

# The Triangle Inequality

NAME \_\_\_\_\_

During this activity, you will compare the sum of the measures of any two sides of a triangle with the measure of the third side.

1. Break a piece of spaghetti into three pieces, and use the pieces to form a triangle. 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 other 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. 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  $s$ ,  $m$ , and  $l$ . (These inequalities should be based on your conclusions from Question 8.)

THE TRIANGLE INEQUALITY

In a triangle with side lengths  $a$ ,  $b$ , and  $c$ ,

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} > \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} > \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} > \underline{\hspace{2cm}}$$