



Question Bank

Math

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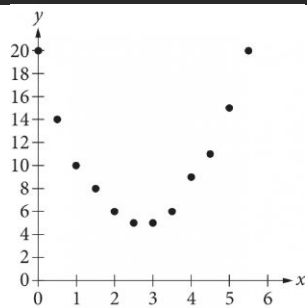
Two-Variable Data (key)





Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: 82aaa0a1



Of the following, which is the best model for the data in the scatterplot?

- A. $y = 2x^2 - 11x - 20$
- B. $y = 2x^2 - 11x + 20$
- C. $y = 2x^2 - 5x - 3$
- D. $y = 2x^2 - 5x + 3$

ID: 82aaa0a1 Answer

Correct Answer: B

Rationale

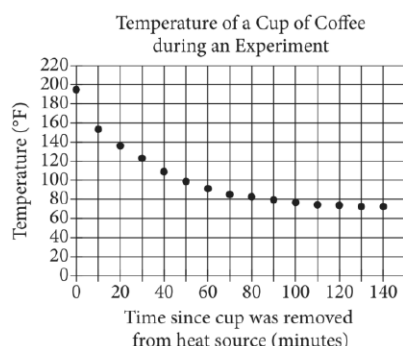
Choice B is correct. The graphical model that most closely fits the data in the scatterplot is a model in which the number of data points above and below the model are approximately balanced. Fitting a graphical model to the data shown results in an upward-facing parabola with a y-intercept near (0,20) and a vertex with an approximate x-value of 2.5. Of the given choices, only choice B gives an equation of an upward-facing parabola with a y-intercept at (0,20). Furthermore, substituting 2.5 for x into the equation in choice B yields $y = 5$. This is approximately the y-value of the vertex of the model.

Choices A, C, and D are incorrect. These equations don't give a graphical model that best fits the data. At $x = 0$, they have y-values of -20 , -3 , and 3 , respectively. At $x = 2.5$, they have y-values of -35 , -3 , and 3 , respectively.



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 83272c51



In an experiment, a heated cup of coffee is removed from a heat source, and the cup of coffee is then left in a room that is kept at a constant temperature. The graph above shows the temperature, in degrees Fahrenheit ($^{\circ}\text{F}$), of the coffee immediately after being removed from the heat source and at 10-minute intervals thereafter. During which of the following 10-minute intervals does the temperature of the coffee decrease at the greatest average rate?

- A. Between 0 and 10 minutes
- B. Between 30 and 40 minutes
- C. Between 50 and 60 minutes
- D. Between 90 and 100 minutes

ID: 83272c51 Answer

Correct Answer: A

Rationale

Choice A is correct. The average rate of change in temperature of the coffee in degrees Fahrenheit per minute is calculated by dividing the difference between two recorded temperatures by the number of minutes in the corresponding interval of time. Since the time intervals given are all 10 minutes, the average rate of change is greatest for the points with the greatest difference in temperature. Of the choices, the greatest difference in temperature occurs between 0 and 10 minutes.

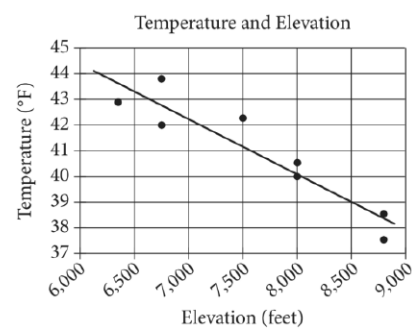
Choices B, C, and D are incorrect and may result from misinterpreting the average rate of change from the graph.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: ac5b6558



The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. What temperature is predicted by the line of best fit for a location in the Lake Tahoe Basin with an elevation of 8,500 feet?

- A. 37°F
- B. 39°F
- C. 41°F
- D. 43°F

ID: ac5b6558 Answer

Correct Answer: B

Rationale

Choice B is correct. The line of best fit passes through the point (8,500, 39). Therefore, the line of best fit predicts a temperature of 39°F for a location in Lake Tahoe Basin with an elevation of 8,500 feet.

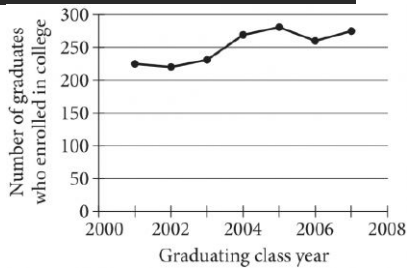
Choice A is incorrect. This is the lowest temperature listed on the scatterplot, and the line of best fit never crosses this value for any of the elevations shown. Choice C is incorrect. According to the line of best fit, the temperature of 41°F is predicted for an elevation of slightly greater than 7,500 feet, not an elevation of 8,500 feet. Choice D is incorrect. According to the line of best fit, the temperature of 43°F is predicted for an elevation of roughly 6,700 feet, not an elevation of 8,500 feet.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: 74dee52b



The line graph shows the number of graduates from the classes of 2001 through 2007 at a certain school who enrolled in college within 24 months of graduation. Of the following, which class had the fewest graduates who enrolled in college within 24 months of graduation?

- A. 2002
- B. 2004
- C. 2005
- D. 2007

ID: 74dee52b Answer

Correct Answer: A

Rationale

Choice A is correct. The year with the fewest graduates who enrolled in college within 24 months of graduation is the point with the lowest value on the vertical axis. This occurs at 2002.

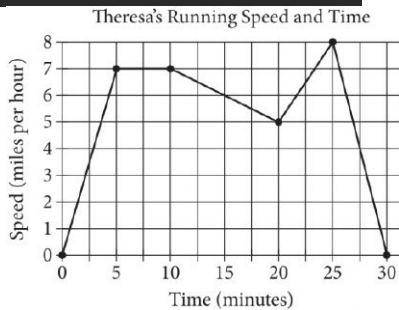
Choice B, C, and D are incorrect. The years 2004, 2005, and 2007 each had a greater number of graduates who enrolled in college within 24 months of graduation than did the year 2002.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ □ □

ID: 9d88a3e3



Theresa ran on a treadmill for thirty minutes, and her time and speed are shown on the graph above. According to the graph, which of the following statements is NOT true concerning Theresa's run?

- A. Theresa ran at a constant speed for five minutes.
- B. Theresa's speed was increasing for a longer period of time than it was decreasing.
- C. Theresa's speed decreased at a constant rate during the last five minutes.
- D. Theresa's speed reached its maximum during the last ten minutes.

ID: 9d88a3e3 Answer

Correct Answer: B

Rationale

Choice B is correct. Theresa's speed was increasing from 0 to 5 minutes and from 20 to 25 minutes, which is a total of 10 minutes. Theresa's speed was decreasing from 10 minutes to 20 minutes and from 25 to 30 minutes, which is a total of 15 minutes. Therefore, Theresa's speed was NOT increasing for a longer period of time than it was decreasing.

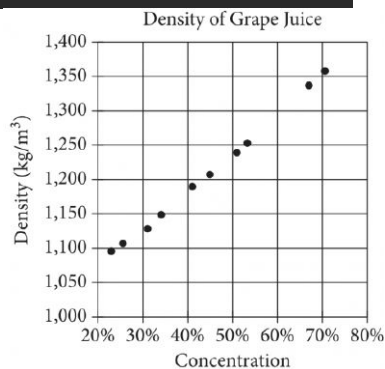
Choice A is incorrect. Theresa ran at a constant speed for the 5-minute period from 5 to 10 minutes. Choice C is incorrect. Theresa's speed decreased at a constant rate during the last 5 minutes, which can be seen since the graph is linear during that time. Choice D is incorrect. Theresa's speed reached its maximum at 25 minutes, which is within the last 10 minutes.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: c9dd92b1



The densities of different concentrations of grape juice are shown in the scatterplot above. According to the trend shown by the data, which of the following is closest to the predicted density, in kilograms per cubic meter (kg/m^3), for grape juice with a concentration of 60%?

- A. 1,200
- B. 1,250
- C. 1,300
- D. 1,350

ID: c9dd92b1 Answer

Correct Answer: C

Rationale

Choice C is correct. The data in the scatterplot show an increasing linear trend. The density when the juice concentration is 60% will be between the densities shown at about 53% and 67% concentration, or between about 1,255 and 1,340 kg/m^3 . Of the choices given, only 1,300 falls within this range.

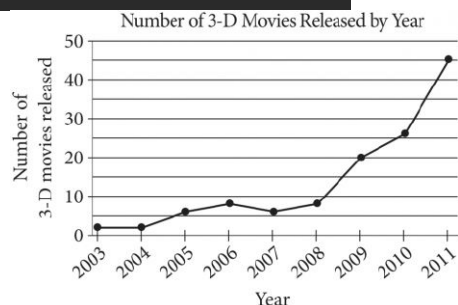
Choices A, B, and D are incorrect. These are the approximate densities of grape juice with a concentration of 45%, 55%, and 70%, respectively.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: a6b2fcce



According to the line graph above, between which two consecutive years was there the greatest change in the number of 3-D movies released?

- A. 2003–2004
- B. 2008–2009
- C. 2009–2010
- D. 2010–2011

ID: a6b2fcce Answer

Correct Answer: D

Rationale

Choice D is correct. The change in the number of 3-D movies released between any two consecutive years can be found by first estimating the number of 3-D movies released for each of the two years and then finding the positive difference between these two estimates. Between 2003 and 2004, this change is approximately $2 - 2 = 0$ movies; between 2008 and 2009, this change is approximately $20 - 8 = 12$ movies; between 2009 and 2010, this change is approximately $26 - 20 = 6$ movies; and between 2010 and 2011, this change is approximately $46 - 26 = 20$ movies. Therefore, of the pairs of consecutive years in the choices, the greatest increase in the number of 3-D movies released occurred during the time period between 2010 and 2011.

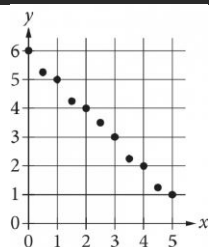
Choices A, B, and C are incorrect. Between 2010 and 2011, approximately 20 more 3-D movies were released. The change in the number of 3-D movies released between any of the other pairs of consecutive years is significantly smaller than 20.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 9296553d



Which of the following could be an equation for a line of best fit for the data in the scatterplot?

- A. $y = -x + 6$
- B. $y = -x - 6$
- C. $y = 6x + 1$
- D. $y = 6x - 1$

ID: 9296553d Answer

Correct Answer: A

Rationale

Choice A is correct. A line of best fit for the data in a scatterplot is a line that follows the trend of the data with approximately half the data points above and half the data points below the line. Based on the given data, a line of best fit will have a positive y-intercept on or near the point $(0, 6)$ and a negative slope. All of the choices are in slope-intercept form $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept. Only choice A is an equation of a line with a positive y-intercept at $(0, 6)$ and a negative slope, -1 .

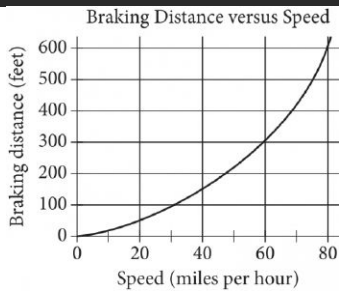
Choice B is incorrect. This equation is for a line that has a negative y-intercept, not a positive y-intercept. Choices C and D are incorrect and may result from one or more sign errors and from switching the values of the y-intercept and the slope in the equation.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: d6121490



The graph above shows the relationship between the speed of a particular car, in miles per hour, and its corresponding braking distance, in feet. Approximately how many feet greater will the car’s braking distance be when the car is traveling at 50 miles per hour than when the car is traveling at 30 miles per hour?

- A. 75
- B. 125
- C. 175
- D. 250

ID: d6121490 Answer

Correct Answer: B

Rationale

Choice B is correct. According to the graph, when the car is traveling at 50 miles per hour, the braking distance is approximately 225 feet, and when the car is traveling at 30 miles per hour, the braking distance is approximately 100 feet. The difference between these braking distances is $225 - 100$, or 125 feet.

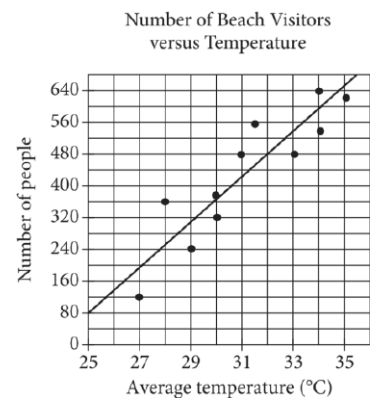
Choice A is incorrect and may result from finding the braking distance for 20 miles per hour, the difference between the given speeds. Choice C is incorrect and may result from subtracting the speed from the braking distance at 50 miles per hour. Choice D is incorrect and may result from finding the difference in the braking distances at 60 and 20 miles per hour.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: 8156d446



Each dot in the scatterplot above represents the temperature and the number of people who visited a beach in Lagos, Nigeria, on one of eleven different days. The line of best fit for the data is also shown. According to the line of best fit, what is the number of people, rounded to the nearest 10, predicted to visit this beach on a day with an average temperature of 32°C ?

ID: 8156d446 Answer

Rationale

The correct answer is 480. An average temperature of 32°C corresponds to the value 32 on the x-axis. On the line of best fit, an x-value of 32 corresponds to a y-value of 480. The values on the y-axis correspond to the number of people predicted to visit this beach. Therefore, 480 people are predicted to visit this beach on a day with an average temperature of 32°C .

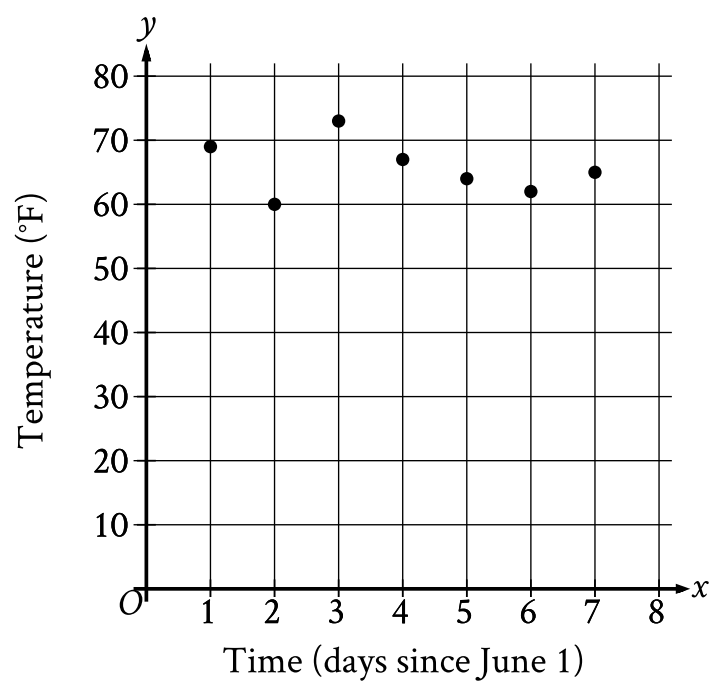
Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: d112bc9d

The scatterplot shows the temperature y , in $^{\circ}\text{F}$, recorded by a meteorologist at various times x , in days since June 1.



During which of the following time periods did the greatest increase in recorded temperature take place?

- A. From $x = 6$ to $x = 7$
- B. From $x = 5$ to $x = 6$
- C. From $x = 2$ to $x = 3$
- D. From $x = 1$ to $x = 2$

ID: d112bc9d Answer

Correct Answer: C

Rationale

Choice C is correct. The scatterplot shows that there was an increase in recorded temperature from $x = 2$ to $x = 3$ and from $x = 6$ to $x = 7$. When $x = 2$, the recorded temperature was approximately 60°F and when $x = 3$, the recorded temperature was greater than 70°F . This means that the increase in recorded temperature from $x = 2$ to $x = 3$ was greater than $(70 - 60)^{\circ}\text{F}$, or 10°F . When $x = 6$, the recorded temperature was greater than 60°F and when $x = 7$, the recorded temperature was less than 70°F . This

means that the increase in recorded temperature from $x = 6$ to $x = 7$ was less than $(70 - 60)^{\circ}\text{F}$, or 10°F . It follows that the greatest increase in recorded temperature took place from $x = 2$ to $x = 3$.

Choice A is incorrect. The increase in recorded temperature from $x = 6$ to $x = 7$ was less than the increase in recorded temperature from $x = 2$ to $x = 3$.

Choice B is incorrect. From $x = 5$ to $x = 6$, a decrease, not an increase, in recorded temperature took place.

Choice D is incorrect. From $x = 1$ to $x = 2$, a decrease, not an increase, in recorded temperature took place.

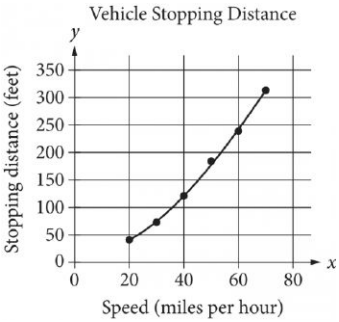
Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: 5c24c861

A study was done to determine a new car’s stopping distance when it was traveling at different speeds. The study was done on a dry road with good surface conditions. The results are shown below, along with the graph of a quadratic function that models the data.



According to the model, which of the following is the best estimate for the stopping distance, in feet, if the vehicle was traveling 55 miles per hour?

- A. 25
- B. 30
- C. 210
- D. 250

ID: 5c24c861 Answer

Correct Answer: C

Rationale

Correct Answer Rationale

Choice C is correct. According to the model, the stopping distance, in feet, of a vehicle traveling 55 miles per hour is about 210 feet. Of the choices given, the best estimate of the stopping distance for a car traveling 55 miles per hour is 210 feet.

Incorrect Answer Rationale

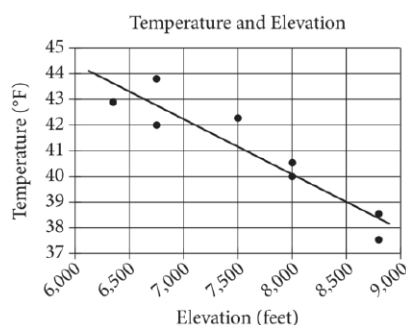
Choices A, B, and D are incorrect and may be the result of incorrectly reading the given quadratic model. The corresponding x-values to the y-values of 25 and 30 are not part of the model. The corresponding x-value to a y-value of 250 is approximately 60 mph, not 55 mph.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 661dfddd



The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. Which of the following statements best describes the association between the elevation and the temperature of locations in the Lake Tahoe Basin?

- A. As the elevation increases, the temperature tends to increase.
- B. As the elevation increases, the temperature tends to decrease.
- C. As the elevation decreases, the temperature tends to decrease.
- D. There is no association between the elevation and the temperature.

ID: 661dfddd Answer

Correct Answer: B

Rationale

Choice B is correct. The association between the elevation and the temperature of locations in the Lake Tahoe Basin can be described by looking at the direction of the line of best fit. The line of best fit slopes downward, which corresponds to the temperature decreasing as the elevation increases.

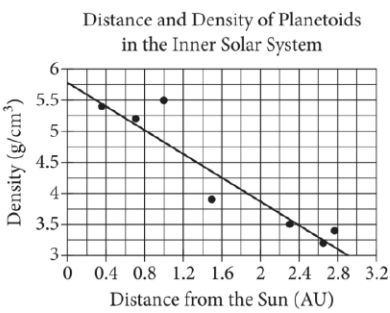
Choices A and C are incorrect. Both of these choices would be represented by a line of best fit that slopes from the lower left to the upper right of the graph, which isn't what's shown on the graph. Choice D is incorrect. This choice would be represented by a line of best fit that is horizontal or has a slope very close to 0. This is not what's shown on the graph.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: cf0ae57a



The scatterplot above shows the densities of 7 planetoids, in grams per cubic centimeter, with respect to their average distances from the Sun in astronomical units (AU). The line of best fit is also shown. An astronomer has discovered a new planetoid about 1.2 AU from the Sun. According to the line of best fit, which of the following best approximates the density of the planetoid, in grams per cubic centimeter?

- A. 3.6
- B. 4.1
- C. 4.6
- D. 5.5

ID: cf0ae57a Answer

Correct Answer: C

Rationale

Choice C is correct. According to the line of best fit, a planetoid with a distance from the Sun of 1.2 AU has a predicted density between 4.5 g/cm^3 and 4.75 g/cm^3 . The only choice in this range is 4.6.

Choices A, B, and D are incorrect and may result from misreading the information in the scatterplot.

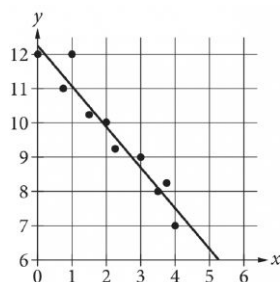
Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ □

ID: 1adb39f0

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown. Which of the following is closest to the difference between the y -coordinate of the data point with $x = 1$ and the y -value predicted by the line of best fit at $x = 1$?



- A. 1
- B. 2
- C. 5
- D. 12

ID: 1adb39f0 Answer

Correct Answer: A

Rationale

Choice A is correct. The data point with $x = 1$ has a y -coordinate of 12. The y -value predicted by the line of best fit at $x = 1$ is approximately 11. The difference between the y -coordinate of the data point and the y -value predicted by the line of best fit at $x = 1$ is $12 - 11$, or 1.

Choices B and C are incorrect and may result from incorrectly reading the scatterplot. Choice D is incorrect. This is the y -coordinate of the data point at $x = 1$.

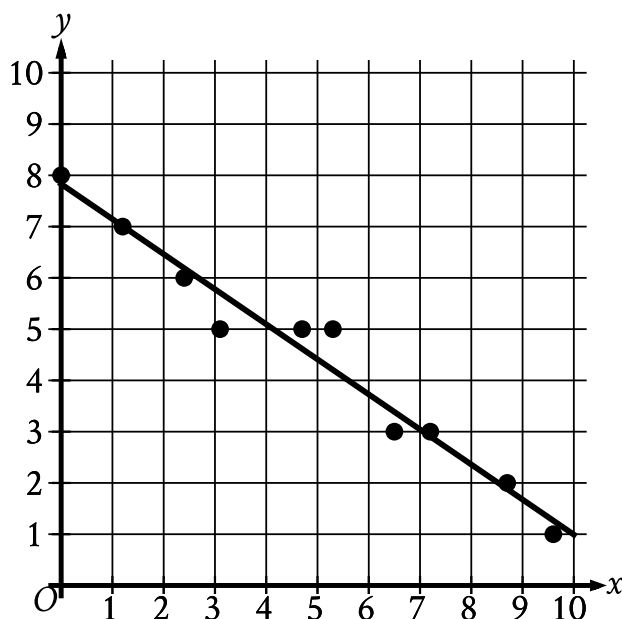
Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ □

ID: 2e74e403

In the given scatterplot, a line of best fit for the data is shown.



Which of the following is closest to the slope of this line of best fit?

- A. 7
- B. 0.7
- C. -0.7
- D. -7

ID: 2e74e403 Answer

Correct Answer: C

Rationale

Choice C is correct. A line of best fit is shown in the scatterplot such that as the value of x increases, the value of y decreases. It follows that the slope of the line of best fit shown is negative. The slope of a line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(0, 8)$ and $(10, 1)$. Substituting $(0, 8)$ for (x_1, y_1) and $(10, 1)$ for (x_2, y_2) in $\frac{y_2 - y_1}{x_2 - x_1}$ yields the slope of the line being approximately $\frac{1 - 8}{10 - 0}$, which is equivalent to $\frac{-7}{10}$, or -0.7 . Therefore, of the given choices, -0.7 is the closest to the slope of this line of best fit.

Choice A is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice B is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ □

ID: 9a144a01

Which of the following is true about the values of 2^x and $2x+2$ for $x > 0$?

- A. For all $x > 0$, it is true that $2^x < 2x+2$.
- B. For all $x > 0$, it is true that $2^x > 2x+2$.
- C. There is a constant c such that if $0 < x < c$, then $2^x < 2x+2$, but if $x > c$, then $2^x > 2x+2$.
- D. There is a constant c such that if $0 < x < c$, then $2^x > 2x+2$, but if $x > c$, then $2^x < 2x+2$.

ID: 9a144a01 Answer

Correct Answer: C

Rationale

Choice C is correct. At $x = 0$, the value of 2^x is less than the value of $2x+2$: $2^0 < 2(0)+2$, which is equivalent to $1 < 2$. As the value of x increases, the value of 2^x remains less than the value of $2x+2$ until $x = 3$, which is when the two values are equal: $2^3 = 2(3)+2$, which is equivalent to $8 = 8$. Then, for $x > 3$, the value of 2^x is greater than the value of $2x+2$. So there is a constant, 3, such that when $0 < x < 3$, then $2^x < 2x+2$, but when $x > 3$, then $2^x > 2x+2$.

Choice A is incorrect because $2^x > 2x+2$ when $x > 3$. Choice B is incorrect because $2^x < 2x+2$ when $0 < x < 3$. Choice D is incorrect because $2^x < 2x+2$ when $0 < x < 3$ and $2^x > 2x+2$ when $x > 3$.

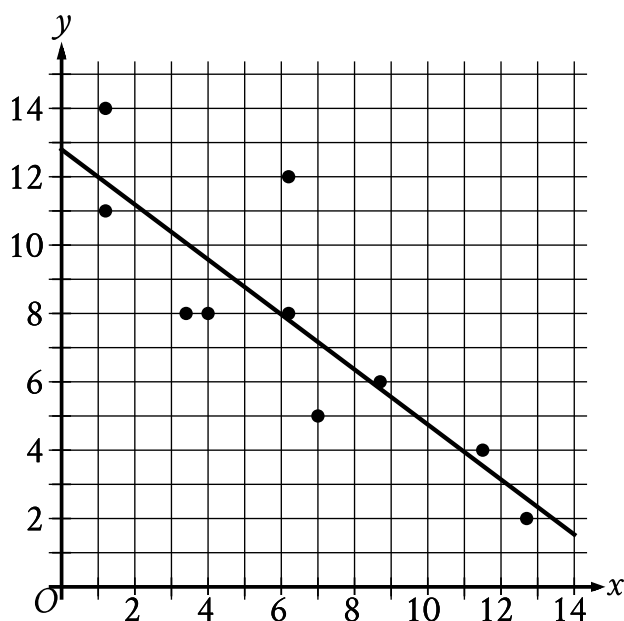
Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 03a16790

The scatterplot shows the relationship between two variables, x and y . A line of best fit is also shown.



Which of the following is closest to the slope of the line of best fit shown?

- A. -2.4
- B. -0.8
- C. 0.8
- D. 2.4

ID: 03a16790 Answer

Correct Answer: B

Rationale

Choice B is correct. A line of best fit is shown in the scatterplot such that as the value of x increases, the value of y decreases. Thus, the slope of the line of best fit shown is negative. The slope of a line passing through two points, (x_1, y_1) and (x_2, y_2) , can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(1, 12)$ and $(11, 4)$. Substituting $(1, 12)$ and $(11, 4)$ for (x_1, y_1) and (x_2, y_2) , respectively, in $\frac{y_2 - y_1}{x_2 - x_1}$ gives $\frac{4 - 12}{11 - 1}$, which is equivalent to $-\frac{8}{10}$, or -0.8 . Therefore, of the given choices, -0.8 is closest to the slope of the line of best fit shown.

Choice A is incorrect and may result from conceptual or calculation errors.



Choice C is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice D is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: 7ac5d686

An inspector begins a day of work with a large sample of shirts that need to be checked for defects. The inspector works at a constant rate throughout the morning. What type of model is best to model the number of shirts remaining to be checked for defects at any given time throughout the morning?

- A. A linear model with a positive slope
- B. A linear model with a negative slope
- C. An exponential growth model
- D. An exponential decay model

ID: 7ac5d686 Answer

Rationale

Choice B is correct. Since the work is done at a constant rate, a linear model best models the situation. The number of shirts remaining is dependent on the length of time the inspector has worked; therefore, if the relationship were graphed, time would be the variable of the horizontal axis and the number of remaining shirts would be the variable of the vertical axis. Since the number of shirts decreases as the time worked increases, it follows that the slope of this graph is negative.

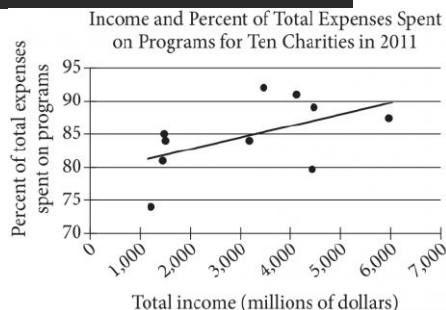
Choice A is incorrect and may result from incorrectly reasoning about the slope. Choices C and D are incorrect and may result from not identifying the constant rate of work as a characteristic of a linear model.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 7fd284ac



The scatterplot above shows data for ten charities along with the line of best fit. For the charity with the greatest percent of total expenses spent on programs, which of the following is closest to the difference of the actual percent and the percent predicted by the line of best fit?

- A. 10%
- B. 7%
- C. 4%
- D. 1%

ID: 7fd284ac Answer

Correct Answer: B

Rationale

Choice B is correct. The charity with the greatest percent of total expenses spent on programs is represented by the highest point on the scatterplot; this is the point that has a vertical coordinate slightly less than halfway between 90 and 95 and a horizontal coordinate slightly less than halfway between 3,000 and 4,000. Thus, the charity represented by this point has a total income of about \$3,400 million and spends about 92% of its total expenses on programs. The percent predicted by the line of best fit is the vertical coordinate of the point on the line of best fit with horizontal coordinate \$3,400 million; this vertical coordinate is very slightly more than 85. Thus, the line of best fit predicts that the charity with the greatest percent of total expenses spent on programs will spend slightly more than 85% on programs. Therefore, the difference between the actual percent (92%) and the prediction (slightly more than 85%) is slightly less than 7%.

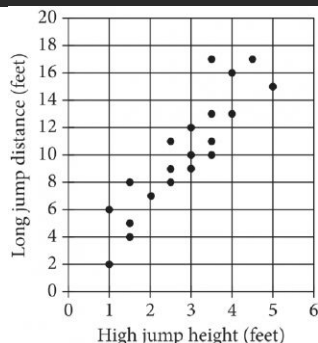
Choice A is incorrect. There is no charity represented in the scatterplot for which the difference between the actual percent of total expenses spent on programs and the percent predicted by the line of best fit is as much as 10%. Choices C and D are incorrect. These choices may result from misidentifying in the scatterplot the point that represents the charity with the greatest percent of total expenses spent on programs.





Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ □

ID: 3d985614



Each dot in the scatterplot above represents the height x , in feet, in the high jump, and the distance y , in feet, in the long jump, made by each student in a group of twenty students. The graph of which of the following equations is a line that most closely fits the data?

- A. $y = 0.82x + 3.30$
- B. $y = 0.82x - 0.82$
- C. $y = 3.30x + 0.82$
- D. $y = 3.30x - 3.30$

ID: 3d985614 Answer

Correct Answer: C

Rationale

Choice C is correct. A line that most closely fits the data is a line with an approximately balanced number of data points above and below the line. Fitting a line to the data shown results in a line with an approximate slope of 3 and a y -intercept near the point $(0, 1)$. An equation for the line can be written in slope-intercept form, $y = mx + b$, where m is the slope and b is the y -coordinate of the y -intercept. The equation $y = 3.30x + 0.82$ in choice C fits the data most closely.

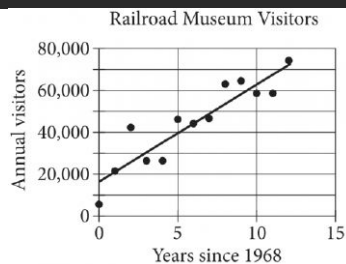
Choices A and B are incorrect because the slope of the lines of these equations is 0.82, which is a value that is too small to be the slope of the line that fits the data shown. Choice D is incorrect. The graph of this equation has a y -intercept at $(0, -3.30)$, not $(0, 0.82)$. This line would lie below all of the data points, and therefore would not closely fit the data.





Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 3c5b19ef



The scatterplot above shows the number of visitors to a railroad museum in Pennsylvania each year from 1968 to 1980, where t is the number of years since 1968 and n is the number of visitors. A line of best fit is also shown. Which of the following could be an equation of the line of best fit shown?

- A. $n = 16,090 + 4,680t$
- B. $n = 4,690 + 16,090t$
- C. $n = 16,090 + 9,060t$
- D. $n = 9,060 + 16,090t$

ID: 3c5b19ef Answer

Correct Answer: A

Rationale

Choice A is correct. An equation of a line of best fit can be written in the form $y = a + bx$, where a is the y -intercept of the line and b is the slope. In the scatterplot shown, the line of best fit intersects the y -axis just over halfway between 10,000 and 20,000, or approximately 16,000. The line of best fit also intersects the graph at (5, 40,000). Using the slope formula $b = \frac{y_2 - y_1}{x_2 - x_1}$ and two points that lie on the graph such as (5, 40,000) and (0, 16,000), the slope can be approximated as $\frac{40,000 - 16,000}{5 - 0}$, or 4,800. Only choice A has a y -intercept near the estimate of 16,000 and a slope near the estimate of 4,800. Therefore, an equation of the line of best fit could be $n = 16,090 + 4,680t$.

Choice B is incorrect because the values for the slope and the y -coordinate of the y -intercept are switched. Choice C is incorrect because the value for the slope is approximately double the actual slope. Choice D is incorrect because the values for the slope and the y -intercept are switched and because the slope is approximately double the actual slope.

Question Difficulty: Medium





Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: ab7740a8

In which of the following tables is the relationship between the values of x and their corresponding y -values nonlinear?

A.

x	1	2	3	4
y	8	11	14	17

B.

x	1	2	3	4
y	4	8	12	16

C.

x	1	2	3	4
y	8	13	18	23

D.

x	1	2	3	4
y	6	12	24	48

ID: ab7740a8 Answer

Correct Answer: D

Rationale

Choice D is correct. The relationship between the values of x and their corresponding y -values is nonlinear if the rate of change between these pairs of values isn't constant. The table for choice D gives four pairs of values: $(1,6)$, $(2,12)$, $(3,24)$, and $(4,48)$. Finding the rate of change, or slope, between $(1,6)$ and $(2,12)$ by using

the slope formula, $\frac{y_2 - y_1}{x_2 - x_1}$, yields $\frac{12 - 6}{2 - 1}$, or 6. Finding the rate of change between $(2,12)$ and $(3,24)$ yields $\frac{24 - 12}{3 - 2}$, or 12. Finding the rate of change between $(3,24)$ and $(4,48)$ yields $\frac{48 - 24}{4 - 3}$, or 24. Since the rate of change isn't constant for these pairs of values, this table shows a nonlinear relationship.

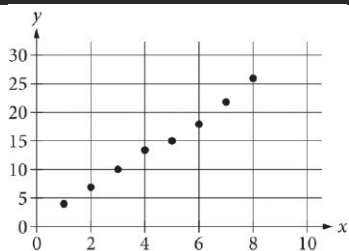
Choices A, B, and C are incorrect. The rate of change between the values of x and their corresponding y -values in each of these tables is constant, being 3, 4, and 5, respectively. Therefore, each of these tables shows a linear relationship.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div> <div></div> <div></div> <div></div> </div>

ID: 9eb896c5



Which of the following could be the equation for a line of best fit for the data shown in the scatterplot above?

- A. $y = 3x + 0.8$
- B. $y = 0.8x + 3$
- C. $y = -0.8x + 3$
- D. $y = -3x + 0.8$

ID: 9eb896c5 Answer

Correct Answer: A

Rationale

Choice A is correct. The data show a strong linear relationship between x and y . The line of best fit for a set of data is a linear equation that minimizes the distances from the data points to the line. An equation for the line of best fit can be written in slope-intercept form, $y = mx + b$, where m is the slope of the graph of the line and b is the y -coordinate of the y -intercept of the graph. Since, for the data shown, the y -values increase as the x -values increase, the slope of a line of best fit must be positive. The data shown lie almost in a line, so the slope

can be roughly estimated using the formula for slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$. The leftmost and rightmost data points have coordinates of about $(1, 4)$ and $(8, 26)$, so the slope is approximately $\frac{26 - 4}{8 - 1} = \frac{22}{7}$, which is a little greater than 3. Extension of the line to the left would intersect the y -axis at about $(0, 1)$. Only choice A represents a line with a slope close to 3 and a y -intercept close to $(0, 1)$.

Choice B is incorrect and may result from switching the slope and y -intercept. The line with a y -intercept of $(0, 3)$ and a slope of 0.8 is farther from the data points than the line with a slope of 3 and a y -intercept of $(0, 0.8)$. Choices C and D are incorrect. They represent lines with negative slopes, not positive slopes.

Question Difficulty: Medium

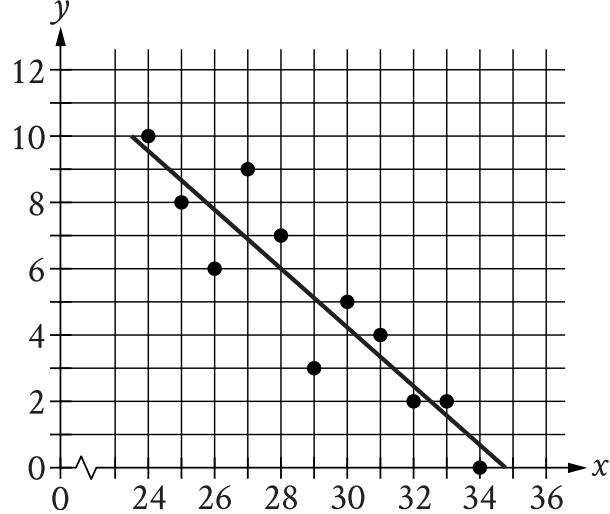




Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	<div><div></div><div></div><div></div></div>

ID: fdfc90e4

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown.



At $x = 32$, which of the following is closest to the y -value predicted by the line of best fit?

- A. 0.4
- B. 1.5
- C. 2.4
- D. 3.3

ID: fdfc90e4 Answer

Correct Answer: C

Rationale

Choice C is correct. At $x = 32$, the line of best fit has a y -value between 2 and 3. The only choice with a value between 2 and 3 is choice C.

Choice A is incorrect. This is the difference between the y -value predicted by the line of best fit and the actual y -value at $x = 32$ rather than the y -value predicted by the line of best fit at $x = 32$.

Choice B is incorrect. This is the y -value predicted by the line of best fit at $x = 31$ rather than at $x = 32$.

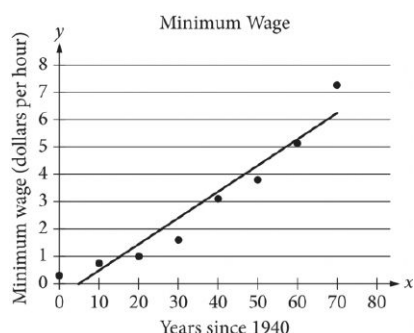
Choice D is incorrect. This is the y -value predicted by the line of best fit at $x = 33$ rather than at $x = 32$.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: d6af3572



The scatterplot above shows the federal-mandated minimum wage every 10 years between 1940 and 2010. A line of best fit is shown, and its equation is $y = 0.096x - 0.488$. What does the line of best fit predict about the increase in the minimum wage over the 70-year period?

- A. Each year between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.
- B. Each year between 1940 and 2010, the average increase in minimum wage was 0.49 dollars.
- C. Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.
- D. Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.488 dollars.

ID: d6af3572 Answer

Correct Answer: A

Rationale

Choice A is correct. The given equation is in slope-intercept form, or $y = mx + b$, where m is the value of the slope of the line of best fit. Therefore, the slope of the line of best fit is 0.096. From the definition of slope, it follows that an increase of 1 in the x -value corresponds to an increase of 0.096 in the y -value. Therefore, the line of best fit predicts that for each year between 1940 and 2010, the minimum wage will increase by 0.096 dollar per hour.

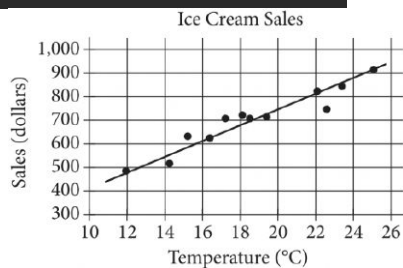
Choice B is incorrect and may result from using the y -coordinate of the y -intercept as the average increase, instead of the slope. Choice C is incorrect and may result from using the 10-year increments given on the x -axis to incorrectly interpret the slope of the line of best fit. Choice D is incorrect and may result from using the y -coordinate of the y -intercept as the average increase, instead of the slope, and from using the 10-year increments given on the x -axis to incorrectly interpret the slope of the line of best fit.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: 1e1027a7



The scatterplot above shows a company's ice cream sales d , in dollars, and the high temperature t , in degrees Celsius ($^{\circ}\text{C}$), on 12 different days. A line of best fit for the data is also shown. Which of the following could be an equation of the line of best fit?

- A. $d = 0.03t + 402$
- B. $d = 10t + 402$
- C. $d = 33t + 300$
- D. $d = 33t + 84$

ID: 1e1027a7 Answer

Correct Answer: D

Rationale

Choice D is correct. On the line of best fit, d increases from approximately 480 to 880 between $t = 12$ and $t = 24$. The slope of the line of best fit is the difference in d -values divided by the difference in t -values, which gives $\frac{880 - 480}{24 - 12} = \frac{400}{12}$, or approximately 33. Writing the equation of the line of best fit in slope-intercept form gives $d = 33t + b$, where b is the y -coordinate of the y -intercept. This equation is satisfied by all points on the line, so $d = 480$ when $t = 12$. Thus, $480 = 33(12) + b$, which is equivalent to $480 = 396 + b$. Subtracting 396 from both sides of this equation gives $b = 84$. Therefore, an equation for the line of best fit could be $d = 33t + 84$.

Choice A is incorrect and may result from an error in calculating the slope and misidentifying the y -coordinate of the y -intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$. Choice B is incorrect and may result from using the smallest value of t on the graph as the slope and misidentifying the

y-coordinate of the y-intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$.

Choice C is incorrect and may result from misidentifying the y-coordinate of the y-intercept as the smallest value of d on the graph.

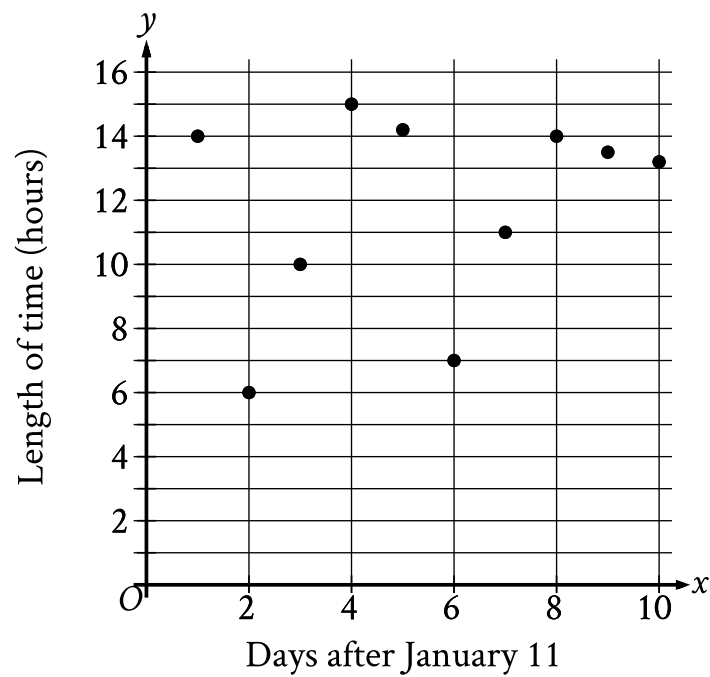
Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: 7b52985c

The scatterplot shows the relationship between the length of time y , in hours, a certain bird spent in flight and the number of days after January 11, x .



What is the average rate of change, in hours per day, of the length of time the bird spent in flight on January 13 to the length of time the bird spent in flight on January 15?

ID: 7b52985c Answer

Correct Answer: 4.5, 9/2

Rationale

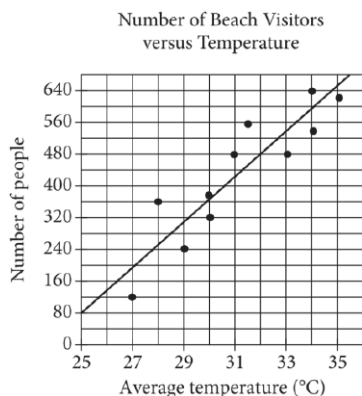
The correct answer is $\frac{9}{2}$. It's given that the scatterplot shows the relationship between the length of time y , in hours, a certain bird spent in flight and the number of days after January 11, x . Since January 13 is 2 days after January 11, it follows that January 13 corresponds to an x -value of 2 in the scatterplot. In the scatterplot, when $x = 2$, the corresponding value of y is 6. In other words, on January 13, the bird spent 6 hours in flight. Since January 15 is 4 days after January 11, it follows that January 15 corresponds to an x -value of 4 in the scatterplot. In the scatterplot, when $x = 4$, the corresponding value of y is 15. In other words, on January 15, the bird spent 15 hours in flight. Therefore, the average rate of change, in hours per day, of the length of time the bird spent in flight on January 13 to the length of time the bird spent in flight on January 15 is the difference in the length of time, in hours, the bird spent in flight divided by the difference in the number of days after January 11, or $\frac{15-6}{4-2}$, which is equivalent to $\frac{9}{2}$. Note that 9/2 and 4.5 are examples of ways to enter a correct answer.





Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: d0430601



Each dot in the scatterplot above represents the temperature and the number of people who visited a beach in Lagos, Nigeria, on one of eleven different days. The line of best fit for the data is also shown. The line of best fit for the data has a slope of approximately 57. According to this estimate, how many additional people per day are predicted to visit the beach for each 5°C increase in average temperature?

ID: d0430601 Answer

Rationale

The correct answer is 285. The number of people predicted to visit the beach each day is represented by the y-values of the line of best fit, and the average temperature, in degrees Celsius (°C), is represented by the x-values. Since the slope of the line of best fit is approximately 57, the y-value, or the number of people predicted to visit the beach each day, increases by 57 for every x-value increase of 1, or every 1°C increase in average temperature. Therefore, an increase of 5°C in average temperature corresponds to a y-value increase of $57(5) = 285$ additional people per day predicted to visit the beach.

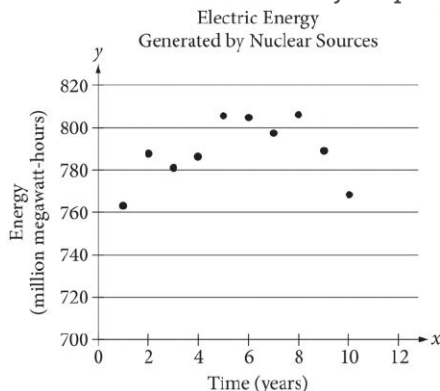
Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: e821a26d

The scatterplot below shows the amount of electric energy generated, in millions of megawatt-hours, by nuclear sources over a 10-year period.



Of the following equations, which best models the data in the scatterplot?

- A. $y = 1.674x^2 + 19.76x - 745.73$
- B. $y = -1.674x^2 - 19.76x - 745.73$
- C. $y = 1.674x^2 + 19.76x + 745.73$
- D. $y = -1.674x^2 + 19.76x + 745.73$

ID: e821a26d Answer

Correct Answer: D

Rationale

Choice D is correct. The data in the scatterplot roughly fall in the shape of a downward-opening parabola; therefore, the coefficient for the x^2 term must be negative. Based on the location of the data points, the y-intercept of the parabola should be somewhere between 740 and 760. Therefore, of the equations given, the best model is $y = -1.674x^2 + 19.76x + 745.73$.

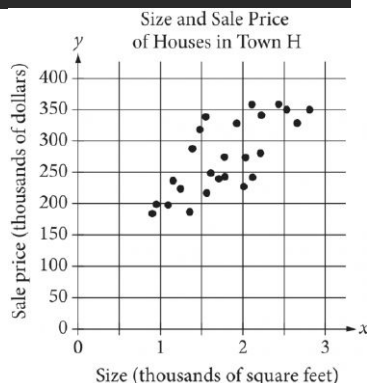
Choices A and C are incorrect. The positive coefficient of the x^2 term means that these equations each define upward-opening parabolas, whereas a parabola that fits the data in the scatterplot must open downward. Choice B is incorrect because it defines a parabola with a y-intercept that has a negative y-coordinate, whereas a parabola that fits the data in the scatterplot must have a y-intercept with a positive y-coordinate.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: 79137c1b



The scatterplot above shows the size x and the sale price y of 25 houses for sale in Town H. Which of the following could be an equation for a line of best fit for the data?

- A. $y = 200x + 100$
- B. $y = 100x + 100$
- C. $y = 50x + 100$
- D. $y = 100x$

ID: 79137c1b Answer

Correct Answer: B

Rationale

Choice B is correct. From the shape of the cluster of points, the line of best fit should pass roughly through the points $(1, 200)$ and $(2.5, 350)$. Therefore, these two points can be used to find an approximate equation for the

line of best fit. The slope of this line of best fit is therefore $\frac{y_2 - y_1}{x_2 - x_1} = \frac{350 - 200}{2.5 - 1}$, or 100. The equation for the line of best fit, in slope-intercept form, is $y = 100x + b$ for some value of b . Using the point $(1, 200)$, 1 can be substituted for x and 200 can be substituted for y : $200 = 100(1) + b$, or $b = 100$. Substituting this value into the slope-intercept form of the equation gives $y = 100x + 100$.

Choice A is incorrect. The line defined by $y = 200x + 100$ passes through the points $(1, 300)$ and $(2, 500)$, both of which are well above the cluster of points, so it cannot be a line of best fit. Choice C is incorrect. The line

defined by $y = 50x + 100$ passes through the points (1,150) and (2,200), both of which lie at the bottom of the cluster of points, so it cannot be a line of best fit. Choice D is incorrect and may result from correctly calculating the slope of a line of best fit but incorrectly assuming the y-intercept is at (0,0).

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: af142f8d

	Amount invested	Balance increase
Account A	\$500	6% annual interest
Account B	\$1,000	\$25 per year

Two investments were made as shown in the table above. The interest in Account A is compounded once per year. Which of the following is true about the investments?

- A. Account A always earns more money per year than Account B.
- B. Account A always earns less money per year than Account B.
- C. Account A earns more money per year than Account B at first but eventually earns less money per year.
- D. Account A earns less money per year than Account B at first but eventually earns more money per year.

ID: af142f8d Answer

Correct Answer: A

Rationale

Choice A is correct. Account A starts with \$500 and earns interest at 6% per year, so in the first year Account A earns $(500)(0.06) = \$30$, which is greater than the \$25 that Account B earns that year. Compounding interest can be modeled by an increasing exponential function, so each year Account A will earn more money than it did the previous year. Therefore, each year Account A earns at least \$30 in interest. Since Account B always earns \$25 each year, Account A always earns more money per year than Account B.

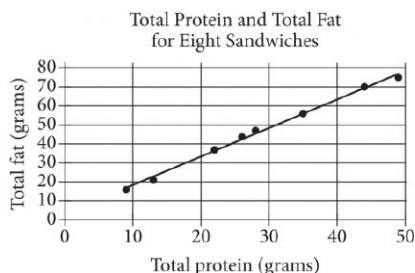
Choices B and D are incorrect. Account A earns \$30 in the first year, which is greater than the \$25 Account B earns in the first year. Therefore, neither the statement that Account A always earns less money per year than Account B nor the statement that Account A earns less money than Account B at first can be true. Choice C is incorrect. Since compounding interest can be modeled by an increasing exponential function, each year Account A will earn more money than it did the previous year. Therefore, Account A always earns at least \$30 per year, which is more than the \$25 per year that Account B earns.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■ ■ ■

ID: 9d95e7ad



The scatterplot above shows the numbers of grams of both total protein and total fat for eight sandwiches on a restaurant menu. The line of best fit for the data is also shown. According to the line of best fit, which of the following is closest to the predicted increase in total fat, in grams, for every increase of 1 gram in total protein?

- A. 2.5
- B. 2.0
- C. 1.5
- D. 1.0

ID: 9d95e7ad Answer

Correct Answer: C

Rationale

Choice C is correct. The predicted increase in total fat, in grams, for every increase of 1 gram in total protein is represented by the slope of the line of best fit. Any two points on the line can be used to calculate the slope of the line as the change in total fat over the change in total protein. For instance, it can be estimated that the points (20,34) and (30,48) are on the line of best fit, and the slope of the line that passes through them is

$\frac{48 - 34}{30 - 20} = \frac{14}{10}$, or 1.4. Of the choices given, 1.5 is the closest to the slope of the line of best fit.

Choices A, B, and D are incorrect and may be the result of incorrectly finding ordered pairs that lie on the line of best fit or of incorrectly calculating the slope.

Question Difficulty: Hard