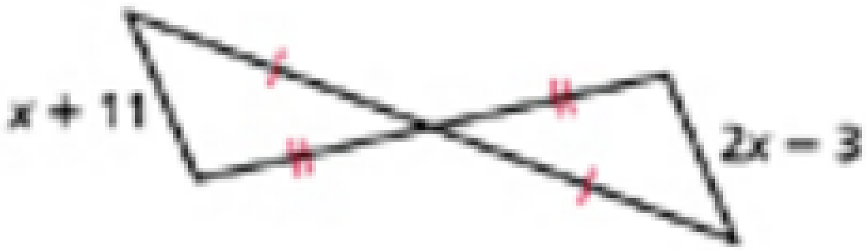
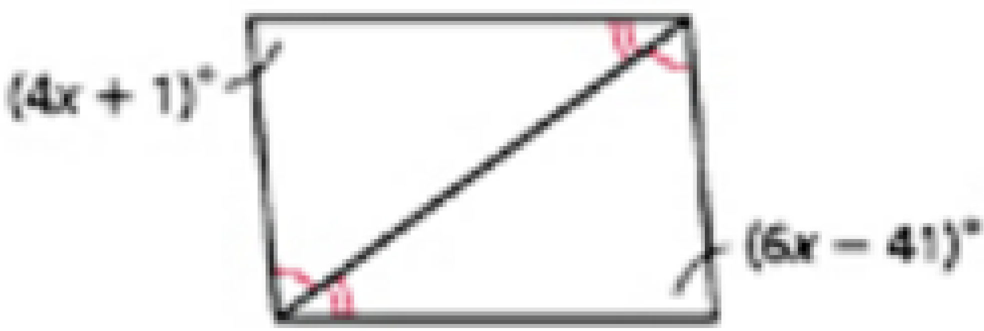
Bellwork

1.



2.



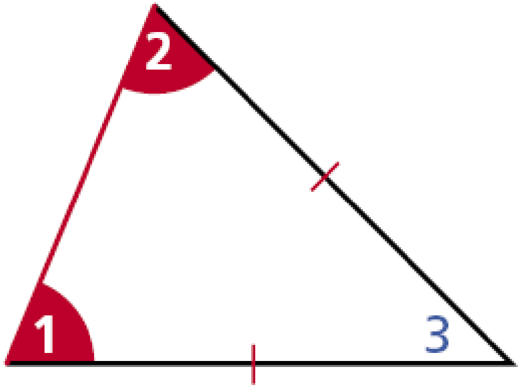
Objectives

Properties of isosceles and equilateral triangles.

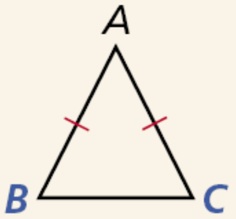
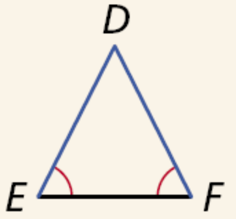
Recall that an isosceles triangle has at least two congruent sides. The congruent sides are called the **legs**. The **vertex angle** is the angle formed by the legs. The side opposite the vertex angle is called the **base**, and the **base angles** are the two angles that have the base as a side.

$\angle 3$ is the vertex angle.

$\angle 1$ and $\angle 2$ are the base angles.



Theorems | Isosceles Triangle

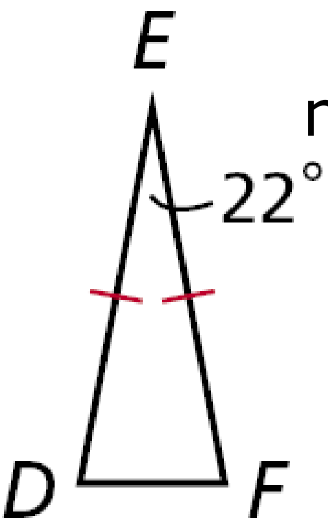
THEOREM	HYPOTHESIS	CONCLUSION
4-8-1 Isosceles Triangle Theorem If two sides of a triangle are congruent, then the angles opposite the sides are congruent.		$\angle B \cong \angle C$
4-8-2 Converse of Isosceles Triangle Theorem If two angles of a triangle are congruent, then the sides opposite those angles are congruent.		$\overline{DE} \cong \overline{DF}$

Reading Math

The Isosceles Triangle Theorem is sometimes stated as “Base angles of an isosceles triangle are congruent.”

Example 2A: Finding the Measure of an Angle

Find m∠*F*.

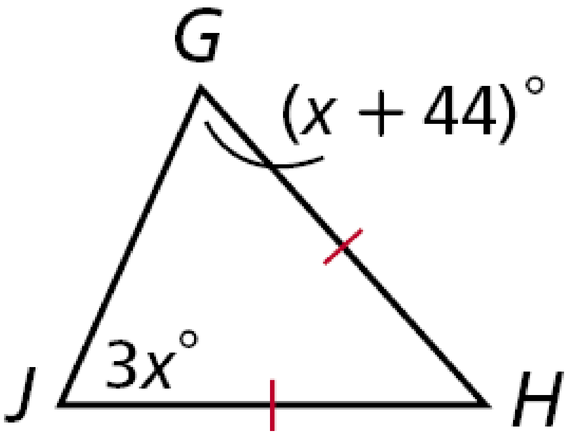


$m\angle F = m\angle D = x°$	*Isosc. Δ Thm.*
$m\angle F + m\angle D + m\angle A = 180$	*Δ Sum Thm.*
$x + x + 22 = 180$	*Substitute the given values.*
$2x = 158$	*Simplify and subtract 22 from both sides.*
$x = 79°$	*Divide both sides by 2.*

Thus $m\angle F = 79°$

Example 2B: Finding the Measure of an Angle

Find m∠*G*.



$m\angle J = m\angle G$ *Isosc. Δ Thm.*

$(x + 44)° = 3x°$ *Substitute the given values.*

$44 = 2x$ *Simplify x from both sides.*

$x = 22°$ *Divide both sides by 2.*

Thus $m\angle G = 22° + 44° = 66°$.

Check It Out! Example 2A

Find m∠H.

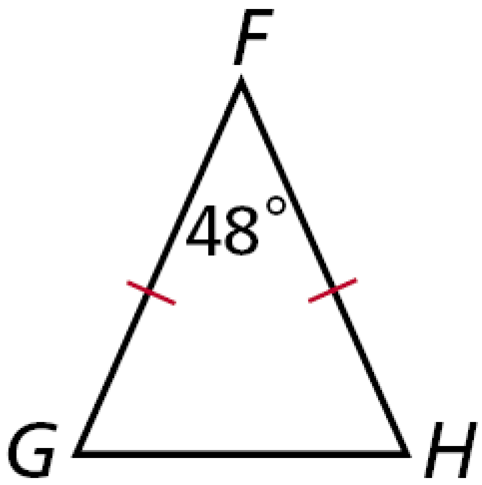
$m\angle H = m\angle G = x°$ *Isosc. Δ Thm.*

$m\angle H + m\angle G + m\angle F = 180$ *Δ Sum Thm.*

$x + x + 48 = 180$ *Substitute the given values.*

$2x = 132$ *Simplify and subtract 48 from both sides.*

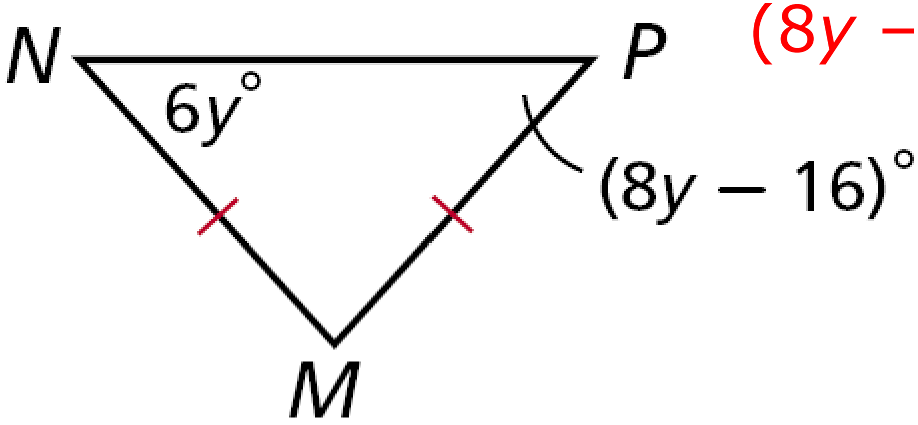
$x = 66°$ *Divide both sides by 2.*



Thus $m\angle H = 66°$

Check It Out! Example 2B

Find m∠*N*.



m∠*P* = m∠*N* *Isosc. Δ Thm.*

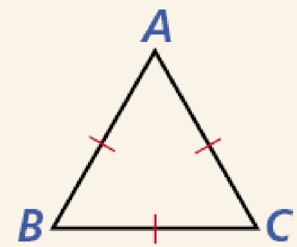
$(8y - 16)° = 6y°$ *Substitute the given values.*

$2y = 16$ *Subtract 6y and add 16 to both sides.*

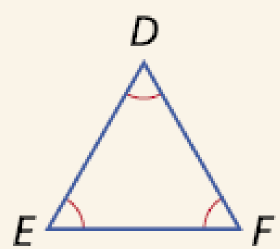
$y = 8°$ *Divide both sides by 2.*

Thus m∠*N* = 6(8) = 48°.

Corollary 4-8-3 Equilateral Triangle

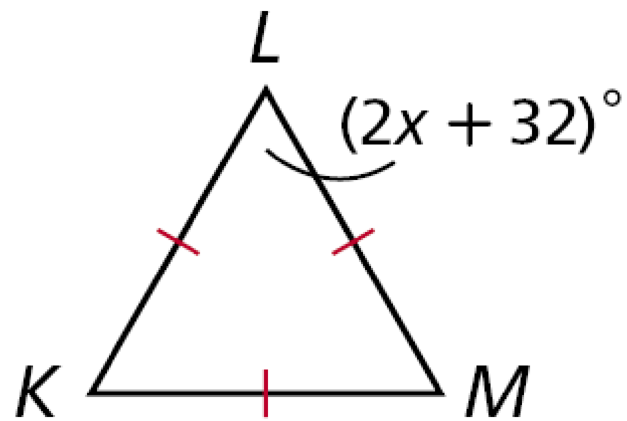
COROLLARY	HYPOTHESIS	CONCLUSION
If a triangle is equilateral, then it is equiangular. (equilateral $\triangle \rightarrow$ equiangular $\triangle$)		$\angle A \cong \angle B \cong \angle C$

Corollary 4-8-4 Equiangular Triangle

COROLLARY	HYPOTHESIS	CONCLUSION
If a triangle is equiangular, then it is equilateral. (equiangular $\triangle \rightarrow$ equilateral $\triangle$)		$\overline{DE} \cong \overline{DF} \cong \overline{EF}$

Example 3A: Using Properties of Equilateral Triangles

Find the value of *x*.



ΔLKM is equilateral.

Equilateral Δ → equiangular Δ

$(2x + 32)° = 60°$ *The measure of each ∠ of an equiangular Δ is 60°.*

$2x = 28$ *Subtract 32 both sides.*

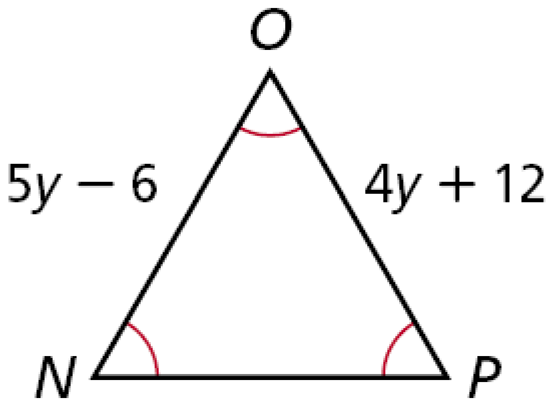
$x = 14$ *Divide both sides by 2.*

Example 3B: Using Properties of Equilateral Triangles

Find the value of *y*.

ΔNPO is equiangular.

Equiangular Δ → equilateral Δ

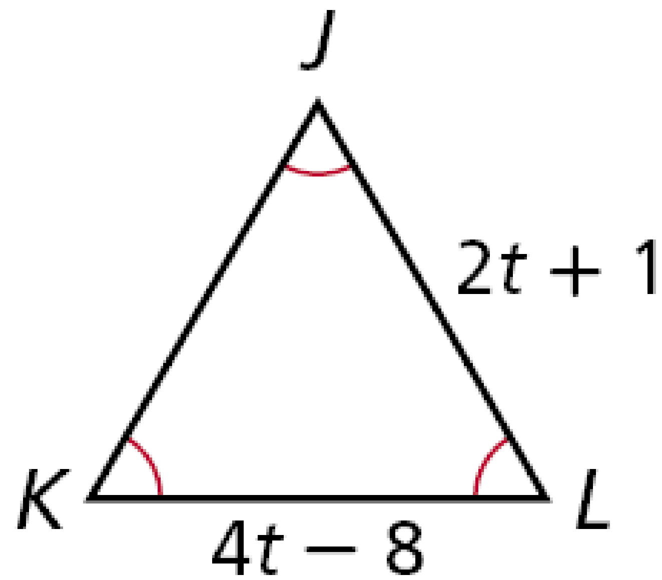


$5y - 6 = 4y + 12$ *Definition of equilateral Δ.*

$y = 18$ *Subtract 4y and add 6 to both sides.*

Check It Out! Example 3

Find the value of JL.



ΔJKL is equiangular.

Equiangular Δ → equilateral Δ

$4t - 8 = 2t + 1$	*Definition of equilateral Δ.*
$2t = 9$	*Subtract 4y and add 6 to both sides.*
$t = 4.5$	*Divide both sides by 2.*

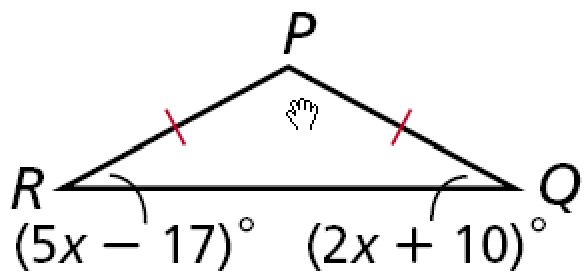
Thus $JL = 2(4.5) + 1 = 10$.

Lesson Quiz: Part I

Find each angle measure.

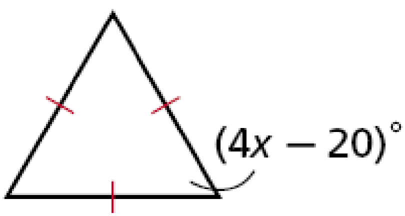
1. m$\angle R$ 28°

2. m$\angle P$ 124°



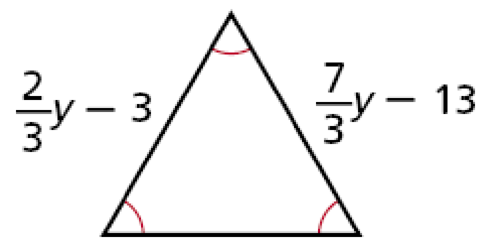
Find each value.

3. x



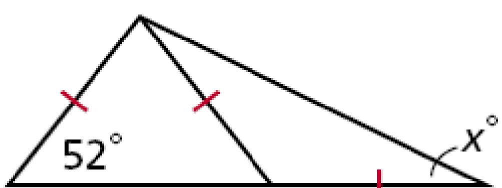
20

4. y



6

5. x



26°

Lesson Quiz: Part II

6. The vertex angle of an isosceles triangle measures $(a + 15)°$, and one of the base angles measures $7a°$. Find a and each angle measure.

$a = 11$; 26°; 77°; 77°

HOMEWORK

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