



Projectile Student Engineering Workbook

Name: _____



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Lesson 1:

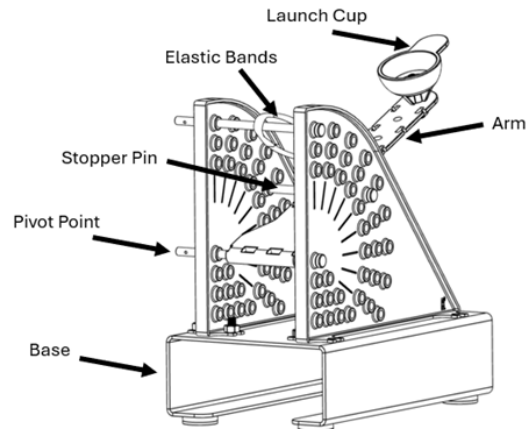
Making Your Catapult Data-Smart

Instructions: As you follow the Lesson 1 slide presentation, complete the following questions.

Introduce and Define

1. Label these parts on the catapult image:

- a. Base
- b. Arm
- c. Elastic bands
- d. Pivot point
- e. Launch cup
- f. Stopper Pin



2. Energy Transfer: Fill in the blanks.

- A. **Energy is stored.** When you pull back the arm and stretch the elastic, you store elastic _____ energy.
- B. **Energy is released.** When the arm is released, the arm accelerates forward quickly, and the elastic potential energy turns into _____ energy.
- C. **The projectile is launched.** The arm stops and releases the projectile, which flies through the air with _____ energy.

3. Where did the energy come from originally? What is the source of energy that powered the Catapult?
4. What happens after launch? Describe these concepts in your own words:
 - a. Parabolic Flight Path:
 - b. Horizontal Component:
 - c. Vertical Component:

Lesson 2:

Instructions: As you follow the Lesson 2 slide presentation, complete the following questions.

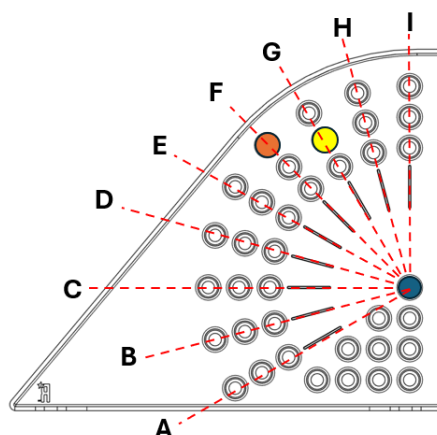
Introduce and Define

Key Vocabulary: As you work through the slides, record these concepts' definitions and a sketch/note that will help you remember each.

Term	Definition	Important Concepts
Force		

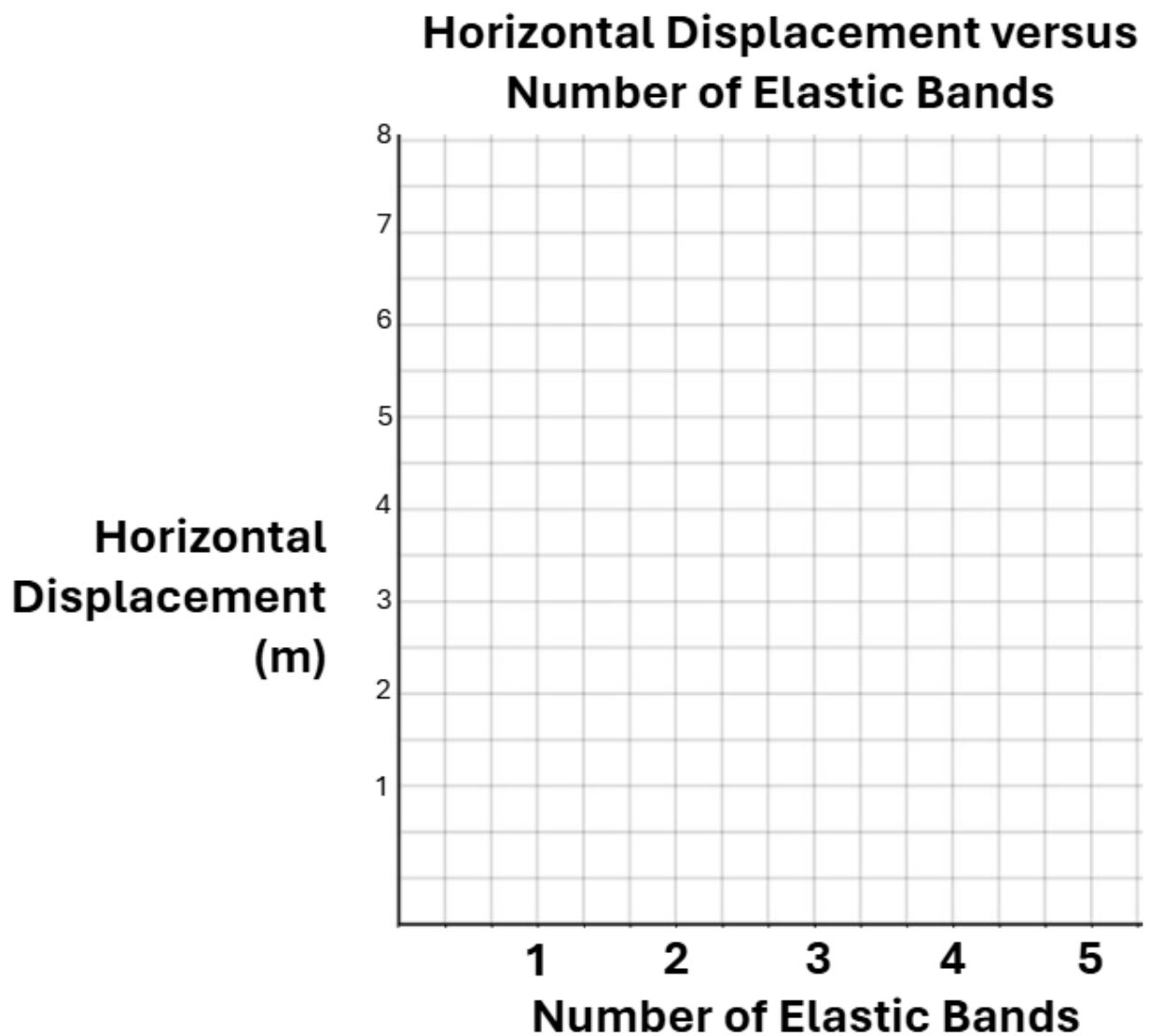
Explore: Pull-Back Angle

1. What is the pull-back angle between the following lettered locations on the diagram?
 - F and E:
 - F and D:
 - F and C:
 - I and C:
2. In the Pull-Back Angle Experiment, what variables will you establish as constants?



3. What variable will you purposefully change?
4. What data will you collect about the projectile's parabolic flight?

8. Follow these instructions to create a Horizontal Displacement versus Number of Elastic Bands graph:
- Identify the largest horizontal displacement value and choose an interval for the vertical axis that will allow you to graph all the data points gathered for this data set. (ex: 1 m per square)
 - Label your graph's vertical y-axis with this interval.
 - For each number of elastic bands, graph the data for the 3 trials and the average you calculated. Label each as shown in the example.
 - Done correctly, you should have 12 points graphed total.
 - Draw in a line of best fit connecting the averages as best as possible.



Lesson 6:

Strategapult Competition

Instructions: Use these pages to guide your team through the Strategapult Competition.

Introducing Strategapult:

- **Winning:** The team with the most points after Round 4 wins
- **Teams:** 2–5 students + 1 Catapult
- **Points:** Earned in each round
- **Rounds:** Each round has a specific challenge, requiring your team to apply what you have learned with precision and speed.
- **Arena:** Each team places their Catapult in the Launch Zone when it is their turn. The challenge will be built in the Flight Zone. No students may enter the Flight Zone.

Round Structure:

- Prepare
 - Understand the challenge
 - Gather measurements
 - Decide your team's strategy
- Predict
 - Decide the variables
- Launch!
 - 1 attempt per team
 - Repeat lineup if time allows
 - Sum points on scorecard

The Variables:

