGLE**, none of the sides are the same length. A scalene triangle may be right, obtuse, or acute.



We can also classify angles by the measure of their interior angles.

In an **ACUTE TRIANGLE**, all angles are less than right angles—each one is less than 90 degrees. An acute triangle may be equilateral, isosceles, or scalene.



In an **OBTUSE TRIANGLE**, one angle is greater than a right angle—it is more than 90 degrees. An obtuse triangle may be isosceles or scalene.

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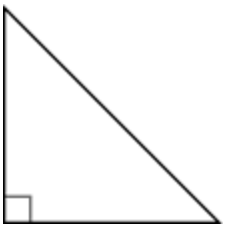
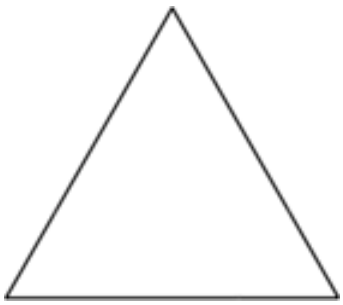
In a **RIGHT TRIANGLE**, one of the angles is a right angle—an angle of 90 degrees. A right triangle may be isosceles or scalene.

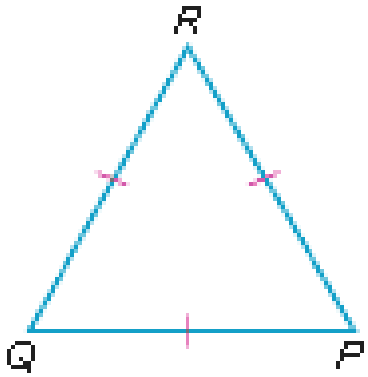




In an **EQUIANGULAR TRIANGLE**, all the angles are congruent—each one measures 60 degrees. An equiangular triangle is a kind of acute triangle, and is always equilateral. All equilateral triangles are also isosceles triangles, too! BUWAHAAHAAAAAAA!!

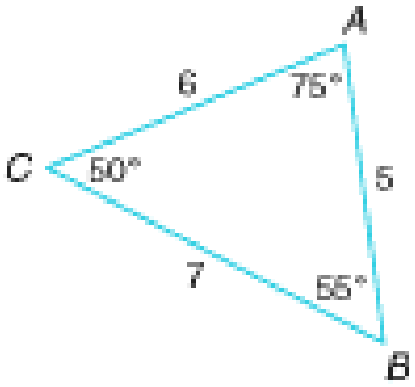
EXAMPLES:

1. Which does not describe $\triangle PQR$



A. acute
B. isosceles
C. equilateral
D. obtuse

2. $\triangle ABC$ is _____.



A. isosceles and scalene
B. equilateral
C. scalene but not acute
D. scalene and acute

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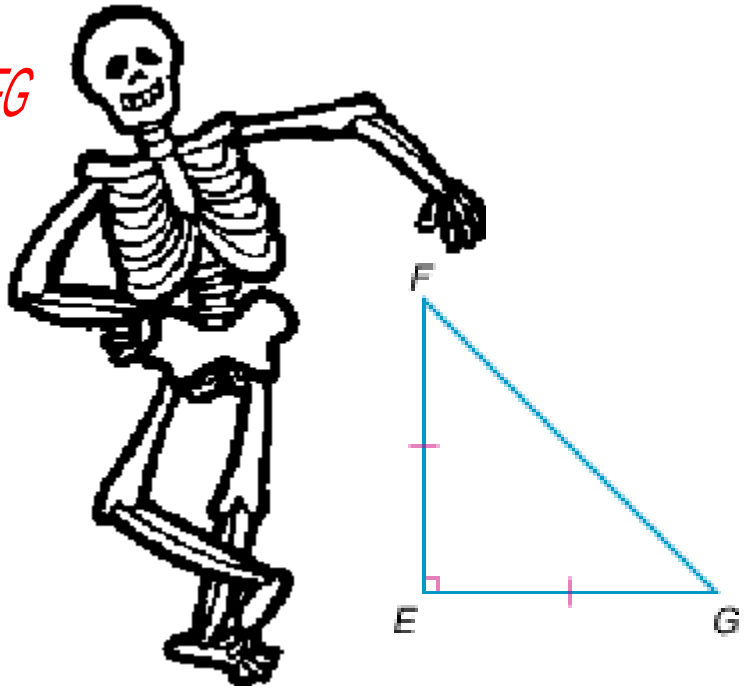
3. What type of triangle is $\triangle EFG$

A. right isosceles
B. acute equilateral
C. acute isosceles
D. right equilateral



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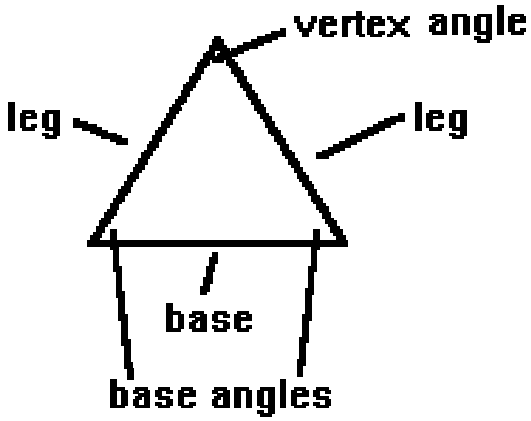
The parts of an isosceles triangle also have special names.



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VERTEX ANGLE - the angle opposite the base.

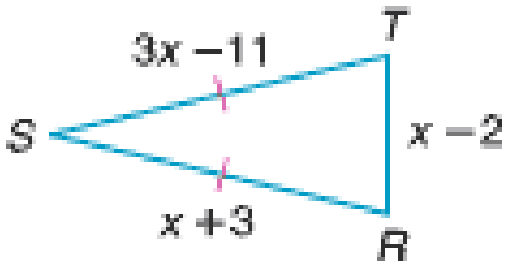
BASE - the side opposite the vertex angle.

LEG - either of the 2 congruent sides.

BASE ANGLES - the two congruent angles opposite each leg.

EXAMPLE:

Triangle RST is isosceles with $\angle S$ as the vertex angle. If $ST = 3x - 11$, $SR = x + 3$, and $RT = x - 2$, find RT.

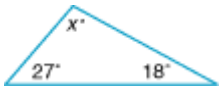


First find x. In this isosceles triangle, $\overline{ST} \cong \overline{SR}$ so
$3x-11 = x+3$
$3x-x = 3+11$
$2x = 14$
$x = 7$
Plug this into the measure of $\overline{RT}$: $x-2 \longrightarrow 7-2 = 5$

Another very important property of triangles is that the sum of the measures of all the interior angles is **180 DEGREES**. If the sum is anything other, then we don't have a triangle. This is called the Angle Sum Theorem.

EXAMPLE:

Find the value of x.



By the angle sum theorem, the sum must be 180.
So, $27 + 18 + x = 180$
$45 + x = 180$
$x = 180 - 45$
$x = 135$
so this is an OBTUSE triangle. Since all the angles are different, it is also scalene.

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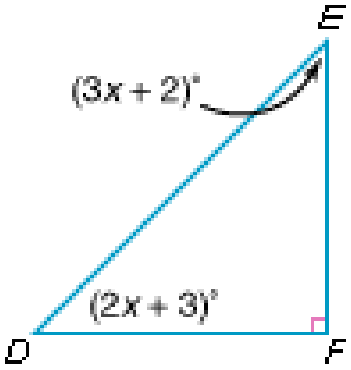
A. 125 B. 135 C. 45 D. 145

EXAMPLE:

What is $m\angle D$ in $\triangle DEF$

Since angle F is 90, the sum or the other two must be 180-90 or 90.
$(3x+2) + (2x+3) = 90$
$5x + 5 = 90$
$5x = 85$
$x = 17$
so measure of angle D is $2(17)+3 = 34 + 3 = 37$



EXAMPLE:

Which statement is not true?

A. A triangle cannot be scalene and isosceles.

B. In an isosceles triangle, the base is congruent to one of the legs.

C. A triangle cannot be obtuse and contain a 90° angle.

D. A triangle can be obtuse and isosceles.

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SAY WHAT???!!

Triangles can also have

EXTERIOR ANGLES! That's right, angles OUTSIDE the triangle.

Angle *x* is an exterior angle of the triangle:

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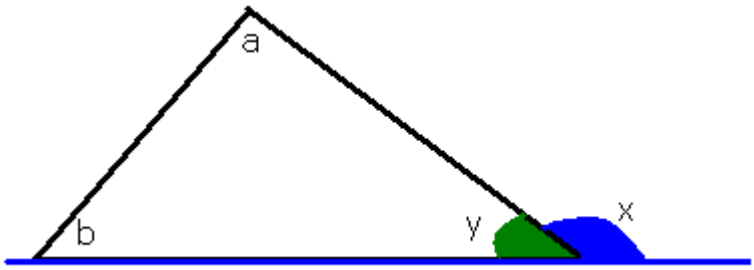

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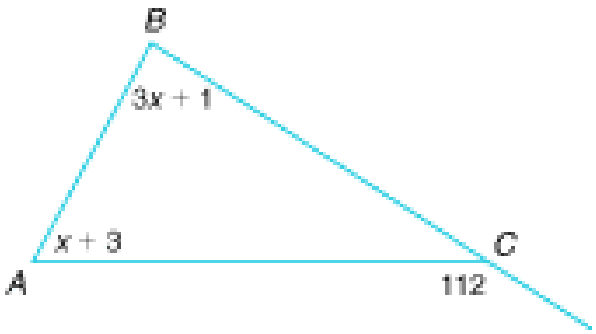
The exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices. In other words, x = a + b in the diagram. This is because *x* and *y* are supplementary! Angles *a* and *b* are called remote interior angles. Their sum is also supplementary with the measure of angle *y*! BUWAHAAHAAAAAAA!!

EXAMPLE:

Find $m\angle B$ if $m\angle A = x + 3$ and $m\angle B = 3x + 1$.



$m\angle ACB = 180\text{-}112 = 68$
$(3x+1)+(x+3) = 180 - 68 = 112$
$4x + 4 = 112$
$4x = 108$
$x = 27$
$m\angle B = 3(27)+1 = 81+1 = 82$

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