

Objective

Determine the line of best fit for a set of experimental data.

Common Core State Standards

- **8.SP.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- **8.SP.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
- **8.SP.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

Statistics and Probability

Line of Best Fit

Previously, students learned how to graph a scatter plot diagram. From their diagram, they were able to determine that the coordinate pairs may have a linear relationship, even though the pairs did not form a perfect line. In this lesson, students will be introduced to the term “line of best fit.” In future mathematics courses, students may hear this line referred to as “the regression line” or “the least squares line.”

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Ask:** Does the line show the general direction of the data? Are there approximately an equal number of pegs (points) above the line as below? What is the slope of the line? What does it mean? What is the y-intercept? What does it mean?
- **Say:** Scatter plots may show an association between two variables.
Ask: What association does this scatter plot suggest? **Say:** It’s important to know that an association is not the same as a cause-and-effect relationship, however. There may be other factors involved that we are not aware of.

Solve It

Reread the problem with students. Have students use their knowledge of graphing to determine the line of best fit. Have them estimate values greater than $x = 7$ that might be on their graph.

More Ideas

For another way to teach about the line of best fit—

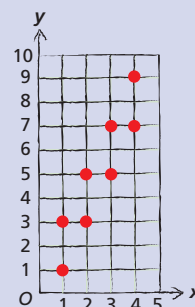
- Have students find scatter plots in the media (newspapers, magazines, online). Have them draw the line of best fit and write an equation that expresses it in y-intercept form ($y + mx = b$).

Formative Assessment

Have students try the following problem.

Which is the line of best fit?

- A. $y = x + 2$
- B. $y = 2x$
- C. $y = x + 1$
- D. $y = 2x + 1$



Try It! 30 minutes | Pairs

Here is a problem about the line of best fit.

Widget Works is a shop that produces handmade custom widgets. The table shows the number of hours worked and the number of widgets produced by ten skilled craftspeople.

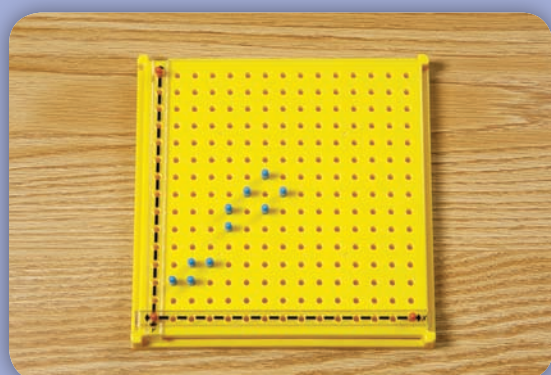
Craftsperson	1	2	3	4	5	6	7	8	9	10
x-Hours Worked	2	7	1	5	2	6	3	4	6	4
y-Widgets Produced	3	7	2	7	2	8	3	5	6	6

Determine the line of best fit that relates to the number of hours worked and the number of widgets produced. Write the equation for the line in y-intercept form ($y = mx + b$).

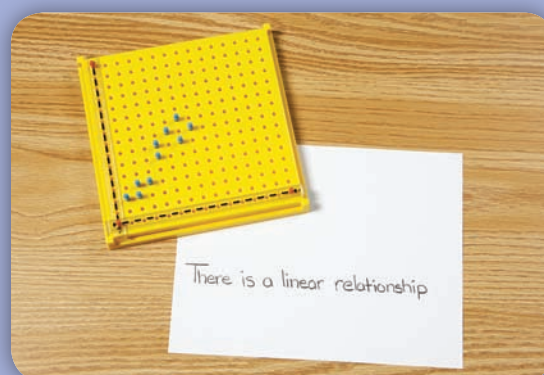
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials

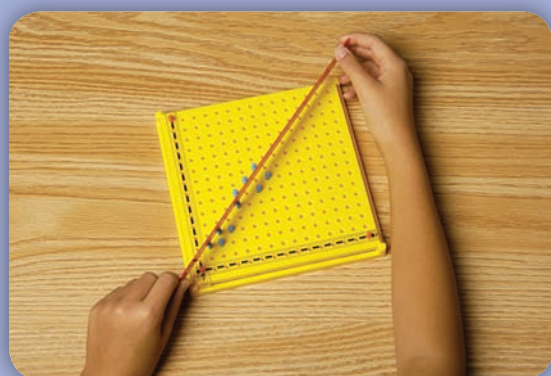
- XY Coordinate Pegboard
- ruler or straightedge



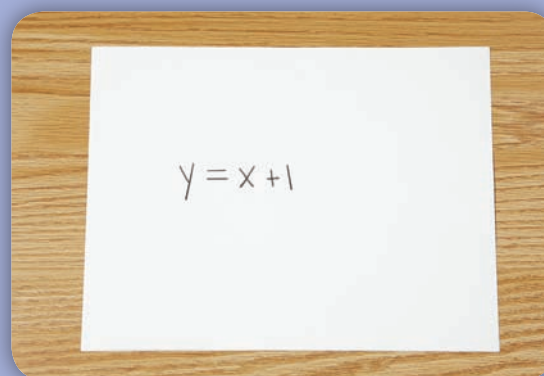
1. Have students peg the coordinate pairs on their XY Coordinate Pegboard.



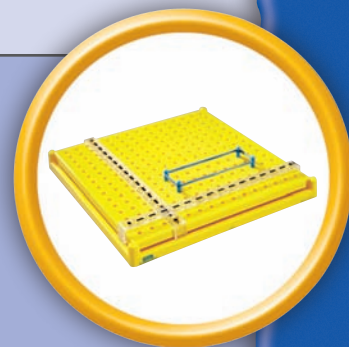
2. Have students determine whether or not there is a linear relationship between the coordinate values. **Ask:** Can you draw a straight line that will lie near all of the data points?



3. Have students take a ruler or straightedge and see if they can find a "line of best fit." The line should "split" the pegs, leaving the same number of pegs above the line as below it (or as close to this as possible).



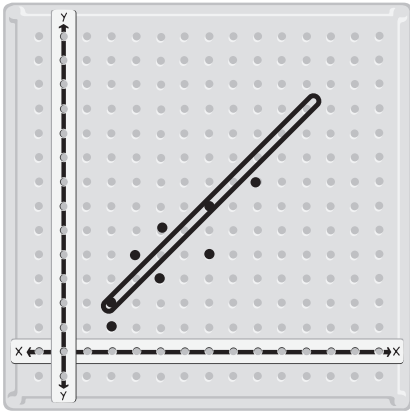
4. Have students use the slope and the y-intercept to write the equation for this line of best fit. (The y-intercept should be estimated to the nearest whole number.)



Use an XY Coordinate Pegboard to model the scatter plot shown. Write the equation for the line of best fit in the form $y = mx + b$.

(Check students' work.)

1.



If the line extended to the y-axis, where would it intersect? 0

What is the slope of the line? 1

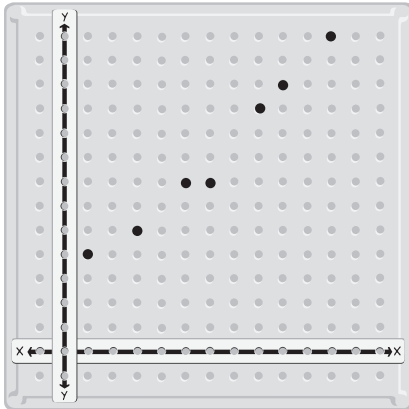
The equation for the line of best fit is

$$y = x$$

Using an XY Coordinate Pegboard, model the scatter plot shown. Write the equation for the line of best fit in the form $y = mx + b$.

(Check students' models.)

2.



For the line of best fit, $b =$ 2

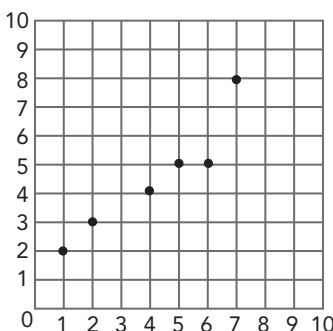
For the line of best fit, $m =$ 1

The equation for the line of best fit is

$$y = x + 2$$

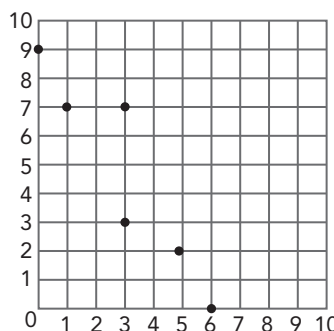
Write the equation for the line of best fit for each scatter plot.

3.



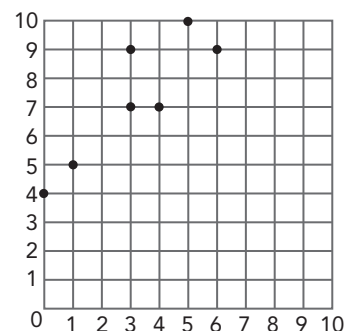
$$y = x + 1$$

4.



$$y = -2x + 9$$

5.



$$y = x + 4$$

Answer Key

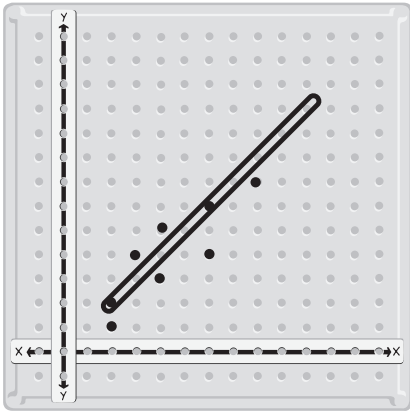
Challenge! How can you tell from looking at the points in a scatter plot if the line of best fit has a positive or negative slope? Draw a picture to help.

Challenge: (Sample) If the points tend to move higher up the grid as they go from left to right, then the line of best fit has a positive slope. If the points tend to move lower down the grid as they go from left to right, then the line of best fit has a negative slope.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Use an XY Coordinate Pegboard to model the scatter plot shown. Write the equation for the line of best fit in the form $y = mx + b$.

1.



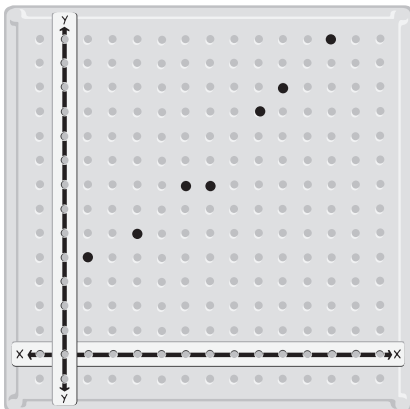
If the line extended to the y-axis, where would it intersect? _____

What is the slope of the line? _____

The equation for the line of best fit is _____.

Using an XY Coordinate Pegboard, model the scatter plot shown. Write the equation for the line of best fit in the form $y = mx + b$.

2.



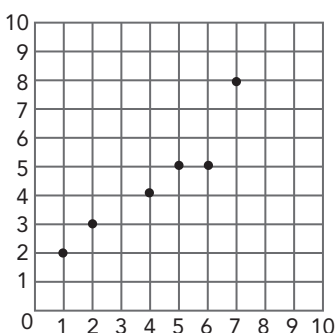
For the line of best fit, $b =$ _____.

For the line of best fit, $m =$ _____.

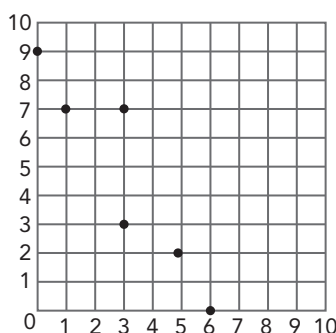
The equation for the line of best fit is _____.

Write the equation for the line of best fit for each scatter plot.

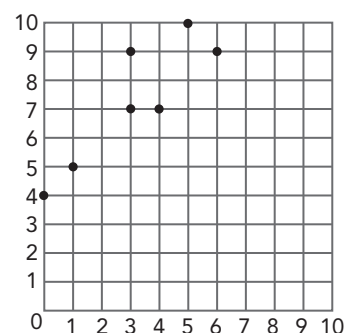
3.



4.



5.



Challenge! How can you tell from looking at the points in a scatter plot if the line of best fit has a positive or negative slope? Draw a picture to help.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.