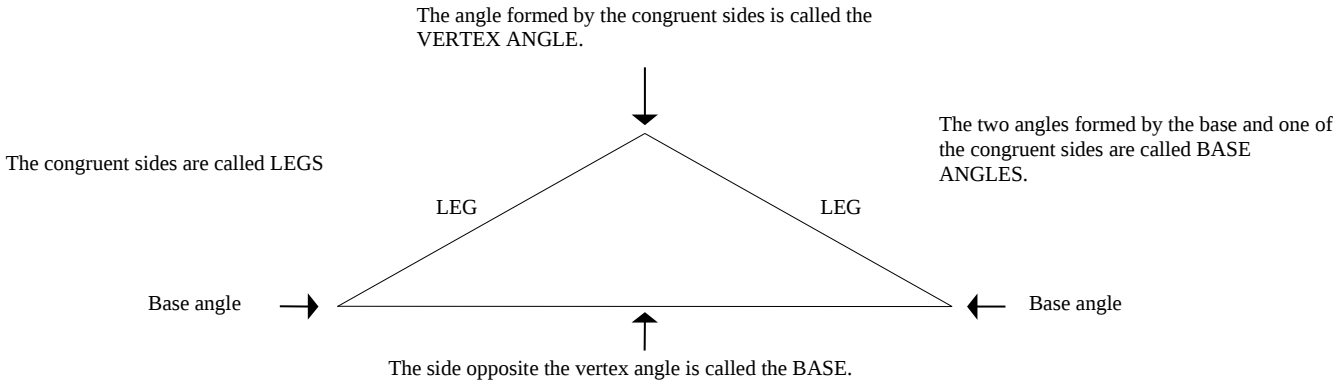
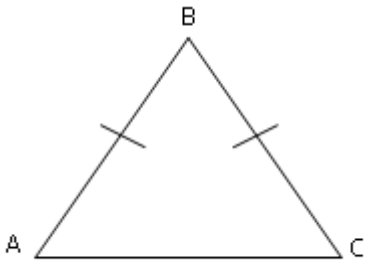
Class Notes
Section 3.3
Analyzing Isosceles Triangles

In an **isosceles triangle**, the two sides that are of equal length are called the **legs** and the third side is called the **base**. The point at which the legs meet is the **vertex** and the angle there is the **vertex angle**. The two angles that include the base are called the **base angles**.



Name the parts of this isosceles triangle:



Other important triangle parts:

<u>Definitions:</u>

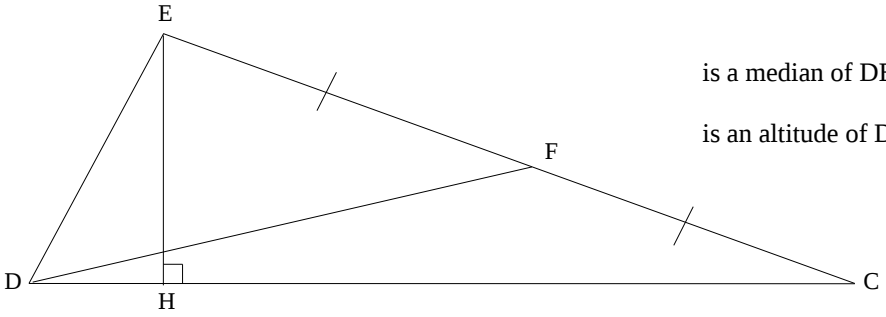
median - a segment that starts from an angle and goes to the midpoint of the opposite side.

altitude - a segment that starts from an angle and is perpendicular to the opposite side.

angle bisector - of a triangle…is a segment that bisects an angle and goes to the opposite side.

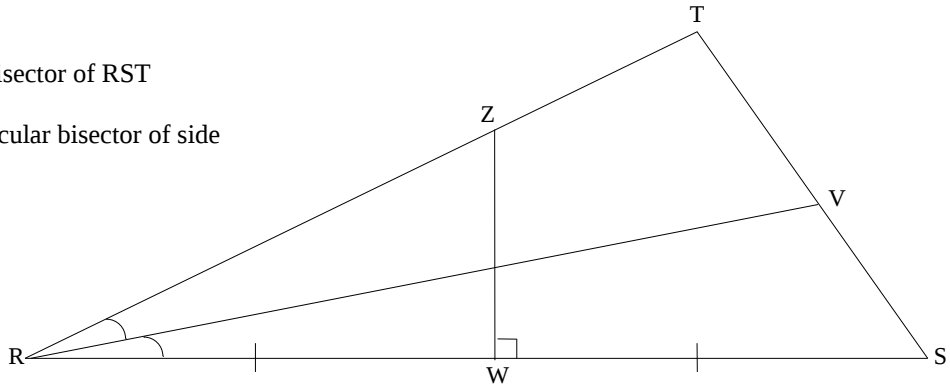
perpendicular bisector - a segment that passes through the midpoint of a side **AND** is perpendicular to that side.

Examples:



is a median of DEC

is an altitude of DEC



is an angle bisector of RST

is a perpendicular bisector of side

Thm – Corresponding altitudes of congruent triangles are congruent.

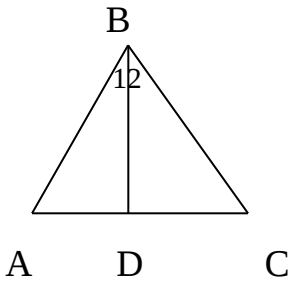
Thm – The bisector of the vertex angle of an isosceles triangle separates the triangle into two congruent triangles.

Proof –

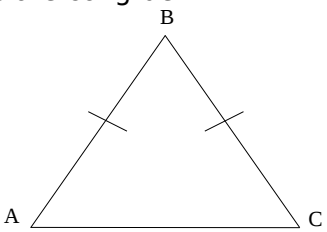
Given : Isosceles ΔABC , with $\overline{AB} \simeq \overline{BC}$

$\overline{BD}$ bisects $\angle ABC$

Prove: $\Delta ABD \simeq \Delta CBD$



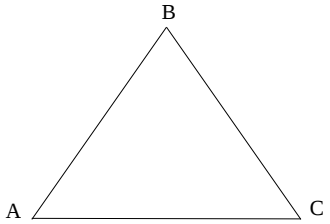
Isosceles Triangle Theorem - if two sides of a triangle are congruent, then the angles opposite those sides are congruent. . . . . .



If

ThenC A

AND (converse) if two angles of a triangle are congruent, then the sides opposite those angles are congruent.

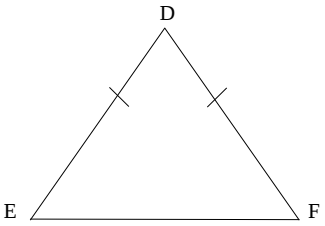


IfA C

Then

Example 1:

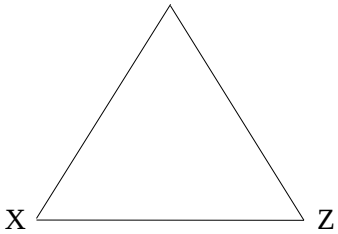
∆DEF is isosceles. ∠D is the vertex angle. The m∠E = 2x + 40 and the m∠F = 3x + 22. Find the measures of each angle.



Example 2:

Given: ∆XYZ is equilateral

Prove: The measure of each angle of ∆XYZ is 60˚



1) First, we have three congruent sides (given); so, their opposite angles are congruent.

2) Now we have three congruent angles. So, the triangle is equiangular.

3) So, we have an equilateral **AND** equiangular triangle.

5) How can we prove the three angles are each 60˚? (hint: what does the sum of the angles of a triangle add up to?)

SO…….

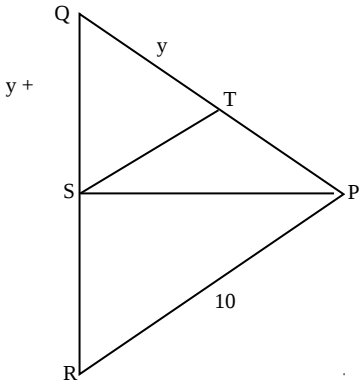
- a triangle is equilateral **if and only if** it is equiangular.
- each angle of an equilateral triangle measures 60˚.

Defn – The perimeter of a triangle is the sum of the lengths of all of its sides.

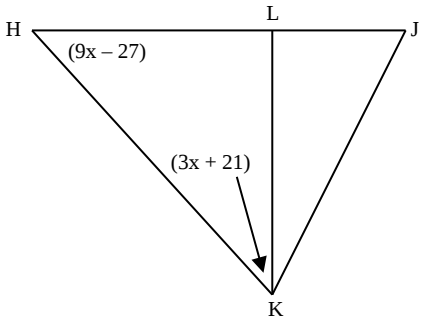
Study the chart on page 145.

Example 3:

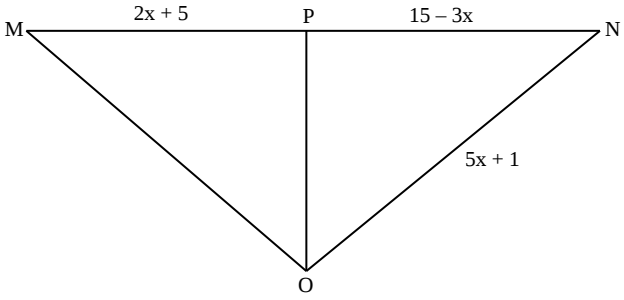
a. In the figure below, $\overline{PQ} \cong \overline{PR}$, and $\overline{PS}$ and $\overline{ST}$ are medians. Find QT and QR.



b. $\overline{KL}$ is an altitude of ΔHJK. Find "x".

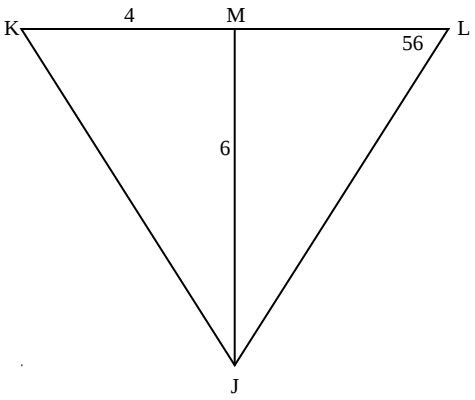


c. $\overline{PO}$ is the perpendicular bisector of $\overline{MN}$. Find "x".



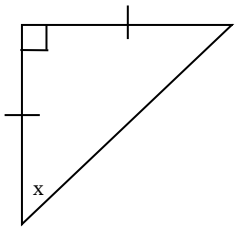
d. In ΔJKL, $\overline{JK} \cong \overline{JL}$, and $\overline{JM}$ is both a median, and altitude, and an angle bisector. Find the following.

1. m∠KMJ
2. KL
3. m∠KJM
4. m∠KJL
5. m∠K

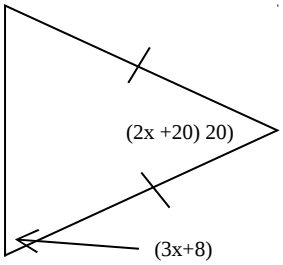


Example 4:

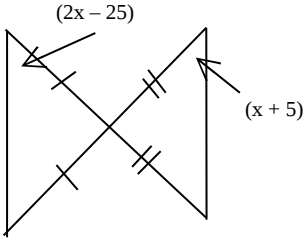
a. x = _____



b. x = _____



c. x = _____



d. Use the figure below to find the angle measures if m∠1 = 30.

m∠2 = _____

m∠3 = _____

m∠4 = _____

m∠5 = _____

m∠6 = _____

m∠7 = _____

m∠8 = _____