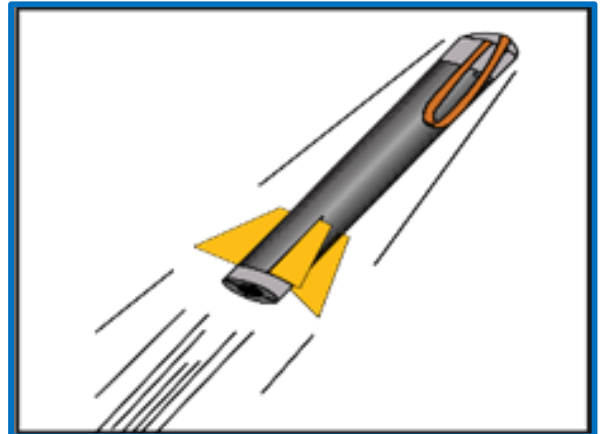


# Foam Rocket Launch Activity

## Objective

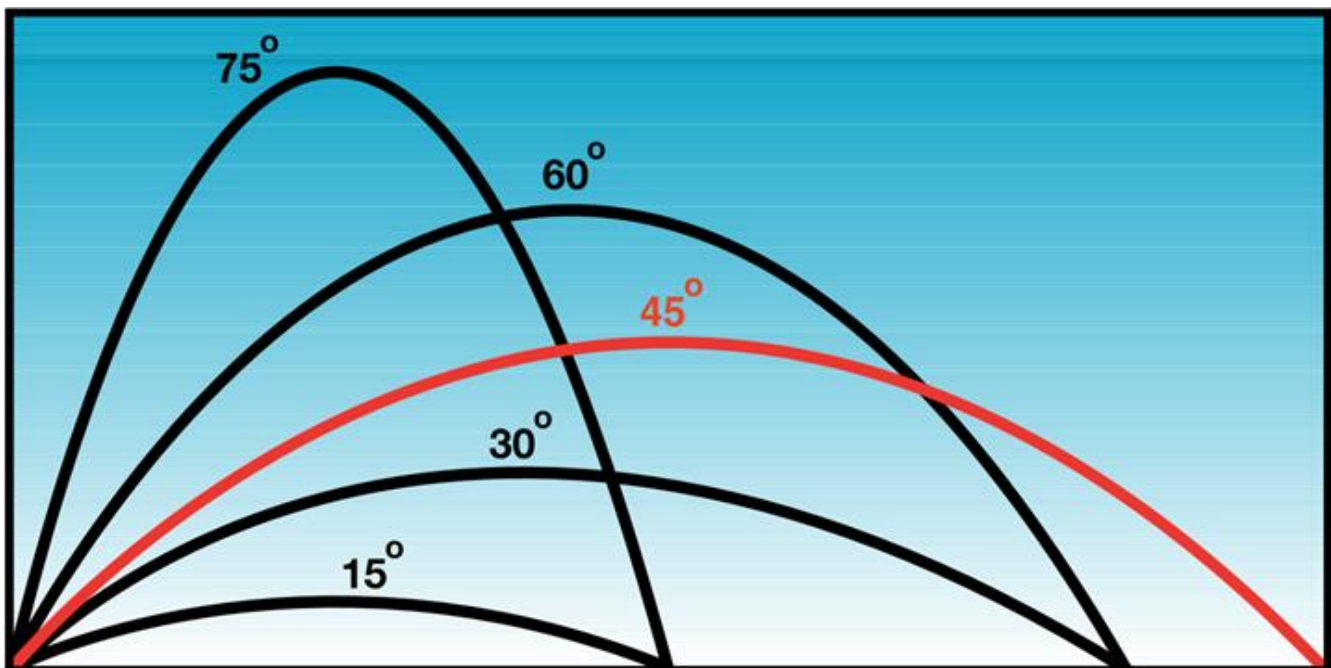
Students will learn about rocket stability and trajectory with rubber band-powered foam rockets.



## Introduction:

(15 Minutes)

Explain that the flight of a foam rocket is similar to that of real rockets. Its motion and course is affected by gravity and by drag or friction with the atmosphere. Tell the students that pulling the rubber band produces an action force that propels the rocket forward while exerting an opposite and equal force on the launcher. Tell them this is Newton's third law of motion. Tell them that gravity causes the foam rocket to decelerate as it climbs upward and then causes it to accelerate as it falls back to the ground. The launch angle works with gravity to shape the flight path or trajectory. Tell them they will launch their rockets at different angles to see how their trajectory changes and the distance the rocket launches changes.



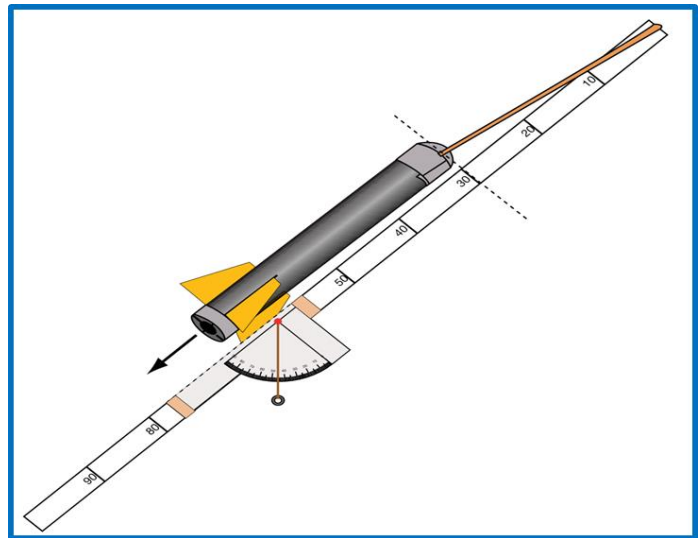
## Instructions:

### Materials:

- 30 cm-long piece of polyethylene foam pipe insulation (for 1/2" size pipe)
- Rubber Band (size 64)
- Styrofoam Food Tray, Cardboard, or stiff Poster Board
- Duct Tape
- Scissors
- Meter Stick
- Press Tack
- Washer or Nut
- Launcher Quadrant Pattern printed on card stock
- Build a Foam Rocket Instructions
- Experiment Data Sheet
- Masking Tape
- Eye protection
- For class - Tape Measure

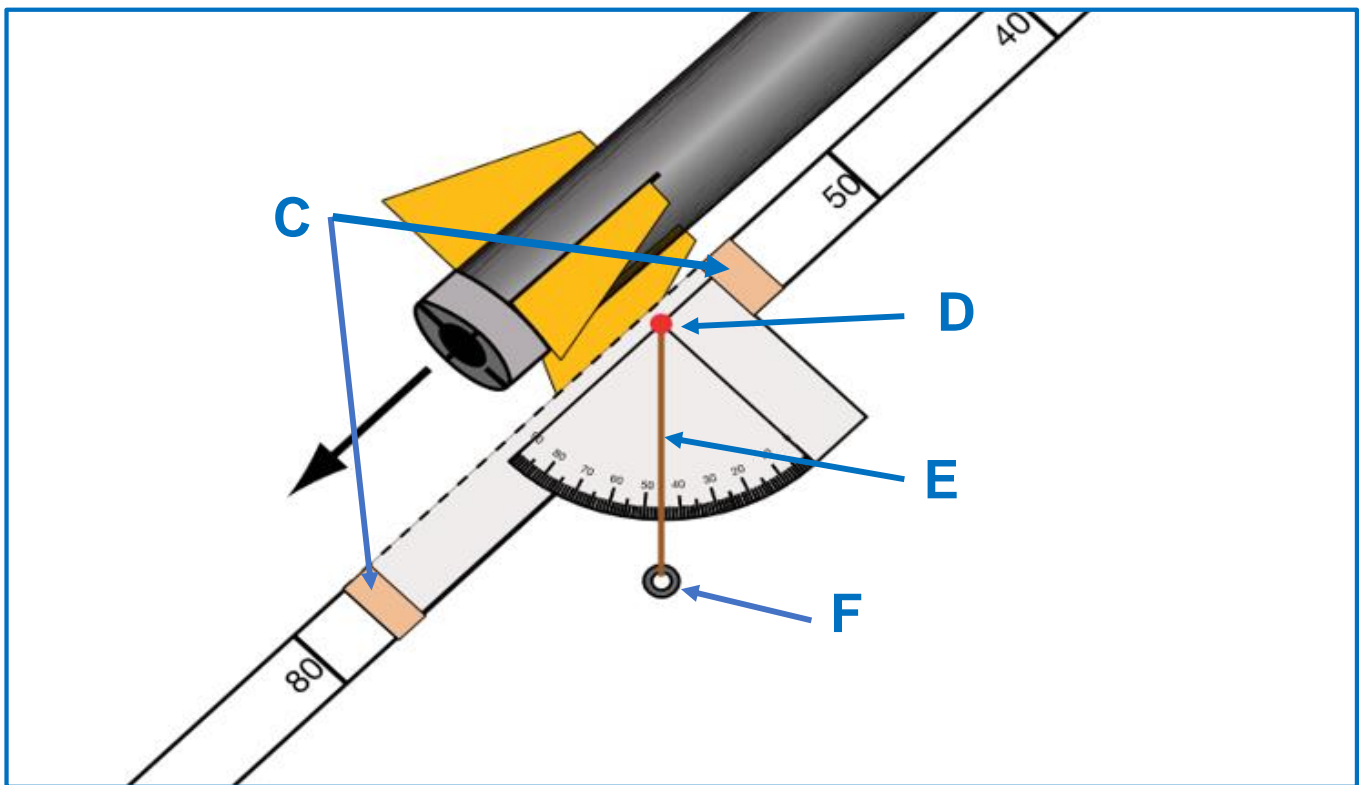
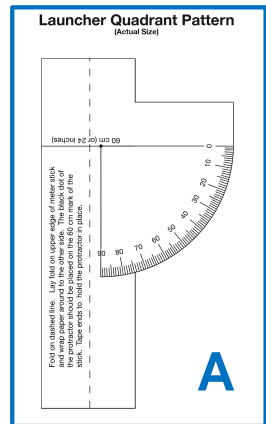
### Building and Testing the Foam Rocket: (60 minutes)

1. Hand out the picture instructions titled **Build a Foam Rocket**.
2. Pair the students and have them help each other make a rocket. They will each make their own rocket.
3. Have the students come up with a name for their rocket.
4. Go over the materials that they will use to make their rocket and launcher.
5. Have the students follow the picture instructions to make their rocket out of the supplies provided.



## Building and Testing the Foam Rocket - continued:

6. After the rocket is complete, have all 4 girls work together to make 1 Launcher per table.
  - A. Print the **Quadrant Pattern** on card stock paper.
  - B. Cut out the pattern and fold it on the dashed line.
  - C. Tape the quadrant to the meter stick so that the black dot lies directly over the 60 cm mark on the meter stick (or 23.5 inch mark on a yard stick).

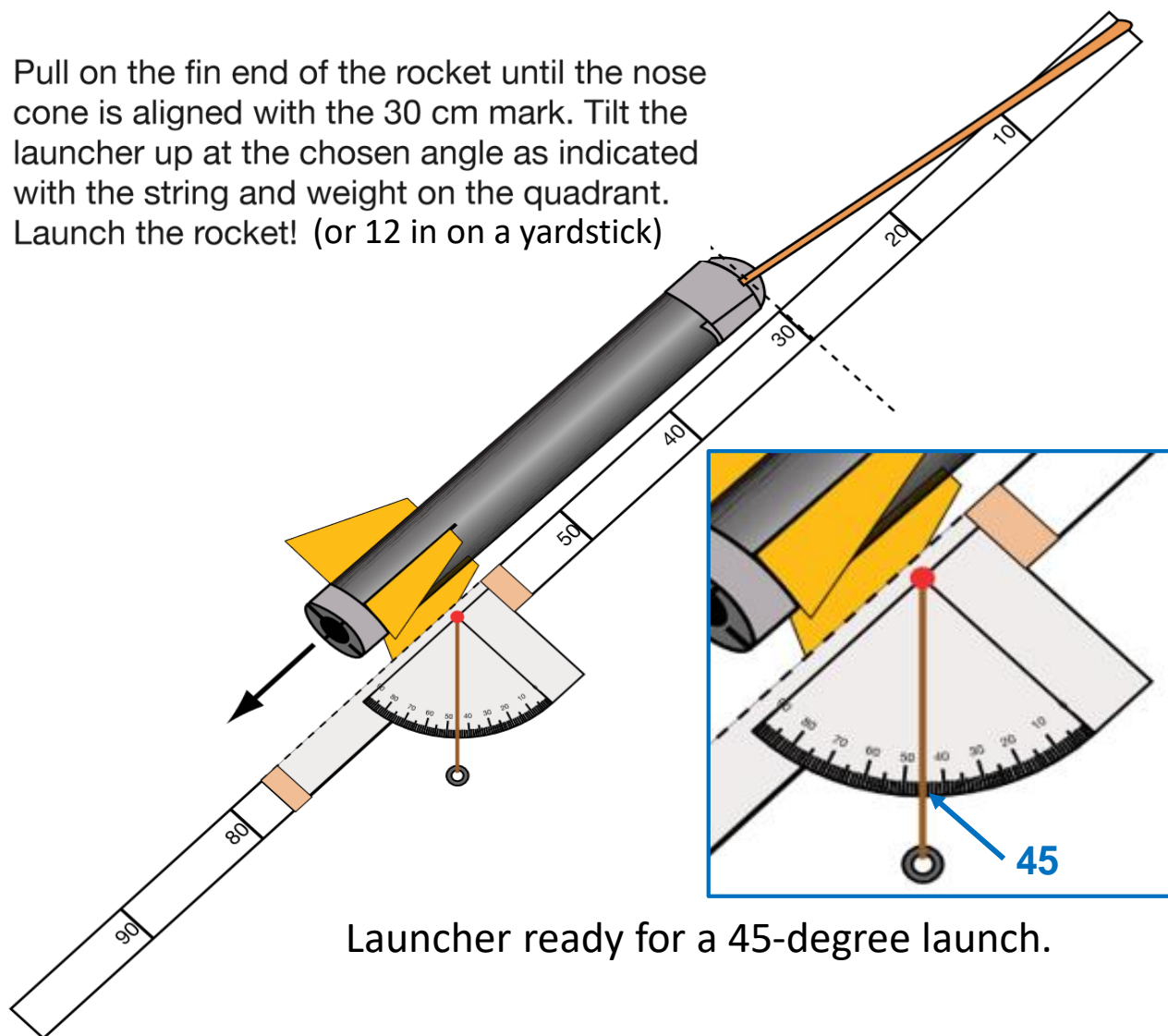


- D. Press a push tack into the black dot.
- E. Tie a string to the push tack and hang a small weight, such as a nut or a washer, on the string. The weight should swing freely.
- F. Refer to the diagram to see how the launcher is used.

## Building and Testing the Foam Rocket - continued:

7. Launch each of the 4 rockets at a 45 degree angle and record the distance on the **Experiment Data Sheet**.

Pull on the fin end of the rocket until the nose cone is aligned with the 30 cm mark. Tilt the launcher up at the chosen angle as indicated with the string and weight on the quadrant. Launch the rocket! (or 12 in on a yardstick)



Launcher ready for a 45-degree launch.

8. Have the students choose 1 of the 4 rockets to launch for the experiment. Explain that they must use one to record their data since they only want to test only 1 variable at a time, the launch angle in this case.
9. Have the students make a hypothesis on which launch angle will achieve the greatest distance from the launch site.
10. Have the students follow the steps for the **Rocket Range Experiment** on the next page. Make sure that each student gets to serve in each of the three roles: Launch Director, Launcher, and Range Officer. **Record data in the Experiment Data Sheet provided.**

## Building and Testing the Foam Rocket - continued:

### Rocket Range Experiment:

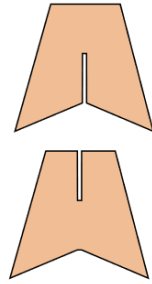
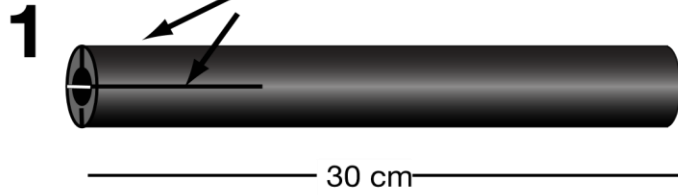
(30 Minutes)

Note: Launch the Rocket in the high ceiling area.

1. Assign duties for the team. You will need the following positions: Launch Director, Launcher, and Range Officer. (Team members will switch jobs so that everyone gets to perform every position.)
2. First Launch:
  1. Launcher: Attach the rocket to the launcher and pull back until the tail of the rocket reaches the 30 cm (or 12 inch mark). Tilt the launcher until it is pointing upwards at an angle between 10 and 80 degrees.
  2. Release the rocket when the Launch Director gives the Go command.
  3. Launch Director: **Record the angle on the data table.** Count down 5-4-3-2-1 and give the lift off of Rockets name. For example you would say 5-4-3-2-1 and launch of the Rocket named ARES.
  4. Range Officer: Measure the distance from the launcher to where the rocket hits the floor (not where it comes to rest after sliding or bouncing). **Report the distance to the Launch Director** and return the rocket to the Launcher for the next launch.
3. Repeat the launches with different angles and with the students rotating between the roles above until each girl has done all 3 roles.
4. The Launch Director will record **the data in the table provided in your bag of materials.**

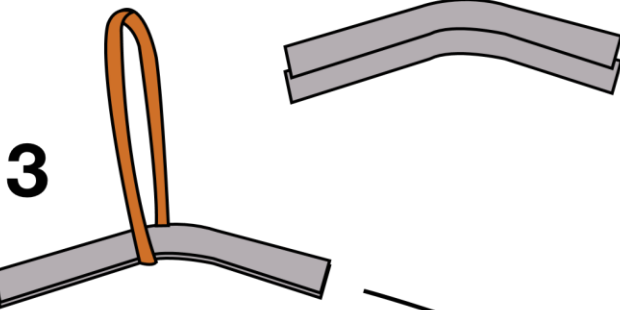
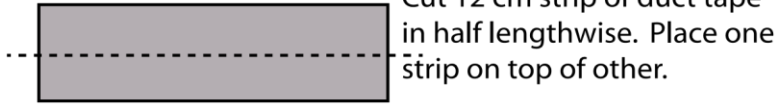
# Build a Foam Rocket

Cut four slits 12 cm long 90 degrees apart.



Different fin shapes can be used.

**2**



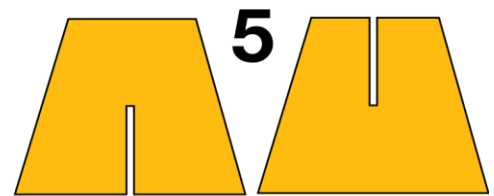
**4** Tape launcher rubber band to nose end of rocket.



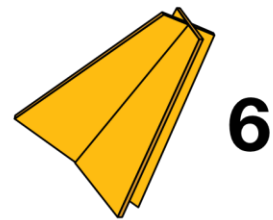
Add tape strip around the nose to strengthen the attachment.



Cut out fins with notches.



Slide fins together.



**7** Slide fins into slits.



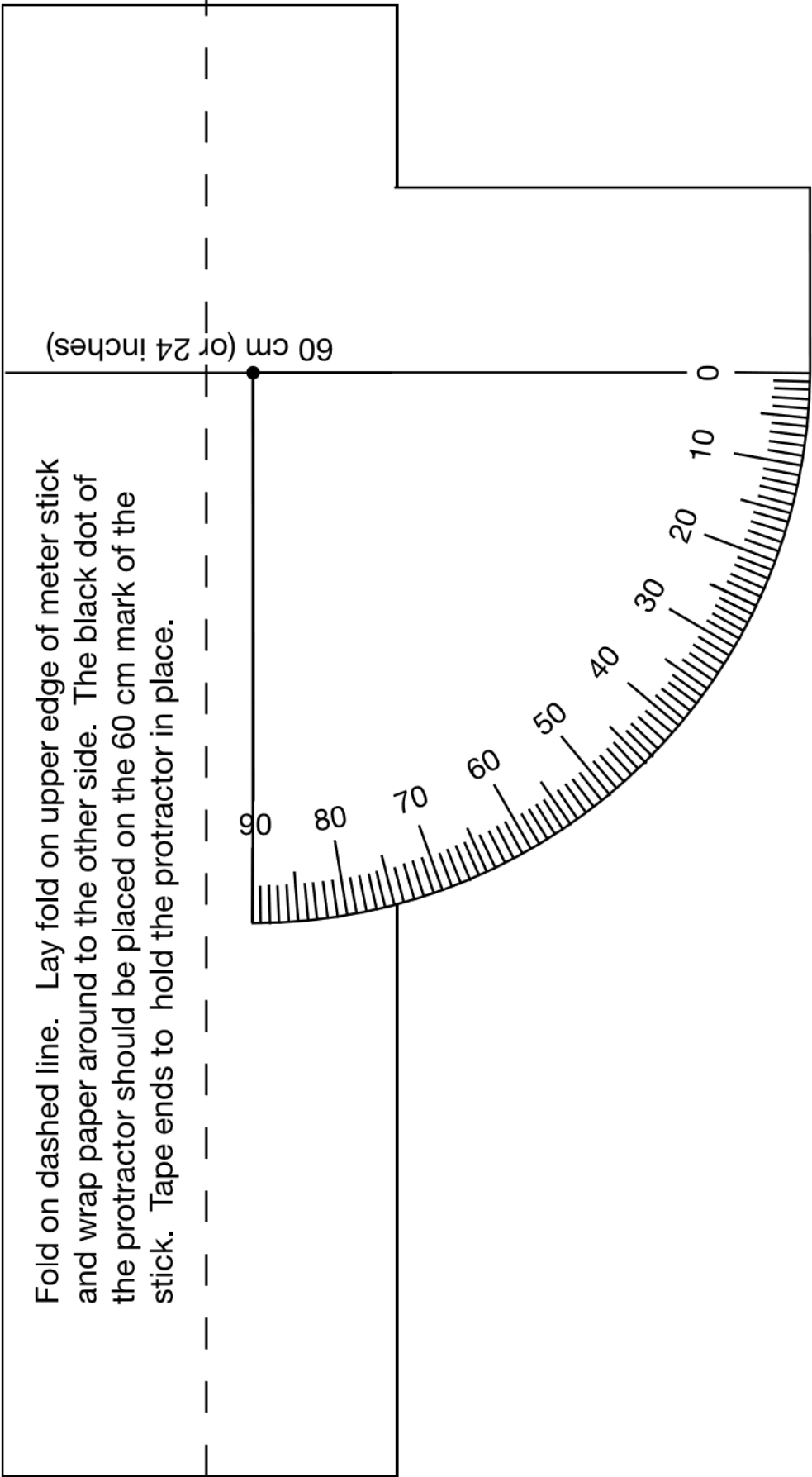
**8** Close fin slits with narrow strip of duct tape.



Ready for flight!

# Launcher Quadrant Pattern

(Actual Size)



# Experiment Data Sheet

Launch Angle	Distance