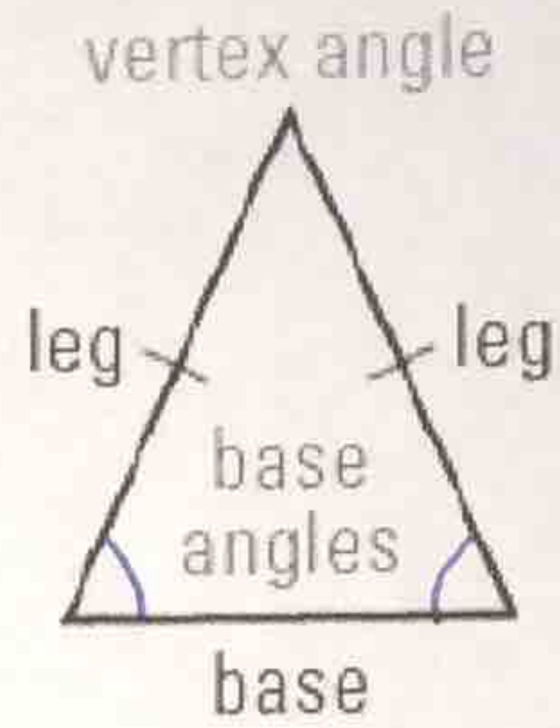
4.7 Use Isosceles and Equilateral Triangles

isosceles triangle - a triangle with at least 2 congruent sides; when there are exactly 2 congruent sides, the 2 sides are called **legs,** the angle formed by the legs is the **vertex angle**, the third side is the **base**, the 2 angles adjacent to the base are called **base angles**



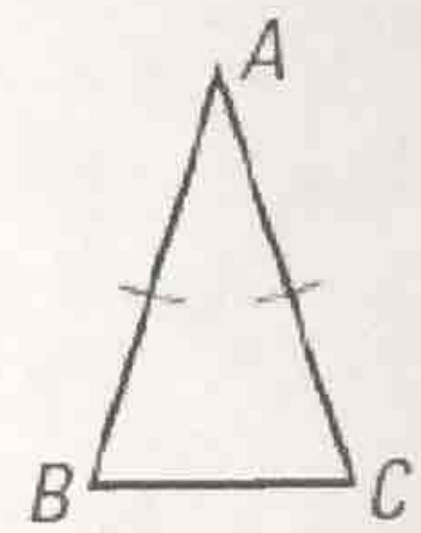
THEOREMS *For Your Notebook*

THEOREM 4.7 Base Angles Theorem

If two sides of a triangle are congruent, then the angles opposite them are congruent.

If $\overline{AB} \cong \overline{AC}$, then $\angle B \cong \angle C$.

Proof: p. 265

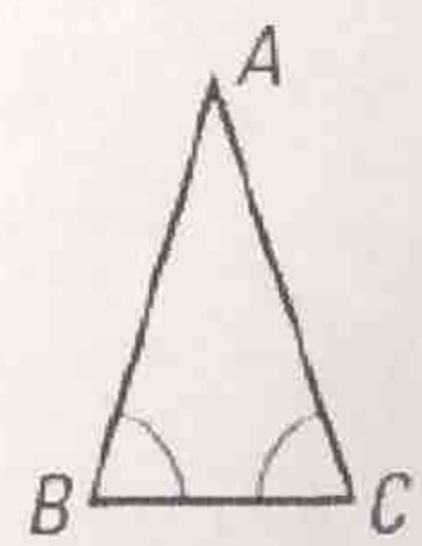


THEOREM 4.8 Converse of Base Angles Theorem

If two angles of a triangle are congruent, then the sides opposite them are congruent.

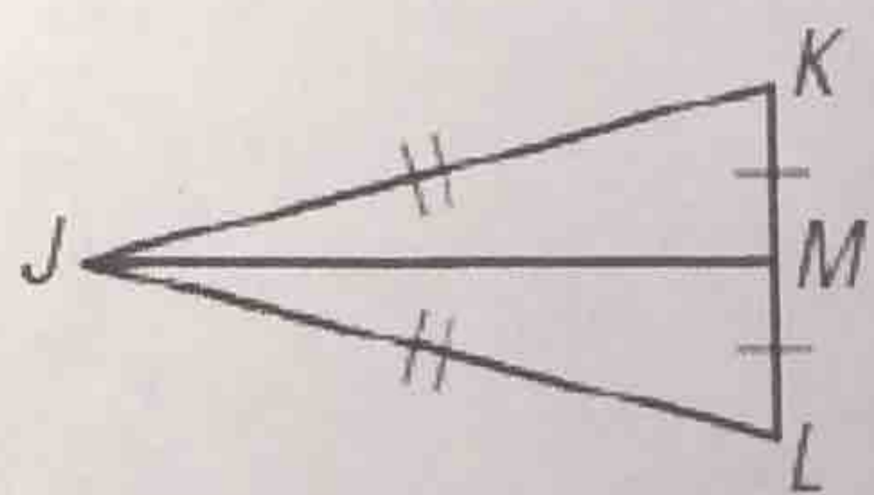
If $\angle B \cong \angle C$, then $\overline{AB} \cong \overline{AC}$.

Proof: Ex. 45, p. 269



Ex 1: Prove the Base Angles Theorem. **GIVEN** ▶ $\overline{JK} \cong \overline{JL}$

PROVE ▶ $\angle K \cong \angle L$



STATEMENTS	REASONS
1. M is the midpoint of $\overline{KL}$	1. Definition of midpoint
2. $\overline{MK} \cong \overline{ML}$	2. Definition of midpoint
3. $\overline{JK} \cong \overline{JL}$	3. Given on diagram
4. $\overline{JM} \cong \overline{JM}$	4. Reflexive Property of Congruence
5. $\triangle JMK \cong \triangle JML$	5. SSS
6. $\angle K \cong \angle L$	6. CPCTC

COROLLARIES

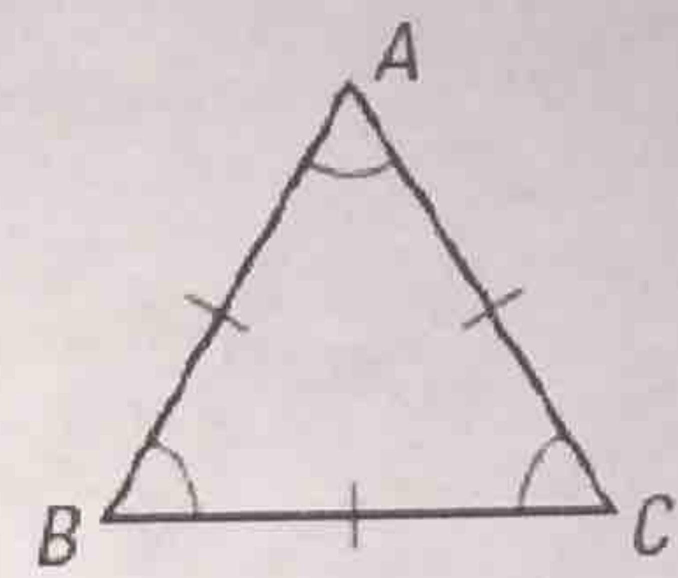
For Your Notebook

Corollary to the Base Angles Theorem

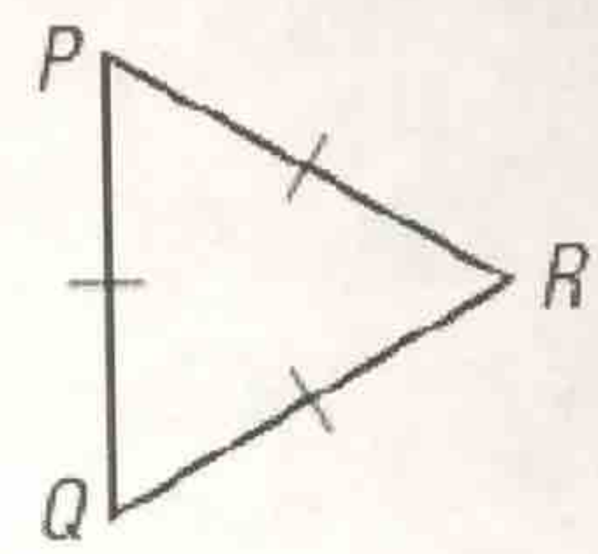
If a triangle is equilateral, then it is equiangular.

Corollary to the Converse of Base Angles Theorem

If a triangle is equiangular, then it is equilateral.



Ex 2: Find the measures of $\angle P, \angle Q, \angle R$.



$\triangle PQR$ is equilateral therefore also equiangular by Corollary to Base Angles Theorem

so $m\angle P = m\angle Q = m\angle R = x$

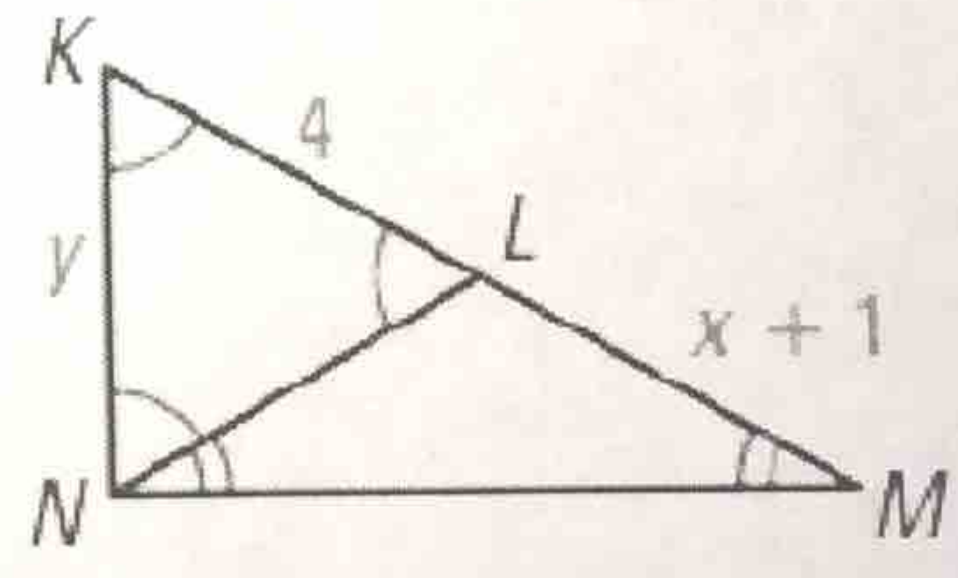
$x + x + x = 180°$

$3x = 180$

$x = 60$

$\boxed{m\angle P = 60°, \; m\angle Q = 60°, \; m\angle R = 60°}$

Ex 3: Find the values of x and y in the diagram.



$\triangle KLN$ is equiangular therefore also equilateral.

$\boxed{y = 4}$

$\triangle LMN$ is isosceles so $\overline{LN} \cong \overline{LM}$

$4 = x + 1$

$\boxed{x = 3}$