

Question ID 1e42e80a

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	

ID: 1e42e80a

Each year, the value of an investment increases by **0.49%** of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

- A. Decreasing exponential
- B. Decreasing linear
- C. Increasing exponential
- D. Increasing linear

ID: 1e42e80a Answer

Correct Answer: C

Rationale

Choice C is correct. Because the value of the investment increases each year, the function that best models how the value of the investment changes over time is an increasing function. It's given that each year, the value of the investment increases by 0.49% of its value the previous year. Since the value of the investment changes by a fixed percentage each year, the function that best models how the value of the investment changes over time is an exponential function. Therefore, the function that best models how the value of the investment changes over time is an increasing exponential function.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect and may result from conceptual errors.

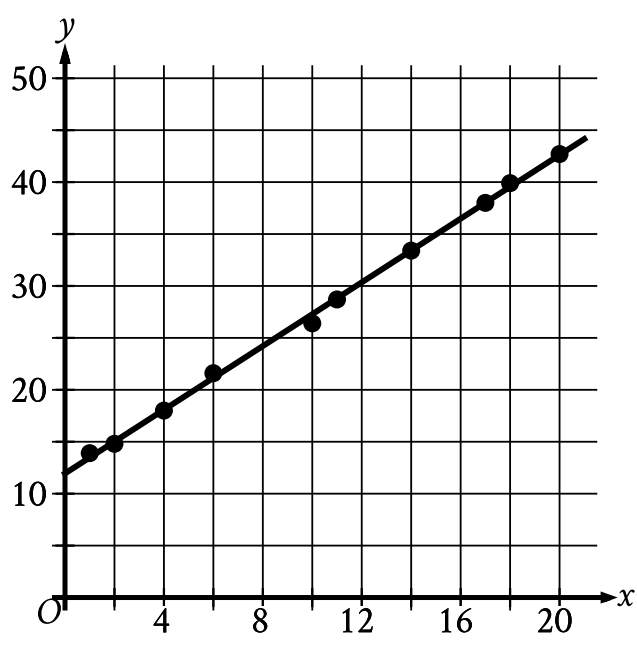
Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Hard

Question ID 14baeb51

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	

ID: 14baeb51



The scatterplot shows the relationship between two variables, x and y , for data set E. A line of best fit is shown. Data set F is created by multiplying the y -coordinate of each data point from data set E by **3.9**. Which of the following could be an equation of a line of best fit for data set F?

- A. $y = 46.8 + 5.9x$
- B. $y = 46.8 + 1.5x$
- C. $y = 12 + 5.9x$
- D. $y = 12 + 1.5x$

ID: 14baeb51 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation of a line of best fit for data set F can be written in the form $y = a + bx$, where a is the y -coordinate of the y -intercept of the line of best fit and b is the slope. The line of best fit shown for data set E has a y -intercept at approximately 0, 12. It's given that data set F is created by multiplying the y -coordinate of each data point from data set E by **3.9**. It follows that a line of best fit for data set F has a y -intercept at approximately 0, 123.9, or 0, 46.8. Therefore, the value of a is approximately 46.8. The slope of a line that passes through points x_1, y_1 and x_2, y_2 can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Since the line of best fit shown for data set E passes approximately through the point 12, 30, it follows that a line of best fit for data set F passes

approximately through the point 12, 303.9, or 12, 117. Substituting 0, 46.8 and 12, 117 for x_1, y_1 and x_2, y_2 , respectively, in $\frac{y_2 - y_1}{x_2 - x_1}$ yields $\frac{117 - 46.8}{12 - 0}$, which is equivalent to $\frac{70.2}{12}$, or 5.85. Therefore, the value of b is approximately 5.85, or approximately 5.9. Thus, $y = 46.8 + 5.9x$ could be an equation of a line of best fit for data set F.

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

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

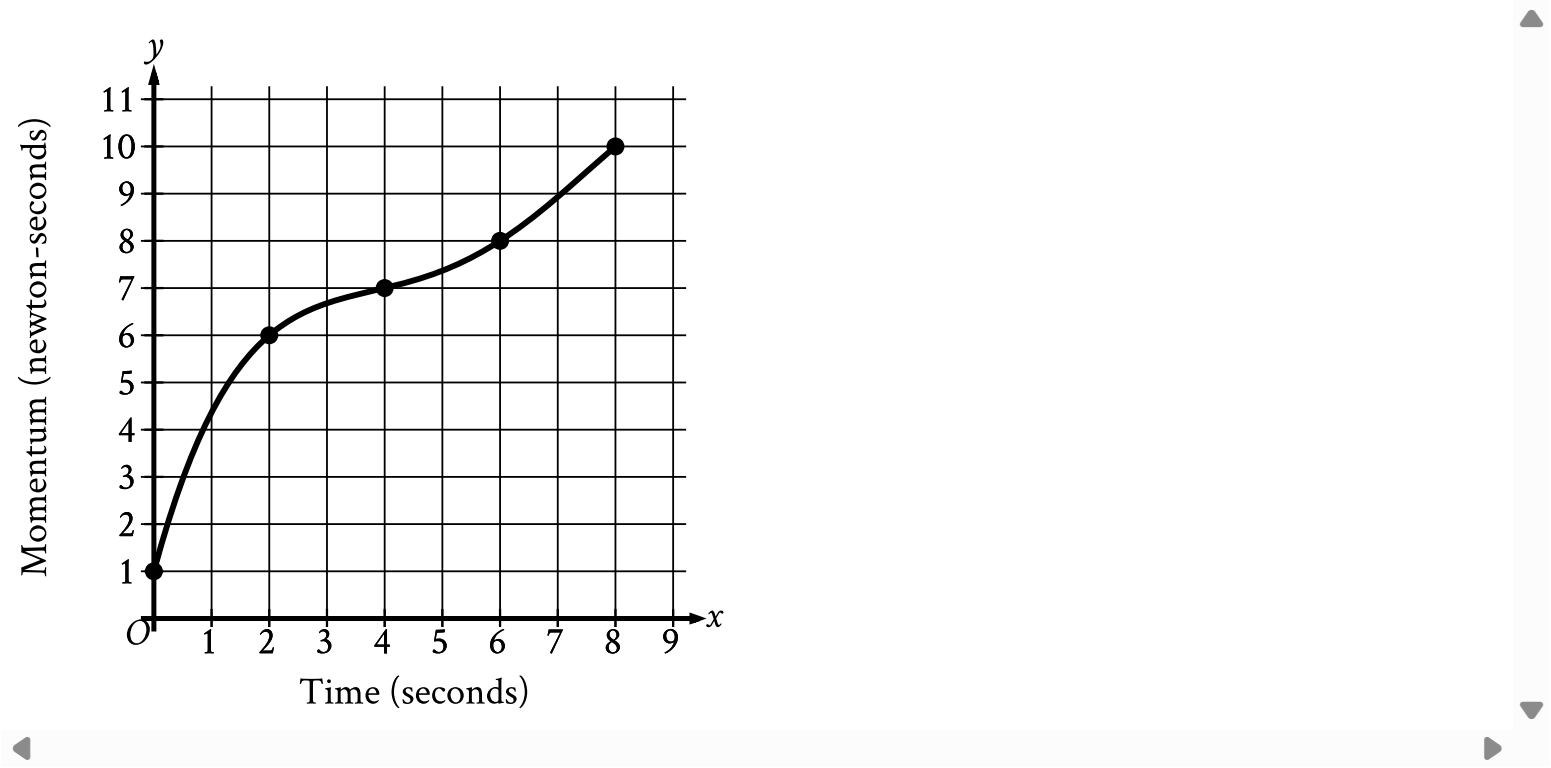
Choice D is incorrect. This could be an equation of a line of best fit for data set E, not data set F.

Question Difficulty: Hard

Question ID 8f250149

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	

ID: 8f250149



The graph shows the momentum y , in newton-seconds, of an object x seconds after the object started moving, for $0 \leq x \leq 8$. What is the average rate of change, in newton-seconds per second, in the momentum of the object from $x = 2$ to $x = 6$?

ID: 8f250149 Answer

Correct Answer: 0.5, 1/2

Rationale

The correct answer is $\frac{1}{2}$. For the graph shown, x represents time, in seconds, and y represents momentum, in newton-seconds. Therefore, the average rate of change, in newton-seconds per second, in the momentum of the object between two x -values is the difference in the corresponding y -values divided by the difference in the x -values. The graph shows that at $x = 2$, the corresponding y -value is 6. The graph also shows that at $x = 6$, the corresponding y -value is 8. It follows that the average rate of change, in newton-seconds per second, from $x = 2$ to $x = 6$ is $\frac{8-6}{6-2}$, which is equivalent to $\frac{2}{4}$, or $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 9cd1e599

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	

ID: 9cd1e599

For $x > 0$, the function f is defined as follows:
 $f(x)$ equals 201% of x
Which of the following could describe this function?

- A. Decreasing exponential
- B. Decreasing linear
- C. Increasing exponential
- D. Increasing linear

ID: 9cd1e599 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that for $x > 0$, fx is equal to 201% of x . This is equivalent to $fx = \frac{201}{100}x$, or $fx = 2.01x$, for $x > 0$. This function indicates that as x increases, fx also increases, which means f is an increasing function. Furthermore, fx increases at a constant rate of 2.01 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect and may result from conceptual errors.

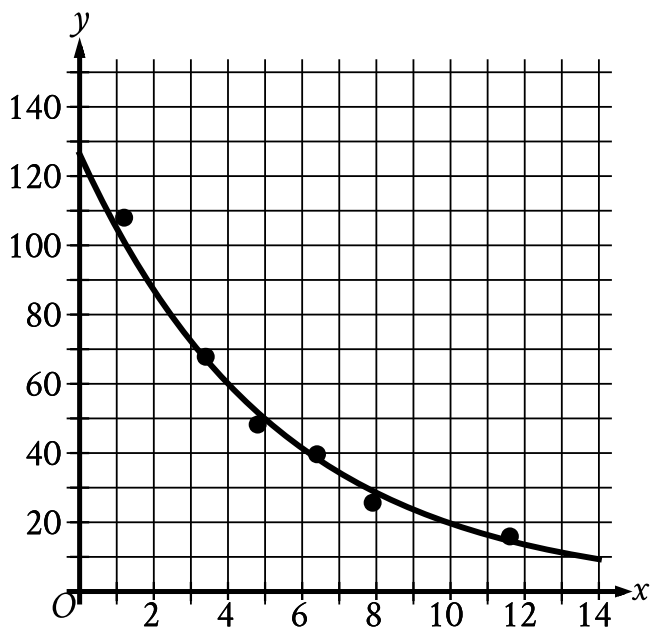
Choice C is incorrect. This could describe the function $fx = 2.01^x$, where fx is equal to 201% of $fx - 1$, not x , for $x > 0$.

Question Difficulty: Hard

Question ID a900a374

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	

ID: a900a374



The scatterplot shows the relationship between two variables, x and y . An equation for the exponential model shown can be written as $y = a(b)^x$, where a and b are positive constants. Which of the following is closest to the value of b ?

- A. 0.83
- B. 1.83
- C. 18.36
- D. 126.35

ID: a900a374 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that an equation for the exponential model shown can be written as $y = ab^x$, where a and b are positive constants. For an exponential model written in this form, if the value of b is greater than 0 but less than 1, the model is decreasing. If the value of b is greater than 1, the model is increasing. The exponential model shown is decreasing. Therefore, the value of b is greater than 0 but less than 1. Of the given choices, only 0.83 is a value greater than 0 but less than 1. Thus, 0.83 is closest to the value of b .

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

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

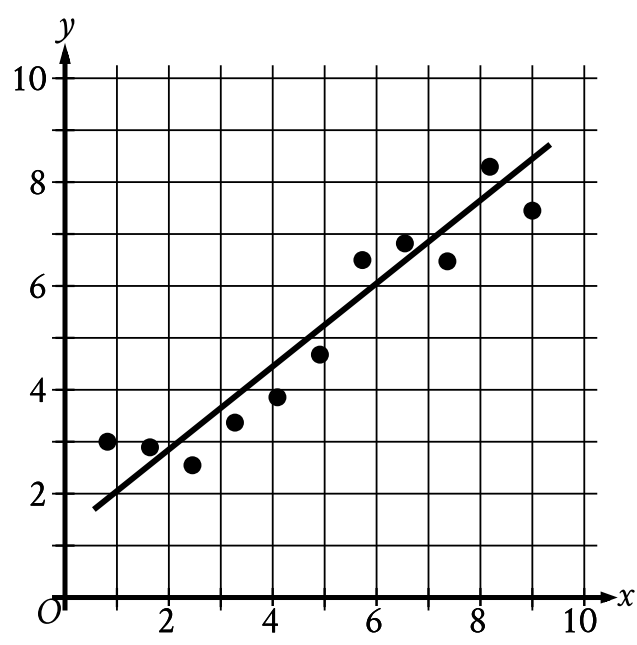
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID b9f9a101

Assessment	Test	Domain	Skill	Difficulty
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ID: b9f9a101



The scatterplot shows the relationship between two variables, x and y . A line of best fit is also shown. For how many of the 11 data points does the line of best fit predict a greater y -value than the actual y -value?

ID: b9f9a101 Answer

Correct Answer: 6

Rationale

The correct answer is 6. The line of best fit predicts a greater y -value than the actual y -value for any data point that's located below the line of best fit. For the scatterplot shown, 6 of the data points are below the line of best fit. Therefore, the line of best fit predicts a greater y -value than the actual y -value for 6 of the data points.

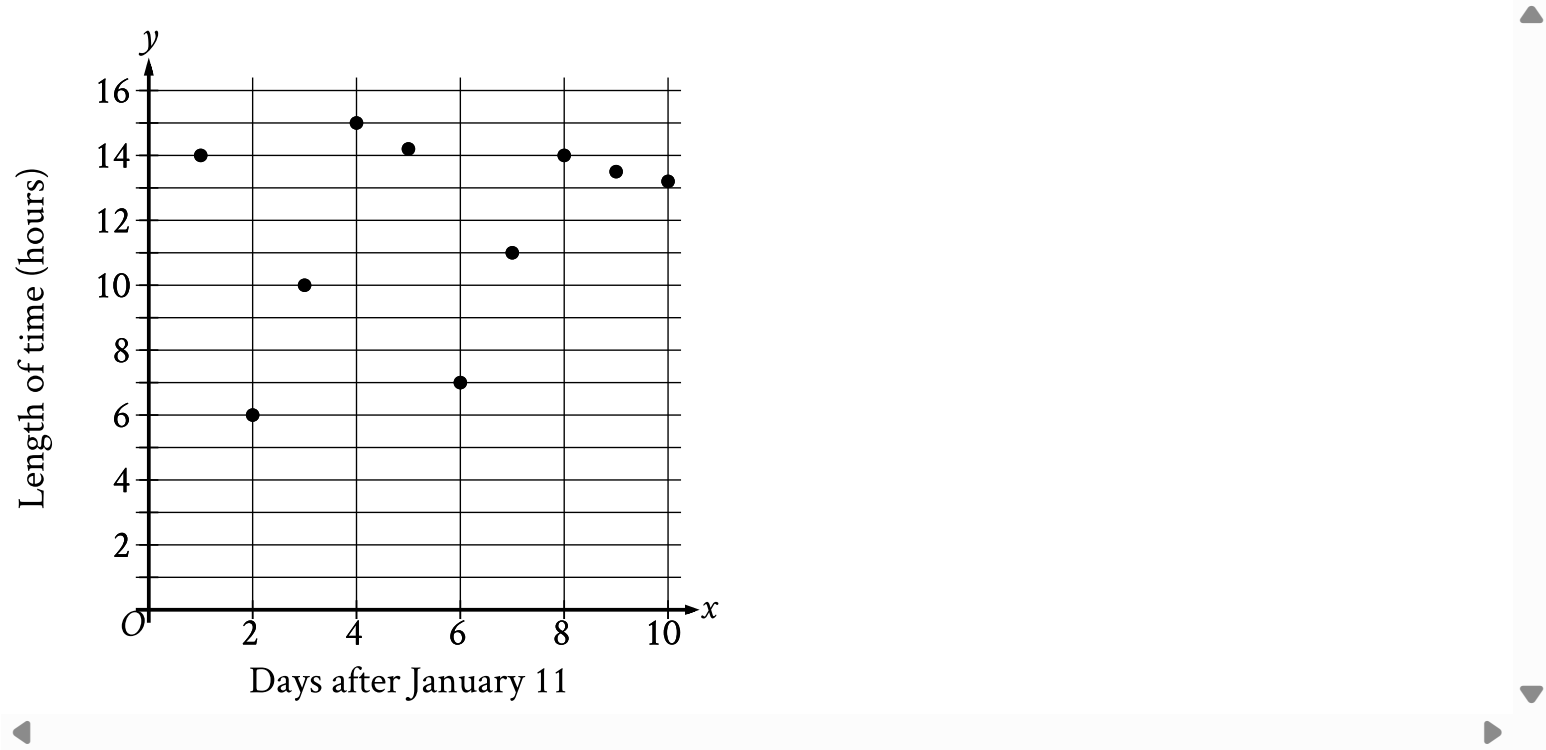
Question Difficulty: Hard

Question ID f96ee12b

Assessment	Test	Domain	Skill	Difficulty
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ID: f96ee12b

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: f96ee12b 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.

Question Difficulty: Hard