LESSON 5.6

NAME _____ DATE _____

Practice with Examples

For use with pages 302–308

GOAL **Read and write an indirect proof and use the Hinge Theorem and its converse to compare side lengths and angle measures**

VOCABULARY

An **indirect proof** is a proof in which you prove that a statement is true by first assuming that its opposite is true. If this assumption leads to an impossibility, then you have proved that the original statement is true.

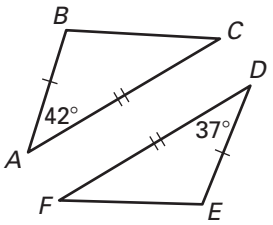
Theorem 5.14 Hinge Theorem
If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first is longer than the third side of the second.

Theorem 5.15 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.

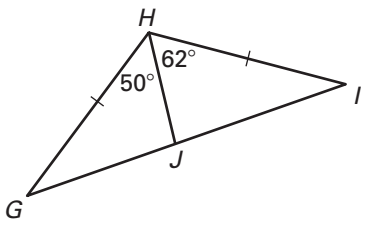
EXAMPLE 1 Using the Hinge Theorem

Complete with $<$, $>$, or $=$.

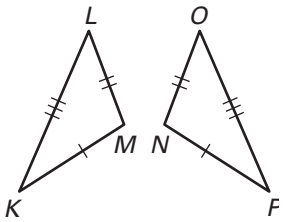
a. BC ____ EF



b. JG ____ JI



c. $m\angle M$ ____ $m\angle N$



SOLUTION

a. By the Hinge Theorem, since $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, $m\angle A > m\angle D$ it follows that $BC > EF$.

b. Since $m\angle JHG < m\angle JHI$, $JG < JI$.

c. $m\angle M = m\angle N$

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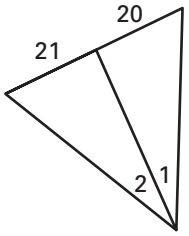
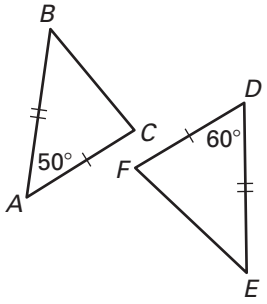
Exercises for Example 1

Complete with $<$, $>$, or $=$.

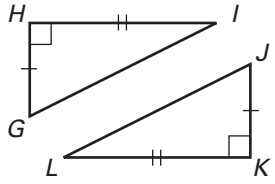
1. $m\angle 1$ ____ $m\angle 2$



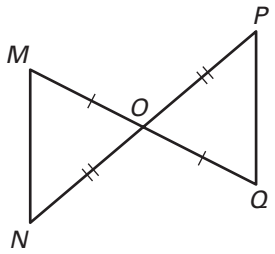
2. BC ____ EF



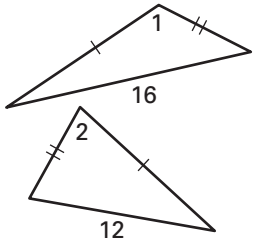
3. GI ____ JL



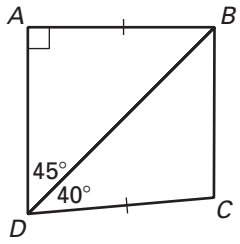
4. MN ____ QP



5. $m\angle 1$ ____ $m\angle 2$



6. AD ____ BC



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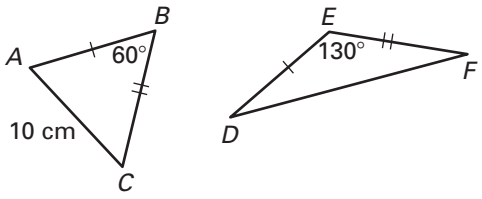
EXAMPLE 2 Finding Possible Side Lengths and Angle Measures

You can use the Hinge Theorem and its converse to choose possible side lengths or angle measures from a given list.

At the right, $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $AC = 10$ cm, $m\angle B = 60°$, and $m\angle E = 130°$. Which of the following is a possible length for $\overline{DF}$: 5 cm, 10 cm, or 15 cm?



SOLUTION

Because the included angle in $\triangle DEF$ is larger than the included angle in $\triangle ABC$, the third side $\overline{DF}$ must be longer than $\overline{AC}$. So of the three choices, the only possible length for $\overline{DF}$ is 15 cm.

Exercise for Example 2

Choose possible side lengths or angle measures from the given list.

7. In a $\triangle ABC$ and a $\triangle XYZ$, $\overline{AB} \cong \overline{YZ}$, $\overline{AC} \cong \overline{YX}$, $BC = 9$ inches, $XZ = 11$ inches, and $m\angle A = 47°$. Which of the following is a possible measure for $\angle Z$: 35°, 42°, 47°, or 53°?