STEM at HOME

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

PRESENTED BY: girlstart

Engineer a Pyramid

Learn how Ancient Egyptians accomplished the monumental task of building gigantic stone pyramids. Then, explore the world of triangle geometry by using thin toothpicks to create your own sturdy structure.

Materials:

- Mini marshmallows (or similar items such as gumdrops, small pieces of modeling clay, Styrofoam packing peanuts, etc.)
- Toothpicks

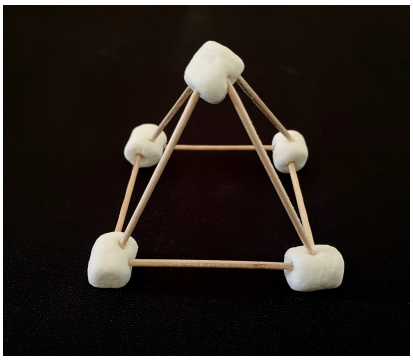
TEKS:

MATH 3.6: The student applies mathematical process standards to analyze attributes of two-dimensional geometric figures to develop generalizations about their properties.
MATH 3.6 A: The student is expected to classify and sort two- and three-dimensional figures, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language.
SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.
MATH 4.6 C: The student is expected to apply knowledge of right angles to identify acute, right, and obtuse triangles.

Experiment/How To:

First, create a simple square pyramid:

1. Use your materials to construct a two-dimensional square out of four toothpicks. Attach the toothpicks at the corners using your mini marshmallows (or similar items such as gumdrops, modeling clay pieces, etc.).
2. Lay your square down on your workspace. Stick the end of a toothpick in each corner so that the other ends of all four toothpicks connect together with another mini marshmallow or similar item.
3. You have now created a three-dimensional square pyramid.



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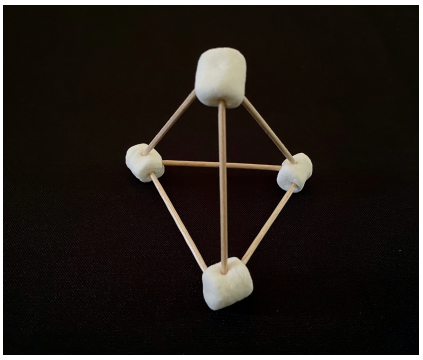
Next, create a simple triangular pyramid:

1. Use your materials to construct a two-dimensional triangle out of three toothpicks. Attach the toothpicks at the corners using your mini marshmallows or similar items.
2. Lay your triangle down on your workspace. Stick the end of a toothpick in each corner so that the other ends of all three toothpicks connect together with another mini marshmallow or similar item.
3. You have now created a three-dimensional triangular pyramid.



Now, use additional materials to add on to either of these two pyramids!

- Is the triangular or square pyramid stronger? Pick your favorite and use it as your inspiration for a larger pyramid.
- Can you connect multiple triangular or square pyramids together? Or, can you make a pyramid that is two or three stories tall?

STEM Connection:

Triangles are a very special geometric shapes that have three sides, and three angles that add up to 180 degrees. Equilateral triangles, which have three equal sides and three 60-degree angles are commonly used when designing buildings. In fact, architects love to utilize triangles in their designs because a triangular shape provides strength and stability. Buildings that incorporate the triangular shape have a wide, heavy base, which allows for weight at the top to be more evenly distributed. An important example of equilateral triangles used in architecture is in Ancient Egyptian pyramids. Each of the four sides of these structures is an equilateral triangle, and they have been standing for over 4,000 years! But how did they build these monstrous stone pyramids without the use of modern-day building technologies?

The method of Egyptian pyramid construction is a mystery that archeologists have been trying to solve for many years. It is believed that workers cut large blocks of stone and then carefully moved them up the pyramid on ramps. This was a slow process! Scientists estimate that it took at least 20,000 workers over 23 *years* to build the Great Pyramid of Giza. Because it took so long to build them, Pharaohs generally started the construction of their pyramids as soon as they became ruler.

Career:

Geometrists study the size, shape, and position of two-dimensional shapes and three-dimensional figures. They use the measurement, properties, and relationships of angles, surfaces, and solids to develop theories and patterns about our world. They apply their findings and geometric reasoning to architecture, art, engineering, robotics, astronomy, sports, nature, and more.

Resources:

http://almostunschoolers.blogspot.com/2011/12/building-bigger-pyramid-marshmallow-and.html
http://www.ducksters.com/history/ancient_egyptian_pyramids.php
https://sciencing.com/triangles-used-in-architecture-12084289.html
https://wild.maths.org/power-triangles

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