

Math 1312
Section 3.3
Analyzing Isosceles Triangles

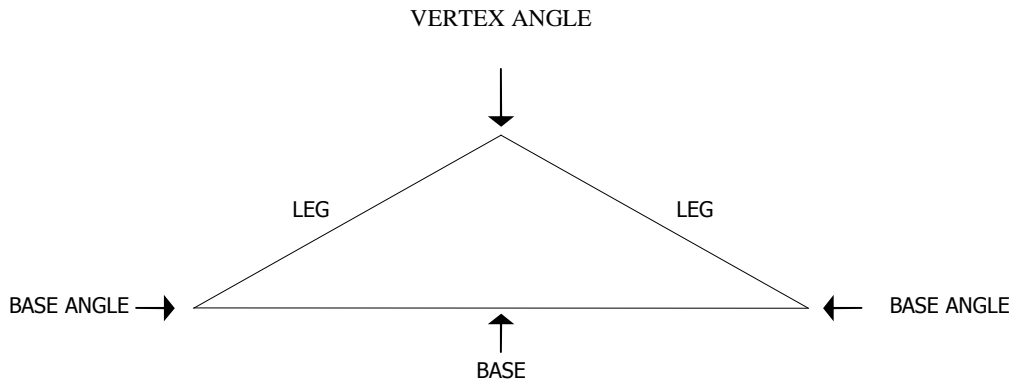
Definitions:

An **isosceles triangle** is a triangle having at least two congruent (of equal length) sides.

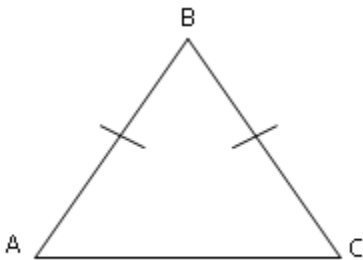
The two sides are called the **legs** and the third side is called the **base**.

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**.



Example: Name the parts of this isosceles triangle:



Other important triangle parts:

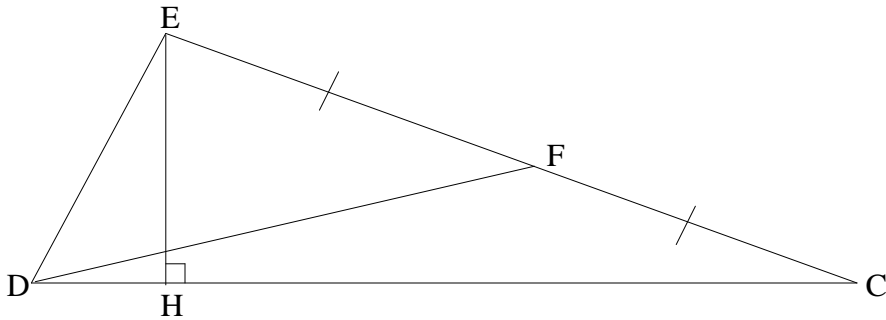
Definitions:

- **Median** is a segment that starts from an angle and goes to the midpoint of the opposite side.
- **Altitude** is 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** is a segment that passes through the midpoint of a side **AND** is perpendicular to that side.

Example: Fill in the blanks.

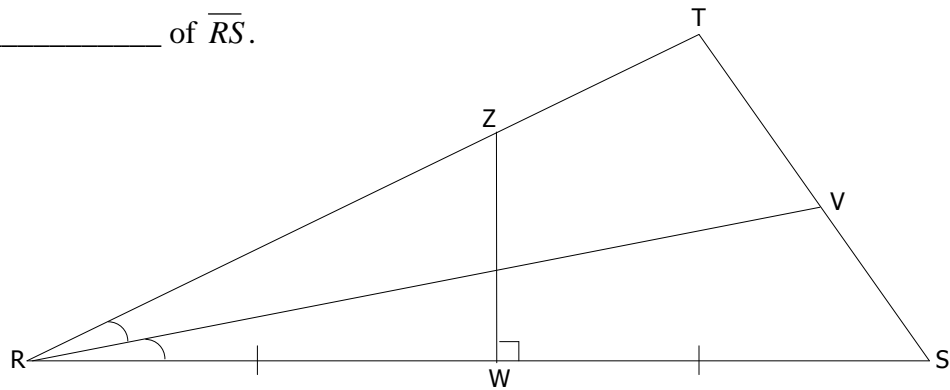
a) \overline{DF} is _____ of $\triangle DEC$.

b) \overline{EH} is _____ of $\triangle DEC$.



c) \overline{RV} is _____ of $\triangle RST$.

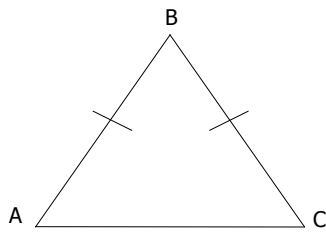
d) \overline{WZ} is _____ of \overline{RS} .



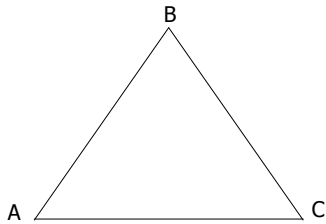
Theorem: Corresponding altitudes of congruent triangles are congruent.

Theorem: The bisector of the vertex angle of an isosceles triangle separates the triangle into two congruent triangles.

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

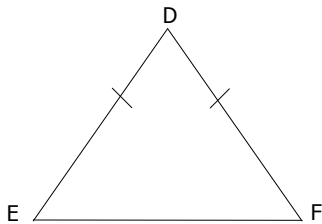


AND (converse): If two angles of a triangle are congruent, then the sides opposite those angles are congruent.



Example:

$\triangle DEF$ is isosceles. $\angle D$ is the vertex angle. $m\angle E = 2x + 40$ and $m\angle F = 3x + 22$. Find the measures of each angle.

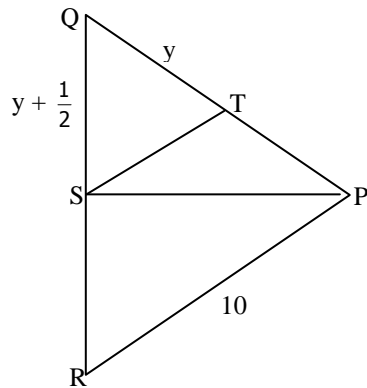


Note:

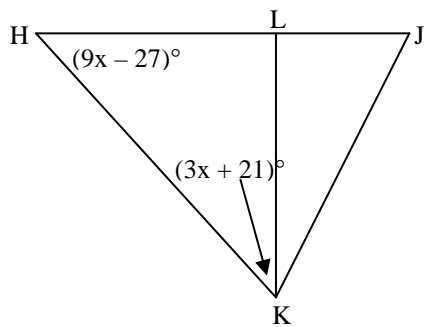
- A triangle is equilateral **if and only if** it is equiangular.
- Each angle of an equilateral triangle measures 60° .

Definition: The perimeter of a triangle is the sum of the lengths of all of its sides.

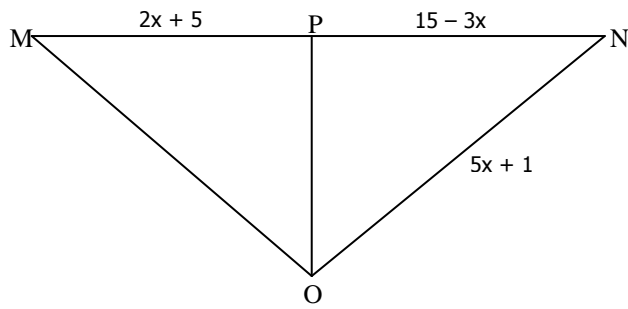
Example: In the figure below, $\overline{PQ} \cong \overline{PR}$, and \overline{PS} and \overline{ST} are medians. Find QT and QR.



Example: \overline{KL} is an altitude of $\triangle HJK$. Find x .

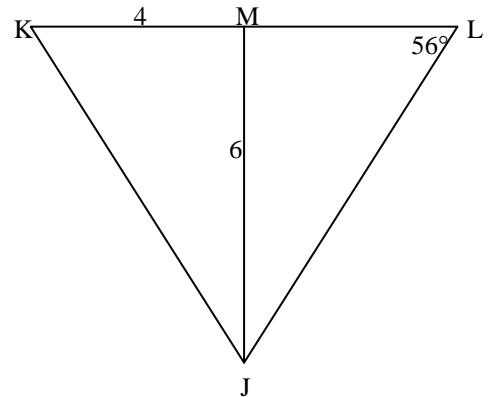


Example: \overline{PO} is the perpendicular bisector of \overline{MN} . Find x .



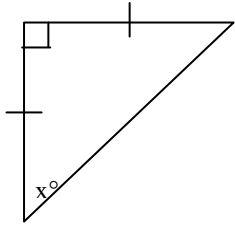
Example: In $\triangle JKL$, $\overline{JK} \cong \overline{JL}$, and \overline{JM} is both a median, and altitude, and an angle bisector. Find the following.

- $m\angle KMJ$
- KL
- $m\angle KJM$
- $m\angle KJL$
- $m\angle K$

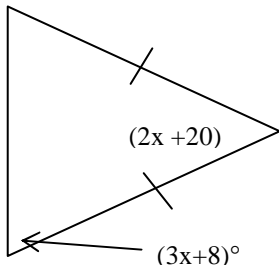


Example:

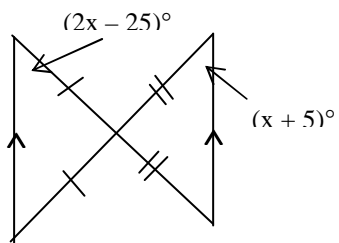
a) $x =$ _____



b) $x =$ _____



c) $x =$ _____



Example: Use the figure below to find the angle measures if $m\angle 1 = 30$.

$m\angle 2 =$ _____

$m\angle 3 =$ _____

$m\angle 4 =$ _____

$m\angle 5 =$ _____

$m\angle 6 =$ _____

$m\angle 7 =$ _____

$m\angle 8 =$ _____

