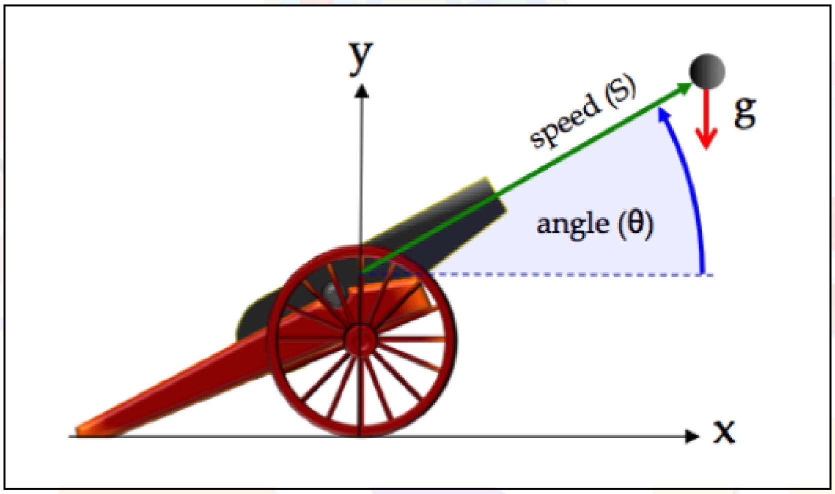
Rubber Band Cannons

Modeling Projectile Motion

NAME: **DATE:** **BLOCK:**

INTRODUCTION: Projectile motion refers to the curved path an object follows when launched into the air, influenced by gravity and the initial force applied. Several factors influence the range (or distance traveled) of a projectile, but two key factors are the launch angle and the amount of force used to propel the object.



In this experiment, we will keep the launch force constant by pulling the rubber band back the same distance each time, while varying the launch angle to study its effect on the horizontal distance, or range. By controlling variables such as the pull-back distance and systematically adjusting the angle, we can isolate the effect of angle on projectile motion. Understanding this relationship is crucial in real-world applications such as sports, engineering, and physics, where accurately predicting the path of a projectile is important.

PRE-LAB QUESTIONS:

1. What is projectile motion, and what factors influence the range of a projectile?

2. How do you think the launch angle will affect the range of a projectile?

3. Why is it important to keep the pull-back distance (launch force) constant during the experiment?

MATERIALS: Recycled box, meter stick, clear tape, protractor sheet, tape measure, rubber band, stopwatch, calculator

PROCEDURE:.

Building the Cannon

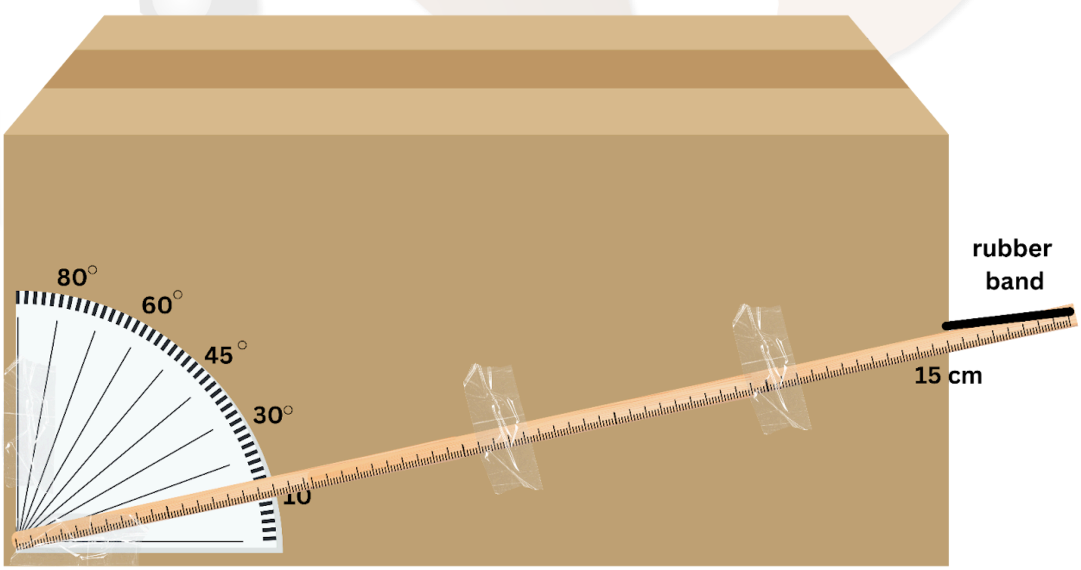
1. Cut out and tape the protractor sheet to the box with 90 degrees aligned to the top (y-axis) and 0 degrees aligned to the bottom (x-axis).
2. Label the angles 10°, 30°, 45°, 60°, and 80° on the protractor.
3. Secure the meter stick to the box, aligning it with the 10° mark. Ensure it is stable and positioned to launch the rubber band.

Launching the Rubber Band

1. Set the cannon to the first angle (10°).
2. Hook the rubber band to the end of the meter stick, pull it back 15 cm, and release to launch.
3. Measure the time of flight using the stopwatch, starting from the moment the rubber band is released until it hits the ground.
4. Measure the horizontal distance (range) from the end of the meter stick to the rubber band using the tape measure.
5. Record the time and range for three trials, ensuring the rubber band is pulled back to 15 cm each time.
6. Repeat the procedure for the remaining angles (30°, 45°, 60°, and 80°), keeping the pull-back distance consistent at 15 cm for each trial.

Calculating average speed

1. For each angle, calculate the average range and time from the three trials.
2. Use the formula for average speed: average range/average time.



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DATA/OBSERVATIONS:

Angle (°)	Trail 1 Time (s)	Trail 1 Range (m)	Trail 2 Time (s)	Trail 2 Range (m)	Trail 3 Time (s)	Trail 3 Range (m)	Avg Time (s)	Avg Range (m)	Avg Speed (m/s)
10									
30									
45									
60									
80									

POST-LAB QUESTIONS:

1. Based on your data, which angle resulted in the greatest range? Why do you think this angle was the most effective?

2. How did the launch angle affect the time of flight of the rubber band? Explain the relationship between angle and time.

3. What happens to the average speed of the rubber band as the launch angle increases? Is there a pattern?

4. How does this experiment model real-world applications of projectile motion, such as launching a rocket or throwing a ball?

PROTRACTOR