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RESOURCE AREA FOR TEACHING

STEAM: SCIENCE, TECHNOLOGY, ENGINEERING, ARTS, MATHEMATICS

LEARNING ACTIVITY

Material Needed

- 6-sided die (numbered or pipped) or stack of 24 index cards
- 12 regular size drinking straws, 7-8 inches long
- String, 2 ft.
- Scissors
- 12-inch ruler
- Pen/pencil

Grade Range

6-8

Topics/Skills

Math: Solving Single-Variable Equations and Inequalities; Triangle Types and Properties

Learning Standards

CCSS Math: [Expressions and Equations with Inequalities]

Duration

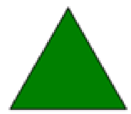
20-30 minutes

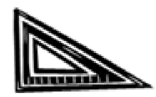
Prep Time

5-10 minutes

Triangle Tango

Investigating the Triangle Inequality Theorem





Students randomly select lengths for the 3 sides of a triangle. Then the Triangle Inequality Theorem is used to determine if the triangle is mathematically possible. Students confirm the theorem by modeling the triangle using simple materials and then identify the type of triangle formed.

Activity Challenge

Use some math, straws, and string to identify and model possible triangles!

Preparation

1. Review the Materials Needed list and gather required items.
2. Measure and cut straws into 18 sections, 3 each of the following sizes: 1-inch, 2-inch**,** 3-inch**,** 4-inch**,** 5-inch**,** and 6-inch.
3. Separate each set of measured straw sections into its own pile.
4. If a 6-sided numbered or pipped (dotted) die is not available, divide a stack of 24 index cards into 4 even stacks. Label the cards in each stack 1-6, combine all the cards, and shuffle them thoroughly.

To Do

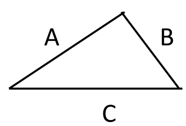
1. Roll the die 3 times (or draw 3 numbered cards) to get the side lengths of a triangle. Order them shortest to longest and record them in the table under **A**, **B**, and **C** (see next page).
2. Add side lengths **A** and **B**. Record the sum in the data table under **A+B**.
3. Write an inequality in the table in the format **A+B > C**, entering the 3 length values (see example in table).
4. Evaluate the inequality and determine if it is true or false.
5. Take the straw sections that correspond to the side lengths from step 1.
6. On a flat surface, lace the string through all 3 straw sections and tie the string ends in overhand fashion, like tying a shoelace. Pull slowly to remove all the slack and observe the sides folding up.
7. If the triangle is possible, indicate the type of triangle in the table using these terms: equilateral (all sides equal), isosceles (two equal sides), scalene (no equal sides).
8. Repeat steps 1-5 for five more triangle models.

Extensions

- Measure the angles in each triangle and note any observed relationships between angles and side lengths.
- Use longer straws and larger numbers to build and evaluate larger triangles.

The Content behind the Activity

This activity involves one of the most important theorems in Euclidean geometry, the **triangle inequality theorem**. This theorem is widely used in architecture and in various engineering applications. It states that the sum of the lengths of two sides of a triangle is greater than the length of the third side. Stated another way, the length of one side of a triangle is less than the sum of the remaining two side lengths (see below). Students evaluate this inequality for each triangle they model to compare mathematically possible triangles to physical ones, providing students a simple means of confirming the theorem.



For a triangle with sides A, B, & C:
A + B > C

Triangles are classified according to their angle and/or side length measures. Triangles are classified by angle measure as **right** (one 90° angle), **obtuse** (one angle larger than 90°), or **acute** (all angles < 90°). By side length, triangles are **equilateral** (all sides equal), **isosceles** (two equal sides), or **scalene** (no equal sides). Side lengths and angle measures are interrelated, meaning the inequality theorem can be used to describe the angles inside a triangle as well as the side lengths.

Triangle Tango Data Table

Model No.	Side Lengths (inches)						
	A	**B**	**C**	**A + B**	**A + B > C, True or False?**	**Possible?**	**Type**
Example	*4*	*4*	*5*	*4 + 4 = 8*	*8 > 5, True*	*Yes*	*Isosceles*
1							
2							
3							
4							
5							
6							