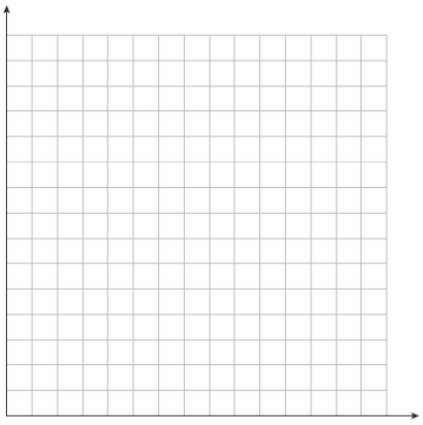
The Need for Speed

Procedure (In Class Laboratory):

- Put the Vernier track on a slight incline as shown above.
- Turn on the LabQuest and make sure the Motion Detector is plugged into the LabQuest at the top at DIG1 (not at the side!).
- Hold the cart up to the highest point on the track at rest.
- Click on the red screen that says DIG1: Position. Click Zero.
- Click on Green Play Button (Collect Button) and let the cart go all the way to the bottom of the ramp.
- Click on Graph tab at the top, Click on Show Graph, Click on Graph 1. You should only see the position-time graph.
- Take the pen and click on 8-10 points on the graph. Record the time and position of each point on the graph.

Time (seconds)	Position (meters)

- Sketch the graph of the position-time function below.

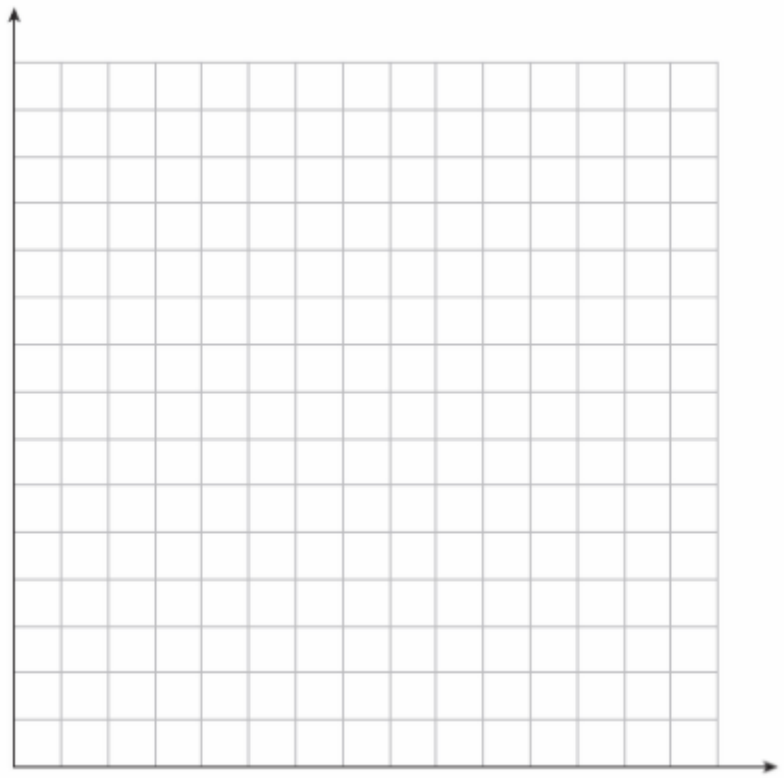


Data Analysis:

1) Is the graph of position-time linear, is it inversely proportional, or is it squared?
2) If we want to linearize a graph like the position-time function, we need to square the x-data. Perform that data change and put your new data in the table below.

Time^2 (s^2)	**Position (meters)**

3) Graph your new data in the graph below. Label your data and put it in a proper scale and draw a best fit line through your data points.



4) What is the slope of your best-fit line?
5) If the equation is $d = \frac{1}{2}at^2$ and we graphed distance vs. time^2, the slope will be equal to ½ a. Calculate the acceleration of the cart.
6) Why is this acceleration of the cart not equal to the acceleration of gravity (a = 9.8 m/s^2)?
7) How would you change this experiment to get the acceleration of gravity?

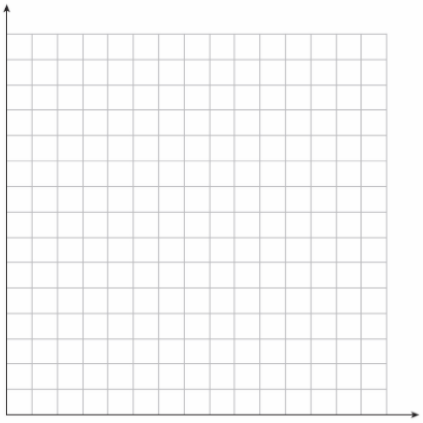
The Need for Speed

Procedure (At Home Laboratory):

- Google "Moving Man Simulation"
- Click on "The Moving Man – Position | Velocity | Acceleration – PhET"
- Click on the Picture with the Play Button
- Put in 0.5 m/s^2 for the acceleration.
- Press the Play Button and then Pause approximately every 0.5 seconds.
- Each time you pause, collect the time and position of the moving man in the table below.

Time (seconds)	**Position (meters)**

- Sketch the graph of the position-time function below.

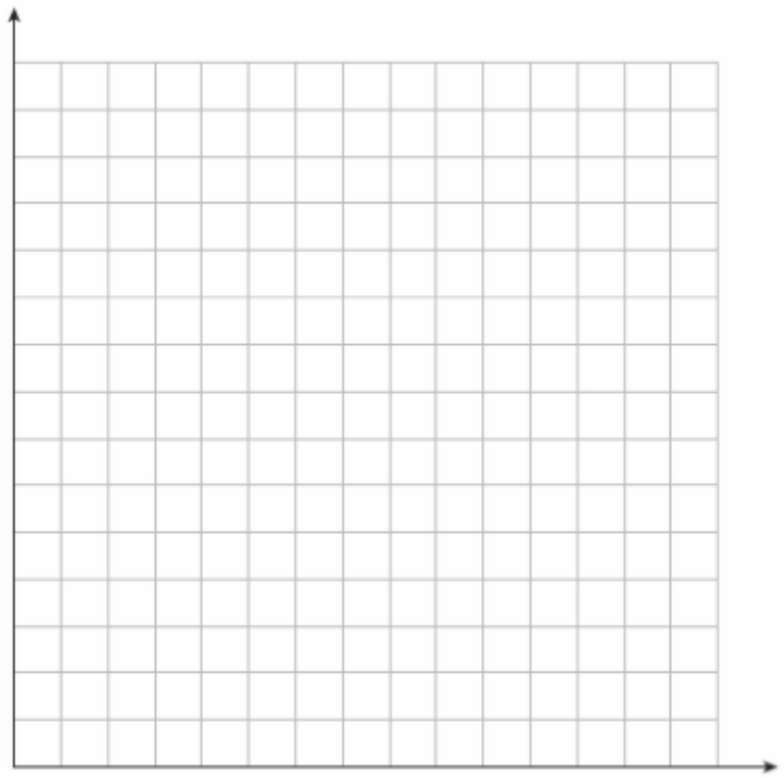


Data Analysis:

8) Is the graph of position-time linear, is it inversely proportional, or is it squared?
9) If we want to linearize a graph like the position-time function, we need to square the x-data. Perform that data change and put your new data in the table below.

Time^2 (s^2)	**Position (meters)**

10) Graph your new data in the graph below. Label your data and put it in a proper scale and draw a best fit line through your data points.



11) What is the slope of your best-fit line?
12) If the equation is $d = \frac{1}{2}at^2$ and we graphed distance vs. time^2, the slope will be equal to ½ a. Calculate the acceleration of the cart.
13) Why is this acceleration of the cart not equal to the acceleration of gravity (a = 9.8 m/s^2)?
14) How would you change this experiment to get the acceleration of gravity?