



# Pennsylvania 4-H Marshmallow Catapult

**Lesson Title: Marshmallow Catapult**

**Age Appropriateness:**

- Elementary
- Middle School
- High School
- All 4-H Ages

**Suggested amount of time for lesson: 40- 60 minutes**

**Supplies Needed**

- Craft sticks
- Rubber bands
- Marshmallows – large or mini
- Bamboo skewer
- Plastic spoon
- Pencil
- Other helpful items might include binder clips, brad fasteners, paper clips or other household items

**4-H Project that aligns with this activity: Junk Drawer Robotics**

**Lesson:**

**Objectives:**

**Design a catapult that satisfies the following requirements:**

- A trebuchet-style swing arm.
  - A **catapult** is any device that throws an object, although it commonly refers to the medieval weapon. **Trebuchets** are a type of **catapult**, using gravity (with a counterweight) or traction (people pulling down), to propel the arm and often employing a sling at the end of the arm for greater distance.
- The arm must be adjustable (moveable pivot point).
- Use at least 5 different types of materials or parts (craft sticks, brads, dowels, paint stirring sticks. etc.) as part of the construction
- Use weights and gravity as power source.
- Launch a Marshmallow at least 6 feet!

## Activity:

Think of how you could design a trebuchet-style mini catapult, big and strong enough to launch a marshmallow with items from your bag of supplies or items you find around your house. Put on your engineer hat and make a sketch of your design idea. You may browse the internet (with an adult or with adult's permission) for pictures of different types of catapults. Search for a trebuchet-style catapult.

1. Put on your engineer hat and make a sketch of your design idea. You may find you have to make several different sketches before you are ready to begin construction. You can make your sketch on plain paper on the **Engineer Notebook pages attached**

### **Did you know?? During the design process, engineers:**

- Identify the problem or challenge.
- Identify design requirements and limitations on the design due to available resources and the environment.
- Brainstorm possible solutions to the problem or challenge.
- Generate ideas and develop the most promising ones.
- Explore possibilities and the pros and cons of each.
- Select an approach by identifying the design that appears to solve the problem best.

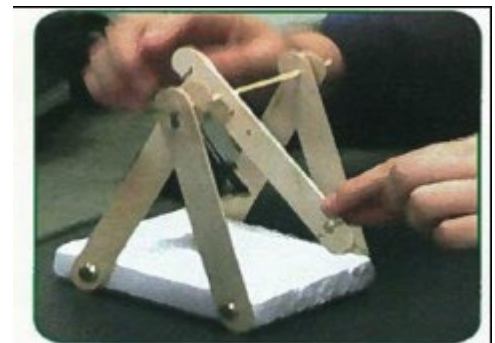
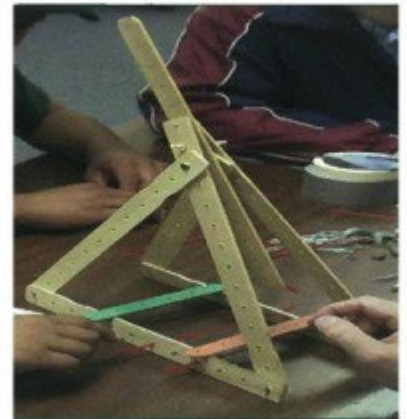
2. Build a model or prototype.

### **Try it out!**

3. Test your Catapult
  - Refine the design by identifying changes that need to be made and improving the model or prototype. (nationalgeographic.com)
  - Think about what you have that be used as weights
  - Plastic spoons make a great payload (marshmallow) holder, but do you have other ideas of what can be used.

It is extremely rare for engineers to get a working design exactly right the first time. Try launching a marshmallow with your catapult.

- How far did the marshmallow go?
  - What could you do to make it go farther?
- If your catapult did not work, go back to the ***Did you know??*** list and see what improvements you could make.



The **Engineering Design Process** consists of six steps and at any point you may need to return to a previous step to redesign or improve your idea:

1. State the Problem
2. Generate Ideas
3. Select a Solution
4. Built the Item
5. Evaluate
6. Present Results

### **Remembering:**

What is a catapult?

Were you able to create a catapult with an adjustable arm?

Were you able to launch your marshmallow at least 6 feet?

### **Applying**

What do you think you could do to improve your design?

What elements would you choose to change if you build a new catapult?

### **Analyzing**

Do you think your catapult would be more or less effective in launching a large marshmallow vs. a small marshmallow?

Are these supplies you wish you had that would make your design more effective?

### **Evaluating**

Did your design meet the specification listed?

Were these things you would do different if you did this again?

### **Sharing**

Did you share your project with anyone?

### **References used for this lesson**

National 4-H Council: Junk Drawer Robotics Module 1 and Youth Robotics Notebook  
<http://www.pickyourspin.org/junk-drawer-robotics-week-one.html>

To Find out More about 4-H programs visit: <https://extension.psu.edu/programs/4-h>



This publication is available in alternative media on request.

The University is committed to equal access to programs, facilities, admission, and employment for all persons. It is the policy of the University to maintain an environment free of harassment and free of discrimination against any person because of age, race, color, ancestry, national origin, religion, creed, service in the uniformed services (as defined in state and federal law), veteran status, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information, or political ideas. Discriminatory conduct and harassment, as well as sexual misconduct and relationship violence, violates the dignity of individuals, impedes the realization of the University's educational mission, and will not be tolerated. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Office, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Email: [aao@psu.edu](mailto:aao@psu.edu), Tel 814-863-0471.

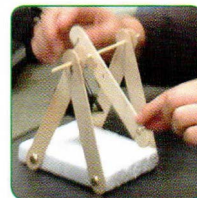
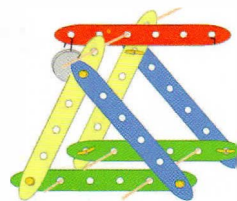


## To Do

### Activity – Marshmallow Catapult Design

Design a special catapult that can launch a marshmallow:

- Design a “Trebuchet” style swing arm catapult.
- The arm of the catapult must be adjustable (moveable pivot point).
- Use at least five (5) different types of materials or parts (craft sticks, brads, dowels, etc.).
- Use weights and gravity as the power source.
- Launch a marshmallow at least six (6) feet.



Use words, drawings, measurements, and other tools to help in describing your design. Describe the materials you plan to use and how you may have to change them by cutting, bending, or fastening them together.



4-H Robotics:

# Engineering for Today and Tomorrow Robotics Notebook

Date \_\_\_\_\_

Signature \_\_\_\_\_

## To Make

### Activity – Marshmallow Catapult Build

Describe how your design worked and any changes you had to make since your first design.

Indicate the target pattern for your marshmallow landings. Were they 6 feet away; were they close to each other?

Draw your final design below: