

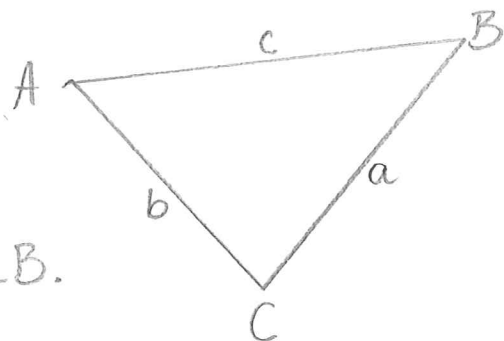
Section 5.5: Inequalities in a Triangle

Essential Question: How do you find the possible lengths of the 3rd side of a triangle, given the lengths of the other 2 sides?

Theorem 5.10:

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.

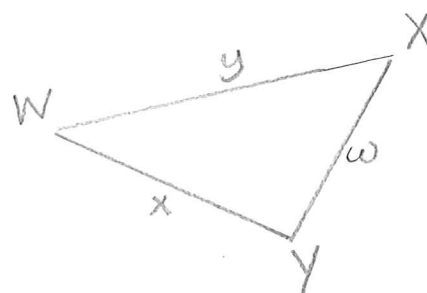
If $a > b$, then $m\angle A > m\angle B$.



Theorem 5.11:

If one angle of a triangle is larger than another angle, then the side opposite of the larger angle is larger than the side opposite the smaller angle.

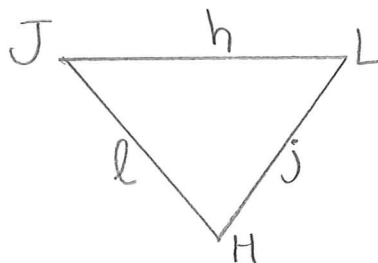
If $m\angle Y > m\angle W$, then $y > w$.



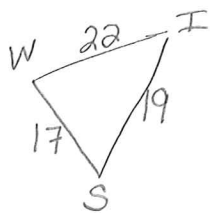
Theorem 5.12: Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is greater than the length of the 3rd side.

$j + h > l$ or $j + l > h$
 $h + l > j$



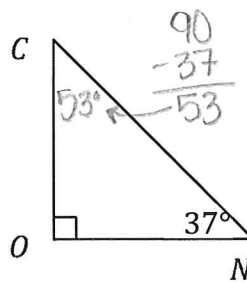
A1. $\triangle WIS$ has side lengths of $WI = 22$, $WS = 17$, and $SI = 19$. List the angles from smallest measure to largest.



Smallest \rightarrow largest
 sides: WS, SI, IW
 \angle 's: $\angle I, \angle W, \angle S$

* Notice \overline{WI} across from $\angle S$, the 3rd pt.

A2. In $\triangle CON$ list the sides in order from longest to shortest.



$\angle O, \angle C, \angle N$
 $\overline{CN}, \overline{ON}, \overline{CO}$
 $CN > ON > CO$

A3. Can you make a triangle with side lengths of 11 inches, 17 inches, and 5 inches? Explain.

$11 + 5 > 17$?
 $16 > 17$? **NO**

* Add 2 smallest sides first to check

Triangle Inequality Thm:
 Sum of 2 sides needs to be $>$ the 3rd but its not

→ Add & subtract the given 2 sides

A4. Describe the possible length of the 3rd side of a triangle given the lengths of the other two sides.

a. 12 cm, 10 cm

$$12 - 10 = 2 \text{ cm}$$

$$12 + 10 = 22 \text{ cm}$$

$$2 \text{ cm} < 3^{\text{rd}} \text{ side} < 22 \text{ cm}$$

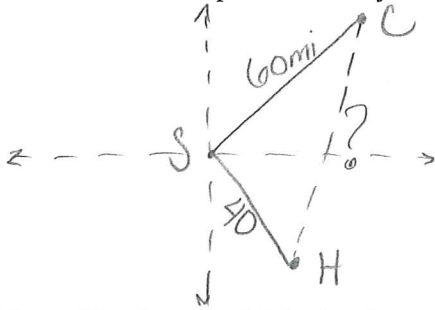
b. 2 ft, 32 in

$$32 - 24 = 8$$

$$32 + 24 = 56$$

$$8 \text{ in} < 3^{\text{rd}} \text{ side} < 56 \text{ in}$$

A5. Crayton Falls is 60 miles NE of Scottsville. Hutch City is 40 miles SE of Scottsville. How far apart are Crayton Falls and Hutch City?



$$60 - 40 = 20$$

$$60 + 40 = 100$$

$$20 \text{ mi} < CH < 100 \text{ mi}$$

OR Crayton Falls and Hutch City are 20 mi to 100 mi apart

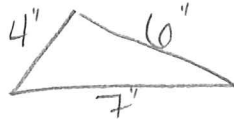
A6. You have a 17-inch piece of wire. You need to bend the wire to form a triangle with whole number side lengths. NO ≅ sides

*More possibilities

a) Sketch and label 2 possible scalene triangles that could be formed.



$$2 + 7 = 9 > 8$$



$$4 + 6 = 10 > 7$$

b) List two combinations of side lengths that will not produce triangles.

$$1, 1, 15$$

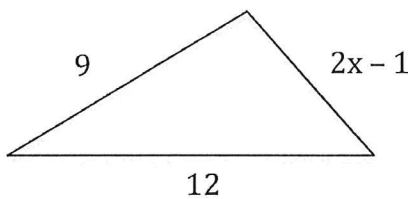
$$1 + 1 = 2 < 15$$

$$1, 2, 14$$

$$1 + 2 = 3 < 14$$

→ The sum is < the 3rd side so the combos do NOT create Δ's

A7. Describe the possible values of x.



$$12 - 9 = 3$$

$$12 + 9 = 21$$

$$3 < 2x - 1 < 21$$

$$+1 \quad +1 \quad +1$$

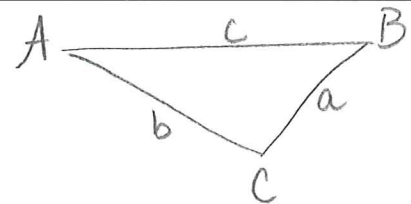
$$4 < 2x < 22$$

$$\frac{4}{2} < \frac{2x}{2} < \frac{22}{2}$$

$$2 < x < 11$$

Section 5.5 Summary:

Given 2 sides of a Δ , the sum ^(add) must be greater than the 3rd side and the difference _(subtract) of the 2 given sides must be less than the 3rd side.



$$|a - b| < c < a + b$$

3rd side