Project Exploration creates transformative learning opportunities for youth underrepresented in the sciences --particularly students of color and girls -- by equipping them with the skills, practices, and mindset needed for a lifelong pursuit of learning. STEM@Home makes activities around science, technology, engineering, and math accessible and fun to do at home. This STEMbook activity, resources, and more are availble at www.projectexploration.org/stemathome.

In this activity, you will:

learn about various structures and make your own models using toothpicks!

Supplies Required:

Tooth Picks
Mini marshmallows

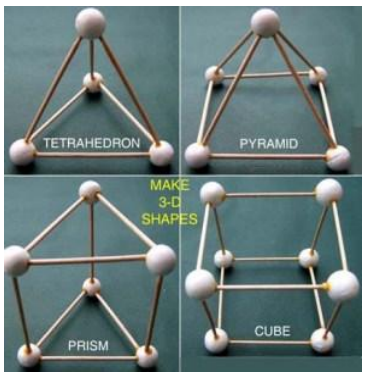
Video

Engineering principles and building with marshmallows: https://tinyurl.com/pogcl8r

Overview

As you look around the city and the various buildings, you might notice that architects use everyday shapes in the design of real world structures. Are there any shapes that you notice are exceptionally more common than others? Why do you think this is?

Today, we're going to use various shapes as we building structures out of tooth picks and mini marshmallows. As we build the structures, we will start to make hypotheses about and investigate which structures are strongest. Are square structures more strong? Or are rectangles? If your structure is weak and wobbly, adding toothpicks to make what shapes makes the strucute stronger? Try making different toothpick structures using the sample shapes below.



Instructions

1. **Problem -** What do we want to solve?
   We need to build three structures, each aimed at solving a specific problem:
   - 1 - strongest structure you can make - needs to hold apple or booklet
   - 2 - tallest structure you can make - at least four stories!
   - 3 - nicest looking strcuture you can make
2. **Solutions -** What are some ways to solve the problem?
   Illustrate your ideas and share them with any nearby friends or family members. Are there other ideas they have? Other shapes you can include? What are some variations of the designs?
3. **Model** - Build your design!
   Build your illustrated designs using the marshmallows and toothpicks you were provided in your STEMkit.
4. **Test** - Does your model work?
   Apply pressure to your models. Does they hold up? What shapes did you use in the strongest designs? Is the strongest design also the best looking design? Does your tallest structure hold up to pressure? What shapes did you use?
5. **Reflect & Redesign -** Was your model successful? Does it need to be redesigned? Explain what was successful and unsuccessful in their model. Does it need to be redesigned? If so, how?

Additional Resources

Think about it! How do shapes play a role in structures? How does engineering play a role in making these strucutes? How does art or being creative play a role in the Engineering Design Process? Did the limited amount of material prevent you in creating the strongest or tallest structures? Expand on your knowledge with these videos and see if you agree that triangles are the strongest shape based on your models.

1. Geometric shapes used in real life architecture: https://tinyurl.com/y58aehvj
2. Why are triangles so strong: https://tinyurl.com/uwtj7yx

Share It Out

Take your structures apart and build them again using all the knowledge you've gained by creating various models and testing them to see which is the strongest and based on which one you think is the nicest looking. Build any structure you'd like!

Share on social media: Take a photo of your final tower and share it on social media using the hastags:

#MarshmallowToothpickChallenge
#ProjectExploration
#STEMatHome

For more activities like this one, go to www.projectexploration.org/stemhome. If you're interested in learning more about Project Exploration and our free events, programs, and activities, please find us on social media and be sure to follow!