UNIT: catapult

BUILD A LAUNCHER- Design for distance

Your Mission:

You’re taking on the role of an energy engineer! Your goal is to design, build, and test a cotton ball launcher that turns stored energy into motion. Test different launch angles and pull-back distances to send your cotton ball flying as far and accurately as possible. Let’s build for distance!

Focus: Forces, Motion & Energy Transfer

Materials:

* Craft sticks (popsicle sticks)
* Rubber bands
* Plastic spoon
* Cotton balls
* Tape
* Paper clips or binder clips
* Ruler or measuring tape
* Protractor
* Target markers (1m and 2m

STUDENT DIRECTIONS:

**Student Directions:**

**STEP 1: Base Structure:**

* + Use craft sticks and rubber bands to build a strong, stable base.
  + Stack 5–6 sticks and wrap rubber bands around both ends to form the body.
  + Use a few more sticks and rubber bands in a cross shape to form a sturdy support.

**STEP 2: Attach the Launcher Arm:**

* + Use a plastic spoon as your catapult arm.
  + Secure the spoon to the top stick using a rubber band so it can pivot (flex and launch).
  + You can also tape it to a single stick and wedge it into your base for better tension.

**STEP 3: Stabilize the Frame:**

* + Use clips or extra sticks to keep the base from moving during launch.
  + Reinforce any wobbly parts with tape or extra rubber bands.

**Test and Measure:**

**STEP 4: Launch the Cotton Ball:**

* + Place a cotton ball in the spoon.
  + Pull the spoon back to different angles (e.g., 30°, 45°, 60°).
  + Let go and launch!

**STEP 5: Record Your Data:**

* + For each test, measure and write down:
    - Pull-back distance (cm or degrees)
    - Launch angle
    - Distance the cotton ball travels (in cm or meters)

**STEP 6: Repeat for Accuracy:**

* + Try launching from the same angle 3 times — are your results consistent?
  + Challenge yourself to hit a target at:
    - 🎯 1 meter
    - 🎯 2 meters

CHALLENGE MODE- IMPROVE YOUR DESIGN:

* Adjust your launcher:
  + Change the number of sticks, the placement of the spoon, or how tightly you wrap the rubber bands.
* Try different materials or tension styles to make your launch go farther or straighter.

REFLECTION:

1. How did changing the spoon angle or pull-back distance affect the launch?  
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2. What energy changes happened during the launch?  
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3. If you wanted to improve your design, what would you change and why?  
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Standards Alignment

NGSS: HS-PS3-3 STEL: STEL 1H, STEL 4H, STEL 6G, STEL 7G CCSS: CCSS.MATH.CONTENT.HSG.MG.A.1, CCSS.MATH.CONTENT.HSN.Q.A.1-3, CCSS.MATH.CONTENT.HSS.ID.A.1, CCSS.MATH.CONTENT.HSS.ID.C.7