Name _____ Date _____ Hour _____

Problem 3.2 – Bridging the Distance

Inverse Variation Patterns

The relationship between length and width for rectangles with a fixed area is not linear. It is an example of an important type of non-linear pattern called an inverse variation.

The word "inverse" suggests that as one variable increases in value, the other variable decreases in values. However, the meaning of inverse variation is more specific than this. The relationship between two non-zero variables, "x" and "y", is an inverse variation if

$$y = k/x \qquad \text{or} \qquad xy = k$$

in which "k" is a constant that is not zero. The value of "k" is determined by the specific relationship.

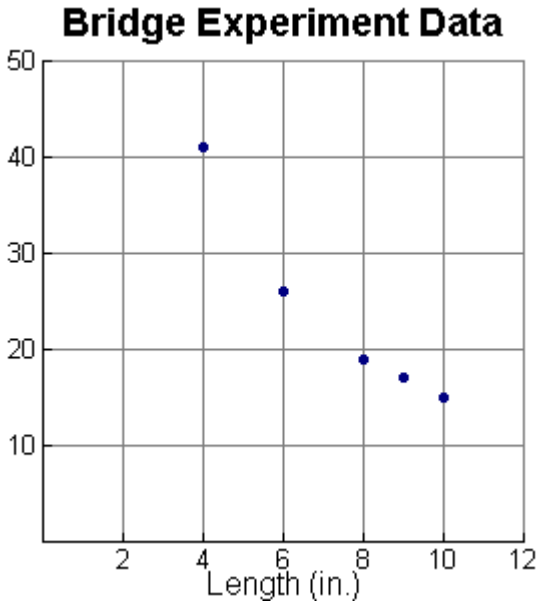
- *How are the equations $y = k/x$ and $xy = k$ related?*
- *For the same "x" value, will the two equations give different "y" values?*

Inverse variation occurs in many situations. For example, consider the table and the graph shown on the next page. They show the *(bridge length, breaking weight)* data collected by a group of students.

Name _____ Date _____ Hour _____

Problem 3.2 – Inverse Variation Patterns

Length	Pennies
4	41
6	26
8	19
9	17
10	15



Using the table and graph, address the following statements and questions.

- *Sketch a curve on your graph that models the pattern in the data.*

- *What value of "k" can you use to model these data with an inverse variation equation? Write the equation.*

- *In your equation, why does the value of "y" decrease as the value of "x" increases?*

- *What happens to the value of "y" as the value of "x" gets close to zero? Why is that a reasonable pattern for the bridge experiment?*

Name _____ Date _____ Hour _____

Problem 3.2 – Inverse Variation Patterns

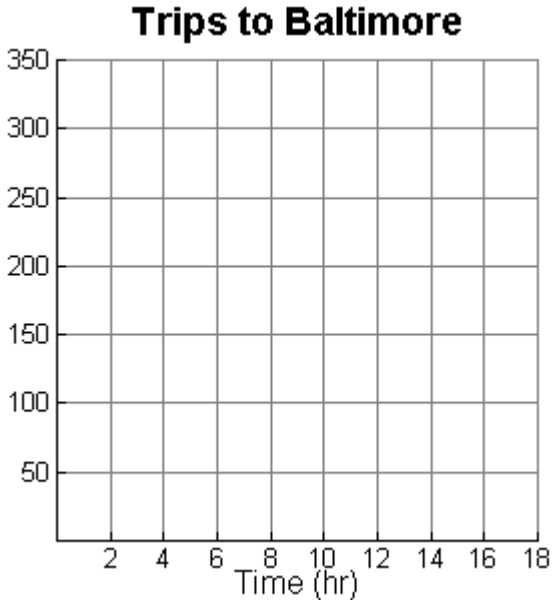
Mr. Cordova lives in Detroit, Michigan. He often travels to Baltimore to visit his grandfather. The trip is 500 miles each way. Here are his notes for his trips to Baltimore last year.

Date	Notes	Travel Time
February 15	Traveled by plane.	1.5 hours
May 22	Drove.	10 hours
July 3	Drove. Stopped for repairs.	14 hours
November 23	Flew. Flight delayed.	4 hours
December 23	Took an overnight train.	18 hours

A. 1) Calculate the average speed in miles per hour for each trip. Record the results in the table.

Time (hr)	1.5	10	14	4	18
Average Speed (mph)					

2) Plot the data on the grid. Draw a line or curve that models the data pattern. Describe the pattern of change in average speed as travel time increases.



Problem 3.2 – Inverse Variation Patterns

3) Write an equation for the relationship between travel time *(t)* and average speed *(s).*

4) Use your equation to find the average speed for 500-mile trips that take 8 hours, 12 hours, and 16 hours. *(Show the work!)*

a) x = 8 b) x = 12 c) x = 16

5) Add the *(travel time, average speed)* data from part 4 to your graph. Do the new points fit the graph model you sketched for the original data?

B. The Cordova family is planning a trip to Mackinac Island near the upper peninsula of Michigan. Mr. Cordova does some calculations to see how the travel time will change if the family drives at different speeds.

Average Speed (mph)	30	40	50	60	70
Travel Time (hr)	10	7.5	6	5	4.3

1) How far from Detroit is Mackinac Island?

2) What equation relates to time (t) to the average speed (s)?

Name _____ Date _____ Hour _____

Problem 3.2 – Inverse Variation Patterns

3) Describe the pattern of change in the travel time as the average speed increases.

   a) How would that pattern appear in a **graph** of the data?

   b) How is it shown by your **equation**?

4) Predict the travel times if the Cordovas drive at average speeds of 45 miles per hour and 65 miles per hour?

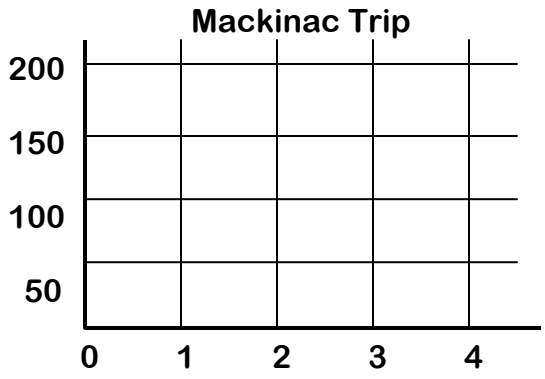
   a) 45 mph - _____

   b) 65 mph - _____

C. Suppose Mr. Cordova decides to aim for an average speed of 50 miles per hour for the trip to Mackinac Island.

1) Complete the table and sketch the graph.

Travel Time (h)	0	1	2	3	4
Distance (miles)	0				



2) Write an equation for the distance *(d)* the family travels in *(t)* hours.

3) How does this graph and equation compare to those in part A and B?