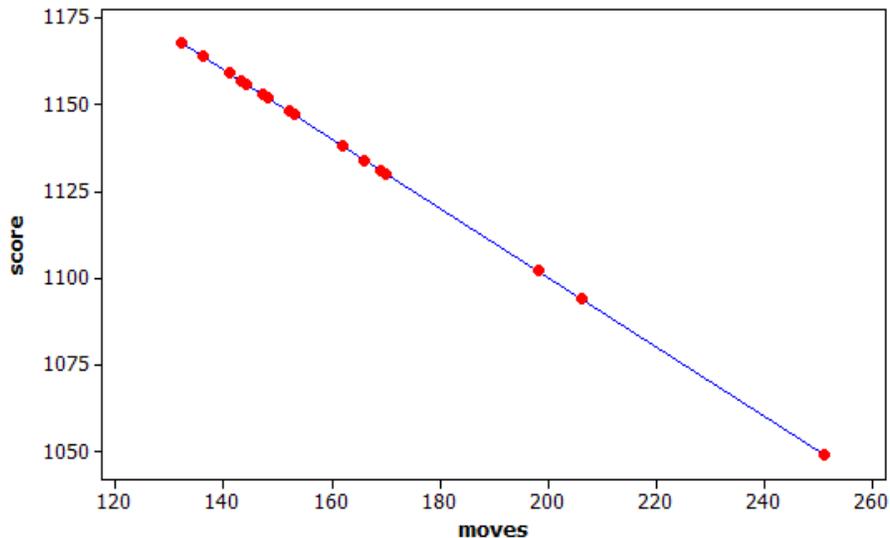


Name \_\_\_\_\_

Date \_\_\_\_\_

- Many computers come with a Solitaire card game. The player moves cards in certain ways to complete specific patterns. The goal is to finish the game in the shortest number of moves possible, and a player’s score is determined by the number of moves. A statistics teacher played the game 16 times and recorded the number of moves and the final score after each game. The line represents the linear function that is used to determine the score from the number of moves.



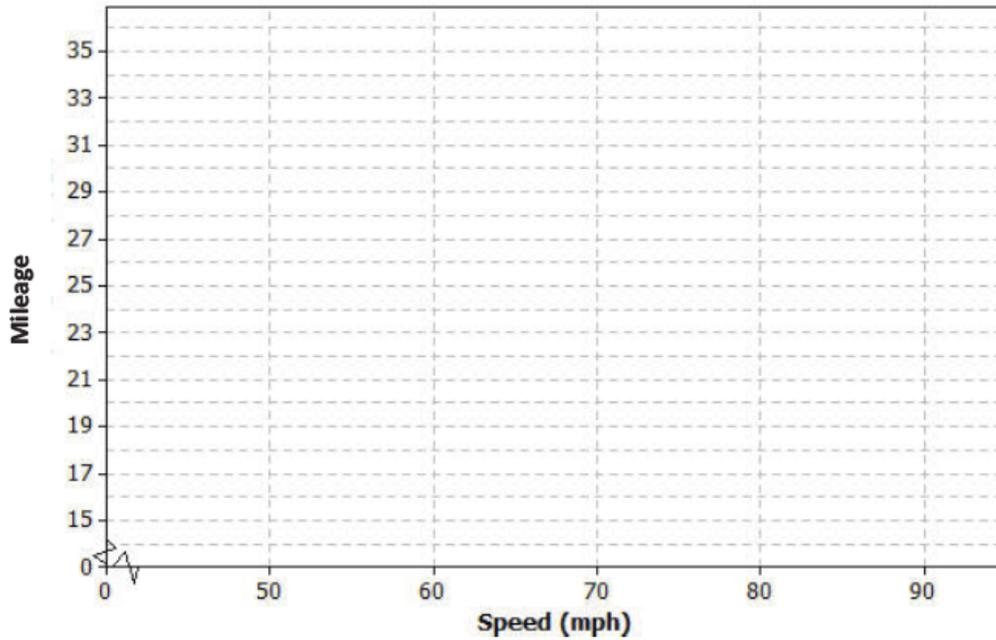
- Was this person’s average score closer to 1130 or 1110? Explain how you decided.
  
- The first two games she played took 169 moves (1131 points) and 153 moves (1147 points). Based on this information, determine the equation of the linear function used by the computer to calculate the score from the number of moves. Explain your work.

- c. Based on the linear function, each time the player makes a move, how many points does she lose?
- d. Based on the linear function, how many points does the player start with in this game? Explain your reasoning.
2. To save money, drivers often try to increase their mileage, which is measured in miles per gallon (mpg). One theory is that speed traveled impacts mileage. Suppose the following data are recorded for five different 300-mile tests, with the car traveling at different speeds in miles per hour (mph) for each test.

Speed (mph)	Mileage
50	32
60	29
70	24
80	20
90	17

- a. For the data in this table, is the association positive or negative? Explain how you decided.

- b. Construct a scatter plot of these data using the following coordinate grid. The vertical axis represents the mileage, and the horizontal axis represents the speed in miles per hour (mph).



- c. Draw a line on your scatter plot that you think is a reasonable model for predicting the mileage from the car speed.
- d. Estimate and interpret the slope of the line you found in part (c).

Suppose additional data were measured for three more tests. These results have been added to the previous tests, and the combined data are shown in the table below.

Speed (mph)	Mileage
20	25
30	27
40	30
50	32
60	29
70	24
80	20
90	17

- e. Does the association for these data appear to be linear? Why or why not?
- f. If your only concern was mileage and you had no traffic constraints, what speed would you recommend traveling based on these data? Explain your choice.

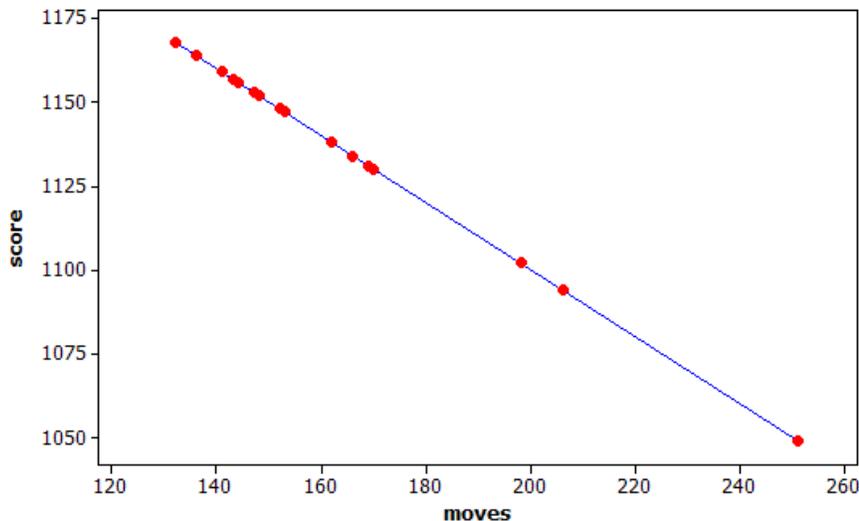
A Progression Toward Mastery					
Assessment Task Item	STEP 1 Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem	STEP 2 Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem	STEP 3 A correct answer with some evidence of reasoning or application of mathematics to solve the problem, OR an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem	STEP 4 A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem	
1	a 8.SP.A.1	Student makes no use of the given data.	Student chooses 1110 based solely on it being the midpoint of the $y$ -axis values.	Student chooses 1130, but reasoning is incomplete or missing.	Student chooses 1130 based on the higher concentration of red dots around those $y$ -values.
	b 8.F.B.4	Student cannot obtain a line.	Student attempts to estimate a line from the graph.	Student uses a reasonable approach but does not obtain the correct line (e.g., interchanges slope and intercept in the equation, sets up an inverse of the slope equation, or shows insufficient work).	Student finds the correct equation (or with minor errors) from slope = $\frac{(1131-1147)}{169-153} = -1$ , and intercept from $1131 = a - 169$ , so $a = 1300$ . Equation: $y = 1300 - x$ , where $y$ represents points and $x$ represents number of moves.
	c 8.F.B.4	Student makes no use of the given data.	Student does not recognize this as a question about slope.	Student estimates the slope from the graph.	Student reports the slope $(-1)$ found in part (b).
	d 8.F.B.4	Student makes no use of the given data.	Student does not recognize this as a question about intercept.	Student estimates the intercept from the graph or solves the equation with $x = 0$ without recognizing a connection to the equation.	Student reports the intercept (1300) found in part (b).

<b>2</b>	<b>a</b>  <b>8.F.B.4</b>	Student makes no use of the given data.	Student bases the answer solely on the content (e.g., faster cars are less fuel efficient).	Student refers to the scatter plot in part (b) or makes a minor error (e.g., misspeaks and describes a negative association but appears to unintentionally call it a positive association).	Student notes that mileage values are decreasing while speeds (mph) are increasing and states that this is a negative association. OR Student solves for the slope and notes the sign of the slope.
	<b>b</b>  <b>8.SP.A.1</b>	Student makes no use of the given data.	Student does not construct a scatter plot with the correct number of dots.	Student constructs a scatter plot but reverses the roles of speed and mileage.	Student constructs a scatter plot that has five dots in the correct locations.
	<b>c</b>  <b>8.SP.A.2</b>	Student does not answer the question.	Student does not draw a line but rather connects the dots.	Student draws a line that does not reasonably describe the behavior of the plotted data.	Student draws a line that reasonably describes the behavior of the plotted data.
	<b>d</b>  <b>8.F.B.4</b>	Student makes no use of the given data.	Student uses the correct approach but makes major calculation errors (e.g., using only values from the table or failing to interpret the slope).	Student uses the correct approach but makes minor errors in calculation or in interpretation.	Student estimates the coordinates for two locations and determines the change in $y$ -values divided by the change in $x$ -values, for example, (50, 33) and (80, 20), which yields $\left(-\frac{13}{30}\right) \approx -0.43\bar{3}$ , and interprets this as the decrease in mileage per additional mph in speed.
	<b>e</b>  <b>8.F.B.5</b>	Student does not comment on the increasing or decreasing pattern in the values.	Student attempts to sketch a graph of the data and comments on the overall pattern but does not comment on the change in the direction of the association.	Student comments only on how the change in the mileage is not constant without commenting on the change in the sign of the differences.	Student comments on the increasing and then decreasing behavior of the mileage column as the mileage column steadily increases.
	<b>f</b>  <b>8.F.B.4</b>	Student does not answer the question.	Student recommends 55 mph based only on anecdote and does not provide any reasoning.	Student recommends a reasonable speed but does not fully justify the choice.	Student recommends and gives justification for a speed between 40 and 50 mph, or at 50 mph, based on the association “peaking” at 50 mph.

Name \_\_\_\_\_

Date \_\_\_\_\_

1. Many computers come with a Solitaire card game. The player moves cards in certain ways to complete specific patterns. The goal is to finish the game in the shortest number of moves possible, and a player’s score is determined by the number of moves. A statistics teacher played the game 16 times and recorded the number of moves and the final score after each game. The line represents the linear function that is used to determine the score from the number of moves.



- a. Was this person’s average score closer to 1130 or 1110? Explain how you decided.

*Most of the games had scores between 1125 and 1175. The mean score will be closer to 1130.*

- b. The first two games she played took 169 moves (1131 points) and 153 moves (1147 points). Based on this information, determine the equation of the linear function used by the computer to calculate the score from the number of moves. Explain your work.

*The difference in the scores is  $1131 - 1147$  or  $-16$ .  
 The difference in the number of moves is  $169 - 153 = 16$   
 The slope is  $-16/16$  or  $-1$ . This means that  
 $1131 = \text{intercept} - 169$ , so intercept equals 1300  
 Score =  $1300 - \text{moves}$*

- c. Based on the linear function, each time the player makes a move, how many points does she lose?

One point lost per move.

- d. Based on the linear function, how many points does the player start with in this game? Explain your reasoning.

1300, or the score when  
the number of moves equals 0.

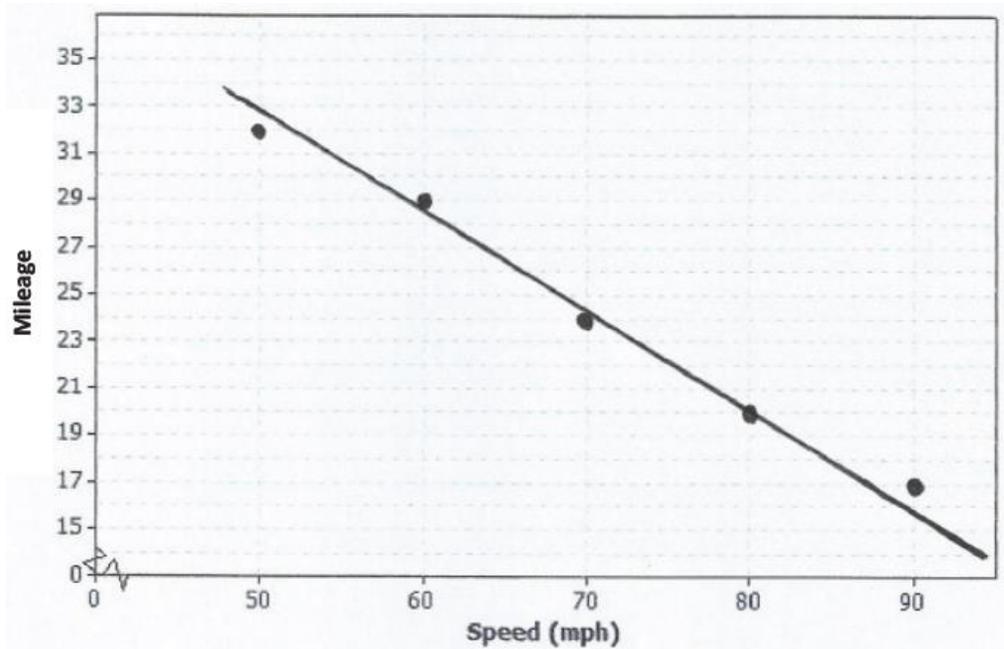
2. To save money, drivers often try to increase their mileage, which is measured in miles per gallon (mpg). One theory is that speed traveled impacts mileage. Suppose the following data are recorded for five different 300-mile tests, with the car traveling at different speeds in miles per hour (mph) for each test.

Speed (mph)	Mileage
50	32
60	29
70	24
80	20
90	17

- a. For the data in this table, is the association positive or negative? Explain how you decided.

As the speed increases in miles per hour,  
the miles per gallon decrease. This  
describes a negative association.

- b. Construct a scatter plot of these data using the following coordinate grid. The vertical axis represents the mileage and the horizontal axis represents the speed in miles per hour (mph).



- c. Draw a line on your scatter plot that you think is a reasonable model for predicting the mileage from the car speed.
- d. Estimate and interpret the slope of the line you found in part (c).

Two points are approximately  $(80, 20)$  and  $(50, 33)$ .

$$\text{So, slope} \approx \frac{20 - 33}{80 - 50} \approx -0.43\bar{3}$$

Each increase of 1 mph in speed predicts a decrease of  $0.43\bar{3}$  mpg.

Suppose additional data were measured for three more tests. These results have been added to the previous tests, and the combined data are shown in the table below.

Speed (mph)	Mileage
20	25
30	27
40	30
50	32
60	29
70	24
80	20
90	17

- e. Does the association for these data appear to be linear? Why or why not?

No, while the speeds increase, the mileage values increase and then mostly decrease. There is no fixed rate of increase or decrease for mileage based on increased speed.

- f. If your only concern was mileage and you had no traffic constraints, what speed would you recommend traveling based on these data? Explain your choice.

About 50 mph. It is around 50 mph that the mpg stops increasing and starts to decrease.