Mars Needs Rubber — Physics

Overview

Apparently, the manned expeditions to Mars are in serious need of rubber to fix the leaking seals in their life pods. You need to get the rubber to them (in the form of rubber bands), and quickly. You have a means of launching the rubber bands, but you'll want to perform some experiments on Earth before you actually risk launching the real thing to Mars.

Materials

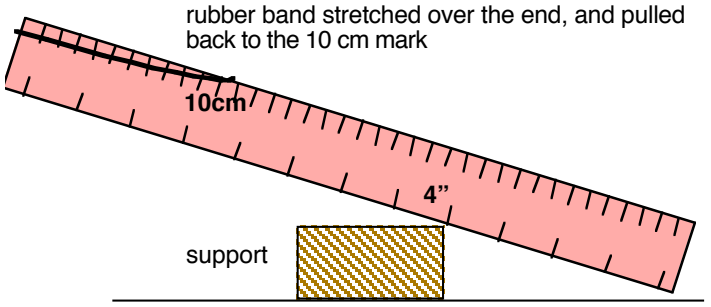
12" ruler, support, lots of rubber bands, box

The Problem

To determine what variables affect the range of the rubber band's flight, and how?

Procedure-
Data Collection

1. The "device" used to launch rubber bands in this activity is a ruler, propped up against a support (a 2"x4" block, or a brick, supplied by the instructor)--the rubber band is placed over the ruler and stretched back as shown in the diagram here. The ruler is held against the block as shown below, with the inches side down. For each rubber land launch, you will need to record the **support value**, which is just the inch mark that rests against the corner of the support (4" in the diagram here).



Another variable that will affect your launch range is how far back the rubber band is stretched. For each rubber band launch, you will need to record **stretch distance**, which is just the distance that the rubber band was stretched back (10 cm in the diagram here).

If there are other variables that you feel might affect the flight range, make sure that you record them in a data table.

2. Peform a series of "test flights," each time recording the **support value**, the **stretch distance**, any other variables that you feel might affect your launch range, and the resulting **launch range**, which is the horizontal distance between where the rubber band is launched, and where it lands. Focus on **support values** of 4" and 6", but work with a number of different stretch lengths.

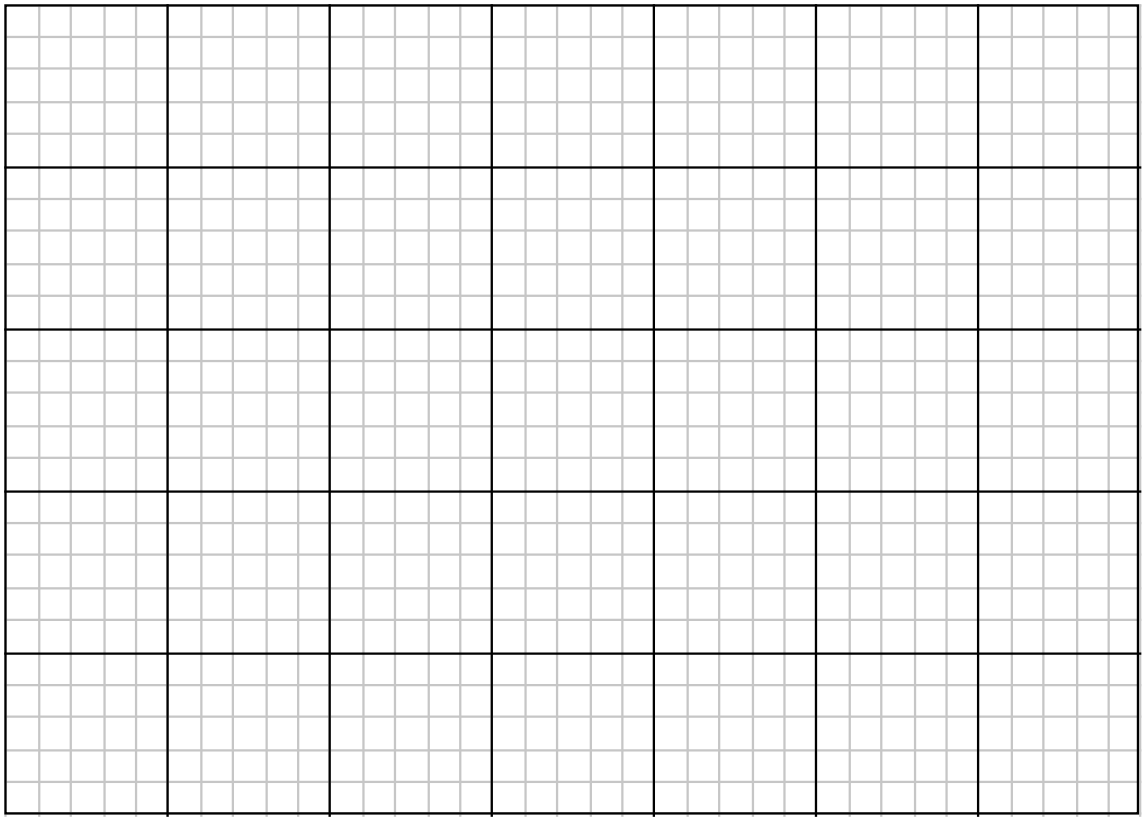
As you perform your trials, you might want to take some notes regarding the launches: record anything that you think might bed of significance. You might also want to repeat a couple of launch trials with the same support value and stretch distance--do you end up getting exactly the same launch range?

3. As you begin to get some idea of what your data looks like, begin graphing it. Keep collecting data and graphing it until you have 15-30 launch trials recorded.

Analysis

Based on your recorded results and the graph you've constructed, write a brief sentence or two here addressing each question.

1. What effect does changing the **support value** have on the launch range?



2. What effect does changing the **stretch distance** have on the launch range?

3. What other values did you discover have an effect on the launch range? How do those values effect the launch range?

4. How consistent was the data that you collected? (Were there any measurements you made that *didn't* fit the overall pattern, or did repeating the same trial several times give you wildly different results?)

Mars Needs Rubber!!!

For your final evaluation, the instructor will give you a **support value** that you must use, and a **launch range** that you need to achieve. A target--Mars--will be placed at that position. You will need to use the data that you've collected to determine what **stretch distance** you should use to hit Mars--you'll have three chances to hit the target!