

# Question ID 5c1751d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 5c1751d6

$x$	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: 5c1751d6 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,  $82 = m(10) - 28$ . 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 4452450d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 4452450d

$$f(x) = 45x + 600$$

The function  $f$  gives the monthly fee  $f(x)$ , in dollars, a facility charges to keep  $x$  crates in storage. What is the monthly fee, in dollars, the facility charges to keep 50 crates in storage?

ID: 4452450d Answer

Correct Answer: 2850

Rationale

The correct answer is 2,850. It's given that the function  $f(x) = 45x + 600$  gives the monthly fee, in dollars, a facility charges to keep  $x$  crates in storage. Substituting 50 for  $x$  in this function yields  $f(50) = 45(50) + 600$ , or  $f(50) = 2,850$ . Therefore, the monthly fee, in dollars, the facility charges to keep 50 crates in storage is 2,850.

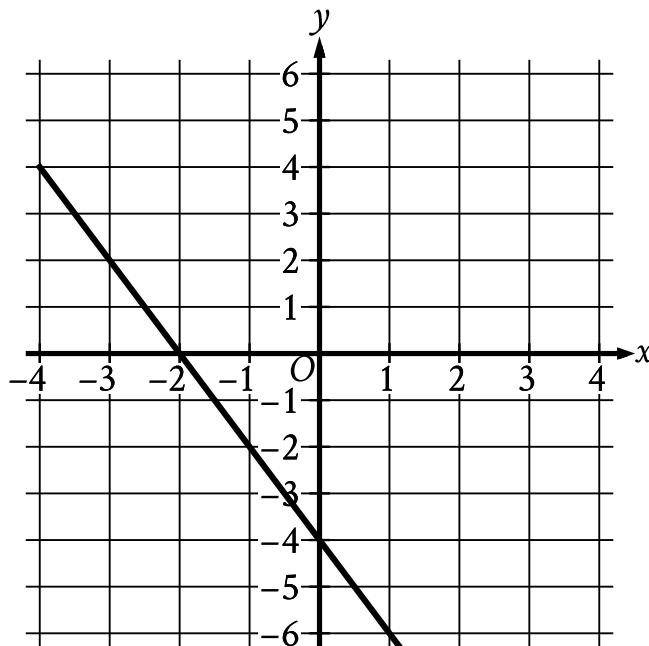
Question Difficulty: Medium

# Question ID e35e5a7e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: e35e5a7e

The graph of  $y = f(x) - 11$  is shown.



Which equation defines the linear function  $f$ ?

- A.  $f(x) = -13x - 11$
- B.  $f(x) = -2x + 7$
- C.  $f(x) = -13x + 7$
- D.  $f(x) = -2x - 11$

ID: e35e5a7e Answer

Correct Answer: B

Rationale

Choice B is correct. The graph of a line in the  $xy$ -plane can be represented by the equation  $y = mx + b$ , where  $m$  is the slope of the line and  $(0, b)$  is the  $y$ -intercept. The slope of a line that passes through the points  $(x_1, y_1)$  and  $(x_2, y_2)$  can be calculated using the formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . The line shown passes through the points  $(-1, -2)$  and  $(0, -4)$ . Substituting  $(-1, -2)$  and  $(0, -4)$  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  $m = \frac{-4 - (-2)}{0 - (-1)}$ , which is equivalent to  $m = \frac{-2}{1}$ , or  $m = -2$ . Since the line shown passes through the point  $(0, -4)$ , it follows that  $b = -4$ . Substituting  $-2$  for  $m$  and  $-4$  for  $b$  in the equation  $y = mx + b$  yields  $y = -2x - 4$ . It's given that the graph shown is the

graph of  $y = f(x) - 11$ . Substituting  $-2x - 4$  for  $y$  in the equation  $y = f(x) - 11$  yields  $-2x - 4 = f(x) - 11$ . Adding 11 to both sides of this equation yields  $-2x + 7 = f(x)$ . Therefore, the equation  $f(x) = -2x + 7$  defines the linear function  $f$ .

Choice A 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: Medium

# Question ID 8c6982c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 8c6982c3

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: 8c6982c3 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  $g(2) = 7(2)$ , or  $g(2) = 14$ . 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  $4(2 + 7)$ .

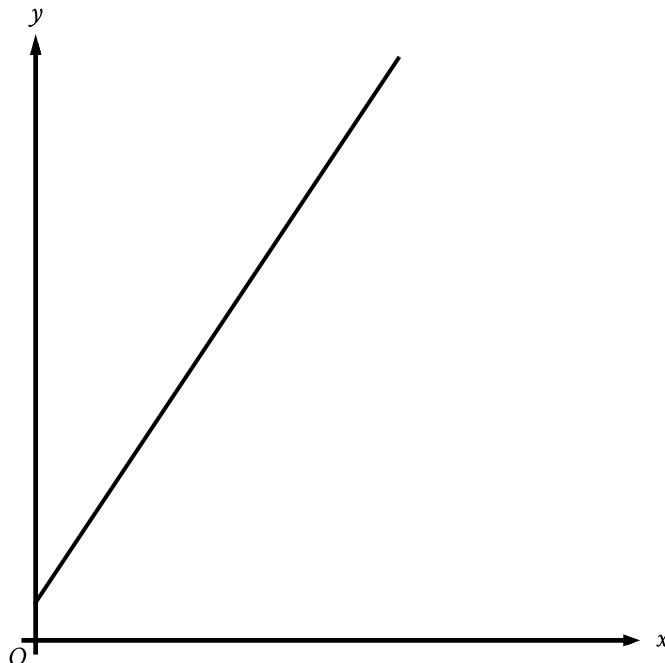
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

# Question ID c3c9b8bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: c3c9b8bc



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: c3c9b8bc 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 e34403e6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: e34403e6

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: e34403e6 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  $f(x) = ax + b$ , where  $a$  and  $b$  are constants. It's given that  $f(0) = 8$ . Substituting 0 for  $x$  and 8 for  $f(x)$  in the equation  $f(x) = ax + b$  yields  $8 = a(0) + b$ , or  $8 = b$ . Substituting 8 for  $b$  in the equation  $f(x) = ax + b$  yields  $f(x) = ax + 8$ . It's given that  $f(1) = 12$ . Substituting 1 for  $x$  and 12 for  $f(x)$  in the equation  $f(x) = ax + 8$  yields  $12 = a(1) + 8$ , or  $12 = a + 8$ . Subtracting 8 from both sides of this equation yields  $a = 4$ . Substituting 4 for  $a$  in the equation  $f(x) = ax + 8$  yields  $f(x) = 4x + 8$ . Therefore, an equation that defines  $f$  is  $f(x) = 4x + 8$ .

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 5363dc9a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 5363dc9a

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: 5363dc9a 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  $(9)(86)$ , or 774, dollars.

Question Difficulty: Medium

# Question ID 51459b74

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 51459b74

Number of cars	Maximum number of passengers and crew
3	174
5	284
10	559

The table shows the linear relationship between the number of cars,  $c$ , on a commuter train and the maximum number of passengers and crew,  $p$ , that the train can carry. Which equation represents the linear relationship between  $c$  and  $p$ ?

- A.  $55c - p = -9$
- B.  $55c - p = 9$
- C.  $55p - c = -9$
- D.  $55p - c = 9$

ID: 51459b74 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that there is a linear relationship between the number of cars,  $c$ , on a commuter train and the maximum number of passengers and crew,  $p$ , that the train can carry. It follows that this relationship can be represented by an equation of the form  $p = mc + b$ , where  $m$  is the rate of change of  $p$  in this relationship and  $b$  is a constant. The rate of change of  $p$  in this relationship can be calculated by dividing the difference in any two values of  $p$  by the difference in the corresponding values of  $c$ . Using two pairs of values given in the table, the rate of change of  $p$  in this relationship is  $\frac{284 - 174}{5 - 3} = 55$ , or 55. Substituting 55 for  $m$  in the equation  $p = mc + b$  yields  $p = 55c + b$ . The value of  $b$  can be found by substituting any value of  $c$  and its corresponding value of  $p$  for  $c$  and  $p$ , respectively, in this equation. Substituting 10 for  $c$  and 559 for  $p$  yields  $559 = 55(10) + b$ , or  $559 = 550 + b$ . Subtracting 550 from both sides of this equation yields  $9 = b$ . Substituting 9 for  $b$  in the equation  $p = 55c + b$  yields  $p = 55c + 9$ . Subtracting 9 from both sides of this equation yields  $p - 9 = 55c$ . Subtracting  $p$  from both sides of this equation yields  $-9 = 55c - p$ , or  $55c - p = -9$ .

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: Medium

# Question ID dfb6b432

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: dfb6b432

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: dfb6b432 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 8e53811f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 8e53811f

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

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: 8e53811f 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(1), 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 9b6c20fe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 9b6c20fe

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: 9b6c20fe 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 c319a5eb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: c319a5eb

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: c319a5eb 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  $f(x) = mx + b$ , where  $m$  represents the slope and  $(0, b)$  represents the  $y$ -intercept of the graph of  $y = f(x)$ . It's given that the graph of the linear function  $f$ , where  $y = f(x)$ , 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  $f(x) = mx + b$  yields  $f(x) = 4x + 2$ .

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 387e1ecb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 387e1ecb

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: 387e1ecb Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph of the linear function  $h$ , where  $y = h(x)$ , 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  $y = h(x)$ ,  $m$  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  $21 = (2)(7) + b$ , 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  $y = h(x)$ , it follows that the equation that defines  $h$  is  $h(x) = 2x + 7$ .

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

Question Difficulty: Medium

# Question ID 4abc1fa3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 4abc1fa3

$$h(x) = x + b$$

For the linear function  $h$ ,  $b$  is a constant and  $h(0) = 45$ . What is the value of  $b$ ?

ID: 4abc1fa3 Answer

Correct Answer: 45

Rationale

The correct answer is 45. It's given that  $h(0) = 45$ . Therefore, for the given function  $h$ , when  $x = 0$ ,  $h(x) = 45$ . Substituting 0 for  $x$  and 45 for  $h(x)$  in the given function,  $h(x) = x + b$ , yields  $45 = 0 + b$ , or  $45 = b$ . Therefore, the value of  $b$  is 45.

Question Difficulty: Medium

# Question ID ab87d548

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: ab87d548

The function  $f$  is defined by  $f(x) = 4x + k(x - 1)$ , where  $k$  is a constant, and  $f(5) = 32$ . What is the value of  $f(10)$ ?

ID: ab87d548 Answer

Correct Answer: 67

Rationale

The correct answer is 67. It's given that  $f(5) = 32$ . Therefore, for the given function  $f$ , when  $x = 5$ ,  $f(x) = 32$ . Substituting 5 for  $x$  and 32 for  $f(x)$  in the given function  $f(x) = 4x + k(x - 1)$  yields  $32 = 4(5) + k(5 - 1)$ , or  $32 = 20 + 4k$ . Subtracting 20 from each side of this equation yields  $12 = 4k$ . Dividing each side of this equation by 4 yields  $k = 3$ . Substituting 3 for  $k$  in the given function  $f(x) = 4x + k(x - 1)$  yields  $f(x) = 4x + 3(x - 1)$ , which is equivalent to  $f(x) = 4x + 3x - 3$ , or  $f(x) = 7x - 3$ . Substituting 10 for  $x$  into this equation yields  $f(10) = 7(10) - 3$ , or  $f(10) = 67$ . Therefore, the value of  $f(10)$  is 67.

Question Difficulty: Medium

# Question ID 200192c0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 200192c0

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: 200192c0 Answer

Correct Answer: C

Rationale

Choice C is correct. An equation defining a linear function can be written in the form  $g(x) = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept of the graph of  $y = g(x)$  in the  $xy$ -plane. It's given that the graph of  $y = g(x)$  has a slope of **2**. Therefore,  $m = 2$ . It's also given that the graph of  $y = g(x)$  passes through the point  $(1, 14)$ . It follows that when  $x = 1$ ,  $g(x) = 14$ . Substituting **1** for  $x$ , **14** for  $g(x)$ , and **2** for  $m$  in the equation  $g(x) = mx + b$  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  $g(x) = mx + b$  yields  $g(x) = 2x + 12$ . Therefore, the equation that defines  $g$  is  $g(x) = 2x + 12$ .

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

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

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

Question Difficulty: Medium

## Question ID c8de424b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: c8de424b

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: c8de424b 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  $f(x) = a + bx$ , where  $f(x)$  is the predicted weight, in pounds, of the animal  $x$  days after it was born, and  $a$  and  $b$  are constants. 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 da1ebb54

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: da1ebb54

The function  $f$  is defined by  $f(x) = \frac{x+15}{5}$ , and  $f(a) = 10$ , where  $a$  is a constant. What is the value of  $a$ ?

- A. 5
- B. 10
- C. 35
- D. 65

ID: da1ebb54 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that  $f(x) = \frac{x+15}{5}$  and  $f(a) = 10$ , where  $a$  is a constant. Therefore, for the given function  $f$ , when  $x = a$ ,  $f(x) = 10$ . Substituting  $a$  for  $x$  and 10 for  $f(x)$  in the given function  $f$  yields  $10 = \frac{a+15}{5}$ . Multiplying both sides of this equation by 5 yields  $50 = a + 15$ . Subtracting 15 from both sides of this equation yields  $35 = a$ . Therefore, the value of  $a$  is 35.

Choice A is incorrect. This is the value of  $a$  if  $f(a) = 4$ .

Choice B is incorrect. This is the value of  $a$  if  $f(a) = 5$ .

Choice D is incorrect. This is the value of  $a$  if  $f(a) = 16$ .

Question Difficulty: Medium

# Question ID 04857055

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 04857055

A linear model estimates the population of a city from **1991** to **2015**. The model estimates the population was **57** thousand in **1991**, **224** thousand in **2011**, and  **$x$**  thousand in **2015**. To the nearest whole number, what is the value of  **$x$** ?

ID: 04857055 Answer

Correct Answer: 257

## Rationale

The correct answer is **257**. It's given that a linear model estimates the population of a city from **1991** to **2015**. Since the population can be estimated using a linear model, it follows that there is a constant rate of change for the model. It's also given that the model estimates the population was **57** thousand in **1991**, **224** thousand in **2011**, and  **$x$**  thousand in **2015**. The change in the population between **2011** and **1991** is **224 – 57**, or **167**, thousand. The change in the number of years between **2011** and **1991** is **2011 – 1991**, or **20**, years. Dividing **167** by **20** gives **167/20**, or **8.35**, thousand per year. Thus, the change in population per year from **1991** to **2015** estimated by the model is **8.35** thousand. The change in the number of years between **2015** and **2011** is **2015 – 2011**, or **4**, years. Multiplying the change in population per year by the change in number of years yields the increase in population from **2011** to **2015** estimated by the model: **(8.35)(4)**, or **33.4**, thousand. Adding the change in population from **2011** to **2015** estimated by the model to the estimated population in **2011** yields the estimated population in **2015**. Thus, the estimated population in **2015** is **33.4 + 224**, or **257.4**, thousand. Therefore to the nearest whole number, the value of  **$x$**  is **257**.

Question Difficulty: Medium

# Question ID 9760e424

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 9760e424

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: 9760e424 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

# Question ID 190aecd4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 190aecd4

$$f(x) = 39$$

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: 190aecd4 Answer

Correct Answer: B

Rationale

Choice B is correct. For the given linear function  $f$ ,  $f(x)$  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  $f(x)$  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 f4b59648

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: f4b59648

The function  $h$  is defined by  $h(x) = 4x + 28$ . The graph of  $y = h(x)$  in the  $xy$ -plane has an  $x$ -intercept at  $(a, 0)$  and a  $y$ -intercept at  $(0, b)$ , where  $a$  and  $b$  are constants. What is the value of  $a + b$ ?

- A. 21
- B. 28
- C. 32
- D. 35

ID: f4b59648 Answer

Correct Answer: A

Rationale

Choice A is correct. The  $x$ -intercept of a graph in the  $xy$ -plane is the point on the graph where  $y = 0$ . It's given that function  $h$  is defined by  $h(x) = 4x + 28$ . Therefore, the equation representing the graph of  $y = h(x)$  is  $y = 4x + 28$ . Substituting 0 for  $y$  in the equation  $y = 4x + 28$  yields  $0 = 4x + 28$ . Subtracting 28 from both sides of this equation yields  $-28 = 4x$ . Dividing both sides of this equation by 4 yields  $-7 = x$ . Therefore, the  $x$ -intercept of the graph of  $y = h(x)$  in the  $xy$ -plane is  $(-7, 0)$ . It's given that the  $x$ -intercept of the graph of  $y = h(x)$  is  $(a, 0)$ . Therefore,  $a = -7$ . The  $y$ -intercept of a graph in the  $xy$ -plane is the point on the graph where  $x = 0$ . Substituting 0 for  $x$  in the equation  $y = 4x + 28$  yields  $y = 4(0) + 28$ , or  $y = 28$ . Therefore, the  $y$ -intercept of the graph of  $y = h(x)$  in the  $xy$ -plane is  $(0, 28)$ . It's given that the  $y$ -intercept of the graph of  $y = h(x)$  is  $(0, b)$ . Therefore,  $b = 28$ . If  $a = -7$  and  $b = 28$ , then the value of  $a + b$  is  $-7 + 28$ , or 21.

Choice B is incorrect. This is the value of  $b$ , not  $a + b$ .

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

Choice D is incorrect. This is the value of  $-a + b$ , not  $a + b$ .

Question Difficulty: Medium

# Question ID 59f935b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 59f935b5

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: 59f935b5 Answer

Correct Answer: 3

Rationale

The correct answer is 3. Substituting 5 for  $f(x)$  in the given function yields  $5 = \frac{9}{7}x + \frac{8}{7}$ . Multiplying each side of this equation by 7 yields  $7(5) = 7\left(\frac{9}{7}x + \frac{8}{7}\right)$ , 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,  $f(x) = 5$  when the value of  $x$  is 3.

Question Difficulty: Medium

# Question ID 76846354

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 76846354

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

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: 76846354 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  $g(m) = -0.05m + 12.1$ , the coefficient of  $m$  is  $-0.05$ . This means that for every increase in the value of  $m$  by 1, the value of  $g(m)$  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 91fa7328

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 91fa7328

A linear function  $f$  gives a company's profit, in dollars, for selling  $x$  items. The company's profit is \$220 when it sells 8 items, and its profit is \$320 when it sells 10 items. Which equation defines  $f$ ?

- A.  $f(x) = 150x - 320$
- B.  $f(x) = 32x$
- C.  $f(x) = 50x - 10x$
- D.  $f(x) = 50x - 180$

ID: 91fa7328 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the relationship between  $x$  and  $f(x)$  is linear. A linear function can be written in the form  $f(x) = mx + b$ , where  $m$  is the slope and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the graph of  $y = f(x)$  in the  $xy$ -plane. Given two points on a line,  $(x_1, y_1)$  and  $(x_2, y_2)$ , the slope of the line can be found using the slope formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . It's given that the company's profit is \$220 when it sells 8 items and the profit is \$320 when it sells 10 items. Since  $f(x)$  represents the company's profit, in dollars, for selling  $x$  items, the graph of  $y = f(x)$  in the  $xy$ -plane passes through the points  $(8, 220)$  and  $(10, 320)$ . Substituting  $(8, 220)$  and  $(10, 320)$  for  $(x_1, y_1)$  and  $(x_2, y_2)$ , respectively, in the slope formula yields  $m = \frac{320 - 220}{10 - 8}$ , which gives  $m = \frac{100}{2}$ , or  $m = 50$ . Substituting 50 for  $m$ , 8 for  $x$ , and 220 for  $f(x)$  in  $f(x) = mx + b$  yields  $220 = (50)(8) + b$ , or  $220 = 400 + b$ . Subtracting 400 from each side of this equation yields  $-180 = b$ . Substituting 50 for  $m$  and  $-180$  for  $b$  in  $f(x) = mx + b$  yields  $f(x) = 50x - 180$ . Therefore, the equation that defines  $f$  is  $f(x) = 50x - 180$ .

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 0334ee02

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 0334ee02

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: 0334ee02 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  $f(h)$ , in dollars. It follows that the relationship can be represented by an equation of the form  $f(h) = mh + b$ , 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  $f(h)$  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  $f(h) = mh + b$  yields  $f(h) = 65h + b$ . The value of  $b$  can be found by substituting any value of  $h$  and its corresponding value of  $f(h)$  for  $h$  and  $f(h)$ , respectively, in this equation. Substituting 1 for  $h$  and 155 for  $f(h)$  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  $f(h) = 65h + b$  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.

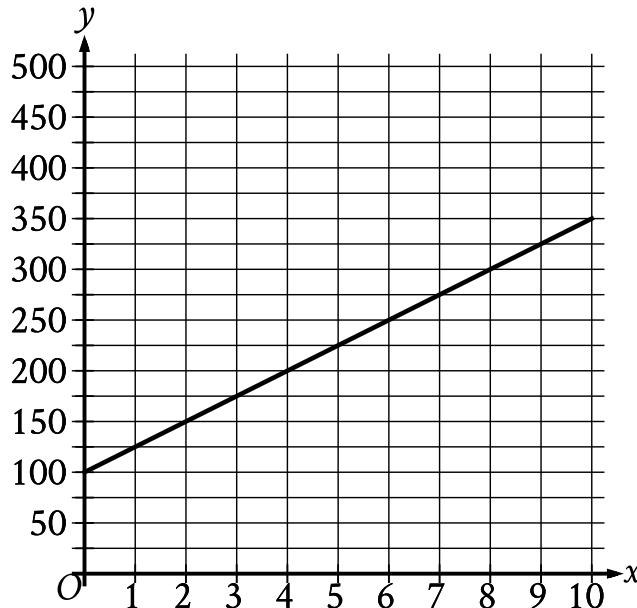
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

# Question ID c05a6f72

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: c05a6f72



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: c05a6f72 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 b3597518

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: b3597518

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 **326**th day of the year?

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

ID: b3597518 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 **326**th 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 ad15efee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: ad15efee

$$f(x) = 2x + 244$$

The given function  $f$  represents the perimeter, in **centimeters (cm)**, of a rectangle with a length of  $x$  cm and a fixed width. What is the width, in **cm**, of the rectangle?

- A. 2
- B. 122
- C. 244
- D. 488

ID: ad15efee Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that  $f(x) = 2x + 244$  represents the perimeter, in **centimeters (cm)**, of a rectangle with a length of  $x$  cm and a fixed width. If  $w$  represents a fixed width, in **cm**, then the perimeter, in **cm**, of a rectangle with a length of  $x$  cm and a fixed width of  $w$  cm can be given by the function  $f(x) = 2x + 2w$ . Therefore,  $2x + 2w = 2x + 244$ .

Subtracting  $2x$  from both sides of this equation yields  $2w = 244$ . Dividing both sides of this equation by 2 yields  $w = 122$ . Therefore, the width, in **cm**, of the rectangle is **122**.

Choice A 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: Medium

# Question ID efdc64ee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: efdc64ee

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: efdc64ee Answer

Correct Answer: C

Rationale

Choice C is correct. An equation that defines a linear function  $f$  can be written in the form  $f(x) = mx + b$ , where  $m$  represents the slope and  $b$  represents the  $y$ -intercept,  $(0, b)$ , of the line of  $y = f(x)$  in the  $xy$ -plane. The function  $f(x) = -5x + 30$  is linear. Therefore, the graph of the given function  $y = f(x)$  in the  $xy$ -plane has a  $y$ -intercept of  $(0, 30)$ . It's given that  $f(x)$  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  $y = f(x)$  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 4023b0c8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 4023b0c8

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

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: 4023b0c8 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 a8b51d6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: a8b51d6b

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: a8b51d6b 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  $f(x) = mx + b$ , where  $m$  represents the slope and  $(0, b)$  represents the  $y$ -intercept of the graph of  $y = f(x)$ . It's given that the graph of the linear function  $f$ , where  $y = f(x)$ , 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  $f(x) = mx + b$  yields  $f(x) = 4x + 3$ .

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 71d6c6f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 71d6c6f2

$$j(x) = mx + 144$$

For the linear function  $j$ ,  $m$  is a constant and  $j(12) = 18$ . What is the value of  $j(10)$ ?

ID: 71d6c6f2 Answer

Correct Answer: 39

Rationale

The correct answer is 39. It's given that for the linear function  $j$ ,  $m$  is a constant and  $j(12) = 18$ . Substituting 12 for  $x$  and 18 for  $j(x)$  in the given equation yields  $18 = m(12) + 144$ . Subtracting 144 from both sides of this equation yields  $-126 = m(12)$ . Dividing both sides of this equation by 12 yields  $-10.5 = m$ . Substituting  $-10.5$  for  $m$  in the given equation,  $j(x) = mx + 144$ , yields  $j(x) = -10.5x + 144$ . Substituting 10 for  $x$  in this equation yields  $j(10) = (-10.5)(10) + 144$ , or  $j(10) = 39$ . Therefore, the value of  $j(10)$  is 39.

Question Difficulty: Medium

# Question ID 25a1d328

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

## ID: 25a1d328

In the linear function  $h$ ,  $h(28) = 15$  and  $h(26) = 22$ . Which equation defines  $h$ ?

- A.  $h(x) = -\frac{2}{7}x + 23$
- B.  $h(x) = -\frac{2}{7}x + 113$
- C.  $h(x) = -\frac{7}{2}x + 23$
- D.  $h(x) = -\frac{7}{2}x + 113$

## ID: 25a1d328 Answer

Correct Answer: D

### Rationale

Choice D is correct. An equation defining  $h$  can be written in the form  $y = mx + b$ , where  $y = h(x)$ ,  $m$  represents the slope of the graph of  $y = h(x)$  in the  $xy$ -plane, and  $b$  represents the  $y$ -coordinate of the  $y$ -intercept of the graph. It's given that  $h(28) = 15$  and  $h(26) = 22$ . It follows that the points  $(28, 15)$  and  $(26, 22)$  are on the graph of  $y = h(x)$  in the  $xy$ -plane. The slope can be found by 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  $(28, 15)$  and  $(26, 22)$  for  $(x_1, y_1)$  and  $(x_2, y_2)$ , respectively, in the slope formula yields  $m = \frac{22 - 15}{26 - 28}$ , or  $m = -\frac{7}{2}$ . Substituting  $-\frac{7}{2}$  for  $m$  and  $(28, 15)$  for  $(x, y)$  in the equation  $y = mx + b$  yields  $15 = (-\frac{7}{2})(28) + b$ , or  $15 = -98 + b$ . Adding 98 to both sides of this equation yields  $113 = b$ . Substituting  $-\frac{7}{2}$  for  $m$  and 113 for  $b$  in the equation  $y = mx + b$  yields  $y = -\frac{7}{2}x + 113$ . Since  $y = h(x)$ , it follows that the equation that defines  $h$  is  $h(x) = -\frac{7}{2}x + 113$ .

Choice A is incorrect. For this function,  $h(26) = \frac{109}{7}$ , not  $h(26) = 22$ .

Choice B is incorrect. For this function,  $h(28) = 105$ , not  $h(28) = 15$ , and  $h(26) = \frac{739}{7}$ , not  $h(26) = 22$ .

Choice C is incorrect. For this function,  $h(28) = -75$ , not  $h(28) = 15$ , and  $h(26) = -68$ , not  $h(26) = 22$ .

Question Difficulty: Medium

# Question ID 2321f18a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

ID: 2321f18a

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: 2321f18a 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