Lesson 5.6 Isosceles and Equilateral Triangles

Monday, January 30, 2023 8:04 PM

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Lesson 5.6 Isosceles

Lesson 5.6
Isosceles and Equilateral Triangles
Workbook pages 315-318

Florida's B.E.S.T. Standards for Mathematics

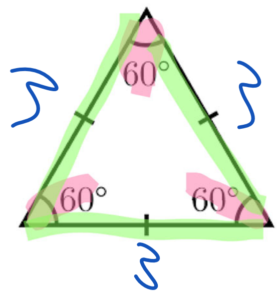
MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.

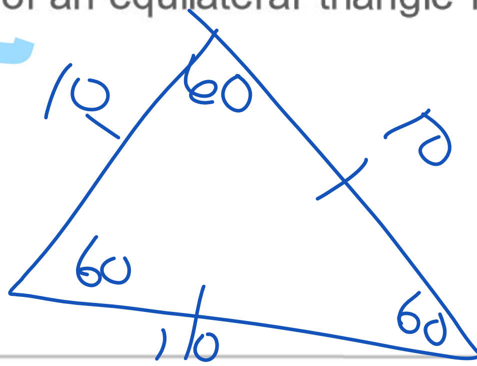
Content Objective
Students will solve problems involving isosceles and equilateral triangles.

Learn
Equilateral Triangles

A triangle is equilateral if and only if it is equiangular. *All angles and sides must be equal

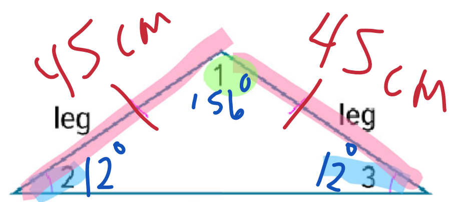
Each angle of an equilateral triangle measures 60°. (180/3=60)





Learn
Isosceles Triangles

An **isosceles triangle** is a triangle with at least two sides congruent. The two congruent sides are called the **legs of an isosceles triangle**.

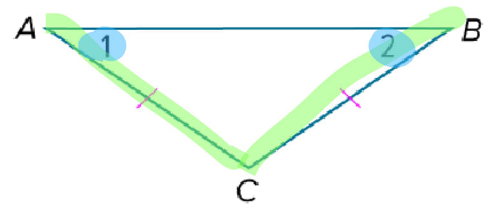


The angle between the sides that are the legs is called the **vertex angle of an isosceles triangle**. ∠1 is the vertex angle of the triangle. The side of the triangle opposite the vertex angle is called the *base*. The two angles formed by the base and the congruent sides are called the **base angles of an isosceles triangle**. ∠2 and ∠3 are the base angles.

Learn
Isosceles Triangles

Theorem 5.10: Isosceles Triangle Theorem

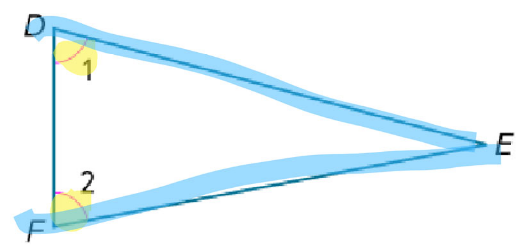
Words	If two sides of a triangle are congruent, then the angles opposite those sides are congruent.
Example	If $\overline{AC} \cong \overline{BC}$, then $\angle 2 \cong \angle 1$.



Learn
Isosceles Triangles

Theorem 5.11: Converse of the Isosceles Triangle Theorem

Words	If two angles of a triangle are congruent, then the sides opposite those angles are congruent.
Example	If $\angle 1 \cong \angle 2$, then $\overline{FE} \cong \overline{DE}$

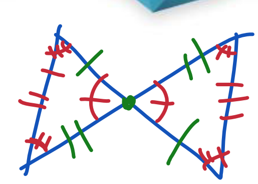


CPCTC

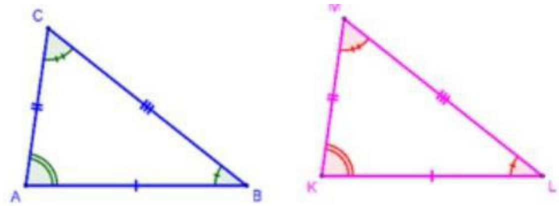
CPCTC is an acronym for Corresponding Parts of Congruent Triangles are Congruent.

It means that once two triangles are proven to be congruent, then the three pairs of sides that correspond must be congruent and the three pairs of angles that correspond must be congruent.

CPCTC is usually used at the end of a proof to show that two angles or two sides are congruent.



SAS



If $\Delta ABC \cong \Delta KLM$ then all the corresponding sides and angles of the triangles are congruent.

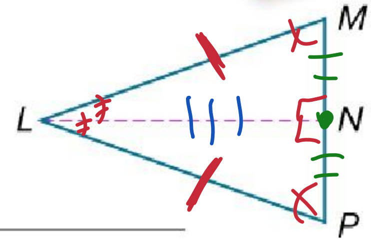
Example 1

Prove Theorems About Isosceles Triangles

Prove the Isosceles Triangle Theorem.

Given: $\triangle LMP$, $\overline{LM} \cong \overline{LP}$

Prove: $\angle M \cong \angle P$



Proof:

Statements	Reasons
1. $\overline{LM} \cong \overline{LP}$	1. Given
2. Draw an auxiliary segment $\overline{LN}$.	2. Two points determine a line.
3. Let N be the midpoint of MP	3. Every segment has exactly one midpoint.
4. MN = PN	4. Midpoint Theorem
5. $\overline{LN} \cong \overline{LN}$	5. Reflexive
6. $\triangle LMN \cong \triangle LPN$	6. SSS
7. $\angle M \cong \angle P$	7. CPCTC

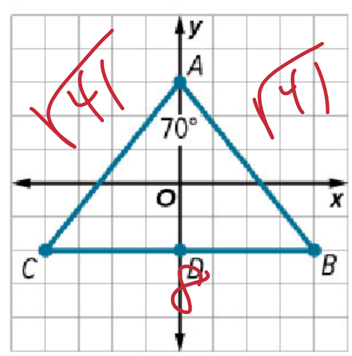
Example 2

Find Missing Measures in Isosceles Triangles

Find $m\angle B$ and $m\angle C$. Determine if the triangle is isosceles.

Part A: Use the distance formula to find the Distance of segments CA and BA.

***use the next page to show your work**



Distance formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

d = distance

(x_1, y_1) = coordinates of the first point

(x_2, y_2) = coordinates of the second point

$A(0, 3)$, $B(4, -2)$, and $C(-4, -2)$.

Distance of segments CA and BA.

$(-4-0)^2 + (-2-3)^2$

$-4^2 + -5^2$

$16 + 25$

$\sqrt{41}$

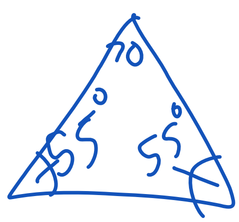
Example 2

Find Missing Measures in Isosceles Triangles

Part B Determine the angle measures.

Because $\overline{AB} \cong \overline{AC}$, we know that $\angle C \cong \angle B$ by the Isosceles Triangle Theorem.

Angle CAB = 70 degrees (that is your vertex angle)



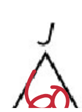
$180 - 70 = 110/2$

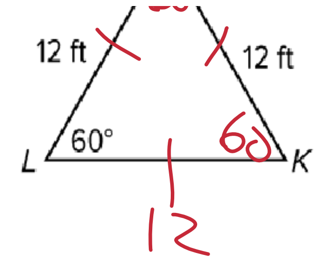
Example 3

Find Missing Measures in Equilateral Triangles

Find $m\angle J$.

60°



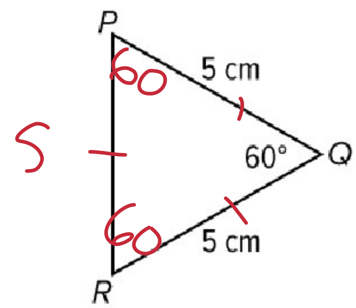


Example 3
Find Missing Measures in Equilateral Triangles

Check

Find $m\angle R$ and PR.

60 5



Example 4
Find Missing Values

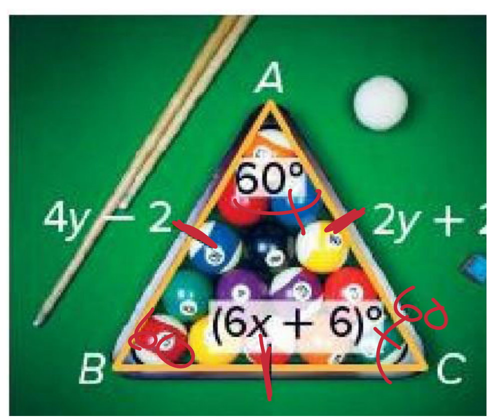
BILLIARDS Find the value of each variable. *Check is this equilateral?

Part A determine the value of x.

$6x + 6 = 60$
$-6 \quad -6$

$6x = 54$
$6 \quad 6$

$x = 9$



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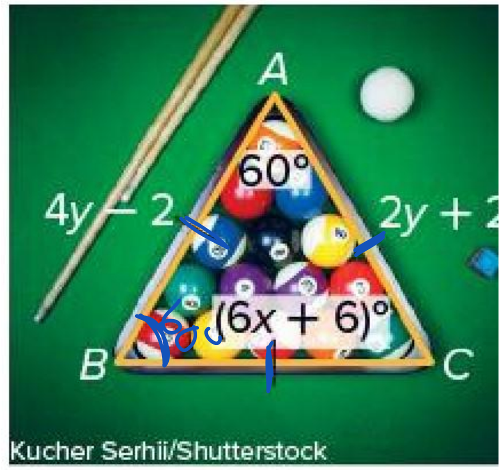
Example 4
Find Missing Values

Part B determine the value of y.

$4y - 2 = 2y + 2$
$\quad +2 \qquad +2$
$4y = 2y + 4$
$-2y \quad -2y$
$2y = 4$
$\frac{2y}{2} = \frac{4}{2}$
$y = 2$



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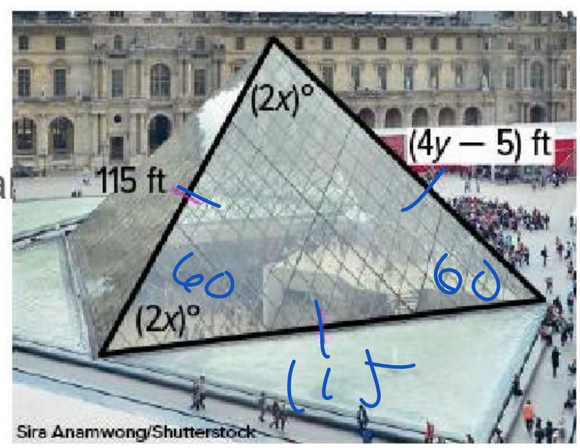
Example 4
Find Missing Values

Check

ARCHITECTURE The main entrance c to the Louvre Museum is a unique metal and glass pyramid, which is an equilatera triangle.

Part A solve for x.

$\frac{2x}{2} = \frac{60}{2}$
$x = 30$



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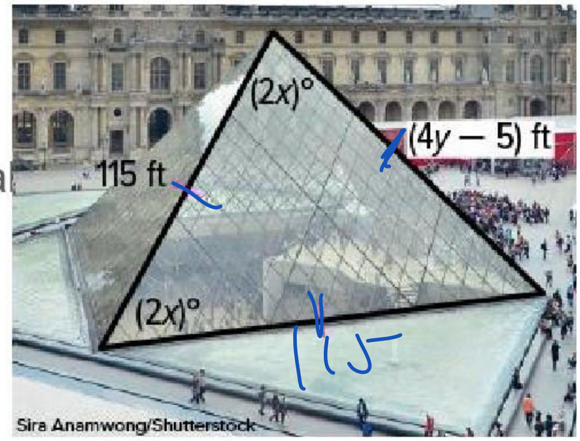
Example 4

Find Missing Values

Check

ARCHITECTURE The main entrance c to the Louvre Museum is a unique metal and glass pyramid, which is an equilatera triangle.

Part B solve for y.



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$4y - 5 = 115$
$+5 \quad +5$
$4y = 120$
$\frac{4y}{4} = \frac{120}{4}$

$y = 30$