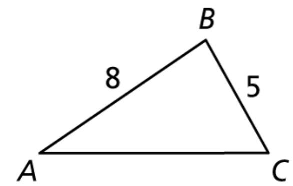
NOTES 6.5 & 6.6
INEQUALITIES IN ONE AND TWO TRIANGLES

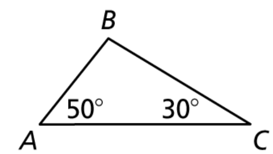
Objective:____

____

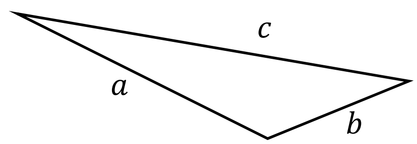
<table>
<tr><th>THEOREM</th><th>DIAGRAM</th></tr>
<tr><td>TRIANGLE LONGER SIDE THEOREM

If one side of a triangle is longer than another side, then the angle opposite the longer side is larger than the angle opposite the shorter side.</td><td>

If $\mathrm{AB} > \mathrm{BC}$, then ________>________.</td></tr>
<tr><td>TRIANGLE LARGER ANGLE THEOREM

If one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.</td><td>

If $m\angle \mathrm{A} > m\angle \mathrm{C}$, then _______>_______.</td></tr>
<tr><td>TRIANGLE INEQUALITY THEOREM

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.</td><td>

If c is the longest side, then $a + b > c$.</td></tr>
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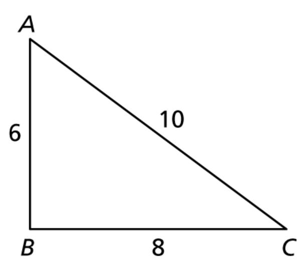
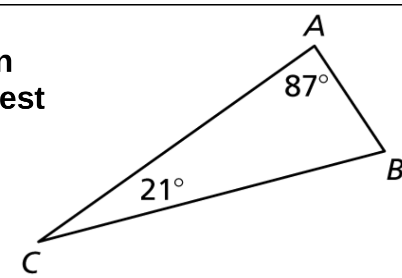
EXAMPLES:

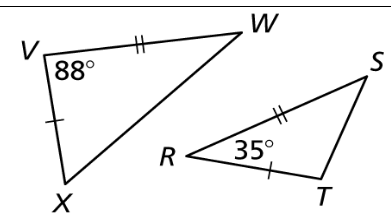
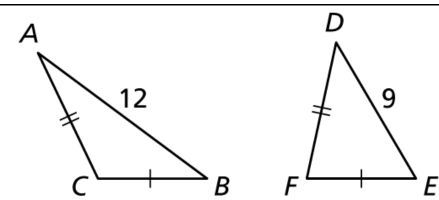
<table>
<tr><td>1. Write the angles in order from smallest to largest.

</td><td>2. Write the sides in order from shortest to longest.

</td></tr>
<tr><td>3. Tell whether a triangle can have sides with the given lengths.
$\mathbf{3, 5, 8}$</td><td>4. Tell whether a triangle can have sides with the given lengths.
$\mathbf{11, 15, 21}$</td></tr>
</table>

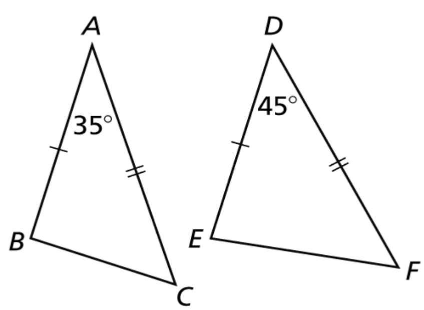
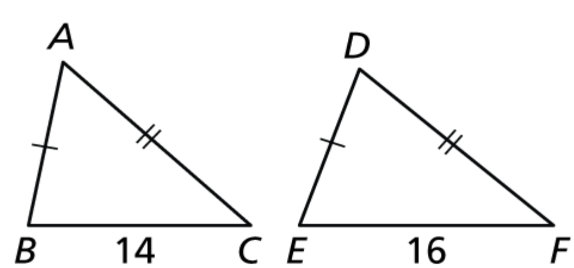
<u>Finding the Range of Values:</u>

Step 1: Find the SUM of the two sides. (ADD)
Step 2: Find the positive DIFFERENCE of the two sides. (SUBTRACT)
Step 3: Write the inequality: <u>DIFFERENCE $< x <$ SUM</u>

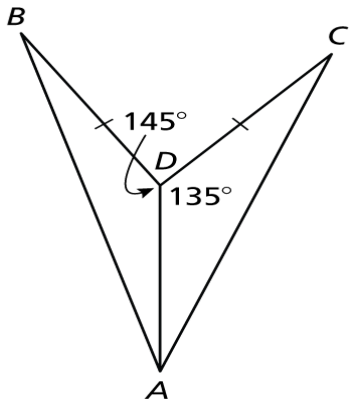
EXAMPLES:

5. Find the <u>range of values</u> for 'x' if the side lengths of a triangle are 4, 19 and x.	**6. Find the <u>range of values</u> for 'x' if the side lengths of a triangle are 2, 7 and x.**

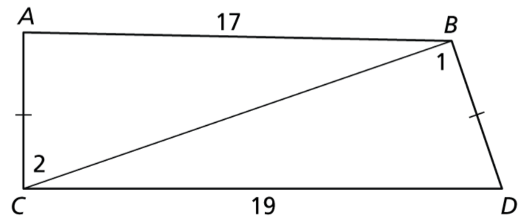
THEOREM	DIAGRAM
HINGE THEOREM If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first is longer than the third side of the second.	 ____________ > ____________
CONVERSE 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.	 ____________ > ____________

7. BC ________ EF 	**8. $m\angle$A ________ $m\angle$D** 

9. $\mathbf{AB}$ __________ $\mathbf{AC}$



10. $\boldsymbol{m\angle 1}$ ________ $\boldsymbol{m\angle 2}$

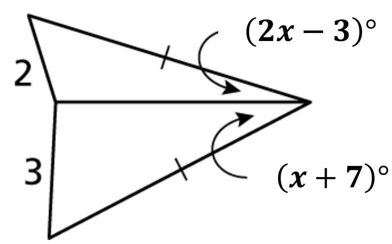


You can use the Hinge Theorem and its converse to find a range of values in two triangles.

Step 1: Compare the side lengths in the triangle.

__________ $<$ _________

So, ____________ $<$ ____________ **(substitute the angles)**



Step 2: Check that the measures are possible for a triangle (sides and angles must be $>$ 0)

(Substitute both angles or sides) ____________ $> \mathbf{0}$ ____________ $> \mathbf{0}$

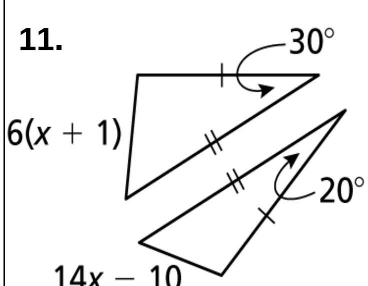
Take the larger of the two values for the next step.

Step 3: Combine the inequalities (Step 2 # $< x <$ Step 1 #)

_____________ $< x <$ _____________

EXAMPLES: Write and solve an inequality for the possible values of 'x'.

11.



12.