



# **BUILDERS BONANZA**

## **Lesson: Catapults**

### **CURRICULUM REFERENCE: Movement**

#### **LESSON OBJECTIVE**

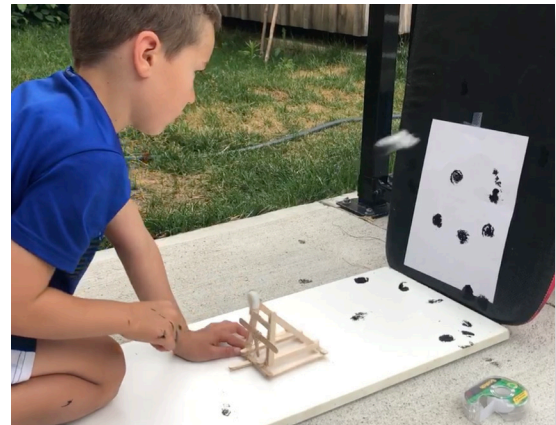
Build your own catapult to see how far a cotton ball or other small objects will fly through the air using force and energy.

**VIDEO:** <https://youtu.be/tVdGhVZO6Bg>

#### **THE SCIENCE BEHIND**

Catapults are a physics-based project that uses stored energy to project an object without the use of an explosive. The three primary energy forces are tension, torsion, and gravity.

**VIDEO:** <https://youtu.be/6U8ZS9r0kq8>



#### **FOLLOW-UP QUESTIONS**

1. How does the motion of the catapult create energy?
2. Why does the cotton ball move once the catapult has released?
3. Does this simple machine make the action of moving the cotton ball easier?
4. What is the purpose of your mechanism?
5. What kind of movement does it demonstrate?
6. What were some of the challenges in designing and making your structure?

#### **LEARNING OUTCOMES**

- Investigate and describe different kinds of movement.
- Investigate the structure and function of simple machines.
- Describe different ways in which objects move.
- Identify ways in which the position of an object can be changed.



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## Lesson: Catapults

### MATERIALS (PER PERSON)

- 4 elastic bands
- 20 popsicle sticks
- Tape
- 10 Cotton balls
- Paint
- 1 plastic bottle cap
- 2 sheets of paper
- Hot glue

### INSTRUCTIONS

1. Using the first four popsicle sticks, create a square base by gluing the ends together.
2. Take three more popsicle sticks and glue them into a stack, one on top of each other. Now make a second stack of three popsicle sticks.
3. Take another popsicle stick and hot glue a plastic bottle cap to one end with the flat part facing the popsicle stick.
4. Take the square and the stacks and glue them together to make three equal parts across the square.
5. Now, take three more popsicle sticks and create a backwards “4”. Make sure the cross part of the “4” hits the middle of the vertical stick. Repeat this step to make a second identical “4” shape with three popsicle sticks.
6. Cut off excess popsicle stick ends so you are only left with the main triangle.
7. Attach both triangles along both sides of the stacks found on the main base square.
8. Take the popsicle stick with the bottle cap and another popsicle stick and tie them together by wrapping an elastic band around them tightly.
9. Using the excess popsicle stick pieces from before, cut and glue them onto the sides of the triangles for added support to your structure.
10. Now let’s add the arm onto our catapult. Do this by gluing the two cross pieces (perpendicular to the bottle cap) to the back side of the base structure.
11. Glue another popsicle stick across the front of the arm to stop the arm with the bottle cap.
12. Take another excess piece and glue it to the bottom of the base (underneath, but flat to the structure) where we will eventually attach the elastic band.
13. Take another popsicle stick and cut it into smaller pieces to reinforce the brace. This will go behind the cross piece and in front of the arm with the bottle cap.
14. Now, we pull the elastic band under the structure and onto the small bottom tab.

### VIDEO DEMOS:

Step 1: <https://youtu.be/jr6zWgXjFRo>

Step 2 & 3: [https://youtu.be/8KNn\\_u9LaXy](https://youtu.be/8KNn_u9LaXy)

Step 4 - 6: <https://youtu.be/r9jqZUzqvVg>

Step 7: <https://youtu.be/oXMa3PzoD6k>

Step 8 & 9: <https://youtu.be/bpl6WpXeQsk>

Step 10 - 12: <https://youtu.be/YW0u-vftsXM>

Step 13 & 14: <https://youtu.be/x5gQd5V3Dcc>