Name ______________________________ Date ______________

LESSON 4.7

Study Guide

For use with pages 264–270

GOAL **Use theorems about isosceles and equilateral triangles.**

Vocabulary

When an isosceles triangle has exactly two congruent sides, these two sides are the **legs.** The angle formed by the legs is the **vertex angle.** The third side is the **base** of the isosceles triangle. The two angles adjacent to the base are called **base angles.**

Theorem 4.7 Base Angles Theorem: If two sides of a triangle are congruent, then the angles opposite them are congruent.

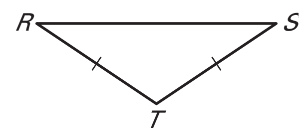
Theorem 4.8 Converse of Base Angles Theorem: If two angles of a triangle are congruent, then the sides opposite them are congruent.

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.

EXAMPLE 1 Identify congruent angles

In the diagram, $\overline{RT} \cong \overline{ST}$. Name two congruent angles.

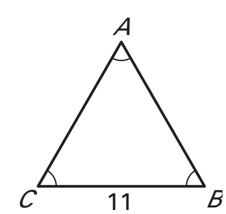


Solution

$\overline{RT} \cong \overline{ST}$, so by the Base Angles Theorem, ≥ $R \cong$ ≥ S.

EXAMPLE 2 Find measures in a triangle

Find *AB* and *AC* in the triangle at the right.

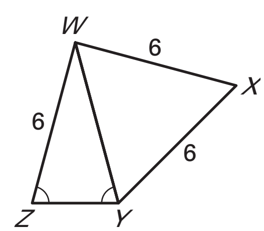


Solution

The diagram shows that $\triangle ABC$ is equiangular. Therefore, by the Corollary to the Converse of Base Angles Theorem, $\triangle ABC$ is equilateral. So, $AB = BC = AC = 11$.

Exercises for Examples 1 and 2

Use the information in the diagram to find the given values.



1. Find WY.

2. Find m≥ WXY.

LESSON 4.7

Study Guide *continued*

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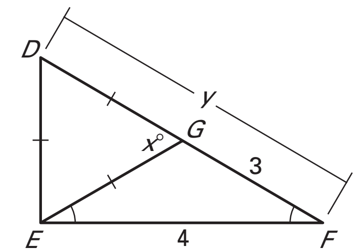
EXAMPLE 3

Use isosceles and equilateral triangles

In the diagram, *m*≥ *DEF* = 90°. Find the values of *x* and *y*.



Solution

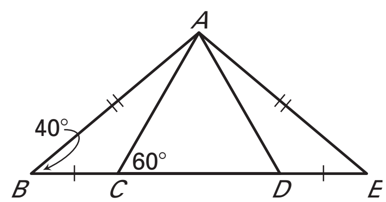
STEP 1 **Find** the value of x. Because $\triangle DEG$ is equilateral, it is also equiangular, and *m*≥ *GDE* = *m*≥ *DEG* = $x°$. So, by the Triangle Sum Theorem, $3x° = 180°$, and $x = 60$.

STEP 2 **Find** the value of y. Because ≥ *GEF* ≅ ≥ *GFE*, $\overline{GE} \cong \overline{GF}$ by the Converse of Base Angles Theorem, so $GE = 3$. Because $\triangle DEG$ is equilateral, $DE = DG = GE = 3$. Because *m*≥ *DEF* = 90°, $\triangle DEF$ is a right triangle. Using the Pythagorean Theorem, $y = \sqrt{3^2 + 4^2} = 5$.

EXAMPLE 4

Solve a multi-step problem

Use the diagram to answer the questions.



a. What congruence postulate can you use to prove that $\triangle ABC \cong \triangle AED$?

b. Explain why $\triangle ACD$ is equiangular.

c. Show that $\triangle ABD \cong \triangle AEC$.

Solution

a. You can see that $\overline{AB} \cong \overline{AE}$ and $\overline{BC} \cong \overline{ED}$. By the Base Angles Theorem, you know that ≥ *B* ≅ ≥ *E*. So, by the SAS Congruence Postulate, $\triangle ABC \cong \triangle AED$.

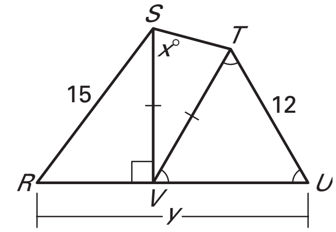
b. Because corresponding parts of congruent triangles are congruent, you know that ≥ *ACB* ≅ ≥ *ADE*, and by the Congruent Supplements Theorem, ≥ *ACD* ≅ ≥ *ADC*. So *m*≥ *ADC* = *m*≥ *ACD* = 60°, and *m*≥ *CAD* = 180° − 60° − 60° = 60°, and $\triangle ACD$ is equiangular.

c. From part (b) you know that $\triangle ACD$ is equiangular. So, ≥ *ADB* ≅≥ *ACE* and therefore $\triangle ABD \cong \triangle AEC$ by the AAS Congruence Postulate.

Exercises for Examples 3 and 4

3. Find the values of x and y in the diagram at the right.

4. In Example 4 above, show that $\triangle ABD \cong \triangle AEC$ using the SSS Congruence Postulate.



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