

Day 5 – Triangle Inequality Theorems – Notes

Angles Exploration Activity

Directions: With your partner, your goal is to create as many triangles as possible from the six pieces given. You will record which three pieces you used by placing a check and whether or not it formed a triangle. At the end, you will make a conjecture on when three sides will actually form a triangle and when they will not.

Triangle	Orange 5cm	Purple 7.07 cm	Green 8.66	Yellow 10 cm	Blue 12.24 cm	Red 14.14 cm	Triangle? Yes or No
1				✓	✓	✓	yes
2		✓	✓	✓			yes
3			✓	✓	✓		yes
4		✓	✓		✓		yes
5		✓	✓			✓	yes
6	✓		✓		✓		yes
7	✓		✓			✓	no
8	✓	✓	✓				yes
9	✓	✓		✓			yes
10	✓	✓			✓		no
11		✓		✓		✓	yes
12	✓	✓				✓	no
13							
14							
15							

**Conjecture:** Take a look at your attempts that would NOT form a triangle. What do you notice about the side lengths in comparison to the side lengths that DID form a triangle?

Not a Triangle

5, 7.07, 14.14

5, 7.07, 12.24

5, 8.66, 14.14

The two shorter legs added together are less than the longest side.

**Triangle Inequality Theorem**

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

Smaller sides  $\left[ a + b \right] > c$  longest side

This means: any two sides of a triangle and add their lengths together - it has to be greater than the remaining side.

**Examples.** Determine if the following lengths will form a triangle:

a. 3 ft, 7 ft, 8 ft

$$3 + 7 > 8$$

$$10 > 8$$

Forms triangle

b. 5 ft, 10 ft, 15 ft

$$5 + 10 > 15$$

$$15 > 15$$

Does not form a triangle

The lengths of two sides of a triangle are 8 ft and 12 ft. Describe a range of values for the third side that would create a triangle.

$$8 + 12 > c \quad \text{and} \quad c + 8 > 12$$

$$c < 20 \quad \quad \quad c > 4$$

$$4 < c < 20$$

**Side Inequality Theorem**

**Side Inequality Theorem:** If one side of a triangle is longer than the other side, then the angle opposite the longer side has a greater measure than the angle opposite the shorter side.

This means: The largest angle of a triangle lies opposite the longest side. The smallest angle lies opposite the shortest side. If two angles are equal, their side lengths will be equal.

**Example:** List the sides from shortest to longest for each diagram.

