Name _____ Date _____

LESSON 5.6

Study Guide

For use with pages 335–341

GOAL **Use inequalities to make comparisons in two triangles.**

Vocabulary

Theorem 5.13 Hinge Theorem: If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first is longer than the third side of the second.

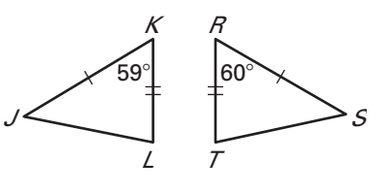
Theorem 5.14 Converse of the Hinge Theorem: If two sides of one triangle are congruent to two sides of another triangle, and the third side of the first is longer than the third side of the second, then the included angle of the first is larger than the included angle of the second.

In an **indirect proof,** you start by making the temporary assumption that the desired conclusion is false. By then showing that this assumption leads to a logical impossibility, you prove the original statement true by contradiction.

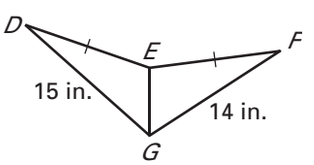
EXAMPLE 1 ## Use the Hinge Theorem and its converse

Complete the statement with <, >, or =. *Explain.*

a. JL __?__ ST



b. $m\geq DEG$ __?__ $m\geq FEG$



Solution

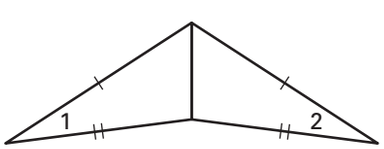
a. You are given that $\overline{JK} \cong \overline{SR}$ and $\overline{KL} \cong \overline{RT}$. Because $59° < 60°$, by the Hinge Theorem, $JL < ST$.

b. You are given that $\overline{DE} \cong \overline{FE}$ and you know that $\overline{EG} \cong \overline{EG}$ by the Reflexive Property. Because 15 inches > 14 inches, $DG > FG$. So, by the Converse of the Hinge Theorem, $m\geq DEG > m\geq FEG$.

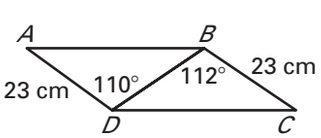
Exercises for Example 1

Complete the statement with <, >, or =. *Explain.*

1. $m\geq 1$ __?__ $m\geq 2$



2. AB __?__ CD



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LESSON 5.6

Study Guide *continued*

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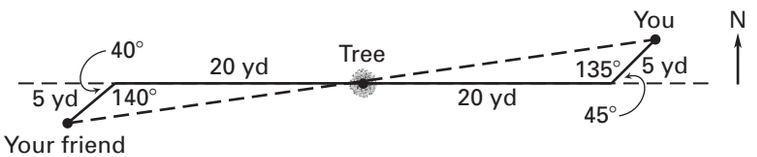
EXAMPLE 2 Solve a multi-step problem

Tree You and a friend walk away from a tree in opposite directions. You both walk 20 yards, then change direction and walk 5 yards. You start due east and then turn 45° toward north. Your friend starts due west and then turns 40° toward south. Who is farther from the tree?

Draw a diagram as shown below. Use linear pairs to find and mark the included angles of 135° and 140°.



Because 140° > 135°, your friend is farther from the tree by the Hinge Theorem.

EXAMPLE 3 Write an indirect proof

Write an indirect proof to show that the sum of an odd number and 2 is also an odd number.

GIVEN: x is an odd number.

PROVE: $x + 2$ is an odd number.

STEP 1 Assume temporarily that $x + 2$ is an even number. This means that $\frac{x+2}{2} = n$ for some whole number n. So, solving for x gives $x = 2(n - 1)$.

STEP 2 If x is odd, then, by definition, x cannot be divided evenly by 2. However, $x = 2(n - 1)$ so $\frac{x}{2} = \frac{2(n-1)}{2} = n - 1$. We know that $n - 1$ is a whole number because n is a whole number, so x *can* be divided evenly by 2. This contradicts the given statement that x is odd.

STEP 3 Therefore, the assumption that $x + 2$ is an even number must be false, which proves that $x + 2$ is an odd number.

Exercises for Examples 2 and 3

3. In Example 2, suppose you walk 20 yards away from the tree due south and then turn 40° toward east and walk 5 yards. Compare your distance from the tree to your friend's distance from the tree.

Write a temporary assumption that you could make to prove the conclusion indirectly.

4. If $xy < 0$ and $x > 0$, then $y < 0$.

5. If $\triangle ABC$ is isosceles and $m\angle A = 100°$, then $m\angle B = m\angle C$.

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