Equations from Data
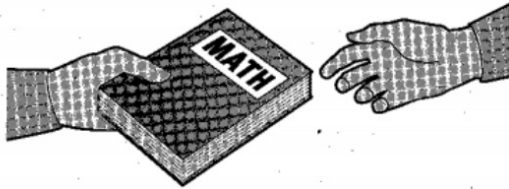
How fast can you and your classmates pass a textbook from one person to the next until the book has been relayed through each person in class?

1. Suppose your entire class lined up in a row. Estimate the length of time you think it would take to pass a book from the first student in the row to the last. Assume that the book starts on a table and the last person must place the book on another table at the end of the row.

Estimated time to pass the book: ___75 sec.___

2. As a class, experiment with the actual time it takes to pass the book using small groups of students in your class. Use the table below to record the times.

+3 +3 +2 +2 +2

Number of Students Passing the Book	3	6	9	11	13	15
Time to Pass the Book (nearest tenth of a second)	3.0	4.5	7	7.3	8.4	10.4

$\rightarrow m = 1$

+1.5 +2.5 +.3 +1.1 +2

$m =$ 0.5   .03   .15   .55

**3.** Based on the data you recorded in the table above, would you revise your estimated time from Item 1? Explain the reasoning behind your answer.

We would revise our estimate to 25 seconds because it only took us 10 seconds to get through over half of the class.

4. Graph the data in your table from Item 2 as a **scatter plot** on the coordinate grid.

Passing the Book

Time (seconds) vs Number of Students

(10,7)

(5,4)
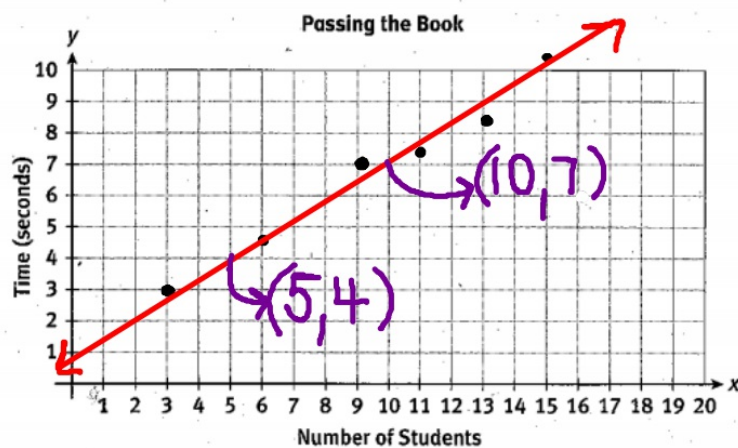
5. Are the data that you collected linear data?

   a. Explain your answer using the scatter plot.

  The data closely resembles a line.

   b. Explain your answer using the table of data.

The time increased as the number of students increased.

6. Describe how the time to pass the book changes as the number of students increases.

The time increased as the number of students increased.

7. Work as a group to predict the number of seconds it will take to pass the book through the whole class.

 a. Place a **trend line** on the scatter plot in Item 4 in a position that your group feels best models the data. Then, mark two points on the line.

 b. In the spaces provided below, enter the coordinates of the two points identified in Part (a).

 Point 1: (5 , 4)   Point 2: (10 , 7)

 c. Why does your group think that this line gives the best position for modeling the scatter plot data?

The line is in the middle of the data points. The data points are evenly distributed above and below the line.

8. Use the coordinate pairs you recorded in Item 7(b) to write the equation for your trend line (or linear model) of the scatter plot.

$$y = 0.6x + 1$$

9. Explain what the variables in the equation of your linear model represent.

x = the number of students
y = time (seconds)

10. What is the meaning of the slope in your linear model?
m = 0.6; The time to pass the book increases by 0.6 seconds for every student added.

11. Use your equation to predict how long it would take to pass the book through all the students in your class.

Predicted time to pass the book: ___16.6 sec___

$$(5,4)(10,7)$$

$$m = \frac{7-4}{10-5} = \frac{3}{5} = 0.6$$

$$y = mx + b$$

$$4 = 0.6(5) + b$$

$$4 = 3 + b$$

$$\frac{-3 \quad -3}{1 = b}$$

$$y = 0.6x + 1$$

$$y = 0.6(26) + 1$$

$$y = 15.6 + 1$$

$$y = 16.6$$

12. Using all of the students in your class, find the actual time it takes to pass the book.

Actual time to pass the book: ____14.07 seconds____