## Math 1312 Section 3.5 Inequalities in a Triangle

**Lemma:** If  $\angle 3$  is an exterior angle of a triangle and  $\angle 1$  and  $\angle 2$  are non-adjacent interior angles, then,  $m \angle 3 > m \angle 1$  and  $m \angle 3 > m \angle 2$ . The measure of an exterior angle is greater than the measure of either of the nonadjacent angles.)



**Lemma:** If a triangle contains a right or obtuse angle, then that angle's measure is greater than either of the two other angles in the triangle.



**Theorem:** If one side of a triangle is longer than a second side then the measure of the angle opposite the longer side is greater than the measure of the angle opposite the shorter side.

**Theorem:** If the measure of one angle of a triangle is greater than the measure of a second angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.

**Example:** Given  $\Delta RST$  with angles that have the following measures. Arrange the sides in order of size.



**Theorem: (Triangle Inequality)** The sum of the lengths of any two sides of a triangle is greater than the length of the third side.



**Theorem: (Triangle Inequality)** The length of any side of a triangle must be between the sum and difference of the other two sides.

**Example:** Which of the following sets of numbers cannot represent the sides of a triangle?



**Example:** If the lengths of two sides of a triangle are 10 and 15, between what two numbers must the measure of the third side fall?

15-10 < × < 10+15 5 < × < 25

**Example:** 

A. Arrange sides from smallest to largest.





B. Arrange angles from smallest to largest.



 $20 \leq 24 \leq 35$ m  $2X \leq m \leq T \leq m \leq T$ 

## Example:

List the sides of **ABC** in order from longest to shortest

 $m \angle A = 4x + 20 = 88^{\circ}$   $m \angle B = 2x + 10 = 44^{\circ}$  $m \angle C = 4x - 20 = 48^{\circ}$ 



gest to shortest.  

$$BC > AB > AC$$

$$4x + 20 + 2x + 10 + 4x - 20 = 180$$

$$10x + 10 = 180$$

$$x + 1 = 18$$

$$x = 17$$

Popper 12 5 Bs

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