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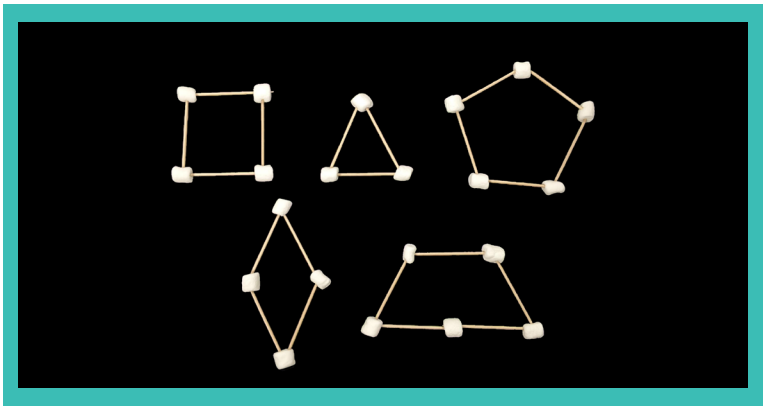
Marshmallow Bridges

The engineering design process has several steps including:

1. Identify a problem.
2. Brainstorm solutions.
3. Select a design.
4. Build a model or prototype.
5. Test and evaluate.
6. Optimize the design.
7. Repeat steps 5 and 6 until a working design is found.
8. Share the solution.



Materials

- Mini marshmallows
- Toothpicks
- 2 flat surfaces for the bridge to sit on (not provided)

Vocabulary

Bridge - A structure that connects two edges of land across a gap or body of water.

Technology - A modification of the natural world made to fulfill human needs or wants.

Engineering - A systematic approach to designing objects, processes, and systems.

Standards

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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SAFETY FIRST! DO NOT eat the mini marshmallows included in your kit.

The Challenge

Create a bridge out of marshmallows and toothpicks to connect two surfaces that are at least 6 inches apart.

Rules:
- You may only use marshmallows and toothpicks.
- Your bridge must span at least 6 inches.
- Your bridge cannot collapse.
- Your bridge must be able to hold extra weight.

Building Process

1. Two-dimensional shapes are the basic building blocks of bridges. Begin by building some basic shapes.
    TRIANGLE: 3 marshmallows and 3 toothpicks.
    SQUARE: 4 marshmallows and 4 toothpicks.
    DIAMOND: 4 marshmallows and 4 toothpicks.
    TRAPEZOID: 5 marshmallows and 5 toothpicks.
    PENTAGON: 5 marshmallows and 5 toothpicks.

2. Examine how each shape functions.
    Which shapes are wobbly?
    Which shape is the easiest to damage?
    Which shape gives you the most distance?
    Which shape takes the most toothpicks and marshmallows to make?
    Which shapes are easiest to connect?
    Which shapes are strongest when connected?

3. Go online and look at photos of bridges. Are any of them made from the shapes that you created? Try combining shapes to build your bridge. Which combination of shapes is the best?

4. Using only the marshmallows and toothpicks now build your bridge to connect your two surfaces. See how much weight your bridge can hold.

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Bridges

Bridges are structures that span a gap, usually over a waterway, road or other divide between lands. Bridges are designed to allow resources such as people, traffic or animals to cross from one location to another. Engineers design and build modern bridges to hold tremendous amounts of weight and last for decades. The longest bridge in the world is the Danyang-Kunshan Grand Bridge in China. Located on the Jinghu High-Speed Railway, the bridge is 102 miles long!

Types of Bridges

Arch Bridges

Beam and Truss Bridges

Suspension Bridges

Read a book and keep Exploring

*Superwomen in STEM: Women Scientists in Math and Coding, Catherine Brereton (2018) Gareth Stevens Publishing, ISBN 9781538214084

*100 Things to Know About Numbers, Computers and Coding, Alice James, Eddie Reynolds, Minna Lacey, Rose Hall and Alex Frith, (2018), Usborne Publishing Ltd., ISBN 9780794544218

*Code Like a Girl: Rad Tech Projects and Practical Tips, Miriam Peskowitz (2019) Alfred A. Knopf publisher, ISBN 9781524713898

*Maker Lab 28 Super Cool Projects: Build, Invent, Create and Discover, Smithsonian (2016), DK Publishing, ISBN 9781465451354

*Project Code: Create Computer Games with Scratch, Kevin Wood (2018), Lerner Publishing Group, ISBN 9781541524392