Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Triangle Inequality Investigation**

Monica

Geometry Period:\_\_\_\_

Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Break a piece of spaghetti into three pieces, and use the pieces to form a triangle. (Make sure the pieces do not overlap.) Measure each side length to the nearest tenth of a centimeter. In the table below, record the measures of each side of the triangle from smallest to largest. Then, find the sum of the measures of the small and medium sides. Repeat this activity twice, with two different triangles, to complete the chart.

|  |  |  |  |
| --- | --- | --- | --- |
| **SMALL** | **MEDIUM** | **LARGE** | **SMALL + MEDIUM** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

2. Break a piece of spaghetti into three pieces so that it is impossible to form a triangle. (The endpoints of the sides should not meet.) Measure each side of the non-triangle to the nearest tenth of a centimeter. In the table below, record the measures of each side of the non-triangle from smallest to largest; then, find the sum of the measures of the small and medium sides. Repeat this activity twice, with two other non-triangles, to complete the chart.

|  |  |  |  |
| --- | --- | --- | --- |
| **SMALL** | **MEDIUM** | **LARGE** | **SMALL + MEDIUM** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

3. Compare the sum of the measures of the small and medium sides to the measure of the large side **for each triangle** you created. Describe what you notice.

4. Compare the sum of the measures of the small and medium sides to the measure of the large side **for each non-triangle** you created. Describe what you notice.

**5. Make a conjecture**. Based on your observations, write a conjecture about the relationship between the sum of the measures of the small and medium sides of a triangle and the measure of the large side of the triangle. Provide a reason for your conjecture.

6. **Test your conjecture**. Using a partner's measurements, test your conjecture. If your conjecture holds for your partner's measurements, provide a convincing reason why your conjecture would hold for any triangle. If your conjecture does not hold for your partner's measurements, revise your conjecture.

**7. Consider this**. Is it possible to have a triangle such that the sum of the measures of the small and medium sides is equal to the measure of the large side? Provide a convincing reason for your answer. (You may use spaghetti, if you like.)

8. **Logical Reasoning**. If the sum of the measures of the small and medium sides of the triangle is greater than the measure of the large side of the triangle, we can conclude that the sum of the measures of any other pair of sides of the triangle will be greater than the measure of the remaining side. Explain why this conclusion is possible.

9. In the box below, write three inequalities that are always true for a triangle with side lengths *a*,

*b*, and *c*. (These inequalities should be based on your conclusions from Question 8.)

**THE TRIANGLE INEQUALITY THEOREM**

In a triangle with side lengths *a, b,* and *c:*

\_\_\_\_\_ + \_\_\_\_\_ > \_\_\_\_\_

\_\_\_\_\_ + \_\_\_\_\_ > \_\_\_\_\_

\_\_\_\_\_ + \_\_\_\_\_ > \_\_\_\_\_

10. Using what you discovered in this investigation, determine if the measurements below could be used to create a triangle. Explain why or why not.

|  |  |  |
| --- | --- | --- |
| **SIDE LENGTHS** | **Is it a triangle? (Yes/No)** | **Explain why or why not.** |
| 5, 8, 3 |  |  |
| 2, 2, 2 |  |  |
| 10, 9, 8 |  |  |
| 6.2, 7.4, 1.1 |  |  |

 11. In , AB = 5, feet and BC = 3 feet. Which inequality represents all possible values for the length of , in feet? (Show your work!)

1)  2)  3)  4) 

 12. The direct distance between city *A* and city *B* is 200 miles. The direct distance between city *B* and city *C* is 300 miles. Which could be the direct distance between city *C* and city *A*? (Show your work!)

 1) 50 miles 2) 350 miles 3) 550 miles 4) 650 miles

13. In the diagram below of , *D* is a point on , AC = 7, AD = 6, and BC = 18. The length of could be

|  |  |
| --- | --- |
| 1) | 5 |
| 2) | 12 |
| 3) | 19 |
| 4) | 25 |

**

14. What is the smallest integer, x, for which x, x + 5, 2x - 15 can be the lengths of the sides of a triangle?