

Question ID 8e21bc65

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 8e21bc65

$f(x) = 39$

For the given linear function f , which table gives three values of x and their corresponding values of $f(x)$?

A.

x	$f(x)$
0	0
1	0
2	0

B.

x	$f(x)$
0	39
1	39
2	39

C.

x	$f(x)$
0	0
1	39
2	78

D.

x	$f(x)$
0	39
1	0
2	−39

ID: 8e21bc65 Answer

Correct Answer: B

Rationale

Choice B is correct. For the given linear function f , fx must equal 39 for all values of x . Of the given choices, only choice B gives three values of x and their corresponding values of fx for the given linear function f .

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 9f5ff8c2

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 9f5ff8c2

The function f defined by $f(t) = 14t + 9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. Which of the following is the best interpretation of 9 in this context?

- A. Tavon will keep the vine plant for 9 months.
- B. The vine plant is expected to grow 9 inches each month.
- C. The vine plant is expected to grow to a maximum length of 9 inches.
- D. The estimated length of the vine plant was 9 inches when Tavon purchased it.

ID: 9f5ff8c2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function f defined by $ft = 14t + 9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. For a function defined by an equation of the form $ft = mt + b$, where m and b are constants, b represents the value of $f0$, or the value of ft when the value of t is 0. Therefore, for the function defined by $ft = 14t + 9$, 9 represents the value of ft when the value of t is 0. This means that 0 months after the vine plant was purchased, the estimated length of the vine plant was 9 inches. Therefore, the best interpretation of 9 in this context is the estimated length of the vine plant was 9 inches when Tavon purchased it.

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

Choice B is incorrect. The vine plant is expected to grow 14 inches, not 9 inches, each month.

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

Question Difficulty: Medium

Question ID a762cee2

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: a762cee2

As part of a science project on evaporation, Amaya measured the height of a liquid in a container over a period of time. The function $f(x) = 33 - 0.18x$ gives the estimated height, in centimeters (cm), of the liquid in the container x days after the start of the project. Which of the following is the best interpretation of **33** in this context?

- A. The estimated height, in cm, of the liquid at the start of the project
- B. The estimated height, in cm, of the liquid at the end of the project
- C. The estimated change in the height, in cm, of the liquid each day
- D. The estimated number of days for all of the liquid to evaporate

ID: a762cee2 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function $fx = 33 - 0.18x$ gives the estimated height, in centimeters (cm), of the liquid in the container x days after the start of the project. For a linear function in the form $fx = a + bx$, where a and b are constants, a represents the value of $f0$ and b represents the rate of change of the function. It follows that in the given function, 33 represents the value of $f0$. Therefore, the best interpretation of 33 in this context is the estimated height, in cm, of the liquid at the start of the project.

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

Choice C is incorrect. The estimated change in the height, in cm, of the liquid each day is 0.18, not 33.

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

Question Difficulty: Medium

Question ID 1ff7bc88

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 1ff7bc88

For the linear function f , $f(0) = 17$ and $f(1) = 17$. Which equation defines f ?

- A. $f(x) = \frac{1}{17}$
- B. $f(x) = 1$
- C. $f(x) = 17$
- D. $f(x) = 34$

ID: 1ff7bc88 Answer

Correct Answer: C

Rationale

Choice C is correct. An equation defining the linear function f can be written in the form $fx = mx + b$, where m is the slope and b is the y -intercept of the graph of $y = fx$ in the xy -plane. The slope of the graph of $y = fx$ can be found using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where x_1, y_1 and x_2, y_2 are any two points that the graph passes through. If $f0 = 17$, it follows that the graph of $y = fx$ passes through the point $0, 17$. If $f1 = 17$, it follows that the graph of $y = fx$ passes through the point $1, 17$. Substituting $0, 17$ and $1, 17$ for x_1, y_1 and x_2, y_2 , respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{17 - 17}{1 - 0}$, which is equivalent to $m = \frac{0}{1}$, or $m = 0$. Since the graph of $y = fx$ passes through $0, 17$, it follows that $b = 17$. Substituting 0 for m and 17 for b in the equation $fx = mx + b$ yields $fx = 0x + 17$, or $fx = 17$. Thus, the equation that defines f is $fx = 17$.

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

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

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

Question Difficulty: Medium

Question ID 2573a53e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 2573a53e

x	10	15	20	25
$f(x)$	82	137	192	247

The table shows four values of x and their corresponding values of $f(x)$. There is a linear relationship between x and $f(x)$ that is defined by the equation $f(x) = mx - 28$, where m is a constant. What is the value of m ?

ID: 2573a53e Answer

Correct Answer: 11

Rationale

The correct answer is 11. It's given that f_x is defined by the equation $f(x) = mx - 28$, where m is a constant. It's also given in the table that when $x = 10$, $f_x = 82$. Substituting 10 for x and 82 for f_x in the equation $f_x = mx - 28$ yields, $82 = m10 - 28$. Adding 28 to both sides of this equation yields $110 = 10m$. Dividing both sides of this equation by 10 yields $11 = m$. Therefore, the value of m is 11.

Question Difficulty: Medium

Question ID 36b3a5b7

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 36b3a5b7

The pressure exerted on a scuba diver at sea level is **14.70 pounds per square inch (psi)**. For each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by **0.44 psi**. What is the total pressure, in **psi**, exerted on the scuba diver at **105** feet below sea level?

- A. **60.90**
- B. **31.50**
- C. **14.70**
- D. **0.44**

ID: 36b3a5b7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the pressure exerted on a scuba diver at sea level is 14.70 pounds per square inch psi. It's also given that for each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by 0.44 psi. The total pressure, in psi, exerted on the scuba diver at x feet below sea level can be represented by the expression $0.44x + 14.70$. Substituting 105 for x in this expression yields $0.44(105) + 14.70$, or 60.90. Therefore, the total pressure exerted on the scuba diver at 105 feet below sea level is 60.90 psi.

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

Choice C is incorrect. This is the pressure, in psi, exerted on the scuba diver at sea level, not at 105 feet below sea level.

Choice D is incorrect. This is the rate by which the pressure, in psi, exerted on the scuba diver increases for each foot the scuba diver descends below sea level.

Question Difficulty: Medium

Question ID ac181113

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: ac181113

Caleb used juice to make popsicles. The function $f(x) = -5x + 30$ approximates the volume, in fluid ounces, of juice Caleb had remaining after making x popsicles. Which statement is the best interpretation of the y -intercept of the graph of $y = f(x)$ in the xy -plane in this context?

- A. Caleb used approximately 5 fluid ounces of juice for each popsicle.
- B. Caleb had approximately 5 fluid ounces of juice when he began to make the popsicles.
- C. Caleb had approximately 30 fluid ounces of juice when he began to make the popsicles.
- D. Caleb used approximately 30 fluid ounces of juice for each popsicle.

ID: ac181113 Answer

Correct Answer: C

Rationale

Choice C is correct. An equation that defines a linear function f can be written in the form $fx = mx + b$, where m represents the slope and b represents the y -intercept, 0, b , of the line of $y = fx$ in the xy -plane. The function $fx = -5x + 30$ is linear. Therefore, the graph of the given function $y = fx$ in the xy -plane has a y -intercept of 0, 30. It's given that fx gives the approximate volume, in fluid ounces, of juice Caleb had remaining after making x popsicles. It follows that the y -intercept of 0, 30 means that Caleb had approximately 30 fluid ounces of juice remaining after making 0 popsicles. In other words, Caleb had approximately 30 fluid ounces of juice when he began to make the popsicles.

Choice A is incorrect. This is an interpretation of the slope, rather than the y -intercept, of the graph of $y = fx$ in the xy -plane.

Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID f762f4c4

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: f762f4c4

$$f(x) = x + b$$

For the linear function f , b is a constant. When $x = 0$, $f(x) = 30$. What is the value of b ?

- A. -30
- B. $-\frac{1}{30}$
- C. $\frac{1}{30}$
- D. 30

ID: f762f4c4 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that when $x = 0$, $fx = 30$. Substituting 0 for x and 30 for fx in the given function yields $30 = 0 + b$, or $30 = b$. Therefore, the value of b is 30.

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

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

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

Question Difficulty: Medium

Question ID b6c5bfb3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: b6c5bfb3

In the xy -plane, the graph of the linear function f contains the points $(0, 2)$ and $(8, 34)$. Which equation defines f , where $y = f(x)$?

- A. $f(x) = 2x + 42$
- B. $f(x) = 32x + 36$
- C. $f(x) = 4x + 2$
- D. $f(x) = 8x + 2$

ID: b6c5bfb3 Answer

Correct Answer: C

Rationale

Choice C is correct. In the xy -plane, the graph of a linear function can be written in the form $fx = mx + b$, where m represents the slope and b represents the y -intercept of the graph of $y = fx$. It's given that the graph of the linear function f , where $y = fx$, in the xy -plane contains the point $0, 2$. Thus, $b = 2$. The slope of the graph of a line containing any two points x_1, y_1 and x_2, y_2 can be found using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since it's given that the graph of the linear function f contains the points $0, 2$ and $8, 34$, it follows that the slope of the graph of the line containing these points is $m = \frac{34 - 2}{8 - 0}$, or $m = 4$. Substituting 4 for m and 2 for b in $fx = mx + b$ yields $fx = 4x + 2$.

Choice A is incorrect. This function represents a graph with a slope of 2 and a y -intercept of 0, 42.

Choice B is incorrect. This function represents a graph with a slope of 32 and a y -intercept of 0, 36.

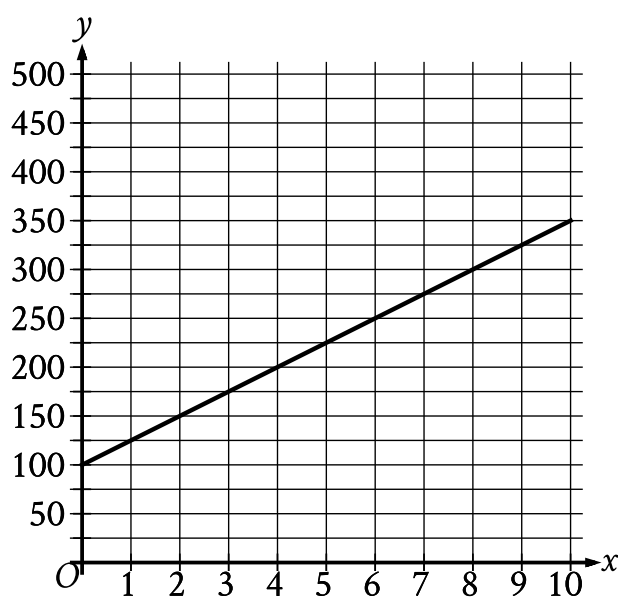
Choice D is incorrect. This function represents a graph with a slope of 8 and a y -intercept of 0, 2.

Question Difficulty: Medium

Question ID d9958f0c

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: d9958f0c



The graph of the function f , where $y = f(x)$, gives the total cost y , in dollars, for a certain video game system and x games. What is the best interpretation of the slope of the graph in this context?

- A. Each game costs \$25.
- B. The video game system costs \$100.
- C. The video game system costs \$25.
- D. Each game costs \$100.

ID: d9958f0c Answer

Correct Answer: A

Rationale

Choice A is correct. The given graph is a line, and the slope of a line is defined as the change in the value of y for each increase in the value of x by 1. It's given that y represents the total cost, in dollars, and that x represents the number of games. Therefore, the change in the value of y for each increase in the value of x by 1 represents the change in total cost, in dollars, for each increase in the number of games by 1. In other words, the slope represents the cost, in dollars, per game. The graph shows that when the value of x increases from 0 to 1, the value of y increases from 100 to 125. It follows that the slope is 25, or the cost per game is \$ 25. Thus, the best interpretation of the slope of the graph is that each game costs \$ 25.

Choice B is incorrect. This is an interpretation of the y -intercept of the graph rather than the slope of the graph.

Choice C is incorrect. The slope of the graph is the cost per game, not the cost of the video game system.

Choice D is incorrect. Each game costs \$ 25, not \$ 100.

Question Difficulty: Medium

Question ID 95e42caf

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 95e42caf

If $f(x) = x + 7$ and $g(x) = 7x$, what is the value of $4f(2) - g(2)$?

- A. -5
- B. 1
- C. **22**
- D. 28

ID: 95e42caf Answer

Correct Answer: C

Rationale

Choice C is correct. The value of $f(2)$ can be found by substituting 2 for x in the given equation $f(x) = x + 7$, which yields $f(2) = 2 + 7$, or $f(2) = 9$. The value of $g(2)$ can be found by substituting 2 for x in the given equation $g(x) = 7x$, which yields $g(2) = 14$. The value of the expression $4f(2) - g(2)$ can be found by substituting the corresponding values into the expression, which gives $4(9) - 14$. This expression is equivalent to $36 - 14$, or 22.

Choice A is incorrect. This is the value of $f(2) - g(2)$, not $4f(2) - g(2)$.

Choice B is incorrect and may result from calculating $4f(2)$ as $4(2) + 7$, rather than $4(2 + 7)$.

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

Question Difficulty: Medium

Question ID 39423fbf

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 39423fbf

For the linear function f , the graph of $y = f(x)$ in the xy -plane has a slope of **39** and passes through the point **(0, 0)**. Which equation defines f ?

- A. $f(x) = -39x$
- B. $f(x) = \frac{1}{39}x$
- C. $f(x) = x - 39$
- D. $f(x) = 39x$

ID: 39423fbf Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining a linear function can be written in the form $fx = mx + b$, where m is the slope and b is the y -intercept of the graph of $y = fx$ in the xy -plane. It's given that the graph of $y = fx$ has a slope of 39, so $m = 39$. It's also given that the graph of $y = fx$ passes through the point 0, 0, so $b = 0$. Substituting 39 for m and 0 for b in $fx = mx + b$ yields $fx = 39x + 0$, or $fx = 39x$. Thus, the equation that defines f is $fx = 39x$.

Choice A is incorrect. This equation defines a function whose graph has a slope of -39, not 39.

Choice B is incorrect. This equation defines a function whose graph has a slope of $\frac{1}{39}$, not 39.

Choice C is incorrect. This equation defines a function whose graph has a slope of 1, not 39, and passes through the point 0, - 39, not 0, 0.

Question Difficulty: Medium

Question ID b771895f

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: b771895f

For the linear function g , the graph of $y = g(x)$ in the xy -plane has a slope of 2 and passes through the point $(1, 14)$. Which equation defines g ?

- A. $g(x) = 2x$
- B. $g(x) = 2x + 2$
- C. $g(x) = 2x + 12$
- D. $g(x) = 2x + 14$

ID: b771895f Answer

Correct Answer: C

Rationale

Choice C is correct. An equation defining a linear function can be written in the form $gx = mx + b$, where m is the slope and b is the y -intercept of the graph of $y = gx$ in the xy -plane. It's given that the graph of $y = gx$ has a slope of 2 . Therefore, $m = 2$. It's also given that the graph of $y = gx$ passes through the point $1, 14$. It follows that when $x = 1$, $gx = 14$. Substituting 1 for x , 14 for gx , and 2 for m in the equation $gx = mx + b$ yields $14 = 2(1) + b$, or $14 = 2 + b$. Subtracting 2 from each side of this equation yields $12 = b$. Therefore, $b = 12$. Substituting 2 for m and 12 for b in the equation $gx = mx + b$ yields $gx = 2x + 12$. Therefore, the equation that defines g is $gx = 2x + 12$.

Choice A is incorrect. For this function, the graph of $y = gx$ in the xy -plane passes through the point $1, 2$, not $1, 14$.

Choice B is incorrect. For this function, the graph of $y = gx$ in the xy -plane passes through the point $1, 4$, not $1, 14$.

Choice D is incorrect. For this function, the graph of $y = gx$ in the xy -plane passes through the point $1, 16$, not $1, 14$.

Question Difficulty: Medium

Question ID 3bf5b5b3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 3bf5b5b3

In the linear function f , $f(0) = 8$ and $f(1) = 12$. Which equation defines f ?

- A. $f(x) = 12x + 8$
- B. $f(x) = 4x$
- C. $f(x) = 4x + 12$
- D. $f(x) = 4x + 8$

ID: 3bf5b5b3 Answer

Correct Answer: D

Rationale

Choice D is correct. Since f is a linear function, it can be defined by an equation of the form $fx = ax + b$, where a and b are constants. It's given that $f0 = 8$. Substituting 0 for x and 8 for fx in the equation $fx = ax + b$ yields $8 = a0 + b$, or $8 = b$. Substituting 8 for b in the equation $fx = ax + b$ yields $fx = ax + 8$. It's given that $f1 = 12$. Substituting 1 for x and 12 for fx in the equation $fx = ax + 8$ yields $12 = a1 + 8$, or $12 = a + 8$. Subtracting 8 from both sides of this equation yields $a = 4$. Substituting 4 for a in the equation $fx = ax + 8$ yields $fx = 4x + 8$. Therefore, an equation that defines f is $fx = 4x + 8$.

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

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

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

Question Difficulty: Medium

Question ID 77830a4f

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 77830a4f

$g(m) = -0.05m + 12.1$

The given function g models the number of gallons of gasoline that remains from a full gas tank in a car after driving m miles. According to the model, about how many gallons of gasoline are used to drive each mile?

- A. 0.05
- B. 12.1
- C. 20
- D. 242.0

ID: 77830a4f Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function g models the number of gallons that remain from a full gas tank in a car after driving m miles. In the given function $gm = - 0.05m + 12.1$, the coefficient of m is -0.05. This means that for every increase in the value of m by 1, the value of gm decreases by 0.05. It follows that for each mile driven, there is a decrease of 0.05 gallons of gasoline. Therefore, 0.05 gallons of gasoline are used to drive each mile.

Choice B is incorrect and represents the number of gallons of gasoline in a full gas tank.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 7c71d844

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 7c71d844

$$w(t) = 300 - 4t$$

The function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. According to the model, what is the predicted volume, in milliliters, draining from the container each second?

- A. 300
- B. 296
- C. 75
- D. 4

ID: 7c71d844 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. The given function $w(t) = 300 - 4t$ can be rewritten as $w(t) = -4t + 300$. Thus, for each increase of t by 1, the value of $w(t)$ decreases by 4 (-4), or 4. Therefore, the predicted volume, in milliliters, draining from the container each second is 4 milliliters.

Choice A is incorrect. This is the amount of liquid, in milliliters, in the container before the liquid begins draining.

Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 52484f52

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 52484f52

The function g is defined by $g(x) = 4x - 6$. What is the value of $g(-7)$?

- A. -34
- B. -22
- C. $-\frac{13}{4}$
- D. $-\frac{1}{4}$

ID: 52484f52 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function g is defined by $gx = 4x - 6$. Substituting -7 for x into the given equation yields $g-7 = 4-7 - 6$, or $g-7 = -34$.

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 is the value of x for which $gx = -7$, not the value of $g-7$.

Question Difficulty: Medium

Question ID 82297d55

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 82297d55

The function f is defined by $f(x) = 7x - 84$. What is the x-intercept of the graph of $y = f(x)$ in the xy-plane?

- A. $(-12, 0)$
- B. $(-7, 0)$
- C. $(7, 0)$
- D. $(12, 0)$

ID: 82297d55 Answer

Correct Answer: D

Rationale

Choice D is correct. The given function f is a linear function. Therefore, the graph of $y = f(x)$ in the xy-plane has one x-intercept at the point $k, 0$, where k is a constant. Substituting 0 for $f(x)$ and k for x in the given function yields $0 = 7k - 84$. Adding 84 to both sides of this equation yields $84 = 7k$. Dividing both sides of this equation by 7 yields $12 = k$. Therefore, the x-intercept of the graph of $y = f(x)$ in the xy-plane is 12, 0.

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

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

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

Question Difficulty: Medium

Question ID 5ddc0ad1

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 5ddc0ad1

Brian saves $\frac{2}{5}$ of the **\$215** he earns each week from his job. If Brian continues to save at this rate, how much money, in dollars, will Brian save in **9** weeks?

ID: 5ddc0ad1 Answer

Correct Answer: 774

Rationale

The correct answer is 774. It's given that Brian saves $\frac{2}{5}$ of the \$ 215 he earns each week from his job. Therefore, Brian saves $\frac{2}{5}$ \$ 215, or \$ 86, per week. If Brian continues to save at this rate of \$ 86 per week for 9 weeks, then he will save a total of 986, or 774, dollars.

Question Difficulty: Medium

Question ID 63a9331e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 63a9331e

For the linear function h , the graph of $y = h(x)$ in the xy -plane passes through the points $(7, 21)$ and $(9, 25)$. Which equation defines h ?

- A. $h(x) = \frac{1}{2}x - \frac{7}{2}$
- B. $h(x) = 2x + 7$
- C. $h(x) = 7x + 21$
- D. $h(x) = 9x + 25$

ID: 63a9331e Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph of the linear function h , where $y = hx$, passes through the points 7, 21 and 9, 25 in the xy -plane. An equation defining h can be written in the form $y = mx + b$, where $y = hx$, m represents the slope of the graph in the xy -plane, and b represents the y -coordinate of the y -intercept of the graph. The slope can be found using any two points, x_1, y_1 and x_2, y_2 , and the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting 7, 21 and 9, 25 for x_1, y_1 and x_2, y_2 , respectively, in the slope formula yields $m = \frac{25 - 21}{9 - 7}$, which is equivalent to $m = \frac{4}{2}$, or $m = 2$. Substituting 2 for m and 7, 21 for x, y in the equation $y = mx + b$ yields $21 = 27 + b$, or $21 = 14 + b$. Subtracting 14 from each side of this equation yields $7 = b$. Substituting 2 for m and 7 for b in the equation $y = mx + b$ yields $y = 2x + 7$. Since $y = hx$, it follows that the equation that defines h is $hx = 2x + 7$.

Choice A is incorrect. For this function, the graph of $y = hx$ in the xy -plane would pass through 7, 0, not 7, 21, and 9, 1, not 9, 25.

Choice C is incorrect. For this function, the graph of $y = hx$ in the xy -plane would pass through 7, 70, not 7, 21, and 9, 84, not 9, 25.

Choice D is incorrect. For this function, the graph of $y = hx$ in the xy -plane would pass through 7, 88, not 7, 21, and 9, 106, not 9, 25.

Question Difficulty: Medium

Question ID 1f65f0a8

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 1f65f0a8

The function f is defined by $f(x) = \frac{9}{7}x + \frac{8}{7}$. For what value of x does $f(x) = 5$?

ID: 1f65f0a8 Answer

Correct Answer: 3

Rationale

The correct answer is 3. Substituting 5 for fx in the given function yields $5 = \frac{9}{7}x + \frac{8}{7}$. Multiplying each side of this equation by 7 yields $75 = 7\frac{9}{7}x + \frac{8}{7}$, or $35 = 9x + 8$. Subtracting 8 from each side of this equation yields $27 = 9x$. Dividing each side of this equation by 9 yields $3 = x$. Therefore, $fx = 5$ when the value of x is 3.

Question Difficulty: Medium

Question ID 224d2503

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 224d2503

The table gives the number of hours, h , of labor and a plumber’s total charge $f(h)$, in dollars, for two different jobs.

h	$f(h)$
1	155
3	285

There is a linear relationship between h and $f(h)$. Which equation represents this relationship?

- A. $f(h) = 25h + 130$
- B. $f(h) = 130h + 25$
- C. $f(h) = 65h + 90$
- D. $f(h) = 90h + 65$

ID: 224d2503 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that there is a linear relationship between a plumber's hours of labor, h , and the plumber's total charge fh , in dollars. It follows that the relationship can be represented by an equation of the form $fh = mh + b$, where m is the rate of change of the function f and b is a constant. The rate of change of f can be calculated by dividing the difference in two values of fh by the difference in the corresponding values of h . Based on the values given in the table, the rate of change of f is $\frac{285 - 155}{3 - 1}$, or 65. Substituting 65 for m in the equation $fh = mh + b$ yields $fh = 65h + b$. The value of b can be found by substituting any value of h and its corresponding value of fh for h and fh , respectively, in this equation. Substituting 1 for h and 155 for fh yields $155 = 65(1) + b$, or $155 = 65 + b$. Subtracting 65 from both sides of this equation yields $90 = b$. Substituting 90 for b in the equation $fh = 65h + b$ yields $f(h) = 65h + 90$.

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

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

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

Question Difficulty: Medium

Question ID bf9315c0

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: bf9315c0

Gabriella deposits **\$35** in a savings account at the end of each week. At the beginning of the **1st** week of a year there was **\$600** in that savings account. How much money, in dollars, will be in the account at the end of the **4th** week of that year?

- A. **460**
- B. **635**
- C. **639**
- D. **740**

ID: bf9315c0 Answer

Correct Answer: D

Rationale

Choice D is correct. It’s given that at the beginning of the 1st week of the year there was \$ 600 in a savings account and Gabriella deposits \$ 35 in that savings account at the end of each week. Therefore, the amount of money, in dollars, in the savings account at the end of the 4th week of that year is $600 + 435$, or 740.

Choice A is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 4th week if Gabriella withdraws, rather than deposits, \$ 35 at the end of each week.

Choice B is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 1st week, not the 4th week.

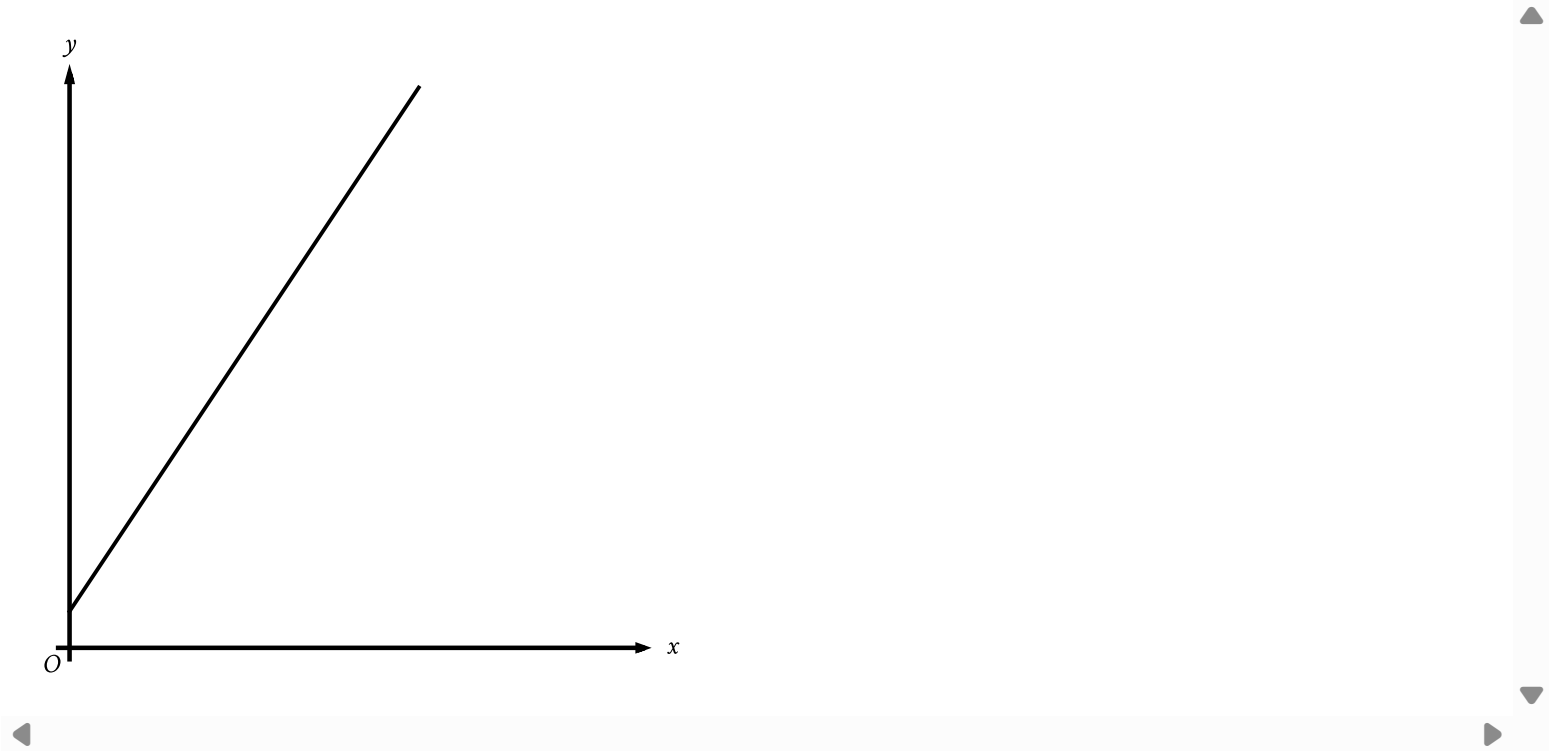
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 85c1496b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 85c1496b



The graph represents the total charge, in dollars, by an electrician for x hours of work. The electrician charges a onetime fee plus an hourly rate. What is the best interpretation of the slope of the graph?

- A. The electrician’s hourly rate
- B. The electrician’s onetime fee
- C. The maximum amount that the electrician charges
- D. The total amount that the electrician charges

ID: 85c1496b Answer

Correct Answer: A

Rationale

Choice A is correct. It’s given that the electrician charges a onetime fee plus an hourly rate. It's also given that the graph represents the total charge, in dollars, for x hours of work. This graph shows a linear relationship in the xy -plane. Thus, the total charge y , in dollars, for x hours of work can be represented as $y = mx + b$, where m is the slope and $0, b$ is the y -intercept of the graph of the equation in the xy -plane. Since the given graph represents the total charge, in dollars, by an electrician for x hours of work, it follows that its slope is m , or the electrician’s hourly rate.

Choice B is incorrect. The electrician's onetime fee is represented by the y -coordinate of the y -intercept, not the slope, of the graph.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID d9069ff3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: d9069ff3

$$f(x) = 14 + 4x$$

The function f represents the total cost, in dollars, of attending an arcade when x games are played. How many games can be played for a total cost of \$58?

ID: d9069ff3 Answer

Correct Answer: 11

Rationale

The correct answer is 11. It's given that the function $f(x) = 14 + 4x$ represents the total cost, in dollars, of attending an arcade when x games are played. Substituting 58 for $f(x)$ in the given equation yields $58 = 14 + 4x$. Subtracting 14 from each side of this equation yields $44 = 4x$. Dividing each side of this equation by 4 yields $11 = x$. Therefore, 11 games can be played for a total cost of \$ 58.

Question Difficulty: Medium

Question ID 61bbd673

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 61bbd673

A model predicts that a certain animal weighed **241** pounds when it was born and that the animal gained **3** pounds per day in its first year of life. This model is defined by an equation in the form $f(x) = a + bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. What is the value of a ?

ID: 61bbd673 Answer

Correct Answer: 241

Rationale

The correct answer is 241. For a certain animal, it's given that a model predicts the animal weighed 241 pounds when it was born and gained 3 pounds per day in its first year of life. It's also given that this model is defined by an equation in the form $fx = a + bx$, where fx is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. It follows that a represents the predicted weight, in pounds, of the animal when it was born and b represents the predicted rate of weight gain, in pounds per day, in its first year of life. Thus, the value of a is 241.

Question Difficulty: Medium

Question ID 14a65be1

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 14a65be1

The function f is defined by $f(x) = 5x + 8$. For what value of x does $f(x) = 58$?

- A. 10
- B. 13
- C. 50
- D. 298

ID: 14a65be1 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function f is defined by $fx = 5x + 8$. Substituting 58 for fx in this equation yields $58 = 5x + 8$. Subtracting 8 from both sides of this equation yields $50 = 5x$. Dividing both sides of this equation by 5 yields $10 = x$. Therefore, the value of x when $fx = 58$ is 10.

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 is the value of $f58$, not the value of x when $fx = 58$.

Question Difficulty: Medium

Question ID d791004d

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: d791004d

In the xy -plane, the graph of the linear function f contains the points $(0, 3)$ and $(7, 31)$. Which equation defines f , where $y = f(x)$?

- A. $f(x) = 28x + 34$
- B. $f(x) = 3x + 38$
- C. $f(x) = 4x + 3$
- D. $f(x) = 7x + 3$

ID: d791004d Answer

Correct Answer: C

Rationale

Choice C is correct. In the xy -plane, an equation of the graph of a linear function can be written in the form $fx = mx + b$, where m represents the slope and $0, b$ represents the y -intercept of the graph of $y = fx$. It's given that the graph of the linear function f , where $y = fx$, in the xy -plane contains the point $0, 3$. Thus, $b = 3$. The slope of the graph of a line containing any two points x_1, y_1 and x_2, y_2 can be found using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since it's given that the graph of the linear function f contains the points $0, 3$ and $7, 31$, it follows that the slope of the graph of the line containing these points is $m = \frac{31 - 3}{7 - 0}$, or $m = 4$. Substituting 4 for m and 3 for b in $fx = mx + b$ yields $fx = 4x + 3$.

Choice A is incorrect. This function represents a graph with a slope of 28 and a y -intercept of $0, 34$.

Choice B is incorrect. This function represents a graph with a slope of 3 and a y -intercept of $0, 38$.

Choice D is incorrect. This function represents a graph with a slope of 7 and a y -intercept of $0, 3$.

Question Difficulty: Medium

Question ID be74dbbf

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: be74dbbf

$$f(x) = 2x + 3$$

For the given function f , the graph of $y = f(x)$ in the xy -plane is parallel to line j . What is the slope of line j ?

ID: be74dbbf Answer

Correct Answer: 2

Rationale

The correct answer is 2. It's given that function f is defined by $f(x) = 2x + 3$. Therefore, the equation representing the graph of $y = f(x)$ in the xy -plane is $y = 2x + 3$, and the graph is a line. For a linear equation in the form $y = mx + b$, m represents the slope of the line. Since the value of m in the equation $y = 2x + 3$ is 2, the slope of the line defined by function f is 2. It's given that line j is parallel to the line defined by function f . The slopes of parallel lines are equal. Therefore, the slope of line j is also 2.

Question Difficulty: Medium

Question ID 2df665b8

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 2df665b8

For the linear function f , the graph of $y = f(x)$ in the xy -plane has a slope of 2 and has a y -intercept at $(0, -5)$. Which equation defines f ?

- A. $f(x) = \frac{1}{2}x - 5$
- B. $f(x) = -\frac{1}{2}x - 5$
- C. $f(x) = -2x - 5$
- D. $f(x) = 2x - 5$

ID: 2df665b8 Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining the linear function f can be written in the form $fx = mx + b$, where m is the slope and $0, b$ is the y -intercept of the graph of $y = fx$ in the xy -plane. It's given that the graph of $y = fx$ has a slope of 2 . Therefore, $m = 2$. It's also given that the graph of $y = fx$ has a y -intercept at $0, -5$. Therefore, $b = -5$. Substituting 2 for m and -5 for b in the equation $fx = mx + b$ yields $fx = 2x - 5$. Thus, the equation that defines f is $fx = 2x - 5$.

Choice A is incorrect. For this function, the graph of $y = fx$ in the xy -plane has a slope of $\frac{1}{2}$, not 2 .

Choice B is incorrect. For this function, the graph of $y = fx$ in the xy -plane has a slope of $-\frac{1}{2}$, not 2 .

Choice C is incorrect. For this function, the graph of $y = fx$ in the xy -plane has a slope of -2 , not 2 .

Question Difficulty: Medium

Question ID de24df33

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: de24df33

In the linear function h , $h(0) = 41$ and $h(1) = 40$. Which equation defines h ?

- A. $h(x) = -x + 41$
- B. $h(x) = -x$
- C. $h(x) = -41x$
- D. $h(x) = -41$

ID: de24df33 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation defining a linear function can be written in the form $hx = ax + b$, where a and b are constants. It's given that $h0 = 41$. Substituting 0 for x and 41 for hx in the equation $hx = ax + b$ yields $41 = a0 + b$, or $b = 41$. Substituting 41 for b in the equation $hx = ax + b$ yields $hx = ax + 41$. It's also given that $h1 = 40$. Substituting 1 for x and 40 for hx in the equation $hx = ax + 41$ yields $40 = a1 + 41$, or $40 = a + 41$. Subtracting 41 from the left- and right-hand sides of this equation yields $-1 = a$. Substituting -1 for a in the equation $hx = ax + 41$ yields $hx = -1x + 41$, or $hx = -x + 41$.

Choice B is incorrect. Substituting 0 for x and 41 for hx in this equation yields $41 = -0$, which isn't a true statement.

Choice C is incorrect. Substituting 0 for x and 41 for hx in this equation yields $41 = -410$, or $41 = 0$, which isn't a true statement.

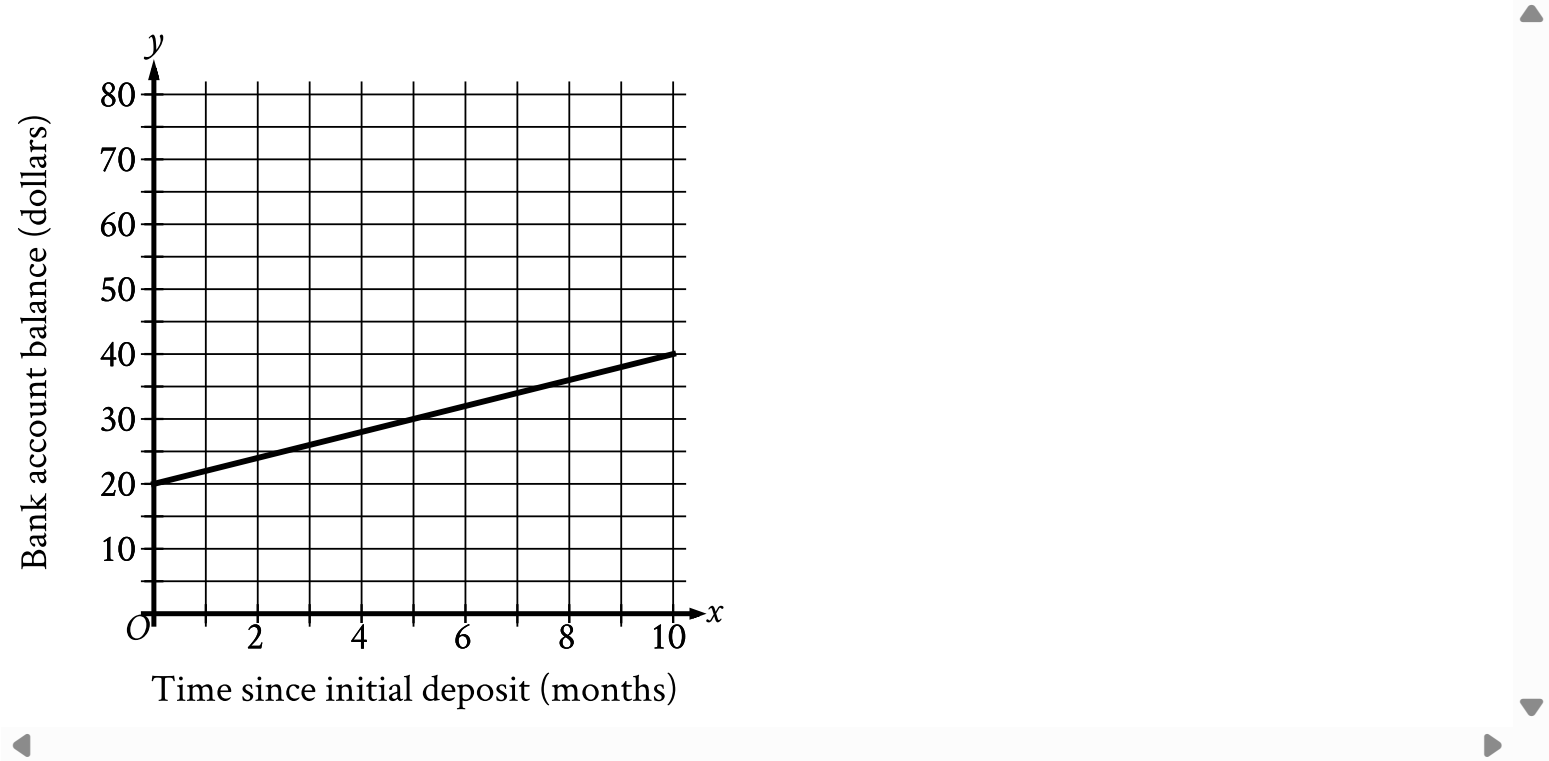
Choice D is incorrect. Substituting 41 for hx in this equation yields $41 = -41$, which isn't a true statement.

Question Difficulty: Medium

Question ID 909d7e2b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 909d7e2b



A bank account was opened with an initial deposit. Over the next several months, regular deposits were made into this account, and there were no withdrawals made during this time. The graph of the function f shown, where $y = f(x)$, estimates the account balance, in dollars, in this bank account x months since the initial deposit. To the nearest whole dollar, what is the amount of the initial deposit estimated by the graph?

ID: 909d7e2b Answer

Correct Answer: 20

Rationale

The correct answer is 20. For the graph shown, the x -axis represents the time since the initial deposit, in months, and the y -axis represents the bank account balance, in dollars. The amount of the initial deposit is estimated by the y -coordinate of the point on the graph that represents 0 months since the initial deposit. Therefore, the amount of the initial deposit is estimated by the corresponding y -value for the point when $x = 0$. When $x = 0$, it is estimated that $y = 20$. Thus, the amount of the initial deposit estimated by the graph, to the nearest whole dollar, is 20.

Question Difficulty: Medium

Question ID 336e802a

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 336e802a

Scientists collected fallen acorns that each housed a colony of the ant species *P. ohioensis* and analyzed each colony's structure. For any of these colonies, if the colony has x worker ants, the equation $y = 0.67x + 2.6$, where $20 \leq x \leq 110$, gives the predicted number of larvae, y , in the colony. If one of these colonies has 58 worker ants, which of the following is closest to the predicted number of larvae in the colony?

- A. 41
- B. 61
- C. 83
- D. 190

ID: 336e802a Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the equation $y = 0.67x + 2.6$, where $20 \leq x \leq 110$, gives the predicted number of larvae, y , in a colony of ants if the colony has x worker ants. If one of these colonies has 58 worker ants, the predicted number of larvae in that colony can be found by substituting 58 for x in the given equation. Substituting 58 for x in the given equation yields $y = 0.67(58) + 2.6$, or $y = 41.46$. Of the given choices, 41 is closest to the predicted number of larvae in the colony.

Choice B is incorrect. This is closest to the predicted number of larvae in a colony with 87 worker ants.

Choice C is incorrect. This is closest to the number of worker ants for which the predicted number of larvae in a colony is 58.

Choice D is incorrect. This is closest to the predicted number of larvae in a colony with 280 worker ants.

Question Difficulty: Medium

Question ID a0755945

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: a0755945

The function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature $f(x)$, in degrees Celsius, of a body of water on the x th day of the year, where $220 \leq x \leq 360$. Based on the model, what is the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year?

- A. 55.20
- B. 3.04
- C. -0.16
- D. -52.16

ID: a0755945 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature, in degrees Celsius, of a body of water on the x th day of the year. Substituting 326 for x in the given function yields $f(326) = 55.20 - 0.16(326)$, which is equivalent to $f(326) = 55.20 - 52.16$, or $f(326) = 3.04$. Therefore, the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year is 3.04.

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

Choice C is incorrect. This is the rate of change, in degrees Celsius per day, of the estimated surface water temperature.

Choice D is incorrect. This is the change, in degrees Celsius, in the estimated surface water temperature over 326 days.

Question Difficulty: Medium

Question ID fd5ffee5

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: fd5ffee5

$g(x) = 11x + 4$

For the given linear function g , which table shows three values of x and their corresponding values of $g(x)$?

A.

x	$g(x)$
-1	7
0	11
1	15

B.

x	$g(x)$
-1	-4
0	0
1	4

C.

x	$g(x)$
-1	-7
0	4
1	15

D.

x	$g(x)$
-1	-11
0	0
1	11

ID: fd5ffee5 Answer

Correct Answer: C

Rationale

Choice C is correct. Each of the tables shows the same three values of x : -1, 0, and 1. Substituting -1 for x in the given function yields $g(-1) = 11(-1) + 4$, or $g(-1) = -7$. Therefore, when $x = -1$, the corresponding value of $g(x)$ is -7. Substituting 0 for x in the given function yields $g(0) = 11(0) + 4$, or $g(0) = 4$. Therefore, when $x = 0$, the corresponding value of $g(x)$ is 4. Substituting 1 for x in the given function yields $g(1) = 11(1) + 4$, or $g(1) = 15$. Therefore, when $x = 1$, the corresponding value of $g(x)$ is 15. The table in choice C shows -7, 4, and 15 as the corresponding value of $g(x)$ for x -values of -1, 0, and 1, respectively. Therefore, the table in choice C shows three values of x and their corresponding values of $g(x)$.

Choice A is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 4x + 11$.

Choice B is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 4x$.

Choice D is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 11x$.

Question Difficulty: Medium

Question ID 55ce77fa

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Algebra	Linear functions	

ID: 55ce77fa

The relationship between two variables, x and y , is linear. For every increase in the value of x by 1, the value of y increases by 8. When the value of x is 2, the value of y is 18. Which equation represents this relationship?

- A. $y = 2x + 18$
- B. $y = 2x + 8$
- C. $y = 8x + 2$
- D. $y = 3x + 26$

ID: 55ce77fa Answer

Correct Answer: C

Rationale

Choice C is correct. It’s given that the relationship between x and y is linear. An equation representing a linear relationship can be written in the form $y = mx + b$, where m is the slope and b is the y -coordinate of the y -intercept of the graph of the relationship in the xy -plane. It’s given that for every increase in the value of x by 1, the value of y increases by 8. The slope of a line can be expressed as the change in y over the change in x . Thus, the slope, m , of the line representing this relationship can be expressed as $\frac{8}{1}$, or 8. Substituting 8 for m in the equation $y = mx + b$ yields $y = 8x + b$. It's also given that when the value of x is 2, the value of y is 18. Substituting 2 for x and 18 for y in the equation $y = 8x + b$ yields $18 = 8(2) + b$, or $18 = 16 + b$. Subtracting 16 from each side of this equation yields $2 = b$. Substituting 2 for b in the equation $y = 8x + b$ yields $y = 8x + 2$. Therefore, the equation $y = 8x + 2$ represents this relationship.

Choice A is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 22, not 18.

Choice B is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 12, not 18.

Choice D is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 3, not 8, and when the value of x is 2, the value of y is 32, not 18.

Question Difficulty: Medium