

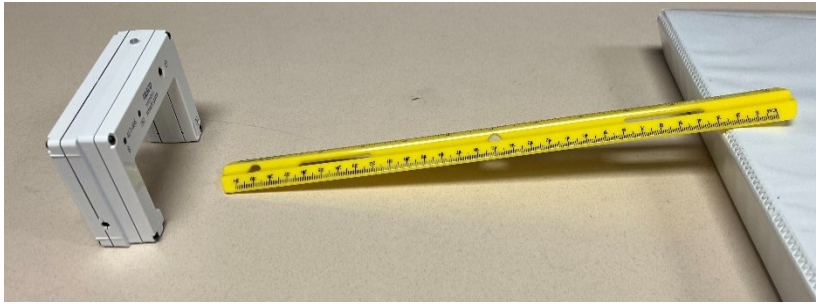
Adapted from "Shoot for Your Grade" by Jim Keefer

Objectives

- Predict the landing spot of a projectile launched horizontally from a desk.

Materials

- Grooved ruler
- Marble
- Meter stick
- Target
- PASCO Wireless Smartgate
- iPad with SPARKvue

**Procedure**

IMPORTANT! The marble must never leave the desk when taking data.

1. Open the SPARKvue app on the iPad and select **Build New Experiment** from the main screen.
 - a. Select the top **1 window layout** from the right.
 - b. Select the **1.23** to get a display.
 - c. Turn on your smartgate and tap the Bluetooth icon in the SPARKvue app. Connect to your smartgate.
 - d. Select **Smart Gate Only**.
 - e. Select **Smart Gate Timer** from the drop-down menu and tap **OK**. Then tap **Done**.
 - f. You should now be back on your screen reading 0.00. In the top right, tap **Select Measurement** and tap **Speed Between Gates**.
2. Make a gentle ramp using your ruler and a book.
3. Set the Smartgate at the bottom of the ramp so that it forms an arch. The marble should pass through the arch after it has left the end of the ruler. (See picture)
4. Record data and roll the marble down the ramp several times to determine the average speed it will have when it rolls off the desk. $v_1 =$ _____, $v_2 =$ _____, $v_3 =$ _____; $V_{ave} =$ _____
5. Take measurements to **calculate** the time until the marble hits the floor. $t =$ _____
6. Using the average speed and time of free fall, **calculate** the landing spot for your marble from directly below the edge of your desk. $x =$ _____
7. Place the target at the calculated location.
8. Call over the teacher.
9. When the teacher is watching, roll the marble down the ramp and see where it lands. The target gives your grade.
Grade = _____

