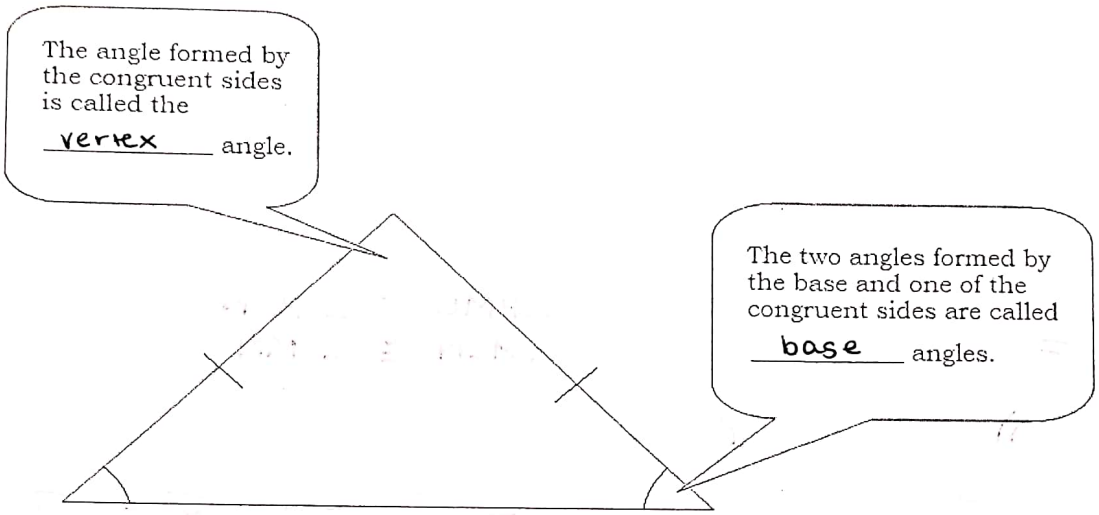
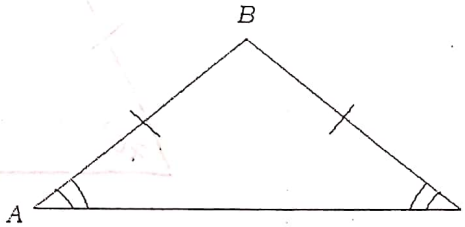
Isosceles Triangle Theorem and its Converse

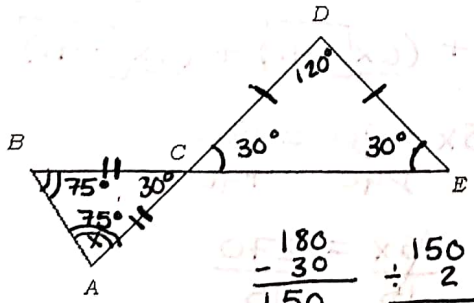
Isosceles Triangle: A triangle with at least 2 sides congruent.



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



Example: If $\overline{DE} \cong \overline{CD}$, $\overline{BC} \cong \overline{AC}$, and $m\angle CDE = 120$, what is the measure of $\angle BAC$?

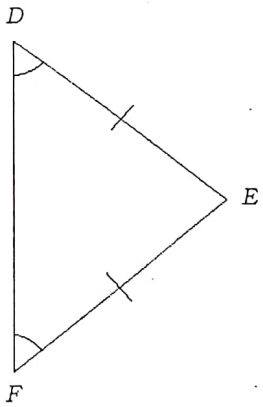


$180 - 30 = 150$; $150 \div 2 = 75$

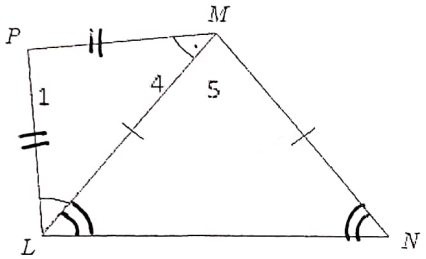
$180 - 120 = 60$; $60 \div 2 = 30$

$\angle BAC = 75°$

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



Example:



a.) Name all of the pairs of congruent angles.

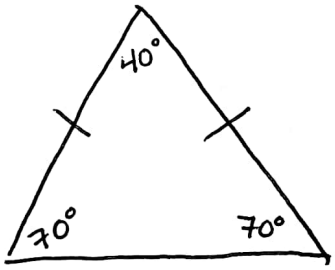
$\angle PML \cong \angle PLN$

$\angle MLN \cong \angle MNL$

b.) Name all of the pairs of congruent segments.

$\overline{ML} \cong \overline{MN}$ $\quad \overline{MP} \cong \overline{LP}$

Example #6: The vertex angle of an isosceles triangle is 40. What is the measure of one base angle?



$180 - 40 = 140$

$140 \div 2 = 70$

one base $\angle$ is 70°

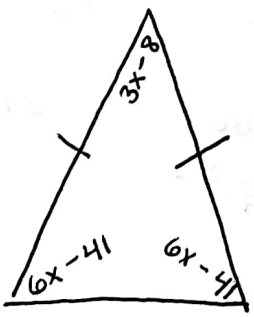
You Try #4: The degree measure of the vertex angle is $(3x - 8)$. The degree measure for each base angle is $(6x - 41)$. What is the value of vertex angle?

$3(18) - 8$

$54 - 8$

46

↑ vertex $\angle$



$(3x - 8) + (6x - 41) + (6x - 41) = 180$

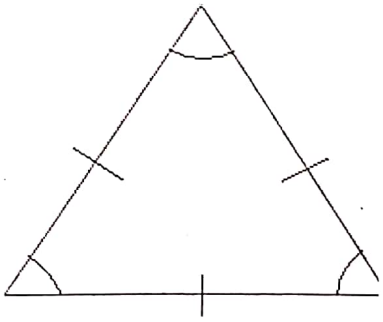
$15x - 90 = 180$

$+90 \quad +90$

$\frac{15x}{15} = \frac{270}{15}$

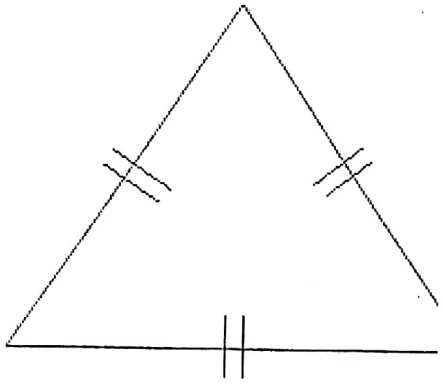
$x = 18$

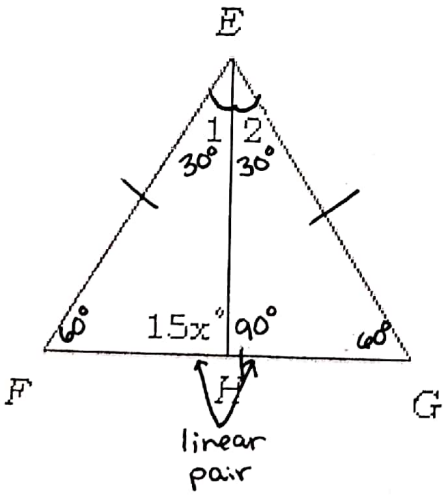
A triangle is equilateral if and only if it is equiangular.



Each angle of an equilateral triangle measures 60°.

$$\begin{array}{r} 180 \\ \div\ 3 \\ \hline 60 \end{array}$$





Example #7: ΔEFG is equilateral, and $\overline{EH}$ bisects $\angle E$.

↑ splits $\angle E$ into two congruent $\angle$s

a.) Find $m\angle 1$ and $m\angle 2$

$$\begin{array}{r} 60 \\ \div\ 2 \\ \hline 30 \end{array}$$

$\angle 1 = 30°$

$\angle 2 = 30°$

b.) Find x.

$15x + 90 = 180$

$-90 \quad -90$

$\frac{15x}{15} = \frac{90}{15}$

$x = 6$