Section 4.6

Link to ISG

LESSON 6

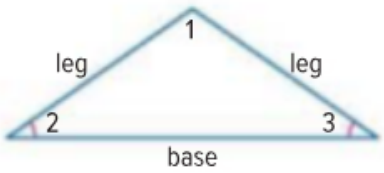
Isosceles and Equilateral Triangles

1 Properties of Isosceles Triangles Recall that isosceles triangles have at least two congruent sides. The parts of an isosceles triangle have special names.

The two congruent sides are called the **legs of an isosceles triangle**, and the angle with sides that are the legs is called the **vertex angle**. The side of the triangle opposite the vertex angle is called the *base*. The two angles formed by the base and the congruent sides are called the **base angles**.

$\angle 1$ is the vertex angle.

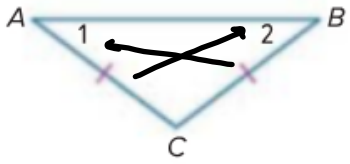
$\angle 2$ and $\angle 3$ are the base angles.



Theorems Isosceles Triangle

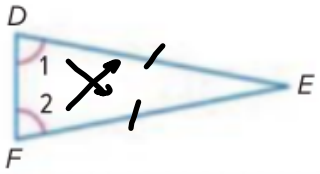
4.10 Isosceles Triangle Theorem
If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

Example If $\overline{AC} \cong \overline{BC}$, then $\angle 2 \cong \angle 1$.



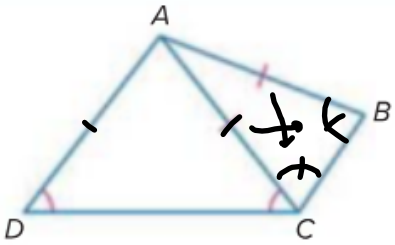
4.11 Converse of Isosceles Triangle Theorem
If two angles of a triangle are congruent, then the sides opposite those angles are congruent.

Example If $\angle 1 \cong \angle 2$, then $\overline{FE} \cong \overline{DE}$.



a. Name two unmarked congruent angles.

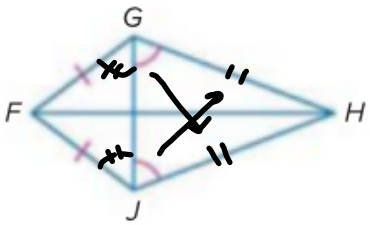
b. Name two unmarked congruent segments.



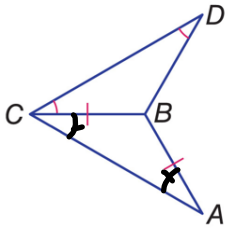
Guided Practice

1A. Name two unmarked congruent angles.

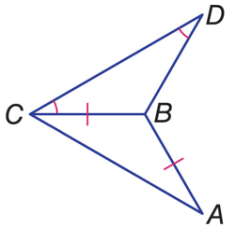
1B. Name two unmarked congruent segments.



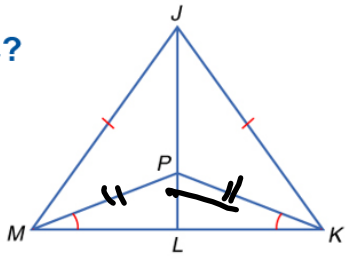
A. Name two unmarked congruent angles.



A. Name two unmarked congruent angles.



B. Which statement correctly names two congruent segments?



A. $\overline{JP} \cong \overline{PL}$

B. $\overline{PM} \cong \overline{PJ}$

C. $\overline{JK} \cong \overline{MK}$

D. $\overline{PM} \cong \overline{PK}$ ←

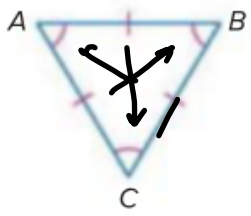
2 Properties of Equilateral Triangles

The Isosceles Triangle Theorem leads to two corollaries about the angles of an equilateral triangle.

Corollaries Equilateral Triangle

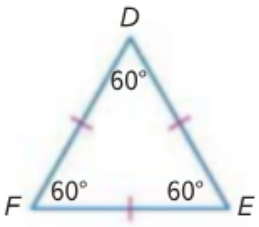
4.3 A triangle is equilateral if and only if it is equiangular.

Example If $\angle A \cong \angle B \cong \angle C$, then $\overline{AB} \cong \overline{BC} \cong \overline{CA}$.



4.4 Each angle of an equilateral triangle measures 60.

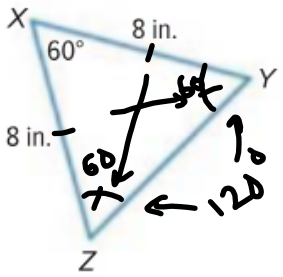
Example If $\overline{DE} \cong \overline{EF} \cong \overline{FD}$, then $m\angle D = m\angle E = m\angle F = 60$.



Example 2 Find Missing Measures

Find each measure.

a. $m\angle Y$ 60°

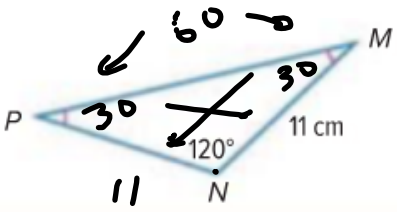


b. YZ 8in

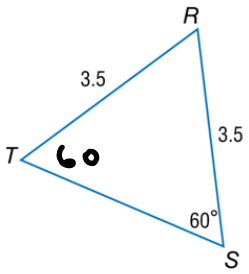
Guided Practice

2A. $m\angle M$

2B. PN



A. Find $m\angle T$.



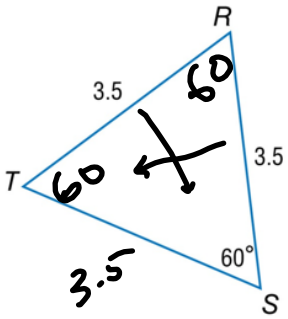
A. 30°

B. 45°

C. 60°

D. 65°

B. Find *TS*.



A. 1.5

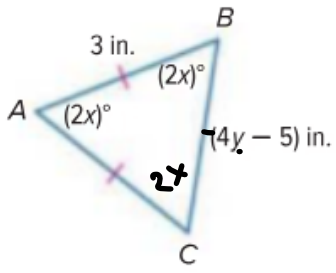
B. 3.5

C. 4

D. 7

Example 3 Find Missing Values

ALGEBRA Find the value of each variable.

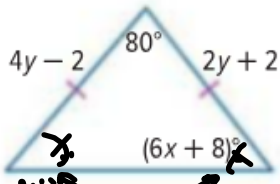


$4y - 5 = 3$
$4y = 8$
$y = 2$

$2x = 60$
$x = 30$

Guided Practice

3. Find the value of each variable.

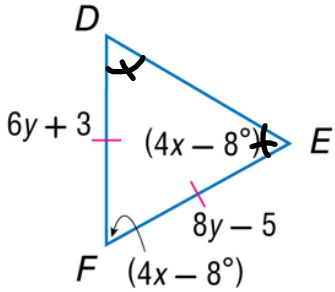


$6x + 8 + 6x + 8 + 80 = 180$
100

$12x + 96 = 180$
$12x = 84$
$x = 7$

$4y - 2 = 2y + 2$
$2y = 4$
$y = 2$

ALGEBRA Find the value of each variable.



$4x - 8 = 60$

$4x = 68$

$x = 17$

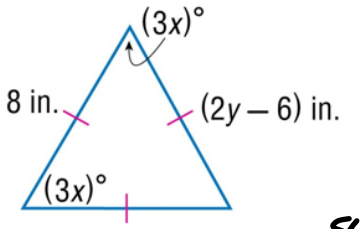
$3(4x-8) = 180$

$6y + 3 = 8y - 5$

$8 = 2y$

$4 = y$

Find the value of each variable.



A. $x = 20, y = 8$

B. $x = 20, y = 7$

C. $x = 30, y = 8$

D. $x = 30, y = 7$

$3x = 60$

$x = 20$

$8 = 2y - 6$

$14 = 2y$

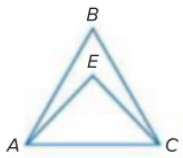
$7 = y$

Check Your Understanding

= Step-by-Step Solutions begin on page R13.

Go Online! for a Self-Check Quiz

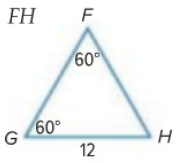
Example 1 **Refer to the figure at the right.**



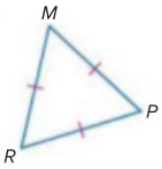
1. If $\overline{AB} \cong \overline{CB}$, name two congruent angles.
2. If $\angle EAC \cong \angle ECA$, name two congruent segments.

Example 2 **Find each measure.**

3. FH

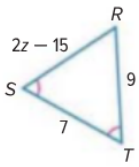


4. $m\angle MRP$

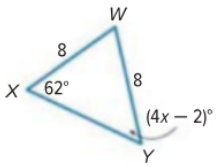


Example 3 MP **SENSE-MAKING** **Find the value of each variable.**

5.

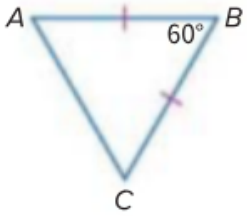


6.

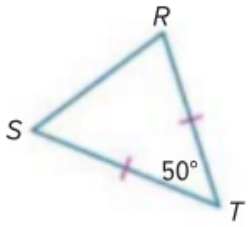


Find each measure.

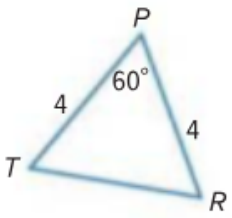
15. $m\angle BAC$



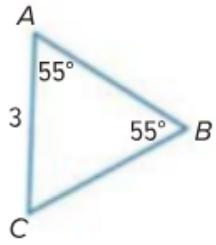
16. $m\angle SRT$



17. TR



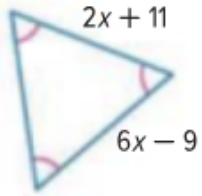
18. CB



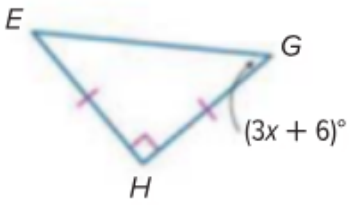
C

REGULARITY Find the value of each variable.

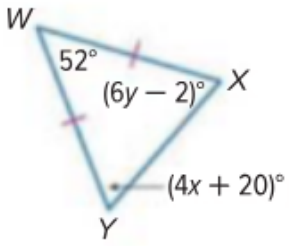
19



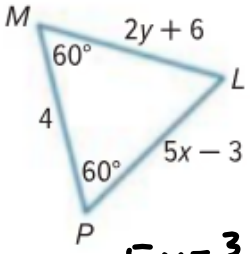
20.



21.



22.



$5x-3=4$

$5(\frac{7}{5})-3$ $5x=7$

$7-3=4$ $x=\frac{7}{5}$