

# 5.6

## Indirect Proof and Inequalities in Two Triangles

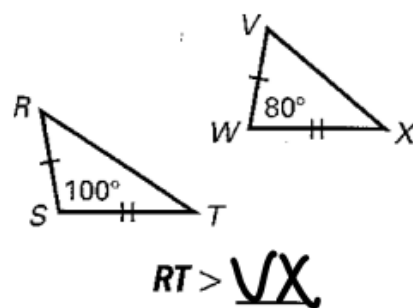
### VOCABULARY

Indirect proof

A proof in which you prove that a statement is true by first assuming that its opposite is true.  $\rightarrow$  leads to an impossibility  
\* proof by contradiction

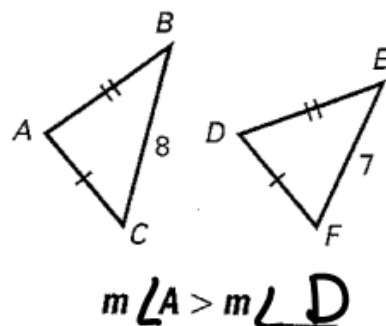
### THEOREM 5.14: HINGE THEOREM

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

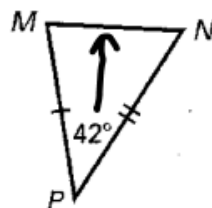
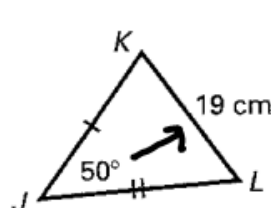
If two sides of one triangle are congruent to two sides of another triangle, and the third side of the first is longer than the third side of the second, then the included angle of the first is greater than the included angle of the second.



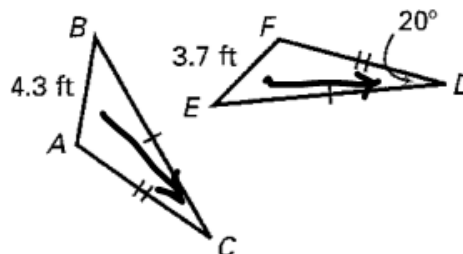
**Example 2** Finding Possible Side Lengths and Angle Measures

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

- a. Which of the following is a possible length for  $MN$ :  
16 cm, 19 cm, or 22 cm?



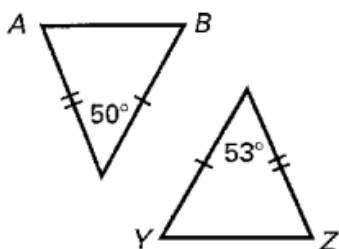
- b. Which of the following is a possible measure for  $\angle C$ :  
 $15^\circ$ ,  $20^\circ$ , or  $25^\circ$ ?

**Solution**

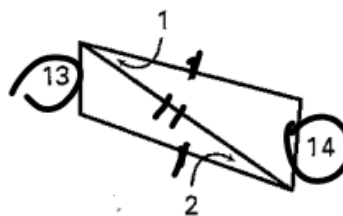
- a. Because the included angle in  $\triangle JKL$  is larger than the included angle in  $\triangle MNP$ , the third side  $KL$  must be longer than  $MN$ . So, of the three choices, the only possible length for  $MN$  is 16 centimeters.
- b. Because the third side in  $\triangle ABC$  is longer than the third side in  $\triangle DEF$ , the included  $\angle C$  must be greater than  $\angle D$ . So, of the three choices, the only possible measure for  $\angle C$  is  $25^\circ$ .

✓ **Checkpoint** Complete the statement with  $<$  or  $>$ .

1.  $AB$   $<$   $YZ$



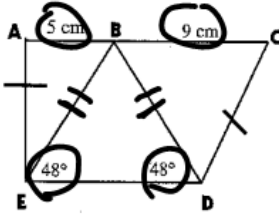
2.  $m\angle 1$   $>$   $m\angle 2$



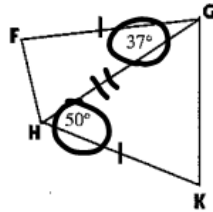
**Ex 1** Complete the inequalities with  $>$ ,  $<$ ,  $=$ , or Cannot Be Determined (CBD)...

**Remember: Find your 2 pairs of congruent corresponding sides first!**

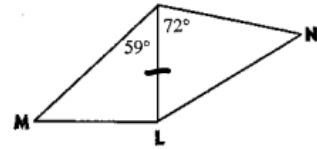
a.)  $m\angle AEB$   $<$   $m\angle BDC$



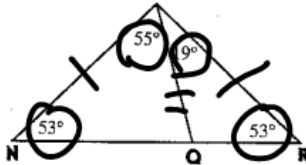
b.)  $GK$   $>$   $FH$



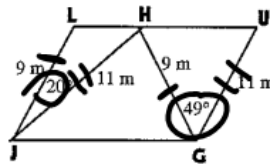
c.)  $ML$  CBD  $LN$



d.)  $NQ$   $>$   $QR$



e.)  $LH$   $<$   $HU$



f.)  $CS$   $>$   $QS$

