UNIT: CATAPULT

REDESIGN FOR ACCURACY

Your Mission:

You’re a design engineer in the Precision Launch Lab! Your challenge is to improve your catapult by adjusting one part at a time—like the angle, force, or mass—to hit a target exactly 100 cm away. Redesign, test, and repeat until your launcher is accurate and consistent!

Focus: Motion, Accuracy & Variable Testing through Redesign

Materials:

* Catapult
* Paper hoops or target markers
* Measuring tape
* Projectiles of different mass (e.g., cotton balls, mini pom-poms, etc.)
* Stopwatch (optional for timing launches)
* Ruler or protractor (optional for angle measurements)

STUDENT DIRECTIONS:

**Step 1: Set up your target.**

* Place your paper hoop or designated target exactly 100 cm away from the front of the catapult.
* Use the tape measure to be as accurate as possible.

**Step 2: Initial test launch (No modifications).**

* Use your default catapult setup.
* Launch your projectile 5 times toward the target.
* Count how many times you hit the target.
* Write your score here:  
  🎯 Target Hits (out of 5): \_\_\_\_\_\_

**Step 3: Start redesigning!**

* Choose one variable to adjust at a time. You can try:
  + ⬆️ Changing the angle of the catapult arm
  + 🟰 Adjusting rubber band tension
  + ⚖️ Switching to a different projectile mass
  + 🪵 Changing the base height or stability

**Step 4: Test your redesigned catapult.**

* After making a change, launch again 5 times.
* Record the number of hits and what you changed.

**Step 5: Repeat and refine.**

* Keep redesigning, but only change one variable at a time so you can tell what made the difference.
* Try at least 2 redesigns.

**Redesign Notes Table (Use your notebook or worksheet):**

| **Redesign #** | **What did you change?** | **Hits out of 5** |
| --- | --- | --- |
| **1** |  |  |
| **2** |  |  |
| **3 (if any)** |  |  |

Which change improved accuracy the most?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WRAP-UP REFLECTION:

1. How did energy change from potential to kinetic in your catapult?  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Which variable had the biggest effect on motion—force, angle, or mass? Why?  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. If you needed to launch a heavier object farther, what would you change?  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Standards Alignment

NGSS: **MS-PS2-1** STEL: STEL **7F**, STEL **7G**, STEL **9D, STEL 9E,**  **STEL11B** CCSS: CCSS.MATH.CONTENT. **6.SP.5**, CCSS.MATH.CONTENT. **7.SP.1,** CCSS.MATH.CONTENT. **7.SP.3,** CCSS.MATH.CONTENT.**8.F.5**