PHYSICS INMOTION
gpb.org/physics-motion

# Unit 1G
# Graphing Relationships
## *Practice Problems TEACHER*

**Work each of the following problems. SHOW ALL WORK.**

1. **A physics teacher asks their students to conduct an experiment in which they pull a block up an incline with a force sensor. The students are supposed to change the mass of the block and measure the force of friction acting on the block.**

   **a. What is the independent variable in the experiment?**

   *Mass of the block*

   **b. What is the dependent variable in the experiment?**

   *Force of friction*

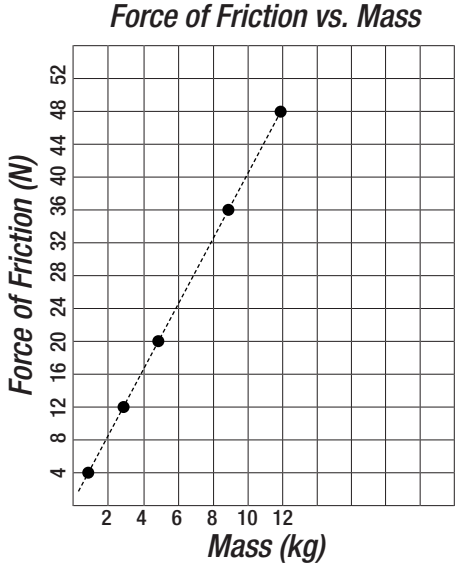
   **c. List some variables that must be held constant in each trial.**

   *Same incline, same force sensor*

2. **The students in the previous problem conduct an experiment, and find the following data:**

| Mass of Block (kg) | Force of Friction (N) |
|---|---|
| 1.0 | 4.10 N |
| 3.0 | 12.2 N |
| 5.0 | 20.0 N |
| 9.0 | 36.6 N |
| 12.0 | 47.9 N |

**Create a line of best fit of the experimental data on the graph below, including a title, axes properly scaled and labeled with units.**




**questions continued on next page**



Copyright © 2018 Georgia Public Broadcasting. All rights reserved. Use or distribution by an unintended recipient is prohibited.

PHYSICS INMOTION
gpb.org/physics-motion

# Unit 1G
# Graphing Relationships
## *Practice Problems TEACHER*

**Work each of the following problems. SHOW ALL WORK.**

3. **Find the slope of the line of best fit from the graph in the previous question.**

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{48\,N - 4\,N}{12\,kg - 1kg} = \frac{44\,N}{11kg} = 4\,N/kg$$

4. **Students are provided with a marble launcher that is able to fire marbles at different speeds. The students can vary the speed of the marble, and then measure the time it takes the marble to reach its peak height. The data collected by the students is:**

| Initial Velocity (m/s) | Time to Peak (s) |
|---|---|
| 3 | 0.31 |
| 5 | 0.51 |
| 9 | 0.92 |
| 10 | 1.02 |
| 12 | 1.22 |

**Determine the following for the experiment:**

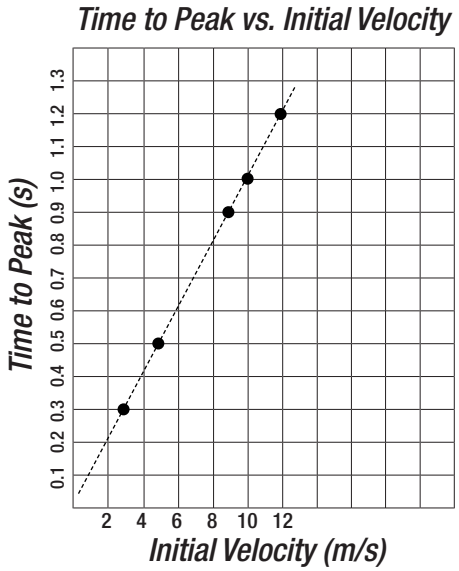
**a. What is the independent variable, and unit?**

*Initial velocity, m/s*

**b. What is the dependent variable, and unit?**

*Time to peak, s*

**Graph the data on the diagram below. Be sure to label your graph and axes (including units), and use the correct scale.**




**questions continued on next page**



Copyright © 2018 Georgia Public Broadcasting. All rights reserved. Use or distribution by an unintended recipient is prohibited.

PHYSICS IN MOTION
gpb.org/physics-motion

# Unit 1G
# Graphing Relationships
## *Practice Problems TEACHER*

**Work each of the following problems. SHOW ALL WORK.**

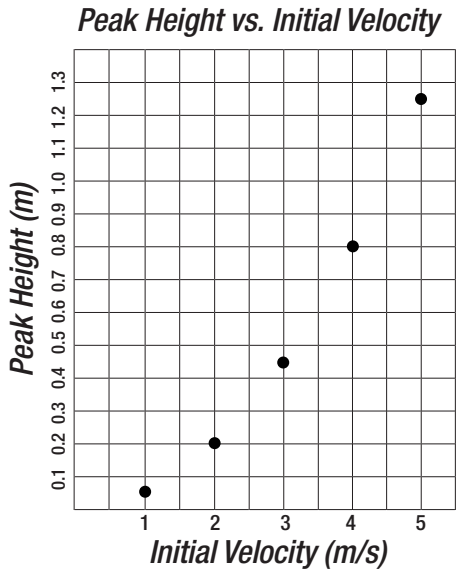
**5. Find the slope of the line of best fit in the previous question.**

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.2\,s - 0.3\,s}{12\,m/s - 3\,m/s} = \frac{0.9\,s}{9\,m/s} = 0.10\,s^2/m$$

**6. The students again use the marble launcher, and, instead, measure the peak height to which the marble flies. The data they collected is displayed in this table:**

| Initial Velocity (m/s) | Peak Height (m) |
|---|---|
| 1 | 0.05 |
| 2 | 0.20 |
| 3 | 0.45 |
| 4 | 0.80 |
| 5 | 1.25 |

**Graph the data on the diagram below. Be sure to label your graph and axes (including units), and use the correct scale.**




**7. Does the graph in the previous question show a linear relationship? If not, what kind of relationship does it show? Is the slope of this line constant?**

*No, this is not a linear relationship. The relationship is exponential, which can be seen by the y-axis variable, Peak Height, increasing at an increasing rate as the x-axis, Initial Velocity, increases. The slope of the line is not constant, and increases over time.*


Copyright © 2018 Georgia Public Broadcasting. All rights reserved. Use or distribution by an unintended recipient is prohibited.