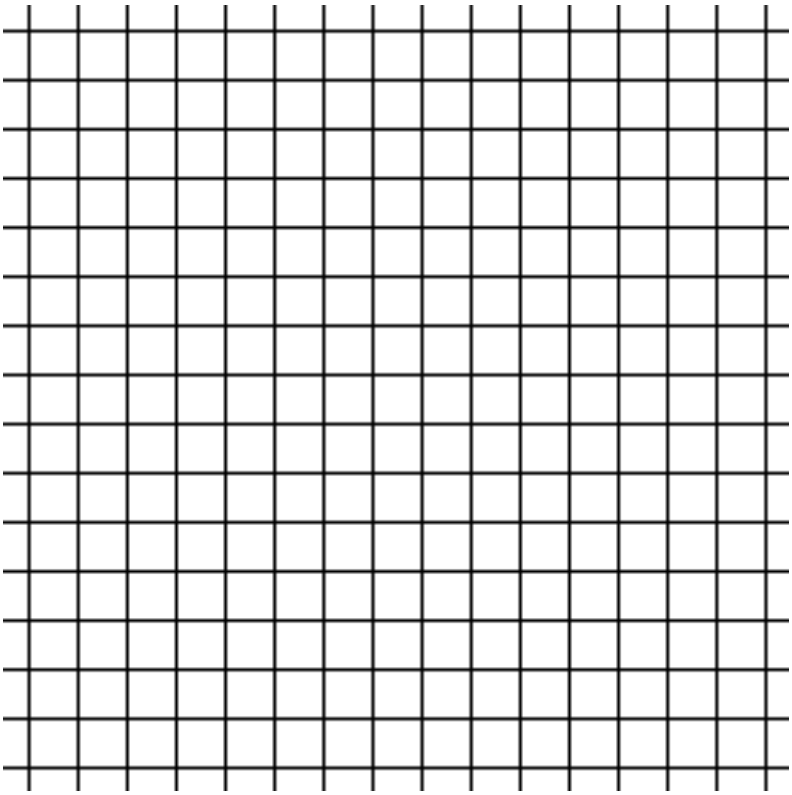
Graphing Motion in One Dimension (Student)

The displacement of a driverless car moving in a straight line at a constant speed may produce the following data:

Table 1: Position of a driverless car

Time (in s)	Position (in m [N])
0.0	0.0
5.0	83.5
10.	167.0
15	250.5
20.	334.0
25	417.5
30.	501.0

Plot *Position vs. Time* on the following grid. Review the handout, *Rules for Making Graphs.*

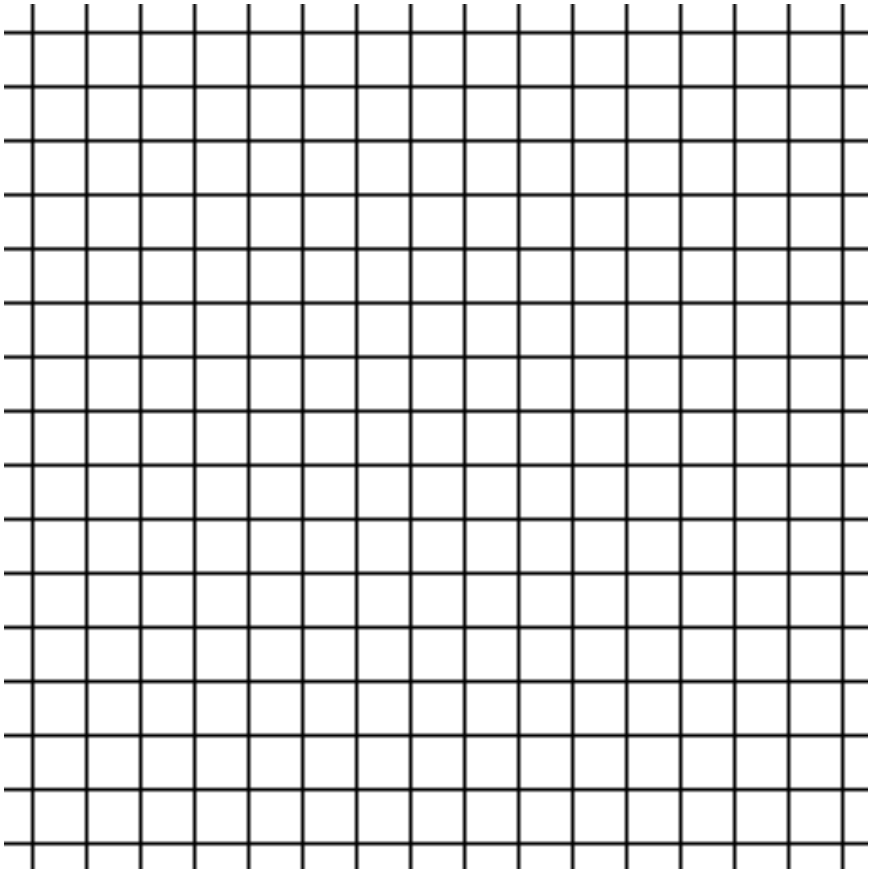


Next, create a table for the velocity of the driverless car. Recall that $\overrightarrow{v_{av}} = \frac{\Delta d}{\Delta t}$ where $\overrightarrow{v_{av}}$ is the ***average velocity***, where $\overrightarrow{\Delta d}$ is the ***displacement*** over the time interval, and Δt is the elapsed ***time***. In this case, the average velocity for each 5 s interval should be plotted at the midpoint of the time interval (i.e. every 2.5 s).

Table 2: Average velocity of a driverless car

Time (in s)	Velocity (in m/s [N])
0.0	
2.5	
7.5	
12.5	
17.5	
22.5	
27.5	

Plot *Velocity vs. Time* on the following grid.



Discussion

1. Describe the Position-Time curve.

2. What can you determine about the movement of the car from this graph?

3. Calculate the slope of the Position-Time curve. Show your work on the graph.

4. How does this slope compare to the velocity you calculated for the car? Should these results be the same? Why or why not?

5. Would there be a difference if you plotted the Distance-Time graph for this data? Why or why not?

6. Calculate the area under the Velocity-Time curve. Show your work on the graph.

7. How does this area compare to the displacement of the car for the same time period?