gROW TULSA

Pulling Together • Developing Understanding • Creating Opportunities

Distance and Time Graphs

Introduction: In this experiment you will learn about distance time graphs. To begin, you will be provided with a seat of data for two different rowing boats (each with eight people and a coxswain). You must plot the data points on a graph and then correctly assign the coxswain commands (the person driving the boat and communicating with the crew) to the correct section on the graph. When you have completed the exercise, you will have a firm understanding of distance/time graphs!

Part 1: Plotting the Data

The following data has been provided to help you practice plotting data points on a graph. There are two data sets. One for boat A and another for boat B. Use the graph paper provided to plot the points on the graph paper found on the next page and then connect the points with a straight line using a ruler or other straight edge.

Data

Boat A		Boat B	
Time A	Distance A	Time B	Distance B
0	0	0	2000
60	200	45	1750
140	800	90	1500
220	1000	190	1200
280	1000	250	1200
370	1500	360	500
500	2000	400	400
520	2000	480	0
		520	0

The first thing you need to accomplish is to draw the axes for the graphs. Look at the data above and determine what the maximum and minimum values are for each seat of data. The

time variables should be plotted on the horizontal (X) axis and the distance data points should be plotted on the vertical (Y) axis. Ideally, when you plot a graph, your data should fill as much of the graph area as possible, so the viewer has the opportunity to get a good view of the data.
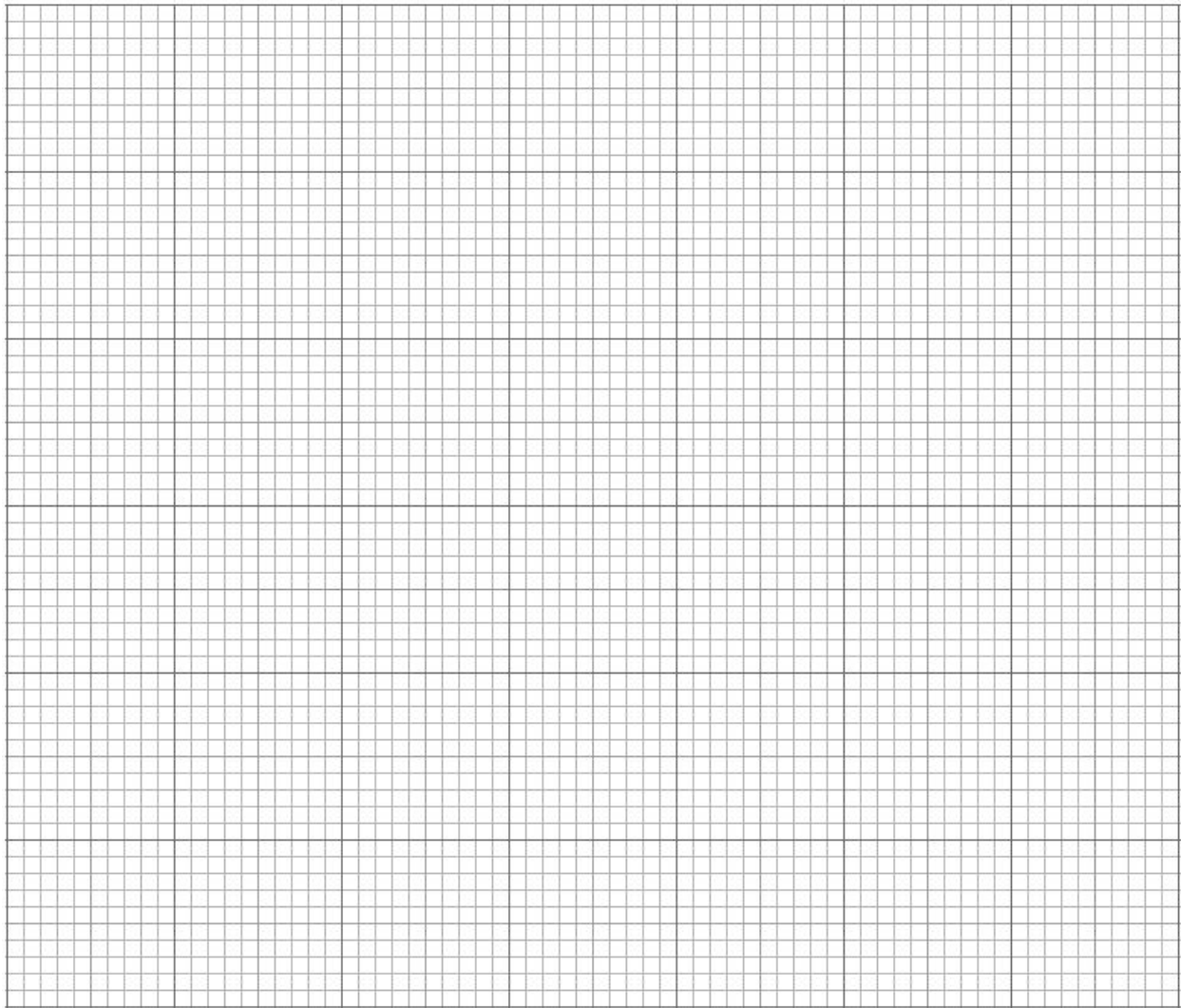
Part 2: Understanding the graph.

In this section you will be provided a series of "commands" from a coxswain. Each command has a alphabetic letter associated with it. When you identify which part of your graph corresponds the best, then mark the graph (in pencil) with the letter of the coxswain command. To make it more manageable, the coxswain commands have been divided into those from coxswain of boat A and those from the coxswain of boat B.

Coxswain Commands For Boat A

A. "Ok, take the power down a little, we are going to row the last 200m toward the finish line as consistently as possible.

B. "Ok, that's 800m gone, let's paddle really lightly"

C. "Ok, stop the boat, we have reached the finish line".

D. "OK, stop rowing, let's rest for a minute"

E. "We are going to do a start and row really hard for 500m, Sit ready, ROW!!!"

F. "Ready Start Rowing,"

G. We have travelled about 200m, let's take the power up for the next 600m! Go Go!

H. OK, we have rowed 1500m, drop the power a little.

Coxswain Commands For Boat B

I. "Hey, I see the another boat rowing by us in the opposite direction!", said the Cox.

J. "Ok, let's row 100m at a really slow pace".

K. We are going to row a 700m piece from here. Sit ready and let's hit the power! As fast as you can row!!!

L. "OK, stop rowing, we have reached the 1200m point of the race course, we will rest for one minute. I can see another boat approaching in another lane!"

M. "Let's row the last 400m of our row with our sprint power toward the start line of the race course".

N. "OK, crew, we are currently at the finish line of the race course and will row toward the start line. Let's start with a 500m piece. Are you ready? Row Hard!!

O. "OK, that's our 500m piece complete, let's power down and cruise for the next 300m.

Part 3: Further Analysis

1. How can you tell that the boat is not moving by looking at the graph?

2. Between which letters is boat A moving the fastest? How can you tell by looking at the graph?

3. Which boat reaches its destination first?

4. At what distance on the race course do the two boats pass each other?

5. What it the total amount of time it takes each boat to travel the 2000m distance?

Lab Extension

Now it is your turn to create your own data. You will need a partner to help you record your data when you row. You will also return the favor for them when they row and record their data.

After a good warm up and stretch on the rowing machine, set your monitor up to read 1000m. Row the piece recording you distance and time every 20 seconds for the entire piece. Use your data to construct a time, distance graph for your row. Try to vary the intensity of your effort as you row for different direction, but keep moving the entire distance!

On the next page is a data table to help your partner record your data as you row. .Print off as many copies as there are in your group.

Sample Data Table

Time (seconds)	Current Distance Travelled (Meters)
0	0
20	
40	
60	
80	
100	
120	
140	
200	
220	
240	
260	
300	
320	
340	
360	
380	

When you have recorded your data. Plot your data on the graph paper provided.

Remember to look at your minimum and maximum values for each variable and adjust your axes so that your graph data will fill most of the graph area. Plot time on the horizontal axis and distance on the vertical axis.
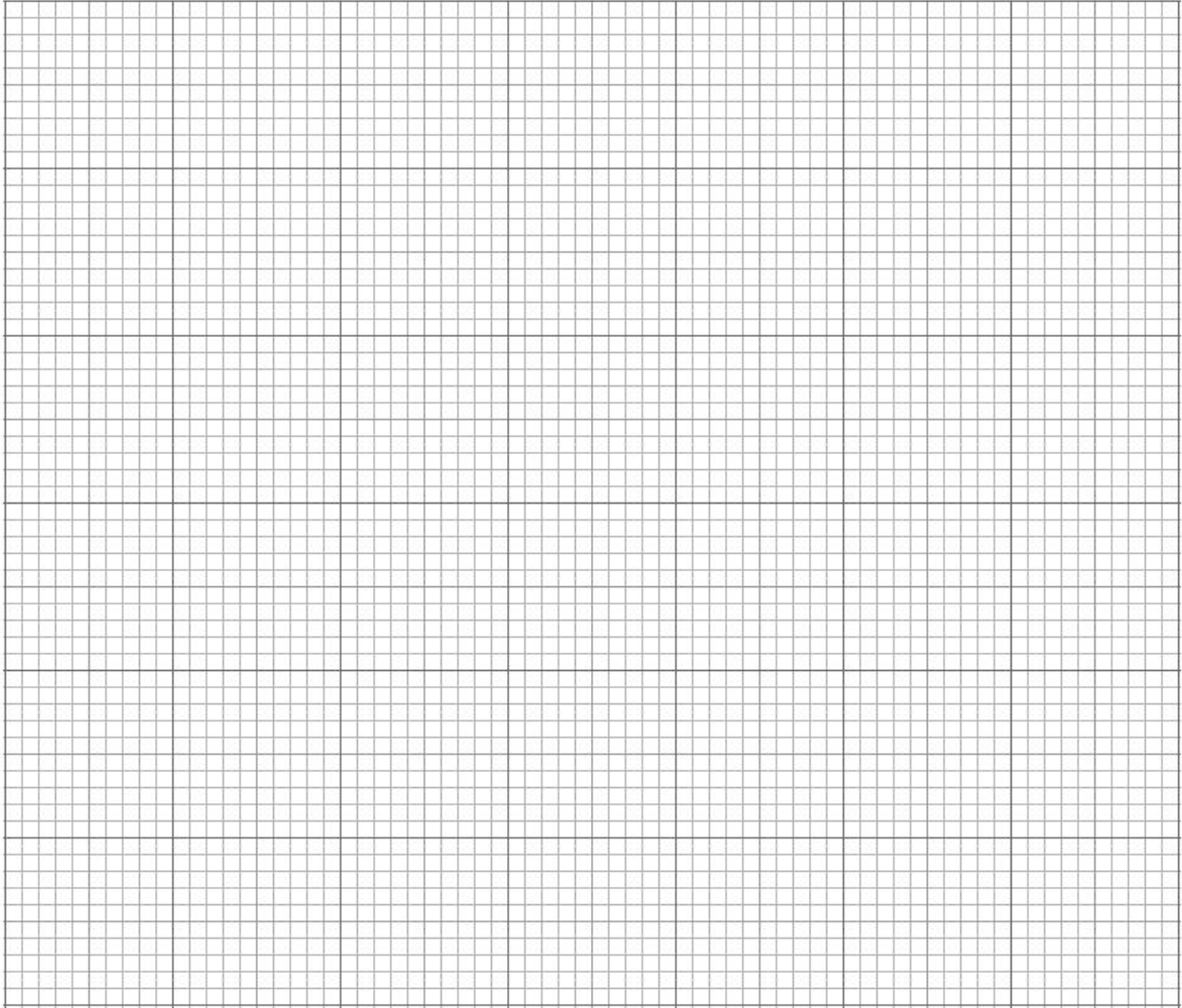
Teacher Key

Part 3: Further Analysis Answers

1. How can you tell that the boat is not moving by looking at the graph?

The line is horizontal on that particular part of the graph

2. Between which letters is boat A moving the slowest? (not including the point where the boat is not moving) How can you tell by looking at the graph?

The points between B and D, because the slope of the line is the least compared to all other parts of the graph.

3. Which boat reaches its destination first? How much earlier does it arrive compared to the other boat?

Boat B reaches its destination first. It reaches its destination 20 seconds earlier than Boat A.

4. At what distance on the race course do the two boats pass each other?

The boats pass by each other at the 1000m point of the race course.

5. What it the total amount of time it takes each boat to travel the 2000m distance?

Boat A takes 500 seconds to travel the distance. Boat B takes 480 seconds to travel the distance.

The Completed Graph Should Look Like This: