

# Question ID 002dba45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 002dba45

Line  $k$  is defined by  $y = -\frac{17}{3}x + 5$ . Line  $j$  is perpendicular to line  $k$  in the  $xy$ -plane. What is the slope of line  $j$ ?

ID: 002dba45 Answer

Correct Answer: .1764, .1765, 3/17

## Rationale

The correct answer is  $\frac{3}{17}$ . It's given that line  $j$  is perpendicular to line  $k$  in the  $xy$ -plane. This means that the slope of line  $j$  is the negative reciprocal of the slope of line  $k$ . The equation of line  $k$ ,  $y = -\frac{17}{3}x + 5$ , is written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the line and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the line. It follows that the slope of line  $k$  is  $-\frac{17}{3}$ . The negative reciprocal of a number is  $-1$  divided by the number. Therefore, the negative reciprocal of  $-\frac{17}{3}$  is  $\frac{-1}{-\frac{17}{3}}$ , or  $\frac{3}{17}$ . Thus, the slope of line  $j$  is  $\frac{3}{17}$ . Note that 3/17, .1764, .1765, and 0.176 are examples of ways to enter a correct answer.

Question Difficulty: Medium

# Question ID 789975b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 789975b7

A gardener buys two kinds of fertilizer. Fertilizer A contains 60% filler materials by weight and Fertilizer B contains 40% filler materials by weight. Together, the fertilizers bought by the gardener contain a total of 240 pounds of filler materials. Which equation models this relationship, where  $x$  is the number of pounds of Fertilizer A and  $y$  is the number of pounds of Fertilizer B?

- A.  $0.4x + 0.6y = 240$
- B.  $0.6x + 0.4y = 240$
- C.  $40x + 60y = 240$
- D.  $60x + 40y = 240$

ID: 789975b7 Answer

Correct Answer: B

## Rationale

Choice B is correct. Since Fertilizer A contains 60% filler materials by weight, it follows that  $x$  pounds of Fertilizer A consists of  $0.6x$  pounds of filler materials. Similarly,  $y$  pounds of Fertilizer B consists of  $0.4y$  pounds of filler materials. When  $x$  pounds of Fertilizer A and  $y$  pounds of Fertilizer B are combined, the result is 240 pounds of filler materials. Therefore, the total amount, in pounds, of filler materials in a mixture of  $x$  pounds of Fertilizer A and  $y$  pounds of Fertilizer B can be expressed as  $0.6x + 0.4y = 240$ .

Choice A is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B. Fertilizer A consists of  $0.6x$  pounds of filler materials and Fertilizer B consists of  $0.4y$  pounds of filler materials. Therefore,  $0.6x + 0.4y$  is equal to 240, not  $0.4x + 0.6y$ . Choice C is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B and incorrectly represents how to take the percentage of a value mathematically. Choice D is incorrect. This choice incorrectly represents how to take the percentage of a value mathematically. Fertilizer A consists of  $0.6x$  pounds of filler materials, not  $60x$  pounds of filler materials, and Fertilizer B consists of  $0.4y$  pounds of filler materials, not  $40y$  pounds of filler materials.

Question Difficulty: Easy

# Question ID 3008cfc3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 3008cfc3

$x$	$y$
$k$	13
$k + 7$	-15

The table gives the coordinates of two points on a line in the  $xy$ -plane. The  $y$ -intercept of the line is  $(k - 5, b)$ , where  $k$  and  $b$  are constants. What is the value of  $b$ ?

ID: 3008cfc3 Answer

Correct Answer: 33

## Rationale

The correct answer is 33. It's given in the table that the coordinates of two points on a line in the  $xy$ -plane are  $(k, 13)$  and  $(k + 7, -15)$ . The  $y$ -intercept is another point on the line. The slope computed using any pair of points from the line will be the same. The slope of a line,  $m$ , between any two points,  $(x_1, y_1)$  and  $(x_2, y_2)$ , on the line can be calculated using the slope formula,  $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$ . It follows that the slope of the line with the given points from the table,  $(k, 13)$  and  $(k + 7, -15)$ , is  $m = \frac{-15 - 13}{k + 7 - k}$ , which is equivalent to  $m = \frac{-28}{7}$ , or  $m = -4$ . It's given that the  $y$ -intercept of the line is  $(k - 5, b)$ . Substituting  $-4$  for  $m$  and the coordinates of the points  $(k - 5, b)$  and  $(k, 13)$  into the slope formula yields  $-4 = \frac{13 - b}{k - (k - 5)}$ , which is equivalent to  $-4 = \frac{13 - b}{5}$ , or  $-4 = \frac{13 - b}{5}$ . Multiplying both sides of this equation by 5 yields  $-20 = 13 - b$ . Subtracting 13 from both sides of this equation yields  $-33 = -b$ . Dividing both sides of this equation by  $-1$  yields  $b = 33$ . Therefore, the value of  $b$  is 33.

Question Difficulty: Hard

# Question ID f224df07

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: f224df07

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

- A. 2
- B. 4
- C. 5
- D. 6

ID: f224df07 Answer

**Correct Answer:** C

## Rationale

Choice C is correct. Let  $a$  equal the number of 120-pound packages, and let  $b$  equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality  $120a + 100b \leq 1,100$  represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality  $a + b \geq 10$  represents this situation. Values of  $a$  and  $b$  that satisfy these two inequalities represent the allowable numbers of 120-pound packages and 100-pound packages the helicopter can transport. To maximize the number of 120-pound packages,  $a$ , in the helicopter, the number of 100-pound packages,  $b$ , in the helicopter needs to be minimized. Expressing  $b$  in terms of  $a$  in the second inequality yields  $b \geq 10 - a$ , so the minimum value of  $b$  is equal to  $10 - a$ . Substituting  $10 - a$  for  $b$  in the first inequality results in  $120a + 100(10 - a) \leq 1,100$ . Using the distributive property to rewrite this inequality yields  $120a + 1,000 - 100a \leq 1,100$ , or  $20a + 1,000 \leq 1,100$ . Subtracting 1,000 from both sides of this inequality yields  $20a \leq 100$ . Dividing both sides of this inequality by 20 results in  $a \leq 5$ . This means that the maximum number of 120-pound packages that the helicopter can carry per trip is 5.

Choices A, B, and D are incorrect and may result from incorrectly creating or solving the system of inequalities.

**Question Difficulty:** Medium

# Question ID d1b66ae6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: d1b66ae6

$$-x + y = -3.5$$

$$x + 3y = 9.5$$

If  $(x, y)$  satisfies the system of equations above, what is the value of  $y$ ?

ID: d1b66ae6 Answer

## Rationale

The correct answer is  $\frac{3}{2}$ . One method for solving the system of equations for  $y$  is to add corresponding sides of the two equations. Adding the left-hand sides gives  $(-x + y) + (x + 3y)$ , or  $4y$ . Adding the right-hand sides yields  $-3.5 + 9.5 = 6$ . It follows that  $4y = 6$ . Finally, dividing both sides of  $4y = 6$  by 4 yields  $y = \frac{6}{4}$  or  $\frac{3}{2}$ . Note that  $3/2$  and  $1.5$  are examples of ways to enter a correct answer.

Question Difficulty: Hard

# Question ID cb8f449f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: cb8f449f

$$\begin{array}{l} \frac{1}{2}y = 4 \\ x - \frac{1}{2}y = 2 \end{array}$$

The system of equations above has solution  $(x, y)$ . What is the value of  $x$ ?

A. 3

B.  $\frac{7}{2}$

C. 4

D. 6

ID: cb8f449f Answer

Correct Answer: D

## Rationale

Choice D is correct. Adding the corresponding sides of the two equations eliminates  $y$  and yields  $x = 6$ , as shown.

$$\begin{array}{r} \frac{1}{2}y = 4 \\ x - \frac{1}{2}y = 2 \\ \hline x + 0 = 6 \end{array}$$

If  $(x, y)$  is a solution to the system, then  $(x, y)$  satisfies both equations in the system and any equation derived from them. Therefore,  $x = 6$ .

Choices A, B, and C are incorrect and may be the result of errors when solving the system.

Question Difficulty: Medium

# Question ID 88e13c8c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 88e13c8c

The total cost  $f(x)$ , in dollars, to lease a car for 36 months from a particular car dealership is given by  $f(x) = 36x + 1,000$ , where  $x$  is the monthly payment, in dollars. What is the total cost to lease a car when the monthly payment is \$400?

- A. \$13,400
- B. \$13,000
- C. \$15,400
- D. \$37,400

ID: 88e13c8c Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that  $f(x)$  is the total cost, in dollars, to lease a car from this dealership with a monthly payment of  $x$  dollars. Therefore, the total cost, in dollars, to lease the car when the monthly payment is \$400 is represented by the value of  $f(x)$  when  $x = 400$ . Substituting 400 for  $x$  in the equation  $f(x) = 36x + 1,000$  yields  $f(400) = 36(400) + 1,000$ , or  $f(400) = 15,400$ . Thus, when the monthly payment is \$400, the total cost to lease a car is \$15,400.

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: Easy

# Question ID 3cdbc026

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

## ID: 3cdbc026

The graph of the equation  $ax + ky = 6$  is a line in the  $xy$ -plane, where  $a$  and  $k$  are constants. If the line contains the points  $(-2, -6)$  and  $(0, -3)$ , what is the value of  $k$ ?

- A.  $-2$
- B.  $-1$
- C.  $2$
- D.  $3$

## ID: 3cdbc026 Answer

**Correct Answer:** A

### Rationale

Choice A is correct. The value of  $k$  can be found using the slope-intercept form of a linear equation,  $y = mx + b$ , where  $m$  is the slope and  $b$  is the  $y$ -coordinate of the  $y$ -intercept. The equation  $ax + ky = 6$  can be rewritten in the form  $y = -\frac{ax}{k} + \frac{6}{k}$ . One of the given points,  $(0, -3)$ , is the  $y$ -intercept. Thus, the  $y$ -coordinate of the  $y$ -intercept  $-3$  must be equal to  $\frac{6}{k}$ . Multiplying both sides by  $k$  gives  $-3k = 6$ . Dividing both sides by  $-3$  gives  $k = -2$ .

Choices B, C, and D are incorrect and may result from errors made rewriting the given equation.

**Question Difficulty:** Hard

# Question ID ff501705

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: ff501705

$$\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y \quad \frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$$

In the given system of equations,  $p$  is a constant. If the system has no solution, what is the value of  $p$ ?

ID: ff501705 Answer

Correct Answer: 6

## Rationale

The correct answer is **6**. A system of two linear equations in two variables,  $x$  and  $y$ , has no solution if the lines represented by the equations in the  $xy$ -plane are parallel and distinct. Lines represented by equations in standard form,  $Ax + By = C$  and  $Dx + Ey = F$ , are parallel if the coefficients for  $x$  and  $y$  in one equation are proportional to the corresponding coefficients in the other equation, meaning  $\frac{D}{A} = \frac{E}{B}$ ; and the lines are distinct if the constants are not proportional, meaning  $\frac{F}{C}$  is not equal to  $\frac{D}{A}$  or  $\frac{E}{B}$ . The first equation in the given system is  $\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y$ . Multiplying each side of this equation by 12 yields  $18y - 3x = 8 - 18y$ . Adding  $18y$  to each side of this equation yields  $36y - 3x = 8$ , or  $-3x + 36y = 8$ . The second equation in the given system is  $\frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$ . Multiplying each side of this equation by 2 yields  $x + 3 = 2py + 9$ . Subtracting  $2py$  from each side of this equation yields  $x + 3 - 2py = 9$ . Subtracting 3 from each side of this equation yields  $x - 2py = 6$ . Therefore, the two equations in the given system, written in standard form, are  $-3x + 36y = 8$  and  $x - 2py = 6$ . As previously stated, if this system has no solution, the lines represented by the equations in the  $xy$ -plane are parallel and distinct, meaning the proportion  $\frac{1}{-3} = \frac{-2p}{36}$ , or  $-\frac{1}{3} = -\frac{p}{18}$ , is true and the proportion  $\frac{6}{8} = \frac{1}{-3}$  is not true. The proportion  $\frac{6}{8} = \frac{1}{-3}$  is not true. Multiplying each side of the true proportion,  $-\frac{1}{3} = -\frac{p}{18}$ , by  $-18$  yields  $6 = p$ . Therefore, if the system has no solution, then the value of  $p$  is **6**.

Question Difficulty: Hard

# Question ID 8c5e6702

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 8c5e6702

A window repair specialist charges **\$220** for the first two hours of repair plus an hourly fee for each additional hour. The total cost for **5** hours of repair is **\$400**. Which function  $f$  gives the total cost, in dollars, for  $x$  hours of repair, where  $x \geq 2$ ?

- A.  $f(x) = 60x + 100$
- B.  $f(x) = 60x + 220$
- C.  $f(x) = 80x$
- D.  $f(x) = 80x + 220$

ID: 8c5e6702 Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that the window repair specialist charges **\$220** for the first two hours of repair plus an hourly fee for each additional hour. Let  $n$  represent the hourly fee for each additional hour after the first two hours. Since it's given that  $x$  is the number of hours of repair, it follows that the charge generated by the hourly fee after the first two hours can be represented by the expression  $n(x - 2)$ . Therefore, the total cost, in dollars, for  $x$  hours of repair is

$f(x) = 220 + n(x - 2)$ . It's given that the total cost for **5** hours of repair is **\$400**. Substituting **5** for  $x$  and **400** for  $f(x)$  into the equation  $f(x) = 220 + n(x - 2)$  yields  $400 = 220 + n(5 - 2)$ , or  $400 = 220 + 3n$ . Subtracting **220** from both sides of this equation yields  $180 = 3n$ . Dividing both sides of this equation by **3** yields  $n = 60$ . Substituting **60** for  $n$  in the equation  $f(x) = 220 + n(x - 2)$  yields  $f(x) = 220 + 60(x - 2)$ , which is equivalent to

$f(x) = 220 + 60x - 120$ , or  $f(x) = 60x + 100$ . Therefore, the total cost, in dollars, for  $x$  hours of repair is  $f(x) = 60x + 100$ .

Choice B is incorrect. This function represents the total cost, in dollars, for  $x$  hours of repair where the specialist charges **\$340**, rather than **\$220**, for the first two hours of repair.

Choice C is incorrect. This function represents the total cost, in dollars, for  $x$  hours of repair where the specialist charges **\$160**, rather than **\$220**, for the first two hours of repair, and an hourly fee of **\$80**, rather than **\$60**, after the first two hours.

Choice D is incorrect. This function represents the total cost, in dollars, for  $x$  hours of repair where the specialist charges **\$380**, rather than **\$220**, for the first two hours of repair, and an hourly fee of **\$80**, rather than **\$60**, after the first two hours.

Question Difficulty: Hard

# Question ID 2937ef4f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 2937ef4f

Hector used a tool called an auger to remove corn from a storage bin at a constant rate. The bin contained 24,000 bushels of corn when Hector began to use the auger. After 5 hours of using the auger, 19,350 bushels of corn remained in the bin. If the auger continues to remove corn at this rate, what is the total number of hours Hector will have been using the auger when 12,840 bushels of corn remain in the bin?

- A. 3
- B. 7
- C. 8
- D. 12

ID: 2937ef4f Answer

Correct Answer: D

## Rationale

Choice D is correct. After using the auger for 5 hours, Hector had removed  $24,000 - 19,350 = 4,650$  bushels of corn from the storage bin. During the 5-hour period, the auger removed corn from the bin at a constant rate of  $\frac{4,650}{5} = 930$  bushels per hour. Assuming the auger continues to remove corn at this rate, after  $x$  hours it will have removed  $930x$  bushels of corn. Because the bin contained 24,000 bushels of corn when Hector started using the auger, the equation  $24,000 - 930x = 12,840$  can be used to find the number of hours,  $x$ , Hector will have been using the auger when 12,840 bushels of corn remain in the bin. Subtracting 12,840 from both sides of this equation and adding  $930x$  to both sides of the equation yields  $11,160 = 930x$ . Dividing both sides of this equation by 930 yields  $x = 12$ . Therefore, Hector will have been using the auger for 12 hours when 12,840 bushels of corn remain in the storage bin.

Choice A is incorrect. Three hours after Hector began using the auger,  $24,000 - 3(930) = 21,210$  bushels of corn remained, not 12,840. Choice B is incorrect. Seven hours after Hector began using the auger,  $24,000 - 7(930) = 17,490$  bushels of corn will remain, not 12,840. Choice C is incorrect. Eight hours after Hector began using the auger,  $24,000 - 8(930) = 16,560$  bushels of corn will remain, not 12,840.

Question Difficulty: Hard

# Question ID 548a4929

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 548a4929

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: 548a4929 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 9bbce683

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 9bbce683

x	y
18	130
23	160
26	178

For line  $h$ , the table shows three values of  $x$  and their corresponding values of  $y$ . Line  $k$  is the result of translating line  $h$  down 5 units in the  $xy$ -plane. What is the  $x$ -intercept of line  $k$ ?

- A.  $(-\frac{26}{3}, 0)$
- B.  $(-\frac{9}{2}, 0)$
- C.  $(-\frac{11}{3}, 0)$
- D.  $(-\frac{17}{6}, 0)$

ID: 9bbce683 Answer

Correct Answer: D

## Rationale

Choice D is correct. The equation of line  $h$  can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the line and  $(0, b)$  is the  $y$ -intercept of the line. It's given that line  $h$  contains the points  $(18, 130)$ ,  $(23, 160)$ , and  $(26, 178)$ . Therefore, its slope  $m$  can be found as  $\frac{160 - 130}{23 - 18}$ , or 6. Substituting 6 for  $m$  in the equation  $y = mx + b$  yields  $y = 6x + b$ . Substituting 130 for  $y$  and 18 for  $x$  in this equation yields  $130 = 6(18) + b$ , or  $130 = 108 + b$ . Subtracting 108 from both sides of this equation yields  $22 = b$ . Substituting 22 for  $b$  in  $y = 6x + b$  yields  $y = 6x + 22$ . Since line  $k$  is the result of translating line  $h$  down 5 units, an equation of line  $k$  is  $y = 6x + 22 - 5$ , or  $y = 6x + 17$ . Substituting 0 for  $y$  in this equation yields  $0 = 6x + 17$ . Solving this equation for  $x$  yields  $x = -\frac{17}{6}$ . Therefore, the  $x$ -intercept of line  $k$  is  $(-\frac{17}{6}, 0)$ .

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: Hard

# Question ID 2b15d65f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 2b15d65f

An economist modeled the demand  $Q$  for a certain product as a linear function of the selling price  $P$ . The demand was 20,000 units when the selling price was \$40 per unit, and the demand was 15,000 units when the selling price was \$60 per unit. Based on the model, what is the demand, in units, when the selling price is \$55 per unit?

- A. 16,250
- B. 16,500
- C. 16,750
- D. 17,500

ID: 2b15d65f Answer

Correct Answer: A

## Rationale

Choice A is correct. Let the economist's model be the linear function  $Q = mP + b$ , where  $Q$  is the demand,  $P$  is the selling price,  $m$  is the slope of the line, and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the line in the  $xy$ -plane, where  $y = Q$ . Two pairs of the selling price  $P$  and the demand  $Q$  are given. Using the coordinate pairs  $(P, Q)$ , two points that satisfy the function are

$(40, 20,000)$  and  $(60, 15,000)$ . The slope  $m$  of the function can be found using the formula  $m = \frac{Q_2 - Q_1}{P_2 - P_1}$ . Substituting the given values into this formula yields  $m = \frac{15,000 - 20,000}{60 - 40}$ , or  $m = -250$ . Therefore,  $Q = -250P + b$ . The value of  $b$  can be found by substituting one of the points into the function. Substituting the values of  $P$  and  $Q$  from the point  $(40, 20,000)$  yields  $20,000 = -250(40) + b$ , or  $20,000 = -10,000 + b$ . Adding 10,000 to both sides of this equation yields  $b = 30,000$ . Therefore, the linear function the economist used as the model is  $Q = -250P + 30,000$ . Substituting 55 for  $P$  yields  $Q = -250(55) + 30,000 = 16,250$ . It follows that when the selling price is \$55 per unit, the demand is 16,250 units.

Choices B, C, and D are incorrect and may result from calculation or conceptual errors.

Question Difficulty: Hard

# Question ID 686b7244

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 686b7244

A certain apprentice has enrolled in **85** hours of training courses. The equation  $10x + 15y = 85$  represents this situation, where  $x$  is the number of on-site training courses and  $y$  is the number of online training courses this apprentice has enrolled in. How many more hours does each online training course take than each on-site training course?

ID: 686b7244 Answer

Correct Answer: 5

## Rationale

The correct answer is **5**. It's given that the equation  $10x + 15y = 85$  represents the situation, where  $x$  is the number of on-site training courses,  $y$  is the number of online training courses, and **85** is the total number of hours of training courses the apprentice has enrolled in. Therefore,  $10x$  represents the number of hours the apprentice has enrolled in on-site training courses, and  $15y$  represents the number of hours the apprentice has enrolled in online training courses. Since  $x$  is the number of on-site training courses and  $y$  is the number of online training courses the apprentice has enrolled in, **10** is the number of hours each on-site course takes and **15** is the number of hours each online course takes. Subtracting these numbers gives  $15 - 10$ , or **5** more hours each online training course takes than each on-site training course.

Question Difficulty: Hard

# Question ID b86123af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: b86123af

Hiro and Sofia purchased shirts and pants from a store. The price of each shirt purchased was the same and the price of each pair of pants purchased was the same. Hiro purchased 4 shirts and 2 pairs of pants for \$86, and Sofia purchased 3 shirts and 5 pairs of pants for \$166. Which of the following systems of linear equations represents the situation, if  $x$  represents the price, in dollars, of each shirt and  $y$  represents the price, in dollars, of each pair of pants?

- A.  $4x + 2y = 86$   
 $3x + 5y = 166$
- B.  $4x + 3y = 86$   
 $2x + 5y = 166$
- C.  $4x + 2y = 166$   
 $3x + 5y = 86$
- D.  $4x + 3y = 166$   
 $2x + 5y = 86$

ID: b86123af Answer

Correct Answer: A

## Rationale

Choice A is correct. Hiro purchased 4 shirts and each shirt cost  $x$  dollars, so he spent a total of  $4x$  dollars on shirts. Likewise, Hiro purchased 2 pairs of pants, and each pair of pants cost  $y$  dollars, so he spent a total of  $2y$  dollars on pants. Therefore, the total amount that Hiro spent was  $4x + 2y$ . Since Hiro spent \$86 in total, this can be modeled by the equation  $4x + 2y = 86$ . Using the same reasoning, Sofia bought 3 shirts at  $x$  dollars each and 5 pairs of pants at  $y$  dollars each, so she spent a total of  $3x + 5y$  dollars on shirts and pants. Since Sofia spent \$166 in total, this can be modeled by the equation  $3x + 5y = 166$ .

Choice B is incorrect and may be the result of switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased. Choice C is incorrect and may be the result of switching the total price each person paid. Choice D is incorrect and may be the result of switching the total price each person paid as well as switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased.

**Question Difficulty:** Easy

# Question ID ee846db7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: ee846db7

A store sells two different-sized containers of a certain Greek yogurt. The store's sales of this Greek yogurt totaled **1,277.94** dollars last month. The equation  $5.48x + 7.30y = 1,277.94$  represents this situation, where  $x$  is the number of smaller containers sold and  $y$  is the number of larger containers sold. According to the equation, which of the following represents the price, in dollars, of each smaller container?

- A.  $5.48$
- B.  $7.30y$
- C.  $7.30$
- D.  $5.48x$

ID: ee846db7 Answer

**Correct Answer:** A

## Rationale

Choice A is correct. It's given that the store's sales of a certain Greek yogurt totaled **1,277.94** dollars last month. It's also given that the equation  $5.48x + 7.30y = 1,277.94$  represents this situation, where  $x$  is the number of smaller containers sold and  $y$  is the number of larger containers sold. Since  $x$  represents the number of smaller containers of yogurt sold, the expression  $5.48x$  represents the total sales, in dollars, from smaller containers of yogurt. This means that  $x$  smaller containers of yogurt were sold at a price of **5.48** dollars each. Therefore, according to the equation, **5.48** represents the price, in dollars, of each smaller container.

Choice B is incorrect. This expression represents the total sales, in dollars, from selling  $y$  larger containers of yogurt.

Choice C is incorrect. This value represents the price, in dollars, of each larger container of yogurt.

Choice D is incorrect. This expression represents the total sales, in dollars, from selling  $x$  smaller containers of yogurt.

**Question Difficulty:** Easy

# Question ID 5b8a8475

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 5b8a8475

Line  $k$  is defined by  $y = 3x + 15$ . Line  $j$  is perpendicular to line  $k$  in the  $xy$ -plane. What is the slope of line  $j$ ?

- A.  $-\frac{1}{3}$
- B.  $-\frac{1}{12}$
- C.  $-\frac{1}{18}$
- D.  $-\frac{1}{45}$

ID: 5b8a8475 Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that line  $j$  is perpendicular to line  $k$  in the  $xy$ -plane. It follows that the slope of line  $j$  is the opposite reciprocal of the slope of line  $k$ . The equation for line  $k$  is written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the line and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the line. It follows that the slope of line  $k$  is 3. The opposite reciprocal of a number is  $-1$  divided by the number. Thus, the opposite reciprocal of 3 is  $-\frac{1}{3}$ . Therefore, the slope of line  $j$  is  $-\frac{1}{3}$ .

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: Easy

# Question ID cfe67646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: cfe67646

The point  $(8, 2)$  in the  $xy$ -plane is a solution to which of the following systems of inequalities?

- A.  $x > 0$   $y > 0$
- B.  $x > 0$   $y < 0$
- C.  $x < 0$   $y > 0$
- D.  $x < 0$   $y < 0$

ID: cfe67646 Answer

Correct Answer: A

## Rationale

Choice A is correct. The given point,  $(8, 2)$ , is located in the first quadrant in the  $xy$ -plane. The system of inequalities in choice A represents all the points in the first quadrant in the  $xy$ -plane. Therefore,  $(8, 2)$  is a solution to the system of inequalities in choice A.

Alternate approach: Substituting  $8$  for  $x$  in the first inequality in choice A,  $x > 0$ , yields  $8 > 0$ , which is true. Substituting  $2$  for  $y$  in the second inequality in choice A,  $y > 0$ , yields  $2 > 0$ , which is true. Since the coordinates of the point  $(8, 2)$  make the inequalities  $x > 0$  and  $y > 0$  true, the point  $(8, 2)$  is a solution to the system of inequalities consisting of  $x > 0$  and  $y > 0$ .

Choice B is incorrect. This system of inequalities represents all the points in the fourth quadrant, not the first quadrant, in the  $xy$ -plane.

Choice C is incorrect. This system of inequalities represents all the points in the second quadrant, not the first quadrant, in the  $xy$ -plane.

Choice D is incorrect. This system of inequalities represents all the points in the third quadrant, not the first quadrant, in the  $xy$ -plane.

Question Difficulty: Easy

# Question ID 608eeb6e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 608eeb6e

$5x = 15 - 4x + y = -2$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $x + y$ ?

- A.  $-17$
- B.  $-13$
- C.  $13$
- D.  $17$

ID: 608eeb6e Answer

Correct Answer: C

## Rationale

Choice C is correct. Adding the second equation of the given system to the first equation yields  $5x + (-4x + y) = 15 + (-2)$ , which is equivalent to  $x + y = 13$ . So the value of  $x + y$  is 13.

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

Choice B is incorrect. This is the value of  $-(x + y)$ .

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

Question Difficulty: Easy

# Question ID be9cb6a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

## ID: be9cb6a2

The cost of renting a backhoe for up to 10 days is \$270 for the first day and \$135 for each additional day. Which of the following equations gives the cost  $y$ , in dollars, of renting the backhoe for  $x$  days, where  $x$  is a positive integer and  $x \leq 10$ ?

- A.  $y = 270x - 135$
- B.  $y = 270x + 135$
- C.  $y = 135x + 270$
- D.  $y = 135x + 135$

## ID: be9cb6a2 Answer

Correct Answer: D

### Rationale

Choice D is correct. It's given that the cost of renting a backhoe for up to 10 days is \$270 for the first day and \$135 for each additional day. Therefore, the cost  $y$ , in dollars, for  $x$  days, where  $x \leq 10$ , is the sum of the cost for the first day, \$270, and the cost for the additional  $x - 1$  days, \$135( $x - 1$ ). It follows that  $y = 270 + 135(x - 1)$ , which is equivalent to  $y = 270 + 135x - 135$ , or  $y = 135x + 135$ .

Choice A is incorrect. This equation represents a situation where the cost of renting a backhoe is \$135 for the first day and \$270 for each additional day.

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: Hard

# Question ID 097e10f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 097e10f5

What value of  $p$  satisfies the equation  $5p + 180 = 250$ ?

- A. 14
- B. 65
- C. 86
- D. 250

ID: 097e10f5 Answer

Correct Answer: A

## Rationale

Choice A is correct. Subtracting 180 from both sides of the given equation yields  $5p = 70$ . Dividing both sides of this equation by 5 yields  $p = 14$ . Therefore, the value of  $p$  that satisfies the equation  $5p + 180 = 250$  is 14.

Choice B is incorrect. This value of  $p$  satisfies the equation  $5p + 180 = 505$ .

Choice C is incorrect. This value of  $p$  satisfies the equation  $5p + 180 = 610$ .

Choice D is incorrect. This value of  $p$  satisfies the equation  $5p + 180 = 1,430$ .

Question Difficulty: Easy

# Question ID 84664a7c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 84664a7c

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height  $h$ , in feet, of the front of the roller-coaster car  $s$  seconds after it starts up the hill?

- A.  $h = 8s + 15$
- B.  $h = 15s + \frac{335}{8}$
- C.  $h = 8s + \frac{335}{15}$
- D.  $h = 15s + 8$

ID: 84664a7c Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that the front of the roller-coaster car starts rising when it's 15 feet above the ground. This initial height of 15 feet can be represented by a constant term, 15, in an equation. Each second, the front of the roller-coaster car rises 8 feet, which can be represented by  $8s$ . Thus, the equation  $h = 8s + 15$  gives the height, in feet, of the front of the roller-coaster car  $s$  seconds after it starts up the hill.

Choices B and C are incorrect and may result from conceptual errors in creating a linear equation. Choice D is incorrect and may result from switching the rate at which the roller-coaster car rises with its initial height.

Question Difficulty: Easy

# Question ID e62cfe5f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: e62cfe5f

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams.

According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

ID: e62cfe5f Answer

## Rationale

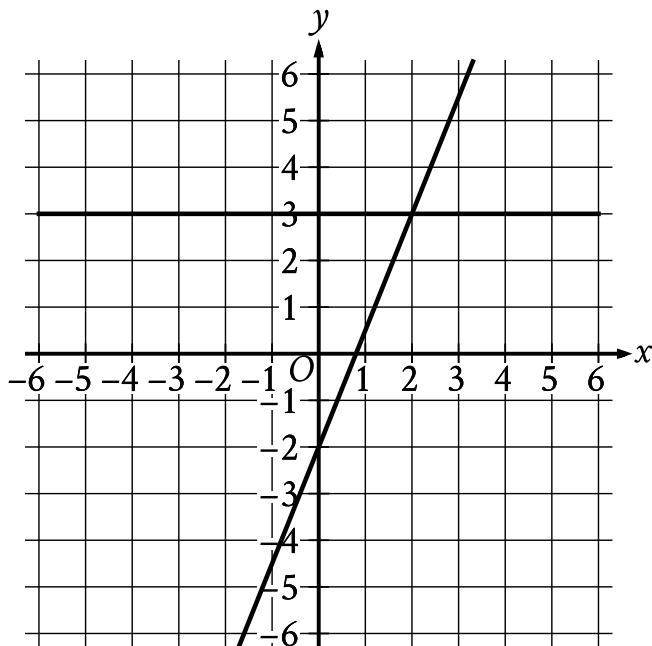
The correct answer is 2.6. According to the model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to 4 times the body weight, in grams, of the bee. Let  $x$  represent the body weight, in grams, of a worker bumblebee and let  $y$  represent the head width, in millimeters. Translating the verbal description of the model into an equation yields  $y = 0.6 + 4x$ . Substituting 0.5 grams for  $x$  in this equation yields  $y = 0.6 + 4(0.5)$ , or  $y = 2.6$ . Therefore, a worker bumblebee with a body weight of 0.5 grams has an estimated head width of 2.6 millimeters. Note that 2.6 and  $13/5$  are examples of ways to enter a correct answer.

**Question Difficulty:** Medium

# Question ID b0fc3166

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: b0fc3166



The graph of a system of linear equations is shown. What is the solution  $(x, y)$  to the system?

- A.  $(0, 3)$
- B.  $(1, 3)$
- C.  $(2, 3)$
- D.  $(3, 3)$

ID: b0fc3166 Answer

Correct Answer: C

**Rationale**

Choice C is correct. The solution to this system of linear equations is represented by the point that lies on both lines shown, or the point of intersection of the two lines. According to the graph, the point of intersection occurs when  $x = 2$  and  $y = 3$ , or at the point  $(2, 3)$ . Therefore, the solution  $(x, y)$  to the system is  $(2, 3)$ .

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:** Easy

# Question ID db422e7f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: db422e7f

Line  $p$  is defined by  $4y + 8x = 6$ . Line  $r$  is perpendicular to line  $p$  in the  $xy$ -plane. What is the slope of line  $r$ ?

ID: db422e7f Answer

Correct Answer: .5, 1/2

## Rationale

The correct answer is  $\frac{1}{2}$ . For an equation in slope-intercept form  $y = mx + b$ ,  $m$  represents the slope of the line in the  $xy$ -plane defined by this equation. It's given that line  $p$  is defined by  $4y + 8x = 6$ . Subtracting  $8x$  from both sides of this equation yields  $4y = -8x + 6$ . Dividing both sides of this equation by 4 yields  $y = -\frac{8}{4}x + \frac{6}{4}$ , or  $y = -2x + \frac{3}{2}$ . Thus, the slope of line  $p$  is  $-2$ . If line  $r$  is perpendicular to line  $p$ , then the slope of line  $r$  is the negative reciprocal of the slope of line  $p$ . The negative reciprocal of  $-2$  is  $-\frac{1}{(-2)} = \frac{1}{2}$ . Note that  $1/2$  and  $.5$  are examples of ways to enter a correct answer.

Question Difficulty: Hard

# Question ID 01682aa5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 01682aa5

Line  $p$  is defined by  $2y + 18x = 9$ . Line  $r$  is perpendicular to line  $p$  in the  $xy$ -plane. What is the slope of line  $r$ ?

- A.  $-9$
- B.  $-\frac{1}{9}$
- C.  $\frac{1}{9}$
- D.  $9$

ID: 01682aa5 Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that line  $r$  is perpendicular to line  $p$  in the  $xy$ -plane. This means that the slope of line  $r$  is the negative reciprocal of the slope of line  $p$ . If the equation for line  $p$  is rewritten in slope-intercept form  $y = mx + b$ , where  $m$  and  $b$  are constants, then  $m$  is the slope of the line and  $(0, b)$  is its  $y$ -intercept. Subtracting  $18x$  from both sides of the equation  $2y + 18x = 9$  yields  $2y = -18x + 9$ . Dividing both sides of this equation by 2 yields  $y = -9x + \frac{9}{2}$ . It follows that the slope of line  $p$  is  $-9$ . The negative reciprocal of a number is  $-1$  divided by the number. Therefore, the negative reciprocal of  $-9$  is  $-\frac{1}{9}$ , or  $\frac{1}{9}$ . Thus, the slope of line  $r$  is  $\frac{1}{9}$ .

Choice A is incorrect. This is the slope of line  $p$ , not line  $r$ .

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of the slope of line  $p$ .

Choice D is incorrect. This is the negative, not the negative reciprocal, of the slope of line  $p$ .

**Question Difficulty:** Medium

# Question ID 45cfb9de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 45cfb9de

Adam's school is a 20-minute walk or a 5-minute bus ride away from his house. The bus runs once every 30 minutes, and the number of minutes,  $w$ , that Adam waits for the bus varies between 0 and 30. Which of the following inequalities gives the values of  $w$  for which it would be faster for Adam to walk to school?

- A.  $w - 5 < 20$
- B.  $w - 5 > 20$
- C.  $w + 5 < 20$
- D.  $w + 5 > 20$

ID: 45cfb9de Answer

Correct Answer: D

## Rationale

Choice D is correct. It is given that  $w$  is the number of minutes that Adam waits for the bus. The total time it takes Adam to get to school on a day he takes the bus is the sum of the minutes,  $w$ , he waits for the bus and the 5 minutes the bus ride takes; thus, this time, in minutes, is  $w + 5$ . It is also given that the total amount of time it takes Adam to get to school on a day that he walks is 20 minutes. Therefore,  $w + 5 > 20$  gives the values of  $w$  for which it would be faster for Adam to walk to school.

Choices A and B are incorrect because  $w - 5$  is not the total length of time for Adam to wait for and then take the bus to school. Choice C is incorrect because the inequality should be true when walking 20 minutes is faster than the time it takes Adam to wait for and ride the bus, not less.

Question Difficulty: Hard

# Question ID 06fc1726

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 06fc1726

If  $f$  is the function defined by  $f(x) = \frac{2x - 1}{3}$ ,

what is the value of  $f(5)$ ?

A.  $\frac{4}{3}$

B.  $\frac{7}{3}$

C. 3

D. 9

ID: 06fc1726 Answer

Correct Answer: C

## Rationale

Choice C is correct. If  $f(x) = \frac{2x - 1}{3}$ , then  $f(5) = \frac{2(5) - 1}{3} = \frac{10 - 1}{3} = \frac{9}{3} = 3$ .

Choice A is incorrect and may result from not multiplying  $x$  by 2 in the numerator. Choice B is incorrect and may result from dividing  $2x$  by 3 and then subtracting 1. Choice D is incorrect and may result from evaluating only the numerator  $2x - 1$ .

Question Difficulty: Easy

# Question ID 6863c7ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 6863c7ce

$$d = 16t$$

The given equation represents the distance  $d$ , in inches, where  $t$  represents the number of seconds since an object started moving. Which of the following is the best interpretation of **16** in this context?

- A. The object moved a total of **16** inches.
- B. The object moved a total of  $16t$  inches.
- C. The object is moving at a rate of **16** inches per second.
- D. The object is moving at a rate of  $\frac{1}{16}$  inches per second.

ID: 6863c7ce Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that in the equation  $d = 16t$ ,  $d$  represents the distance, in inches, and  $t$  represents the number of seconds since an object started moving. In this equation,  $t$  is being multiplied by **16**. This means that the object's distance increases by **16** inches each second. Therefore, the best interpretation of **16** in this context is that the object is moving at a rate of **16** inches per second.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect. This is the best interpretation of  $16t$ , rather than **16**, in this context.

Choice D is incorrect and may result from conceptual errors.

**Question Difficulty:** Easy

# Question ID a5834ea4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: a5834ea4

$f(x) = 39$  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: a5834ea4 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 0b332f00

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 0b332f00

The function  $g$  is defined by  $g(x) = 6x$ . For what value of  $x$  is  $g(x) = 54$ ?

ID: 0b332f00 Answer

Correct Answer: 9

## Rationale

The correct answer is **9**. It's given that  $g(x) = 6x$ . Substituting **54** for  $g(x)$  in the given function yields  $54 = 6x$ . Dividing both sides of this equation by **6** yields  $x = 9$ . Therefore, the value of  $x$  when  $g(x) = 54$  is **9**.

Question Difficulty: Easy

# Question ID 349a5bc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 349a5bc1

$4x + 5 = 165$  What is the solution to the given equation?

ID: 349a5bc1 Answer

Correct Answer: 40

## Rationale

The correct answer is 40. Subtracting 5 from both sides of the given equation yields  $4x = 160$ . Dividing both sides of this equation by 4 yields  $x = 40$ . Therefore, the solution to the given equation is 40.

Question Difficulty: Easy

# Question ID bf4a8b6a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: bf4a8b6a

A company that provides whale-watching tours takes groups of **21** people at a time. The company's revenue is **80** dollars per adult and **60** dollars per child. If the company's revenue for one group consisting of adults and children was **1,440** dollars, how many people in the group were children?

- A. **3**
- B. **9**
- C. **12**
- D. **18**

ID: bf4a8b6a Answer

Correct Answer: C

## Rationale

Choice C is correct. Let  $x$  represent the number of children in a whale-watching tour group. Let  $y$  represent the number of adults in this group. Because it's given that **21** people are in a group and the group consists of adults and children, it must be true that  $x + y = 21$ . Since the company's revenue is **60** dollars per child, the total revenue from  $x$  children in this group was  $60x$  dollars. Since the company's revenue is **80** dollars per adult, the total revenue from  $y$  adults in this group was  $80y$  dollars. Because it's given that the total revenue for this group was **1,440** dollars, it must be true that  $60x + 80y = 1,440$ . The equations  $x + y = 21$  and  $60x + 80y = 1,440$  form a linear system of equations that can be solved to find the value of  $x$ , which represents the number of children in the group, using the elimination method. Multiplying both sides of the equation  $x + y = 21$  by **80** yields  $80x + 80y = 1,680$ . Subtracting  $60x + 80y = 1,440$  from  $80x + 80y = 1,680$  yields  $(80x + 80y) - (60x + 80y) = 1,680 - 1,440$ , which is equivalent to  $80x - 60x + 80y - 80y = 240$ , or  $20x = 240$ . Dividing both sides of this equation by **20** yields  $x = 12$ . Therefore, **12** people in the group were children.

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

Choice B is incorrect. This is the number of adults in the group, not the number of children in the group.

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

**Question Difficulty:** Medium

# Question ID 7e3f8363

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 7e3f8363

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: 7e3f8363 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 0eae6be1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

## ID: 0eae6be1

The number  $y$  is 84 less than the number  $x$ . Which equation represents the relationship between  $x$  and  $y$ ?

- A.  $y = x + 84$
- B.  $y = \frac{1}{84}x$
- C.  $y = 84x$
- D.  $y = x - 84$

## ID: 0eae6be1 Answer

Correct Answer: D

### Rationale

Choice D is correct. It's given that the number  $y$  is 84 less than the number  $x$ . A number that's 84 less than the number  $x$  is equivalent to 84 subtracted from the number  $x$ , or  $x - 84$ . Therefore, the equation  $y = x - 84$  represents the relationship between  $x$  and  $y$ .

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

# Question ID 447fa970

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 447fa970

The function  $f$  is defined by the equation  $f(x) = 7x + 2$ . What is the value of  $f(x)$  when  $x = 4$ ?

ID: 447fa970 Answer

Correct Answer: 30

## Rationale

The correct answer is 30. The value of  $f(x)$  when  $x = 4$  can be found by substituting 4 for  $x$  in the given equation  $f(x) = 7x + 2$ . This yields  $f(4) = 7(4) + 2$ , or  $f(4) = 30$ . Therefore, when  $x = 4$ , the value of  $f(x)$  is 30.

Question Difficulty: Easy

# Question ID Odd6227f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: Odd6227f

At how many points do the graphs of the equations  $y = x + 20$  and  $y = 8x$  intersect in the  $xy$ -plane?

- A. 0
- B. 1
- C. 2
- D. 8

ID: Odd6227f Answer

**Correct Answer:** B

## Rationale

Choice B is correct. Each given equation is written in slope-intercept form,  $y = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept of the graph of the equation in the  $xy$ -plane. The graphs of two lines that have different slopes will intersect at exactly one point. The graph of the first equation is a line with slope 1. The graph of the second equation is a line with slope 8. Since the graphs are lines with different slopes, they will intersect at exactly one point.

Choice A is incorrect because two graphs of linear equations have 0 intersection points only if they are parallel and therefore have the same slope.

Choice C is incorrect because two graphs of linear equations in the  $xy$ -plane can have only 0, 1, or infinitely many points of intersection.

Choice D is incorrect because two graphs of linear equations in the  $xy$ -plane can have only 0, 1, or infinitely many points of intersection.

**Question Difficulty:** Medium

# Question ID b1228811

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: b1228811

Marisa needs to hire at least 10 staff members for an upcoming project. The staff members will be made up of junior directors, who will be paid \$640 per week, and senior directors, who will be paid \$880 per week. Her budget for paying the staff members is no more than \$9,700 per week. She must hire at least 3 junior directors and at least 1 senior director. Which of the following systems of inequalities represents the conditions described if  $x$  is the number of junior directors and  $y$  is the number of senior directors?

$$640x + 880y \geq 9,700$$

$$x + y \leq 10$$

$$x \geq 3$$

- A.  $y \geq 1$

$$640x + 880y \leq 9,700$$

$$x + y \geq 10$$

$$x \geq 3$$

- B.  $y \geq 1$

$$640x + 880y \geq 9,700$$

$$x + y \geq 10$$

$$x \leq 3$$

- C.  $y \leq 1$

$$640x + 880y \leq 9,700$$

$$x + y \leq 10$$

$$x \leq 3$$

- D.  $y \leq 1$

ID: b1228811 Answer

Correct Answer: B

### Rationale

Choice B is correct. Marisa will hire  $x$  junior directors and  $y$  senior directors. Since she needs to hire at least 10 staff members,  $x + y \geq 10$ . Each junior director will be paid \$640 per week, and each senior director will be paid \$880 per week. Marisa's budget for paying the new staff is no more than \$9,700 per week; in terms of  $x$  and  $y$ , this condition is  $640x + 880y \leq 9,700$ . Since Marisa must hire at least 3 junior directors and at least 1 senior director, it follows that  $x \geq 3$  and  $y \geq 1$ . All four of these conditions are represented correctly in choice B.

Choices A and C are incorrect. For example, the first condition,  $640x + 880y \geq 9,700$ , in each of these options implies that Marisa can pay the new staff members more than her budget of \$9,700. Choice D is incorrect because Marisa needs to hire at least 10 staff members, not at most 10 staff members, as the inequality  $x + y \leq 10$  implies.

**Question Difficulty:** Medium

# Question ID 6105234d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 6105234d

John paid a total of \$165 for a microscope by making a down payment of \$37 plus  $p$  monthly payments of \$16 each. Which of the following equations represents this situation?

- A.  $16p - 37 = 165$
- B.  $37p - 16 = 165$
- C.  $16p + 37 = 165$
- D.  $37p + 16 = 165$

ID: 6105234d Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that John made a \$16 payment each month for  $p$  months. The total amount of these payments can be represented by the expression  $16p$ . The down payment can be added to that amount to find the total amount John paid, yielding the expression  $16p + 37$ . It's given that John paid a total of \$165. Therefore, the expression for the total amount John paid can be set equal to that amount, yielding the equation  $16p + 37 = 165$ .

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: Easy

# Question ID 7efe5495

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 7efe5495

$y = 3x$   $2x + y = 12$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $5x$ ?

- A. 24
- B. 15
- C. 12
- D. 5

ID: 7efe5495 Answer

**Correct Answer:** C

## Rationale

Choice C is correct. It's given by the first equation in the system that  $y = 3x$ . Substituting  $3x$  for  $y$  in the equation  $2x + y = 12$  yields  $2x + 3x = 12$ , or  $5x = 12$ .

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 2c121b25

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 2c121b25

Valentina bought two containers of beads. In the first container 30% of the beads are red, and in the second container 70% of the beads are red. Together, the containers have at least 400 red beads. Which inequality shows this relationship, where  $x$  is the total number of beads in the first container and  $y$  is the total number of beads in the second container?

A.  $0.3x + 0.7y \geq 400$

B.  $0.7x + 0.3y \leq 400$

C.  $\frac{x}{3} + \frac{y}{7} \leq 400$

D.  $30x + 70y \geq 400$

ID: 2c121b25 Answer

Correct Answer: A

## Rationale

Choice A is correct. It is given that  $x$  is the total number of beads in the first container and that 30% of those beads are red; therefore, the expression  $0.3x$  represents the number of red beads in the first container. It is given that  $y$  is the total number of beads in the second container and that 70% of those beads are red; therefore, the expression  $0.7y$  represents the number of red beads in the second container. It is also given that, together, the containers have at least 400 red beads, so the inequality that shows this relationship is  $0.3x + 0.7y \geq 400$ .

Choice B is incorrect because it represents the containers having a total of at most, rather than at least, 400 red beads. Choice C is incorrect and may be the result of misunderstanding how to represent a percentage of beads in each container. Also, the inequality shows the containers having a combined total of at most, rather than at least, 400 red beads. Choice D is incorrect because the percentages were not converted to decimals.

Question Difficulty: Easy

# Question ID 83f2c3bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 83f2c3bf

$y = x + 4$  Which table gives three values of  $x$  and their corresponding values of  $y$  for the given equation?

A.

$x$	$y$
0	4
1	5
2	6

B.

$x$	$y$
0	6
1	5
2	4

C.

$x$	$y$
0	2
1	1
2	0

D.

$x$	$y$
0	0
1	1
2	2

ID: 83f2c3bf Answer

Correct Answer: A

### Rationale

Choice A is correct. Substituting **0** for  $x$  into the given equation yields  $y = 0 + 4$ , or  $y = 4$ . Therefore, when  $x = 0$ , the corresponding value of  $y$  for the given equation is **4**. Substituting **1** for  $x$  into the given equation yields  $y = 1 + 4$ , or  $y = 5$ . Therefore, when  $x = 1$ , the corresponding value of  $y$  for the given equation is **5**. Substituting **2** for  $x$  into the given equation yields  $y = 2 + 4$ , or  $y = 6$ . Therefore, when  $x = 2$ , the corresponding value of  $y$  for the given equation is **6**. Of the choices given, only the table in choice A gives these three values of  $x$  and their corresponding values of  $y$  for the given equation.

Choice B is incorrect. This table gives three values of  $x$  and their corresponding values of  $y$  for the equation  $y = -x + 6$ .

Choice C is incorrect. This table gives three values of  $x$  and their corresponding values of  $y$  for the equation  $y = -x + 2$ .

Choice D is incorrect. This table gives three values of  $x$  and their corresponding values of  $y$  for the equation  $y = x$ .

**Question Difficulty:** Easy

# Question ID c50ede6d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

## ID: c50ede6d

The total cost, in dollars, to rent a surfboard consists of a **\$25** service fee and a **\$10** per hour rental fee. A person rents a surfboard for  $t$  hours and intends to spend a maximum of **\$75** to rent the surfboard. Which inequality represents this situation?

- A.  $10t \leq 75$
- B.  $10 + 25t \leq 75$
- C.  $25t \leq 75$
- D.  $25 + 10t \leq 75$

## ID: c50ede6d Answer

Correct Answer: D

### Rationale

Choice D is correct. The cost of the rental fee depends on the number of hours the surfboard is rented. Multiplying  $t$  hours by **10** dollars per hour yields a rental fee of  **$10t$**  dollars. The total cost of the rental consists of the rental fee plus the **25** dollar service fee, which yields a total cost of  **$25 + 10t$**  dollars. Since the person intends to spend a maximum of **75** dollars to rent the surfboard, the total cost must be at most **75** dollars. Therefore, the inequality  **$25 + 10t \leq 75$**  represents this situation.

Choice A is incorrect. This represents a situation where the rental fee, not the total cost, is at most **75** dollars.

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: Easy

# Question ID c1bd5301

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: c1bd5301

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: c1bd5301 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 b23bba4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

## ID: b23bba4c

$$3a + 4b = 25$$

A shipping company charged a customer \$25 to ship some small boxes and some large boxes. The equation above represents the relationship between  $a$ , the number of small boxes, and  $b$ , the number of large boxes, the customer had shipped. If the customer had 3 small boxes shipped, how many large boxes were shipped?

- A. 3
- B. 4
- C. 5
- D. 6

## ID: b23bba4c Answer

**Correct Answer:** B

### Rationale

Choice B is correct. It's given that  $a$  represents the number of small boxes and  $b$  represents the number of large boxes the customer had shipped. If the customer had 3 small boxes shipped, then  $a = 3$ . Substituting 3 for  $a$  in the equation

$3a + 4b = 25$  yields  $3(3) + 4b = 25$  or  $9 + 4b = 25$ . Subtracting 9 from both sides of the equation yields  $4b = 16$ . Dividing both sides of this equation by 4 yields  $b = 4$ . Therefore, the customer had 4 large boxes shipped.

Choices A, C, and D are incorrect. If the number of large boxes shipped is 3, then  $b = 3$ . Substituting 3 for  $b$  in the given equation yields  $3a + 4(3) = 25$  or  $3a + 12 = 25$ . Subtracting 12 from both sides of the equation and then dividing by 3

yields  $a = \frac{13}{3}$ . However, it's given that the number of small boxes shipped,  $a$ , is 3, not  $\frac{13}{3}$ , so  $b$  cannot equal 3. Similarly, if  $b = 5$  or  $b = 6$ , then  $a = \frac{5}{3}$  or  $a = \frac{1}{3}$ , respectively, which is also not true.

**Question Difficulty:** Easy

# Question ID 24854644

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 24854644

What is the equation of the line that passes through the point  $(0, 5)$  and is parallel to the graph of  $y = 7x + 4$  in the  $xy$ -plane?

- A.  $y = 5x$
- B.  $y = 7x + 5$
- C.  $y = 7x$
- D.  $y = 5x + 7$

ID: 24854644 Answer

Correct Answer: B

## Rationale

Choice B is correct. The equation of a line in the  $xy$ -plane can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the line and  $(0, b)$  is its  $y$ -intercept. It's given that the line passes through the point  $(0, 5)$ . Therefore,  $b = 5$ . It's also given that the line is parallel to the graph of  $y = 7x + 4$ , which means the line has the same slope as the graph of  $y = 7x + 4$ . The slope of the graph of  $y = 7x + 4$  is 7. Therefore,  $m = 7$ . Substituting 7 for  $m$  and 5 for  $b$  in the equation  $y = mx + b$  yields  $y = 7x + 5$ .

Choice A is incorrect. The graph of this equation passes through the point  $(0, 0)$ , not  $(0, 5)$ , and has a slope of 5, not 7.

Choice C is incorrect. The graph of this equation passes through the point  $(0, 0)$ , not  $(0, 5)$ .

Choice D is incorrect. The graph of this equation passes through the point  $(0, 7)$ , not  $(0, 5)$ , and has a slope of 5, not 7.

Question Difficulty: Easy

# Question ID 71189542

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 71189542

A group of 202 people went on an overnight camping trip, taking 60 tents with them. Some of the tents held 2 people each, and the rest held 4 people each. Assuming all the tents were filled to capacity and every person got to sleep in a tent, exactly how many of the tents were 2-person tents?

- A. 30
- B. 20
- C. 19
- D. 18

ID: 71189542 Answer

Correct Answer: C

## Rationale

Choice C is correct. Let  $x$  represent the number of 2-person tents and let  $y$  represent the number of 4-person tents. It is given that the total number of tents was 60 and the total number of people in the group was 202. This situation can be expressed as a system of two equations,  $x + y = 60$  and  $2x + 4y = 202$ . The first equation can be rewritten as  $y = -x + 60$ .

Substituting  $-x + 60$  for  $y$  in the equation  $2x + 4y = 202$  yields  $2x + 4(-x + 60) = 202$ . Distributing and combining like terms gives  $-2x + 240 = 202$ . Subtracting 240 from both sides of  $-2x + 240 = 202$  and then dividing both sides by  $-2$  gives  $x = 19$ . Therefore, the number of 2-person tents is 19.

Alternate approach: If each of the 60 tents held 4 people, the total number of people that could be accommodated in tents would be 240. However, the actual number of people who slept in tents was 202. The difference of 38 accounts for the 2-person tents. Since each of these tents holds 2 people fewer than a 4-person tent,  $\frac{38}{2} = 19$  gives the number of 2-person tents.

Choice A is incorrect. This choice may result from assuming exactly half of the tents hold 2 people. If that were true, then the total number of people who slept in tents would be  $2(30) + 4(30) = 180$ ; however, the total number of people who slept in tents was 202, not 180. Choice B is incorrect. If 20 tents were 2-person tents, then the remaining 40 tents would be 4-person tents. Since all the tents were filled to capacity, the total number of people who slept in tents would be  $2(20) + 4(40) = 40 + 160 = 200$ ; however, the total number of people who slept in tents was 202, not 200. Choice D is incorrect. If 18 tents were 2-person tents, then the remaining 42 tents would be 4-person tents. Since all the tents were filled to capacity, the total number of people who slept in tents would be  $2(18) + 4(42) = 36 + 168 = 204$ ; however, the total number of people who slept in tents was 202, not 204.

**Question Difficulty:** Medium

# Question ID dba8d38a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: dba8d38a

A petting zoo sells two types of tickets. The standard ticket, for admission only, costs \$5. The premium ticket, which includes admission and food to give to the animals, costs \$12. One Saturday, the petting zoo sold a total of 250 tickets and collected a total of \$2,300 from ticket sales. Which of the following systems of equations can be used to find the number of standard tickets,  $s$ , and premium tickets,  $p$ , sold on that Saturday?

$$s + p = 250$$

A.  $5s + 12p = 2,300$

$$s + p = 250$$

B.  $12s + 5p = 2,300$

$$5s + 12p = 250$$

C.  $s + p = 2,300$

$$12s + 5p = 250$$

D.  $s + p = 2,300$

ID: dba8d38a Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that the petting zoo sells two types of tickets, standard and premium, and that  $s$  represents the number of standard tickets sold and  $p$  represents the number of premium tickets sold. It's also given that the petting zoo sold 250 tickets on one Saturday; thus,  $s + p = 250$ . It's also given that each standard ticket costs \$5 and each premium ticket costs \$12. Thus, the amount collected in ticket sales can be represented by  $5s$  for standard tickets and  $12p$  for premium tickets. On that Saturday the petting zoo collected a total of \$2,300 from ticket sales; thus,  $5s + 12p = 2,300$ . These two equations are correctly represented in choice A.

Choice B is incorrect. The second equation in the system represents the cost per standard ticket as \$12, not \$5, and the cost per premium ticket as \$5, not \$12. Choices C and D are incorrect. The equations represent the total collected from standard and premium ticket sales as \$250, not \$2,300, and the total number of standard and premium tickets sold as \$2,300, not \$250. Additionally, the first equation in choice D represents the cost per standard ticket as \$12, not \$5, and the cost per premium ticket as \$5, not \$12.

**Question Difficulty:** Easy

# Question ID 64c85440

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 64c85440

In North America, the standard width of a parking space is at least 7.5 feet and no more than 9.0 feet. A restaurant owner recently resurfaced the restaurant's parking lot and wants to determine the number of parking spaces,  $n$ , in the parking lot that could be placed perpendicular to a curb that is 135 feet long, based on the standard width of a parking space. Which of the following describes all the possible values of  $n$ ?

- A.  $18 \leq n \leq 135$
- B.  $7.5 \leq n \leq 9$
- C.  $15 \leq n \leq 135$
- D.  $15 \leq n \leq 18$

ID: 64c85440 Answer

Correct Answer: D

## Rationale

Choice D is correct. Placing the parking spaces with the minimum width of 7.5 feet gives the maximum possible number of parking spaces. Thus, the maximum number that can be placed perpendicular to a 135-foot-long curb is  $\frac{135}{7.5} = 18$ . Placing the parking spaces with the maximum width of 9 feet gives the minimum number of parking spaces. Thus, the minimum number that can be placed perpendicular to a 135-foot-long curb is  $\frac{135}{9} = 15$ . Therefore, if  $n$  is the number of parking spaces in the lot, the range of possible values for  $n$  is  $15 \leq n \leq 18$ .

Choices A and C are incorrect. These choices equate the length of the curb with the maximum possible number of parking spaces. Choice B is incorrect. This is the range of possible values for the width of a parking space instead of the range of possible values for the number of parking spaces.

Question Difficulty: Medium

# Question ID 87322577

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 87322577

$$x + y = 75$$

The equation above relates the number of minutes,  $x$ , Maria spends running each day and the number of minutes,  $y$ , she spends biking each day. In the equation, what does the number 75 represent?

- A. The number of minutes spent running each day
- B. The number of minutes spent biking each day
- C. The total number of minutes spent running and biking each day
- D. The number of minutes spent biking for each minute spent running

ID: 87322577 Answer

Correct Answer: C

## Rationale

Choice C is correct. Maria spends  $x$  minutes running each day and  $y$  minutes biking each day. Therefore,  $x + y$  represents the total number of minutes Maria spent running and biking each day. Because  $x + y = 75$ , it follows that 75 is the total number of minutes that Maria spent running and biking each day.

Choices A and B are incorrect. The number of minutes Maria spent running each day is represented by  $x$  and need not be 75. Similarly, the number of minutes that Maria spends biking each day is represented by  $y$  and need not be 75. The number of minutes Maria spends running each day and biking each day may vary; however, the total number of minutes she spends each day on these activities is constant and equal to 75. Choice D is incorrect. The number of minutes Maria spent biking for each minute spent running cannot be determined from the information provided.

Question Difficulty: Easy

# Question ID 5c94e6fa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 5c94e6fa

$$3x + 21 = 3x + k$$

In the given equation,  $k$  is a constant. The equation has infinitely many solutions. What is the value of  $k$ ?

ID: 5c94e6fa Answer

Correct Answer: 21

## Rationale

The correct answer is **21**. It's given that the equation  $3x + 21 = 3x + k$  has infinitely many solutions. If an equation in one variable has infinitely many solutions, then the equation is true for any value of the variable. Subtracting  $3x$  from both sides of the given equation yields  $k = 21$ . Since this equation must be true for any value of  $x$ , the value of  $k$  is **21**.

Question Difficulty: Easy

# Question ID 7a5a74a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 7a5a74a6

$$3(2x - 6) - 11 = 4(x - 3) + 6$$

If  $x$  is the solution to the equation above,  
what is the value of  $x - 3$ ?

A.  $\frac{23}{2}$

B.  $\frac{17}{2}$

C.  $\frac{15}{2}$

D.  $-\frac{15}{2}$

ID: 7a5a74a6 Answer

Correct Answer: B

## Rationale

Choice B is correct. Because 2 is a factor of both  $2x$  and 6, the expression  $2x - 6$  can be rewritten as  $2(x - 3)$ . Substituting  $2(x - 3)$  for  $(2x - 6)$  on the left-hand side of the given equation yields  $3(2)(x - 3) - 11 = 4(x - 3) + 6$ , or  $6(x - 3) - 11 = 4(x - 3) + 6$ . Subtracting  $4(x - 3)$  from both sides of this equation yields  $2(x - 3) - 11 = 6$ . Adding 11 to both sides of this equation yields  $2(x - 3) = 17$ . Dividing both sides of this equation by 2 yields  $x - 3 = \frac{17}{2}$ .

Alternate approach: Distributing 3 to the quantity  $(2x - 6)$  on the left-hand side of the given equation and distributing 4 to the quantity  $(x - 3)$  on the right-hand side yields  $6x - 18 - 11 = 4x - 12 + 6$ , or  $6x - 29 = 4x - 6$ . Subtracting  $4x$  from both sides of this equation yields  $2x - 29 = -6$ . Adding 29 to both sides of this equation yields  $2x = 23$ . Dividing both sides of this equation by 2 yields  $x = \frac{23}{2}$ . Therefore, the value of  $x - 3$  is  $\frac{23}{2} - 3$ , or  $\frac{17}{2}$ .

Choice A is incorrect. This is the value of  $x$ , not  $x - 3$ . Choices C and D are incorrect. If the value of  $x - 3$  is  $\frac{15}{2}$  or  $-\frac{15}{2}$ , it follows that the value of  $x$  is  $\frac{21}{2}$  or  $-\frac{9}{2}$ , respectively. However, solving the given equation for  $x$  yields  $x = \frac{23}{2}$ . Therefore, the value of  $x - 3$  can't be  $\frac{15}{2}$  or  $-\frac{15}{2}$ .

**Question Difficulty:** Medium

# Question ID b7e6394d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: b7e6394d

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by \$5. Assuming gasoline costs \$4 per gallon, which equation can Alan use to determine how many fewer average miles,  $m$ , he should drive each week?

A.  $\frac{25}{4}m = 95$

B.  $\frac{25}{4}m = 5$

C.  $\frac{4}{25}m = 95$

D.  $\frac{4}{25}m = 5$

ID: b7e6394d Answer

Correct Answer: D

## Rationale

Choice D is correct. Since gasoline costs \$4 per gallon, and since Alan's car travels an average of 25 miles per gallon, the expression  $\frac{4}{25}$  gives the cost, in dollars per mile, to drive the car. Multiplying  $\frac{4}{25}$  by  $m$  gives the cost for Alan to drive  $m$  miles in his car. Alan wants to reduce his weekly spending by \$5, so setting  $\frac{4}{25}m$  equal to 5 gives the number of miles,  $m$ , by which he must reduce his driving.

Choices A, B, and C are incorrect. Choices A and B transpose the numerator and the denominator in the fraction. The fraction  $\frac{25}{4}$  would result in the unit miles per dollar, but the question requires a unit of dollars per mile. Choices A and C set the expression equal to 95 instead of 5, a mistake that may result from a misconception that Alan wants to reduce his driving by 5 miles each week; instead, the question says he wants to reduce his weekly expenditure by \$5.

Question Difficulty: Hard

## Question ID 95cad55f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 95cad55f

A laundry service is buying detergent and fabric softener from its supplier. The supplier will deliver no more than 300 pounds in a shipment. Each container of detergent weighs 7.35 pounds, and each container of fabric softener weighs 6.2 pounds. The service wants to buy at least twice as many containers of detergent as containers of fabric softener. Let  $d$  represent the number of containers of detergent, and let  $s$  represent the number of containers of fabric softener, where  $d$  and  $s$  are nonnegative integers. Which of the following systems of inequalities best represents this situation?

A.  $7.35d + 6.2s \leq 300$   
 $d \geq 2s$

B.  $7.35d + 6.2s \leq 300$   
 $2d \geq s$

C.  $14.7d + 6.2s \leq 300$   
 $d \geq 2s$

D.  $14.7d + 6.2s \leq 300$   
 $2d \geq s$

ID: 95cad55f Answer

Correct Answer: A

## Rationale

Choice A is correct. The number of containers in a shipment must have a weight less than or equal to 300 pounds. The total weight, in pounds, of detergent and fabric softener that the supplier delivers can be expressed as the weight of each container multiplied by the number of each type of container, which is 7.35d for detergent and 6.2s for fabric softener. Since this total cannot exceed 300 pounds, it follows that  $7.35d + 6.2s \leq 300$ . Also, since the laundry service wants to buy at least twice as many containers of detergent as containers of fabric softener, the number of containers of detergent should be greater than or equal to two times the number of containers of fabric softener. This can be expressed by the inequality  $d \geq 2s$ .

Choice B is incorrect because it misrepresents the relationship between the numbers of each container that the laundry service wants to buy. Choice C is incorrect because the first inequality of the system incorrectly doubles the weight per container of detergent. The weight of each container of detergent is 7.35, not 14.7 pounds. Choice D is incorrect because it doubles the weight per container of detergent and transposes the relationship between the numbers of containers.

**Question Difficulty:** Hard

# Question ID bf36c815

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

## ID: bf36c815

The function  $g$  is defined by  $g(x) = -x + 8$ .

What is the value of  $g(0)$ ?

- A.  $-8$
- B.  $0$
- C.  $4$
- D.  $8$

## ID: bf36c815 Answer

**Correct Answer:** D

### Rationale

Choice D is correct. The value of  $g(0)$  is found by substituting 0 for  $x$  in the function  $g$ . This yields  $g(0) = -0 + 8$ , which can be rewritten as  $g(0) = 8$ .

Choice A is incorrect and may result from misinterpreting the equation as  $g(x) = x + (-8)$  instead of  $g(x) = -x + 8$ . Choice B is incorrect. This is the value of  $x$ , not  $g(x)$ . Choice C is incorrect and may result from calculation errors.

**Question Difficulty:** Easy

# Question ID 968e9e51

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 968e9e51

$$y \leq x$$

Which of the following ordered pairs  $(x,y)$  is a solution to the system of inequalities above?

- A.  $(1,0)$
- B.  $(-1,0)$
- C.  $(0,1)$
- D.  $(0,-1)$

ID: 968e9e51 Answer

**Correct Answer:** D

## Rationale

Choice D is correct. The solutions to the given system of inequalities is the set of all ordered pairs  $(x,y)$  that satisfy both inequalities in the system. For an ordered pair to satisfy the inequality  $y \leq x$ , the value of the ordered pair's y-coordinate must be less than or equal to the value of the ordered pair's x-coordinate. This is true of the ordered pair  $(0, -1)$ , because  $-1 \leq 0$ . To satisfy the inequality  $y \leq -x$ , the value of the ordered pair's y-coordinate must be less than or equal to the value of the additive inverse of the ordered pair's x-coordinate. This is also true of the ordered pair  $(0, -1)$ . Because 0 is its own additive inverse,  $-1 \leq -(0)$  is the same as  $-1 \leq 0$ . Therefore, the ordered pair  $(0, -1)$  is a solution to the given system of inequalities.

Choice A is incorrect. This ordered pair satisfies only the inequality  $y \leq x$  in the given system, not both inequalities. Choice B is incorrect. This ordered pair satisfies only the inequality  $y \leq -x$  in the system, but not both inequalities. Choice C is incorrect. This ordered pair satisfies neither inequality.

**Question Difficulty:** Medium

# Question ID 9f3cb472

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 9f3cb472

Line  $t$  in the  $xy$ -plane has a slope of  $-\frac{1}{3}$  and passes through the point  $(9, 10)$ . Which equation defines line  $t$ ?

- A.  $y = 13x - \frac{1}{3}$
- B.  $y = 9x + 10$
- C.  $y = -\frac{x}{3} + 10$
- D.  $y = -\frac{x}{3} + 13$

ID: 9f3cb472 Answer

Correct Answer: D

## Rationale

Choice D is correct. The equation that defines line  $t$  in the  $xy$ -plane can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of line  $t$  and  $(0, b)$  is its  $y$ -intercept. It's given that line  $t$  has a slope of  $-\frac{1}{3}$ . Therefore,  $m = -\frac{1}{3}$ . Substituting  $-\frac{1}{3}$  for  $m$  in the equation  $y = mx + b$  yields  $y = -\frac{1}{3}x + b$ , or  $y = -\frac{x}{3} + b$ . It's also given that line  $t$  passes through the point  $(9, 10)$ . Substituting 9 for  $x$  and 10 for  $y$  in the equation  $y = -\frac{x}{3} + b$  yields  $10 = -\frac{9}{3} + b$ , or  $10 = -3 + b$ . Adding 3 to both sides of this equation yields  $13 = b$ . Substituting 13 for  $b$  in the equation  $y = -\frac{x}{3} + b$  yields  $y = -\frac{x}{3} + 13$ .

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

Choice B is incorrect. This equation defines a line that has a slope of 9, not  $-\frac{1}{3}$ , and passes through the point  $(0, 10)$ , not  $(9, 10)$ .

Choice C is incorrect. This equation defines a line that passes through the point  $(0, 10)$ , not  $(9, 10)$ .

Question Difficulty: Medium

# Question ID aa85b138

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: aa85b138

$$2n + 6 = 14$$

A tree had a height of 6 feet when it was planted. The equation above can be used to find how many years  $n$  it took the tree to reach a height of 14 feet. Which of the following is the best interpretation of the number 2 in this context?

- A. The number of years it took the tree to double its height
- B. The average number of feet that the tree grew per year
- C. The height, in feet, of the tree when the tree was 1 year old
- D. The average number of years it takes similar trees to grow 14 feet

ID: aa85b138 Answer

Correct Answer: B

## Rationale

Choice B is correct. The height of the tree at a given time is equal to its height when it was planted plus the number of feet that the tree grew. In the given equation, 14 represents the height of the tree at the given time, and 6 represents the height of the tree when it was planted. It follows that  $2n$  represents the number of feet the tree grew from the time it was planted until the time it reached a height of 14 feet. Since  $n$  represents the number of years between the given time and the time the tree was planted, 2 must represent the average number of feet the tree grew each year.

Choice A is incorrect and may result from interpreting the coefficient 2 as doubling instead of as increasing by 2 each year. Choice C is incorrect. The height of the tree when it was 1 year old was  $2(1) + 6 = 8$  feet, not 2 feet. Choice D is incorrect.

No information is given to connect the growth of one particular tree to the growth of similar trees.

Question Difficulty: Medium

# Question ID 15daa8d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 15daa8d6

$$2x + 16 = a(x + 8)$$

In the given equation,  $a$  is a constant. If the equation has infinitely many solutions, what is the value of  $a$ ?

ID: 15daa8d6 Answer

Correct Answer: 2

## Rationale

The correct answer is **2**. An equation with one variable,  $x$ , has infinitely many solutions only when both sides of the equation are equal for any defined value of  $x$ . It's given that  $2x + 16 = a(x + 8)$ , where  $a$  is a constant. This equation can be rewritten as  $2(x + 8) = a(x + 8)$ . If this equation has infinitely many solutions, then both sides of this equation are equal for any defined value of  $x$ . Both sides of this equation are equal for any defined value of  $x$  when  $2 = a$ . Therefore, if the equation has infinitely many solutions, the value of  $a$  is **2**.

Alternate approach: If the given equation,  $2x + 16 = a(x + 8)$ , has infinitely many solutions, then both sides of this equation are equal for any value of  $x$ . If  $x = 0$ , then substituting 0 for  $x$  in  $2x + 16 = a(x + 8)$  yields

$$2(0) + 16 = a(0 + 8), \text{ or } 16 = 8a.$$

Dividing both sides of this equation by 8 yields  $2 = a$ .

Question Difficulty: Medium

# Question ID 2f0a43b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 2f0a43b2

If  $\frac{x}{8} = 5$ , what is the value of  $\frac{8}{x}$ ?

ID: 2f0a43b2 Answer

Correct Answer: .2, 1/5

## Rationale

The correct answer is  $\frac{1}{5}$ . Since the number 5 can also be written as  $\frac{5}{1}$ , the given equation can also be written as  $\frac{x}{8} = \frac{5}{1}$ . This equation is equivalent to  $\frac{8}{x} = \frac{1}{5}$ . Therefore, the value of  $\frac{8}{x}$  is  $\frac{1}{5}$ . Note that 1/5 and .2 are examples of ways to enter a correct answer.

Alternate approach: Multiplying both sides of the equation  $\frac{x}{8} = 5$  by 8 yields  $x = 40$ . Substituting 40 for  $x$  into the expression  $\frac{8}{x}$  yields  $\frac{8}{40}$ , or  $\frac{1}{5}$ .

Question Difficulty: Easy

# Question ID ebf8d2b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: ebf8d2b7

A machine makes large boxes or small boxes, one at a time, for a total of **700** minutes each day. It takes the machine **10** minutes to make a large box or **5** minutes to make a small box. Which equation represents the possible number of large boxes,  $x$ , and small boxes,  $y$ , the machine can make each day?

- A.  $5x + 10y = 700$
- B.  $10x + 5y = 700$
- C.  $(x + y)(10 + 5) = 700$
- D.  $(10 + x)(5 + y) = 700$

ID: ebf8d2b7 Answer

Correct Answer: B

## Rationale

Choice B is correct. It's given that it takes the machine **10** minutes to make a large box. It's also given that  $x$  represents the possible number of large boxes the machine can make each day. Multiplying **10** by  $x$  gives  $10x$ , which represents the amount of time spent making large boxes. It's given that it takes the machine **5** minutes to make a small box. It's also given that  $y$  represents the possible number of small boxes the machine can make each day. Multiplying **5** by  $y$  gives  $5y$ , which represents the amount of time spent making small boxes. Combining the amount of time spent making  $x$  large boxes and  $y$  small boxes yields  $10x + 5y$ . It's given that the machine makes boxes for a total of **700** minutes each day. Therefore  $10x + 5y = 700$  represents the possible number of large boxes,  $x$ , and small boxes,  $y$ , the machine can make each day.

Choice A is incorrect and may result from associating the time of **10** minutes with small, rather than large, boxes and the time of **5** minutes with large, rather than small, boxes.

Choice C is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

# Question ID 997bec28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 997bec28

The perimeter of an isosceles triangle is **83** inches. Each of the two congruent sides of the triangle has a length of **24** inches. What is the length, in inches, of the third side?

ID: 997bec28 Answer

**Correct Answer:** 35

## Rationale

The correct answer is **35**. It's given that the perimeter of an isosceles triangle is **83** inches and that each of the two congruent sides has a length of **24** inches. The perimeter of a triangle is the sum of the lengths of its three sides. The equation  $24 + 24 + x = 83$  can be used to represent this situation, where  $x$  is the length, in inches, of the third side. Combining like terms on the left-hand side of this equation yields  $48 + x = 83$ . Subtracting **48** from both sides of this equation yields  $x = 35$ . Therefore, the length, in inches, of the third side is **35**.

**Question Difficulty:** Easy

# Question ID 12ee1edc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 12ee1edc

$$(b - 2)x = 8$$

In the given equation,  $b$  is a constant. If the equation has no solution, what is the value of  $b$ ?

- A. 2
- B. 4
- C. 6
- D. 10

ID: 12ee1edc Answer

Correct Answer: A

## Rationale

Choice A is correct. This equation has no solution when there is no value of  $x$  that produces a true statement. Solving the given equation for  $x$  by dividing both sides by  $(b - 2)$  gives  $x = \frac{8}{(b - 2)}$ . When  $(b - 2) = 0$ , the right-hand side of this equation will be undefined, and the equation will have no solution. Therefore, when  $b = 2$ , there is no value of  $x$  that satisfies the given equation.

Choices B, C, and D are incorrect. Substituting 4, 6, and 10 for  $b$  in the given equation yields exactly one solution, rather than no solution, for  $x$ . For example, substituting 4 for  $b$  in the given equation yields  $(4 - 2)x = 8$ , or  $2x = 8$ . Dividing both sides of  $2x = 8$  by 2 yields  $x = 4$ . Similarly, if  $b = 6$  or  $b = 10$ ,  $x = 2$  and  $x = 1$ , respectively.

Question Difficulty: Medium

# Question ID c6b151d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: c6b151d4

A total of **364** paper straws of equal length were used to construct two types of polygons: triangles and rectangles. The triangles and rectangles were constructed so that no two polygons had a common side. The equation  $3x + 4y = 364$  represents this situation, where  $x$  is the number of triangles constructed and  $y$  is the number of rectangles constructed. What is the best interpretation of  $(x, y) = (24, 73)$  in this context?

- A. If **24** triangles were constructed, then **73** rectangles were constructed.
- B. If **24** triangles were constructed, then **73** paper straws were used.
- C. If **73** triangles were constructed, then **24** rectangles were constructed.
- D. If **73** triangles were constructed, then **24** paper straws were used.

ID: c6b151d4 Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that **364** paper straws of equal length were used to construct triangles and rectangles, where no two polygons had a common side. It's also given that the equation  $3x + 4y = 364$  represents this situation, where  $x$  is the number of triangles constructed and  $y$  is the number of rectangles constructed. The equation  $(x, y) = (24, 73)$  means that if  $x = 24$ , then  $y = 73$ . Substituting **24** for  $x$  and **73** for  $y$  in  $3x + 4y = 364$  yields  $3(24) + 4(73) = 364$ , or  $364 = 364$ , which is true. Therefore, in this context, the equation  $(x, y) = (24, 73)$  means that if **24** triangles were constructed, then **73** rectangles were constructed.

Choice B 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: Easy

# Question ID 0d391910

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 0d391910

The function  $f$  is defined by  $f(x) = 4x$ . For what value of  $x$  does  $f(x) = 8$ ?

ID: 0d391910 Answer

Correct Answer: 2

## Rationale

The correct answer is 2. Substituting 8 for  $f(x)$  in the given equation yields  $8 = 4x$ . Dividing the left- and right-hand sides of this equation by 4 yields  $x = 2$ . Therefore, the value of  $x$  is 2 when  $f(x) = 8$ .

Question Difficulty: Easy

# Question ID ee439cff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: ee439cff

On a car trip, Rhett and Jessica each drove for part of the trip, and the total distance they drove was under **220** miles. Rhett drove at an average speed of **35 miles per hour (mph)**, and Jessica drove at an average speed of **40 mph**. Which of the following inequalities represents this situation, where  $r$  is the number of hours Rhett drove and  $j$  is the number of hours Jessica drove?

- A.  $35r + 40j > 220$
- B.  $35r + 40j < 220$
- C.  $40r + 35j > 220$
- D.  $40r + 35j < 220$

ID: ee439cff Answer

Correct Answer: B

## Rationale

Choice B is correct. It's given that Rhett drove at an average speed of **35** miles per hour and that he drove for  $r$  hours. Multiplying **35** miles per hour by  $r$  hours yields  $35r$  miles, or the distance that Rhett drove. It's also given that Jessica drove at an average speed of **40** miles per hour and that she drove for  $j$  hours. Multiplying **40** miles per hour by  $j$  hours yields  $40j$  miles, or the distance that Jessica drove. The total distance, in miles, that Rhett and Jessica drove can be represented by the expression  $35r + 40j$ . It's given that the total distance they drove was under **220** miles. Therefore, the inequality  $35r + 40j < 220$  represents this situation.

Choice A is incorrect. This inequality represents a situation in which the total distance Rhett and Jessica drove was over, rather than under, **220** miles.

Choice C is incorrect. This inequality represents a situation in which Rhett drove at an average speed of **40**, rather than **35**, miles per hour, Jessica drove at an average speed of **35**, rather than **40**, miles per hour, and the total distance they drove was over, rather than under, **220** miles.

Choice D is incorrect. This inequality represents a situation in which Rhett drove at an average speed of **40**, rather than **35**, miles per hour, and Jessica drove at an average speed of **35**, rather than **40**, miles per hour.

Question Difficulty: Easy

# Question ID ee2f611f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: ee2f611f

A local transit company sells a monthly pass for \$95 that allows an unlimited number of trips of any length. Tickets for individual trips cost \$1.50, \$2.50, or \$3.50, depending on the length of the trip. What is the minimum number of trips per month for which a monthly pass could cost less than purchasing individual tickets for trips?

ID: ee2f611f Answer

## Rationale

The correct answer is 28. The minimum number of individual trips for which the cost of the monthly pass is less than the cost of individual tickets can be found by assuming the maximum cost of the individual tickets, \$3.50. If  $n$  tickets costing \$3.50 each are purchased in one month, the inequality  $95 < 3.50n$  represents this situation. Dividing both sides of the inequality by 3.50 yields  $27.14 < n$ , which is equivalent to  $n > 27.14$ . Since only a whole number of tickets can be purchased, it follows that 28 is the minimum number of trips.

**Question Difficulty:** Hard

# Question ID 8c98c834

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

## ID: 8c98c834

The equation  $y = 0.1x$  models the relationship between the number of different pieces of music a certain pianist practices,  $y$ , during an  $x$ -minute practice session. How many pieces did the pianist practice if the session lasted 30 minutes?

- A. 1
- B. 3
- C. 10
- D. 30

## ID: 8c98c834 Answer

**Correct Answer:** B

### Rationale

Choice B is correct. It's given that the equation  $y = 0.1x$  models the relationship between the number of different pieces of music a certain pianist practices,  $y$ , and the number of minutes in a practice session,  $x$ . Since it's given that the session lasted 30 minutes, the number of pieces the pianist practiced can be found by substituting 30 for  $x$  in the given equation, which yields  $y = 0.1(30)$ , or  $y = 3$ .

Choices A and C are incorrect and may result from misinterpreting the values in the equation. Choice D is incorrect. This is the given value of  $x$ , not the value of  $y$ .

**Question Difficulty:** Easy

# Question ID 563407e5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 563407e5

A bakery sells trays of cookies. Each tray contains at least 50 cookies but no more than 60. Which of the following could be the total number of cookies on 4 trays of cookies?

- A. 165
- B. 205
- C. 245
- D. 285

ID: 563407e5 Answer

**Correct Answer:** B

## Rationale

Choice B is correct. If each tray contains the least number of cookies possible, 50 cookies, then the least number of cookies possible on 4 trays is  $50 \times 4 = 200$  cookies. If each tray contains the greatest number of cookies possible, 60 cookies, then the greatest number of cookies possible on 4 trays is  $60 \times 4 = 240$  cookies. If the least number of cookies on 4 trays is 200 and the greatest number of cookies is 240, then 205 could be the total number of cookies on these 4 trays of cookies because  $200 \leq 205 \leq 240$ .

Choices A, C, and D are incorrect. The least number of cookies on 4 trays is 200 cookies, and the greatest number of cookies on 4 trays is 240 cookies. The choices 165, 245, and 285 are each either less than 200 or greater than 240; therefore, they cannot represent the total number of cookies on 4 trays.

**Question Difficulty:** Easy

# Question ID 25e1cfed

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

**ID: 25e1cfed**

How many solutions does the equation  $10(15x - 9) = -15(6 - 10x)$  have?

- A. Exactly one
- B. Exactly two
- C. Infinitely many
- D. Zero

**ID: 25e1cfed Answer**

**Correct Answer:** C

## Rationale

Choice C is correct. Applying the distributive property to each side of the given equation yields  $150x - 90 = -90 + 150x$ . Applying the commutative property of addition to the right-hand side of this equation yields  $150x - 90 = 150x - 90$ . Since the two sides of the equation are equivalent, this equation is true for any value of  $x$ . Therefore, the given equation has infinitely many solutions.

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:** Hard

# Question ID 317e80f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 317e80f9

$x + y = 18$   $5y = x$  What is the solution  $(x, y)$  to the given system of equations?

- A.  $(15, 3)$
- B.  $(16, 2)$
- C.  $(17, 1)$
- D.  $(18, 0)$

ID: 317e80f9 Answer

**Correct Answer:** A

## Rationale

Choice A is correct. The second equation in the given system defines the value of  $x$  as  $5y$ . Substituting  $5y$  for  $x$  into the first equation yields  $5y + y = 18$  or  $6y = 18$ . Dividing each side of this equation by 6 yields  $y = 3$ . Substituting 3 for  $y$  in the second equation yields  $5(3) = x$  or  $x = 15$ . Therefore, the solution  $(x, y)$  to the given system of equations is  $(15, 3)$ .

Choice B is incorrect. Substituting 16 for  $x$  and 2 for  $y$  in the second equation yields  $5(2) = 16$ , which is not true. Therefore,  $(16, 2)$  is not a solution to the given system of equations.

Choice C is incorrect. Substituting 17 for  $x$  and 1 for  $y$  in the second equation yields  $5(1) = 17$ , which is not true. Therefore,  $(17, 1)$  is not a solution to the given system of equations.

Choice D is incorrect. Substituting 18 for  $x$  and 0 for  $y$  in the second equation yields  $5(0) = 18$ , which is not true. Therefore,  $(18, 0)$  is not a solution to the given system of equations.

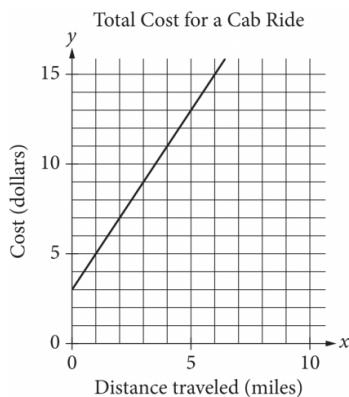
**Question Difficulty:** Easy

# Question ID 3f5375d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

## ID: 3f5375d9

The line graphed in the  $xy$ -plane below models the total cost, in dollars, for a cab ride,  $y$ , in a certain city during nonpeak hours based on the number of miles traveled,  $x$ .



According to the graph, what is the cost for each additional mile traveled, in dollars, of a cab ride?

- A. \$2.00
- B. \$2.60
- C. \$3.00
- D. \$5.00

## ID: 3f5375d9 Answer

**Correct Answer:** A

### Rationale

Choice A is correct. The cost of each additional mile traveled is represented by the slope of the given line. The slope of the line can be calculated by identifying two points on the line and then calculating the ratio of the change in  $y$  to the change in  $x$  between the two points. Using the points  $(1, 5)$  and  $(2, 7)$ , the slope is equal to  $\frac{7-5}{2-1}$ , or 2. Therefore, the cost for each additional mile traveled of the cab ride is \$2.00.

Choice B is incorrect and may result from calculating the slope of the line that passes through the points  $(5, 13)$  and  $(0, 0)$ . However,  $(0, 0)$  does not lie on the line shown. Choice C is incorrect. This is the  $y$ -coordinate of the  $y$ -intercept of the graph and represents the flat fee for a cab ride before the charge for any miles traveled is added. Choice D is incorrect. This value represents the total cost of a 1-mile cab ride.

**Question Difficulty:** Easy

# Question ID fdee0fbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

## ID: fdee0fbf

In the  $xy$ -plane, line  $k$  intersects the  $y$ -axis at the point  $(0, -6)$  and passes through the point  $(2, 2)$ . If the point  $(20, w)$  lies on line  $k$ , what is the value of  $w$ ?

## ID: fdee0fbf Answer

### Rationale

The correct answer is 74. The  $y$ -intercept of a line in the  $xy$ -plane is the ordered pair  $(x, y)$  of the point of intersection of the line with the  $y$ -axis. Since line  $k$  intersects the  $y$ -axis at the point  $(0, -6)$ , it follows that  $(0, -6)$  is the  $y$ -intercept of this line. An equation of any line in the  $xy$ -plane can be written in the form  $y = mx + b$ , where  $m$  is the slope of the line and  $b$  is the  $y$ -coordinate of the  $y$ -intercept. Therefore, the equation of line  $k$  can be written as  $y = mx + (-6)$ , or  $y = mx - 6$ . The value of  $m$  can be found by substituting the  $x$ - and  $y$ -coordinates from a point on the line, such as  $(2, 2)$ , for  $x$  and  $y$ , respectively. This results in  $2 = 2m - 6$ . Solving this equation for  $m$  gives  $m = 4$ . Therefore, an equation of line  $k$  is  $y = 4x - 6$ . The value of  $w$  can be found by substituting the  $x$ -coordinate, 20, for  $x$  in the equation of line  $k$  and solving this equation for  $y$ . This gives  $y = 4(20) - 6$ , or  $y = 74$ . Since  $w$  is the  $y$ -coordinate of this point,  $w = 74$ .

**Question Difficulty:** Hard

# Question ID 541bef2f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 541bef2f

$y \leq x + 7$   $y \geq -2x - 1$  Which point  $(x, y)$  is a solution to the given system of inequalities in the  $xy$ -plane?

- A.  $(-14, 0)$
- B.  $(0, -14)$
- C.  $(0, 14)$
- D.  $(14, 0)$

ID: 541bef2f Answer

Correct Answer: D

## Rationale

Choice D is correct. A point  $(x, y)$  is a solution to a system of inequalities in the  $xy$ -plane if substituting the  $x$ -coordinate and the  $y$ -coordinate of the point for  $x$  and  $y$ , respectively, in each inequality makes both of the inequalities true. Substituting the  $x$ -coordinate and the  $y$ -coordinate of choice D, 14 and 0, for  $x$  and  $y$ , respectively, in the first inequality in the given system,  $y \leq x + 7$ , yields  $0 \leq 14 + 7$ , or  $0 \leq 21$ , which is true. Substituting 14 for  $x$  and 0 for  $y$  in the second inequality in the given system,  $y \geq -2x - 1$ , yields  $0 \geq -2(14) - 1$ , or  $0 \geq -29$ , which is true. Therefore, the point  $(14, 0)$  is a solution to the given system of inequalities in the  $xy$ -plane.

Choice A is incorrect. Substituting  $-14$  for  $x$  and  $0$  for  $y$  in the inequality  $y \leq x + 7$  yields  $0 \leq -14 + 7$ , or  $0 \leq -7$ , which is not true.

Choice B is incorrect. Substituting 0 for  $x$  and  $-14$  for  $y$  in the inequality  $y \geq -2x - 1$  yields  $-14 \geq -2(0) - 1$ , or  $-14 \geq -1$ , which is not true.

Choice C is incorrect. Substituting 0 for  $x$  and 14 for  $y$  in the inequality  $y \leq x + 7$  yields  $14 \leq 0 + 7$ , or  $14 \leq 7$ , which is not true.

Question Difficulty: Hard

# Question ID 620fe971

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

## ID: 620fe971

A team of workers has been moving cargo off of a ship. The equation below models the approximate number of tons of cargo,  $y$ , that remains to be moved  $x$  hours after the team started working.

$$y = 120 - 25x$$

The graph of this equation in the  $xy$ -plane is a line. What is the best interpretation of the  $x$ -intercept in this context?

- A. The team will have moved all the cargo in about 4.8 hours.
- B. The team has been moving about 4.8 tons of cargo per hour.
- C. The team has been moving about 25 tons of cargo per hour.
- D. The team started with 120 tons of cargo to move.

## ID: 620fe971 Answer

**Correct Answer:** A

### Rationale

Choice A is correct. The  $x$ -intercept of the line with equation  $y = 120 - 25x$  can be found by substituting 0 for  $y$  and finding the value of  $x$ . When  $y = 0$ ,  $x = 4.8$ , so the  $x$ -intercept is at  $(4.8, 0)$ . Since  $y$  represents the number of tons of cargo remaining to be moved  $x$  hours after the team started working, it follows that the  $x$ -intercept refers to the team having no cargo remaining to be moved after 4.8 hours. In other words, the team will have moved all of the cargo after about 4.8 hours.

Choice B is incorrect and may result from incorrectly interpreting the value 4.8. Choices C and D are incorrect and may result from misunderstanding the  $x$ -intercept. These statements are accurate but not directly relevant to the  $x$ -intercept.

**Question Difficulty:** Medium

# Question ID 6a87902f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 6a87902f

$y = 2x + 10$   $y = 2x - 1$  At how many points do the graphs of the given equations intersect in the  $xy$ -plane?

- A. Zero
- B. Exactly one
- C. Exactly two
- D. Infinitely many

ID: 6a87902f Answer

Correct Answer: A

## Rationale

Choice A is correct. A system of two linear equations in two variables,  $x$  and  $y$ , has zero points of intersection if the lines represented by the equations in the  $xy$ -plane are distinct and parallel. The graphs of two lines in the  $xy$ -plane represented by equations in slope-intercept form,  $y = mx + b$ , are distinct if the  $y$ -coordinates of their  $y$ -intercepts,  $b$ , are different and are parallel if their slopes,  $m$ , are the same. For the two equations in the given system,  $y = 2x + 10$  and  $y = 2x - 1$ , the values of  $b$  are 10 and  $-1$ , respectively, and the values of  $m$  are both 2. Since the values of  $b$  are different, the graphs of these lines have different  $y$ -coordinates of the  $y$ -intercept and are distinct. Since the values of  $m$  are the same, the graphs of these lines have the same slope and are parallel. Therefore, the graphs of the given equations are lines that intersect at zero points in the  $xy$ -plane.

Choice B is incorrect. The graphs of a system of two linear equations have exactly one point of intersection if the lines represented by the equations have different slopes. Since the given equations represent lines with the same slope, there is not exactly one intersection point.

Choice C is incorrect. The graphs of a system of two linear equations can never have exactly two intersection points.

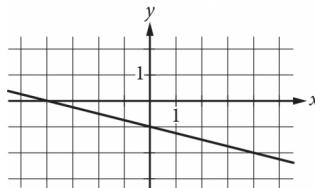
Choice D is incorrect. The graphs of a system of two linear equations have infinitely many intersection points when the lines represented by the equations have the same slope and the same  $y$ -coordinate of the  $y$ -intercept. Since the given equations represent lines with different  $y$ -coordinates of their  $y$ -intercepts, there are not infinitely many intersection points.

Question Difficulty: Medium

# Question ID b2845d88

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

ID: b2845d88



Which of the following is an equation of the graph shown in the  $xy$ -plane above?

- A.  $y = -\frac{1}{4}x - 1$
- B.  $y = -x - 4$
- C.  $y = -x - \frac{1}{4}$
- D.  $y = -4x - 1$

ID: b2845d88 Answer

Correct Answer: A

## Rationale

Choice A is correct. The slope of the line can be found by choosing any two points on the line, such as  $(4, -2)$  and  $(0, -1)$ . Subtracting the  $y$ -values results in  $-2 - (-1) = -1$ , the change in  $y$ . Subtracting the  $x$ -values results in  $4 - 0 = 4$ , the change in  $x$ . Dividing the change in  $y$  by the change in  $x$  yields  $-1 \div 4 = -\frac{1}{4}$ , the slope. The line intersects the  $y$ -axis at  $(0, -1)$ , so  $-1$  is the  $y$ -coordinate of the  $y$ -intercept. This information can be expressed in slope-intercept form as the equation  $y = -\frac{1}{4}x - 1$ .

Choice B is incorrect and may result from incorrectly calculating the slope and then misidentifying the slope as the  $y$ -intercept. Choice C is incorrect and may result from misidentifying the slope as the  $y$ -intercept. Choice D is incorrect and may result from incorrectly calculating the slope.

Question Difficulty: Easy

# Question ID f75bd744

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: f75bd744

$$4x - 6y = 10y + 2 \quad ty = \frac{1}{2} + 2x$$

In the given system of equations,  $t$  is a constant. If the system has no solution, what is the value of  $t$ ?

ID: f75bd744 Answer

Correct Answer: 8

## Rationale

The correct answer is 8. The given system of equations can be solved using the elimination method. Multiplying both sides of the second equation in the given system by  $-2$  yields  $-2ty = -1 - 4x$ , or  $-1 - 4x = -2ty$ . Adding this equation to the first equation in the given system,  $4x - 6y = 10y + 2$ , yields  $(4x - 6y) + (-1 - 4x) = (10y + 2) + (-2ty)$ , or  $-1 - 6y = 10y - 2ty + 2$ . Subtracting  $10y$  from both sides of this equation yields  $(-1 - 6y) - (10y) = (10y - 2ty + 2) - (10y)$ , or  $-1 - 16y = -2ty + 2$ . If the given system has no solution, then the equation  $-1 - 16y = -2ty + 2$  has no solution. If this equation has no solution, the coefficients of  $y$  on each side of the equation,  $-16$  and  $-2t$ , must be equal, which yields the equation  $-16 = -2t$ . Dividing both sides of this equation by  $-2$  yields  $8 = t$ . Thus, if the system has no solution, the value of  $t$  is 8.

Alternate approach: A system of two linear equations in two variables,  $x$  and  $y$ , has no solution if the lines represented by the equations in the  $xy$ -plane are parallel and distinct. Lines represented by equations in the form  $Ax + By = C$ , where  $A$ ,  $B$ , and  $C$  are constant terms, are parallel if the ratio of the  $x$ -coefficients is equal to the ratio of the  $y$ -coefficients, and distinct if the ratio of the  $x$ -coefficients are not equal to the ratio of the constant terms. Subtracting  $10y$  from both sides of the first equation in the given system yields  $(4x - 6y) - (10y) = (10y + 2) - (10y)$ , or  $4x - 16y = 2$ . Subtracting  $2x$  from both sides of the second equation in the given system yields  $(ty) - (2x) = (\frac{1}{2} + 2x) - (2x)$ , or  $-2x + ty = \frac{1}{2}$ . The ratio of the  $x$ -coefficients for these equations is  $-\frac{2}{4}$ , or  $-\frac{1}{2}$ . The ratio of the  $y$ -coefficients for these equations is  $-\frac{t}{16}$ . The ratio of the constant terms for these equations is  $\frac{1/2}{2}$ , or  $\frac{1}{4}$ . Since the ratio of the  $x$ -coefficients,  $-\frac{1}{2}$ , is not equal to the ratio of the constants,  $\frac{1}{4}$ , the lines represented by the equations are distinct. Setting the ratio of the  $x$ -coefficients equal to the ratio of the  $y$ -coefficients yields  $-\frac{1}{2} = -\frac{t}{16}$ . Multiplying both sides of this equation by  $-16$  yields  $(-\frac{1}{2})(-16) = (-\frac{t}{16})(-16)$ , or  $t = 8$ . Therefore, when  $t = 8$ , the lines represented by these equations are parallel. Thus, if the system has no solution, the value of  $t$  is 8.

Question Difficulty: Hard

# Question ID b450ab03

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: b450ab03

An employee at a restaurant prepares sandwiches and salads. It takes the employee **1.5** minutes to prepare a sandwich and **1.9** minutes to prepare a salad. The employee spends a total of **46.1** minutes preparing  $x$  sandwiches and  $y$  salads. Which equation represents this situation?

- A.  $1.9x + 1.5y = 46.1$
- B.  $1.5x + 1.9y = 46.1$
- C.  $x + y = 46.1$
- D.  $30.7x + 24.3y = 46.1$

ID: b450ab03 Answer

Correct Answer: B

## Rationale

Choice B is correct. It's given that the employee takes **1.5** minutes to prepare a sandwich. Multiplying **1.5** by the number of sandwiches,  $x$ , yields  **$1.5x$** , the amount of time the employee spends preparing  $x$  sandwiches. It's also given that the employee takes **1.9** minutes to prepare a salad. Multiplying **1.9** by the number of salads,  $y$ , yields  **$1.9y$** , the amount of time the employee spends preparing  $y$  salads. It follows that the total amount of time, in minutes, the employee spends preparing  $x$  sandwiches and  $y$  salads is  **$1.5x + 1.9y$** . It's given that the employee spends a total of **46.1** minutes preparing  $x$  sandwiches and  $y$  salads. Thus, the equation  **$1.5x + 1.9y = 46.1$**  represents this situation.

Choice A is incorrect. This equation represents a situation where it takes the employee **1.9** minutes, rather than **1.5** minutes, to prepare a sandwich and **1.5** minutes, rather than **1.9** minutes, to prepare a salad.

Choice C is incorrect. This equation represents a situation where it takes the employee **1** minute, rather than **1.5** minutes, to prepare a sandwich and **1** minute, rather than **1.9** minutes, to prepare a salad.

Choice D is incorrect. This equation represents a situation where it takes the employee **30.7** minutes, rather than **1.5** minutes, to prepare a sandwich and **24.3** minutes, rather than **1.9** minutes, to prepare a salad.

Question Difficulty: Easy

# Question ID b3abf40f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: b3abf40f

$$F(x) = \frac{9}{5}(x - 273.15) + 32$$

The function  $F$  gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of  $x$  kelvins. If a temperature increased by 9.10 kelvins, by how much did the temperature increase, in degrees Fahrenheit?

- A. 16.38
- B. 48.38
- C. 475.29
- D. 507.29

ID: b3abf40f Answer

Correct Answer: A

## Rationale

Choice A is correct. It's given that the function  $F(x) = \frac{9}{5}(x - 273.15) + 32$  gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of  $x$  kelvins. A temperature that increased by 9.10 kelvins means that the value of  $x$  increased by 9.10 kelvins. It follows that an increase in  $x$  by 9.10 increases  $F(x)$  by  $\frac{9}{5}(9.10)$ , or 16.38. Therefore, if a temperature increased by 9.10 kelvins, the temperature increased by 16.38 degrees Fahrenheit.

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

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

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

Question Difficulty: Hard

# Question ID 6ac23de7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 6ac23de7

$$\frac{4x}{5} = 20$$

In the equation above, what is the value of  $x$ ?

A. 25

B. 24

C. 16

D. 15

ID: 6ac23de7 Answer

Correct Answer: A

## Rationale

Choice A is correct. Multiplying both sides of the equation by 5 results in  $4x = 100$ . Dividing both sides of the resulting equation by 4 results in  $x = 25$ .

Choice B is incorrect and may result from adding 20 and 4. Choice C is incorrect and may result from dividing 20 by 5 and then multiplying the result by 4. Choice D is incorrect and may result from subtracting 5 from 20.

Question Difficulty: Easy

# Question ID 6e6a3241

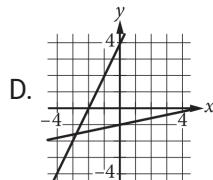
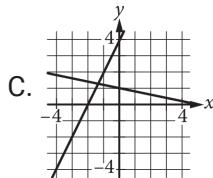
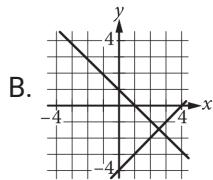
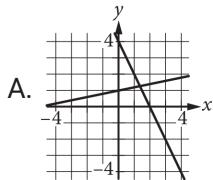
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■ ■ □

ID: 6e6a3241

$$x + 5y = 5$$

$$2x - y = -4$$

Which of the following graphs in the  $xy$ -plane could be used to solve the system of equations above?



ID: 6e6a3241 Answer

Correct Answer: C

## Rationale

Choice C is correct. The graph of a system of equations is the graph that shows the lines represented by each of the equations in the system. The x-intercept of the graph of each given equation can be found by substituting 0 for y in each equation:  $x + 5(0) = 5$ , or  $x = 5$ , and  $2x - 0 = -4$ , or  $x = -2$ . The y-intercept of the graph of each equation can be found by substituting 0 for x in each equation:  $0 + 5y = 5$ , or  $y = 1$ , and  $2(0) - y = -4$  or  $y = 4$ . Using these x- and y- intercept values, the line that has equation  $x + 5y = 5$  passes through the points  $(0,1)$  and  $(5,0)$ , and the line that has equation  $2x - y = -4$  passes through the points  $(0,4)$  and  $(-2,0)$ . Only the lines in choice C pass through these points and can be used to solve the given system of equations.

Choices A, B, and D are incorrect. In choices A and B, neither line passes through  $(0,1)$  and  $(5,0)$  or  $(0,4)$  and  $(-2,0)$ . In choice D, although one line passes through  $(0,4)$  and  $(-2,0)$  the other line doesn't pass through  $(0,1)$  and  $(5,0)$ .

**Question Difficulty:** Medium

# Question ID e6cb2402

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: e6cb2402

$3(kx + 13) = \frac{48}{17}x + 36$  In the given equation,  $k$  is a constant. The equation has no solution. What is the value of  $k$ ?

ID: e6cb2402 Answer

Correct Answer: .9411, .9412, 16/17

## Rationale

The correct answer is  $\frac{16}{17}$ . It's given that the equation  $3(kx + 13) = \frac{48}{17}x + 36$  has no solution. A linear equation in the form  $ax + b = cx + d$ , where  $a, b, c$ , and  $d$  are constants, has no solution only when the coefficients of  $x$  on each side of the equation are equal and the constant terms aren't equal. Dividing both sides of the given equation by 3 yields  $kx + 13 = \frac{48}{51}x + \frac{36}{3}$ , or  $kx + 13 = \frac{16}{17}x + 12$ . Since the coefficients of  $x$  on each side of the equation must be equal, it follows that the value of  $k$  is  $\frac{16}{17}$ . Note that 16/17, .9411, .9412, and 0.941 are examples of ways to enter a correct answer.

Question Difficulty: Hard

# Question ID e470e19d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: e470e19d

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: e470e19d 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 f7e39fe9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: f7e39fe9

$x$	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: f7e39fe9 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 aff28230

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: aff28230

$x = 10$   $y = x + 21$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $y$ ?

- A. 2.1
- B. 10
- C. 21
- D. 31

ID: aff28230 Answer

Correct Answer: D

## Rationale

Choice D is correct. It's given by the first equation in the given system of equations that  $x = 10$ . Substituting 10 for  $x$  in the second equation in the given system yields  $y = 10 + 21$ , or  $y = 31$ . Therefore, the value of  $y$  is 31.

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

Choice B is incorrect. This is the value of  $x$ , not the value of  $y$ .

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

Question Difficulty: Easy

# Question ID f5929f7a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: f5929f7a

$y = -\frac{1}{9}x$   $y = \frac{1}{2}x$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $x$ ?

- A.  $-9$
- B.  $-7$
- C.  $0$
- D.  $2$

ID: f5929f7a Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given by the first equation in the system that  $y = -\frac{1}{9}x$ . Substituting  $-\frac{1}{9}x$  for  $y$  in the second equation in the system yields  $-\frac{1}{9}x = \frac{1}{2}x$ . Multiplying the left-hand side of this equation by  $\frac{2}{2}$  and the right-hand side by  $\frac{9}{9}$  yields  $-\frac{2}{18}x = \frac{9}{18}x$ . Adding  $\frac{2}{18}x$  to both sides of this equation yields  $0 = \frac{11}{18}x$ . Multiplying both sides of this equation by  $\frac{18}{11}$  yields  $x = 0$ .

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

Question Difficulty: Medium

# Question ID 6c71f3ec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

## ID: 6c71f3ec

A salesperson's total earnings consist of a base salary of  $x$  dollars per year, plus commission earnings of 11% of the total sales the salesperson makes during the year. This year, the salesperson has a goal for the total earnings to be at least 3 times and at most 4 times the base salary. Which of the following inequalities represents all possible values of total sales  $s$ , in dollars, the salesperson can make this year in order to meet that goal?

- A.  $2x \leq s \leq 3x$
- B.  $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$
- C.  $3x \leq s \leq 4x$
- D.  $\frac{3}{0.11}x \leq s \leq \frac{4}{0.11}x$

## ID: 6c71f3ec Answer

**Correct Answer:** B

### Rationale

Choice B is correct. It's given that a salesperson's total earnings consist of a base salary of  $x$  dollars per year plus commission earnings of 11% of the total sales the salesperson makes during the year. If the salesperson makes  $s$  dollars in total sales this year, the salesperson's total earnings can be represented by the expression  $x + 0.11s$ . It's also given that the salesperson has a goal for the total earnings to be at least 3 times and at most 4 times the base salary, which can be represented by the expressions  $3x$  and  $4x$ , respectively. Therefore, this situation can be represented by the inequality  $3x \leq x + 0.11s \leq 4x$ . Subtracting  $x$  from each part of this inequality yields  $2x \leq 0.11s \leq 3x$ . Dividing each part of this inequality by 0.11 yields  $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$ . Therefore, the inequality  $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$  represents all possible values of total sales  $s$ , in dollars, the salesperson can make this year in order to meet their goal.

Choice A is incorrect. This inequality represents a situation in which the total sales, rather than the total earnings, are at least 2 times and at most 3 times, rather than at least 3 times and at most 4 times, the base salary.

Choice C is incorrect. This inequality represents a situation in which the total sales, rather than the total earnings, are at least 3 times and at most 4 times the base salary.

Choice D is incorrect. This inequality represents a situation in which the total earnings are at least 4 times and at most 5 times, rather than at least 3 times and at most 4 times, the base salary.

**Question Difficulty:** Hard

# Question ID 7392dfc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 7392dfc1

Which of the following is equivalent to  $4x + 6 = 12$ ?

- A.  $2x + 4 = 6$
- B.  $x + 3 = 3$
- C.  $3x + 2 = 4$
- D.  $2x + 3 = 6$

ID: 7392dfc1 Answer

Correct Answer: D

## Rationale

Choice D is correct. Dividing each side of the original equation by 2 yields  $\frac{4x + 6}{2} = \frac{12}{2}$ , which simplifies to  $2x + 3 = 6$ .

Choice A is incorrect. Dividing each side of the original equation by 2 gives  $2x + 3 = 6$ , which is not equivalent to  $2x + 4 = 6$ .

Choice B is incorrect. Dividing each side of the original equation by 4 gives  $x + \frac{3}{2} = 3$ , which is not equivalent to  $x + 3 = 3$ .

Choice C is incorrect. Dividing each side of the original equation by 3 gives  $\frac{4}{3}x + 2 = 4$ , which is not equivalent to  $3x + 2 = 4$ .

Question Difficulty: Easy

# Question ID 93954cfa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 93954cfa

One pound of grapes costs \$2. At this rate, how many dollars will  $c$  pounds of grapes cost?

- A.  $2c$
- B.  $2+c$
- C.  $\frac{2}{c}$
- D.  $\frac{c}{2}$

ID: 93954cfa Answer

Correct Answer: A

## Rationale

Choice A is correct. If one pound of grapes costs \$2, two pounds of grapes will cost 2 times \$2, three pounds of grapes will cost 3 times \$2, and so on. Therefore,  $c$  pounds of grapes will cost  $c$  times \$2, which is  $2c$  dollars.

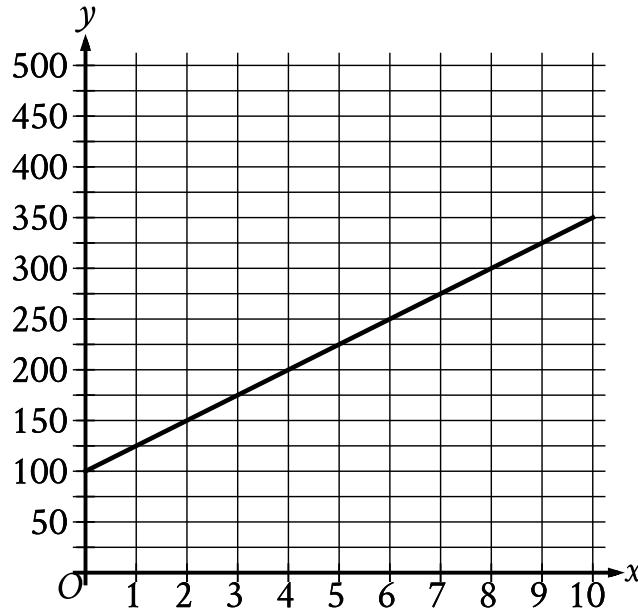
Choice B is incorrect and may result from incorrectly adding instead of multiplying. Choice C is incorrect and may result from assuming that  $c$  pounds cost \$2, and then finding the cost per pound. Choice D is incorrect and could result from incorrectly assuming that 2 pounds cost \$ $c$ , and then finding the cost per pound.

Question Difficulty: Easy

# Question ID 5cf1bbc9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■ ■ □

ID: 5cf1bbc9



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: 5cf1bbc9 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 74c03c21

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 74c03c21

A bus traveled on the highway and on local roads to complete a trip of **160 miles**. The trip took **4 hours**. The bus traveled at an average speed of **55 miles per hour (mph)** on the highway and an average speed of **25 mph** on local roads. If  $x$  is the time, in hours, the bus traveled on the highway and  $y$  is the time, in hours, it traveled on local roads, which system of equations represents this situation?

$$55x + 25y = 4$$

A.  $x + y = 160$

$$55x + 25y = 160$$

B.  $x + y = 4$

$$25x + 55y = 4$$

C.  $x + y = 160$

$$25x + 55y = 160$$

D.  $x + y = 4$

ID: 74c03c21 Answer

Correct Answer: B

## Rationale

Choice B is correct. If the bus traveled at an average speed of **55 miles per hour (mph)** on the highway for  $x$  hours, then the bus traveled  $55x$  miles on the highway. If the bus traveled at an average speed of **25 mph** on local roads for  $y$  hours, then the bus traveled  $25y$  miles on local roads. It's given that the trip was **160 miles**. This can be represented by the equation  $55x + 25y = 160$ . It's also given that the trip took **4 hours**. This can be represented by the equation  $x + y = 4$ . Therefore, the system consisting of the equations  $55x + 25y = 160$  and  $x + y = 4$  represents this situation.

Choice A is incorrect. This system of equations represents a situation where the trip was **4 miles** and took **160 hours**.

Choice C is incorrect. This system of equations represents a situation where the trip was **4 miles** and took **160 hours**, and the bus traveled at an average speed of **25 mph** on the highway and **55 mph** on local roads.

Choice D is incorrect. This system of equations represents a situation where the bus traveled at an average speed of **25 mph** on the highway and **55 mph** on local roads.

Question Difficulty: Medium

# Question ID 9c7741c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 9c7741c6

On a 210-mile trip, Cameron drove at an average speed of 60 miles per hour for the first  $x$  hours. He then completed the trip, driving at an average speed of 50 miles per hour for the remaining  $y$  hours. If  $x = 1$ , what is the value of  $y$ ?

ID: 9c7741c6 Answer

## Rationale

The correct answer is 3. It's given that Cameron drove 60 miles per hour for  $x$  hours; therefore, the distance driven at this speed can be represented by  $60x$ . He then drove 50 miles per hour for  $y$  hours; therefore, the distance driven at this speed can be represented by  $50y$ . Since Cameron drove 210 total miles, the equation  $60x + 50y = 210$  represents this situation. If  $x = 1$ , substitution yields  $60(1) + 50y = 210$ , or  $60 + 50y = 210$ . Subtracting 60 from both sides of this equation yields  $50y = 150$ . Dividing both sides of this equation by 50 yields  $y = 3$ .

**Question Difficulty:** Medium

# Question ID 68f2cbaf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 68f2cbaf

Ty set a goal to walk at least **24** kilometers every day to prepare for a multiday hike. On a certain day, Ty plans to walk at an average speed of **4** kilometers per hour. What is the minimum number of hours Ty must walk on that day to fulfill the daily goal?

- A. **4**
- B. **6**
- C. **20**
- D. **24**

ID: 68f2cbaf Answer

Correct Answer: B

## Rationale

Choice B is correct. It's given that Ty plans to walk at an average speed of **4** kilometers per hour. The number of kilometers Ty will walk is determined by the expression  **$4s$** , where  **$s$**  is the number of hours Ty walks. The given goal of at least **24** kilometers means that the inequality  **$4s \geq 24$**  represents the situation. Dividing both sides of this inequality by **4** gives  **$s \geq 6$** , which corresponds to a minimum of **6** hours Ty must walk.

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: Easy

# Question ID 8abed0fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 8abed0fb

$$y = 2x + 3$$

$$x = 1$$

What is the solution  $(x, y)$  to the given system of equations?

- A.  $(1, 2)$
- B.  $(1, 5)$
- C.  $(2, 3)$
- D.  $(2, 7)$

ID: 8abed0fb Answer

Correct Answer: B

## Rationale

Choice B is correct. Since it's given that  $x = 1$ , substituting 1 for x in the first equation yields  $y = 2(1) + 3$ . Simplifying the right-hand side of this equation yields  $y = 2 + 3$ , or  $y = 5$ . Therefore, the ordered pair  $(1, 5)$  is a solution to the given system of equations.

Choice A is incorrect and may result from a calculation error when substituting 1 for x in the first equation. Choices C and D are incorrect. Because it's given that  $x = 1$ , x cannot equal 2 as stated in these ordered pairs.

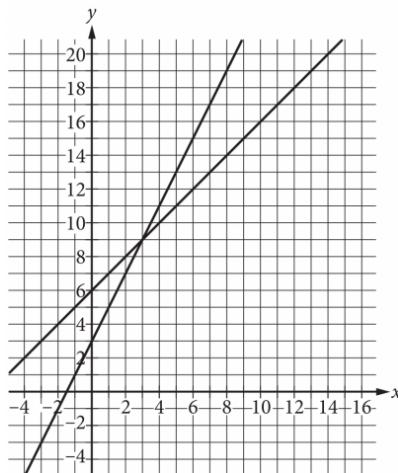
Question Difficulty: Easy

# Question ID e1259a5a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: e1259a5a

A system of two linear equations is graphed in the  $xy$ -plane below.



Which of the following points is the solution to the system of equations?

- A. (3,9)
- B. (6,15)
- C. (8,10)
- D. (12,18)

ID: e1259a5a Answer

**Correct Answer:** A

## Rationale

Choice A is correct. The solution to this system of linear equations is the point that lies on both lines graphed, or the point of intersection of the two lines. According to the graphs, the point of intersection occurs when  $x = 3$  and  $y = 9$ , or at the point (3,9).

Choices B and D are incorrect. Each of these points lies on one line, but not on both lines in the  $xy$ -plane. Choice C is incorrect. This point doesn't lie on either of the lines graphed in the  $xy$ -plane.

**Question Difficulty:** Easy

# Question ID b988eeec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: b988eeec

The functions  $f$  and  $g$  are defined as  $f(x) = \frac{1}{4}x - 9$  and  $g(x) = \frac{3}{4}x + 21$ . If the function  $h$  is defined as  $h(x) = f(x) + g(x)$ , what is the  $x$ -coordinate of the  $x$ -intercept of the graph of  $y = h(x)$  in the  $xy$ -plane?

ID: b988eeec Answer

Correct Answer: -12

## Rationale

The correct answer is **-12**. It's given that the functions  $f$  and  $g$  are defined as  $f(x) = \frac{1}{4}x - 9$  and  $g(x) = \frac{3}{4}x + 21$ . If the function  $h$  is defined as  $h(x) = f(x) + g(x)$ , then substituting  $\frac{1}{4}x - 9$  for  $f(x)$  and  $\frac{3}{4}x + 21$  for  $g(x)$  in this function yields  $h(x) = \frac{1}{4}x - 9 + \frac{3}{4}x + 21$ . This can be rewritten as  $h(x) = \frac{4}{4}x + 12$ , or  $h(x) = x + 12$ . The  $x$ -intercept of a graph in the  $xy$ -plane is the point on the graph where  $y = 0$ . The equation representing the graph of  $y = h(x)$  is  $y = x + 12$ . Substituting  $0$  for  $y$  in this equation yields  $0 = x + 12$ . Subtracting  $12$  from both sides of this equation yields  $-12 = x$ , or  $x = -12$ . Therefore, the  $x$ -coordinate of the  $x$ -intercept of the graph of  $y = h(x)$  in the  $xy$ -plane is **-12**.

Question Difficulty: Hard

# Question ID 3d04de9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

## ID: 3d04de9c

A principal used a total of **25** flags that were either blue or yellow for field day. The principal used **20** blue flags. How many yellow flags were used?

- A. **5**
- B. **20**
- C. **25**
- D. **30**

## ID: 3d04de9c Answer

**Correct Answer:** A

### Rationale

Choice A is correct. It's given that a principal used a total of **25** blue flags and yellow flags. It's also given that of the **25** flags used, **20** flags were blue. Subtracting the number of blue flags used from the total number of flags used results in the number of yellow flags used. It follows that the number of yellow flags used is  $25 - 20$ , or **5**.

Choice B is incorrect. This is the number of blue flags used. Choice C is incorrect. This is the total number of flags used.

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

**Question Difficulty:** Easy

# Question ID 70feb725

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 70feb725

During a month, Morgan ran  $r$  miles at 5 miles per hour and biked  $b$  miles at 10 miles per hour. She ran and biked a total of 200 miles that month, and she biked for twice as many hours as she ran. What is the total number of miles that Morgan biked during the month?

- A. 80
- B. 100
- C. 120
- D. 160

ID: 70feb725 Answer

**Correct Answer:** D

## Rationale

Choice D is correct. The number of hours Morgan spent running or biking can be calculated by dividing the distance she traveled during that activity by her speed, in miles per hour, for that activity. So the number of hours she ran can be

represented by the expression  $\frac{r}{5}$ , and the number of hours she biked can be represented by the expression  $\frac{b}{10}$ . It's given

that she biked for twice as many hours as she ran, so this can be represented by the equation  $\frac{b}{10} = 2\left(\frac{r}{5}\right)$ , which can be rewritten as  $b = 4r$ . It's also given that she ran  $r$  miles and biked  $b$  miles, and that she ran and biked a total of 200 miles.

This can be represented by the equation  $r + b = 200$ . Substituting  $4r$  for  $b$  in this equation yields  $r + 4r = 200$ , or  $5r = 200$ . Solving for  $r$  yields  $r = 40$ . Determining the number of miles she biked,  $b$ , can be found by substituting 40 for  $r$  in  $r + b = 200$ , which yields  $40 + b = 200$ . Solving for  $b$  yields  $b = 160$ .

Choices A, B, and C are incorrect because they don't satisfy that Morgan biked for twice as many hours as she ran. In choice A, if she biked 80 miles, then she ran 120 miles, which means she biked for 8 hours and ran for 24 hours. In choice B, if she biked 100 miles, then she ran 100 miles, which means she biked for 10 hours and ran for 20 hours. In choice C, if she biked 120 miles, then she ran for 80 miles, which means she biked for 12 hours and ran for 16 hours.

**Question Difficulty:** Hard

## Question ID 8a87c2c8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 8a87c2c8

$x + 3 = -2y + 5$   $x - 3 = 2y + 7$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $2x$ ?

- A. **-2**
- B. **6**
- C. **12**
- D. **24**

ID: 8a87c2c8 Answer

**Correct Answer:** C

### Rationale

Choice C is correct. Adding the second equation in the given system to the first equation in the given system yields  $(x + 3) + (x - 3) = (-2y + 5) + (2y + 7)$ . Adding like terms in this equation yields  $2x = 12$ . Thus, the value of  $2x$  is 12.

Choice A is incorrect. This is the value of  $y$ , not  $2x$ . Choice B is incorrect. This is the value of  $x$ , not  $2x$ .

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

**Question Difficulty:** Medium

# Question ID 60f71697

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 60f71697

$8x = 88$  What value of  $x$  is the solution to the given equation?

- A. 11
- B. 80
- C. 96
- D. 704

ID: 60f71697 Answer

Correct Answer: A

## Rationale

Choice A is correct. Dividing both sides of the given equation by 8 yields  $x = 11$ . Therefore, 11 is the solution to the given equation.

Choice B is incorrect. This is the solution to the equation  $x + 8 = 88$ .

Choice C is incorrect. This is the solution to the equation  $x - 8 = 88$ .

Choice D is incorrect. This is the solution to the equation  $\frac{x}{8} = 88$ .

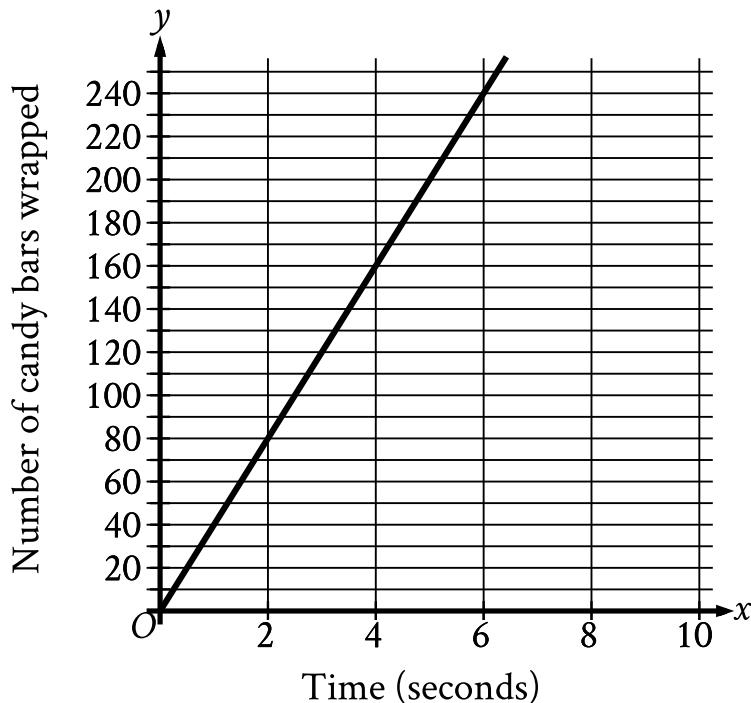
Question Difficulty: Easy

# Question ID 13294295

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 13294295

The graph shown models the number of candy bars a certain machine wraps with a label in  $x$  seconds.



According to the graph, what is the estimated number of candy bars the machine wraps with a label per second?

- A. 2
- B. 40
- C. 78
- D. 80

ID: 13294295 Answer

Correct Answer: B

### Rationale

Choice B is correct. For the graph shown, the  $x$ -axis represents time, in seconds, and the  $y$ -axis represents the number of candy bars wrapped. The slope of a line in the  $xy$ -plane is the change in  $y$  for each 1-unit increase in  $x$ . It follows that the slope of the graph shown represents the estimated number of candy bars the machine wraps with a label per second. The slope,  $m$ , of a line in the  $xy$ -plane can be found using any two points,  $(x_1, y_1)$  and  $(x_2, y_2)$ , on the line and the slope formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . The graph shown passes through the points  $(0, 0)$  and  $(2, 80)$ . Substituting these points for  $(x_1, y_1)$  and  $(x_2, y_2)$ , respectively, in the slope formula yields  $m = \frac{80 - 0}{2 - 0}$ , which is equivalent to  $m = \frac{80}{2}$ , or  $m = 40$ . Therefore, the estimated number of candy bars the machine wraps with a label per second is 40.

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:** Easy

# Question ID ed92fb68

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: ed92fb68

$$4x + 5y = 100$$

$$5x + 4y = 62$$

If the system of equations above has solution  $(x, y)$ ,

what is the value of  $x + y$ ?

A. 0

B. 9

C. 18

D. 38

ID: ed92fb68 Answer

**Correct Answer:** C

## Rationale

Choice C is correct. Adding the given equations yields  $9x + 9y = 162$ . Dividing each side of the equation  $9x + 9y = 162$  by 9 gives  $x + y = 18$ .

Choice A is incorrect and may result from incorrectly adding the equations. Choice B is incorrect and may result from conceptual or computational errors. Choice D is incorrect. This value is equivalent to  $y - x$ .

**Question Difficulty:** Medium

# Question ID 1a621af4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: 1a621af4

A number  $x$  is at most 2 less than 3 times the value of  $y$ . If the value of  $y$  is  $-4$ , what is the greatest possible value of  $x$ ?

ID: 1a621af4 Answer

Correct Answer: -14

## Rationale

The correct answer is  $-14$ . It's given that a number  $x$  is at most 2 less than 3 times the value of  $y$ . Therefore,  $x$  is less than or equal to 2 less than 3 times the value of  $y$ . The expression  $3y$  represents 3 times the value of  $y$ . The expression  $3y - 2$  represents 2 less than 3 times the value of  $y$ . Therefore,  $x$  is less than or equal to  $3y - 2$ . This can be shown by the inequality  $x \leq 3y - 2$ . Substituting  $-4$  for  $y$  in this inequality yields  $x \leq 3(-4) - 2$  or,  $x \leq -14$ . Therefore, if the value of  $y$  is  $-4$ , the greatest possible value of  $x$  is  $-14$ .

Question Difficulty: Hard

# Question ID 3e9eaffc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 3e9eaffc

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: 3e9eaffc 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 af2ba762

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

## ID: af2ba762

According to data provided by the US Department of Energy, the average price per gallon of regular gasoline in the United States from September 1, 2014, to December 1, 2014, is modeled by the function  $F$  defined below, where  $F(x)$  is the average price per gallon  $x$  months after September 1.

$$F(x) = 2.74 - 0.19(x - 3)$$

The constant 2.74 in this function estimates which of the following?

- A. The average monthly decrease in the price per gallon
- B. The difference in the average price per gallon from September 1, 2014, to December 1, 2014
- C. The average price per gallon on September 1, 2014
- D. The average price per gallon on December 1, 2014

## ID: af2ba762 Answer

**Correct Answer:** D

### Rationale

Choice D is correct. Since 2.74 is a constant term, it represents an actual price of gas rather than a measure of change in gas price. To determine what gas price it represents, find  $x$  such that  $F(x) = 2.74$ , or  $2.74 = 2.74 - 0.19(x - 3)$ . Subtracting 2.74 from both sides gives  $0 = -0.19(x - 3)$ . Dividing both sides by  $-0.19$  results in  $0 = x - 3$ , or  $x = 3$ . Therefore, the average price of gas is \$2.74 per gallon 3 months after September 1, 2014, which is December 1, 2014.

Choice A is incorrect. Since 2.74 is a constant, not a multiple of  $x$ , it cannot represent a rate of change in price. Choice B is incorrect. The difference in the average price from September 1, 2014, to December 1, 2014, is  $F(3) - F(0) = 2.74 - 0.19(3 - 3) - (2.74 - 0.19(0 - 3)) = 2.74 - (2.74 + 0.57) = -0.57$ , which is not 2.74. Choice C is incorrect. The average price per gallon on September 1, 2014, is  $F(0) = 2.74 - 0.19(0 - 3) = 2.74 + 0.57 = 3.31$ , which is not 2.74.

**Question Difficulty:** Hard

# Question ID 19fdf387

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

## ID: 19fdf387

In the  $xy$ -plane, the graph of  $y = x + 3$  intersects the graph of  $y = 2x - 6$  at the point  $(a,b)$ . What is the value of  $a$ ?

- A. 3
- B. 6
- C. 9
- D. 12

## ID: 19fdf387 Answer

**Correct Answer:** C

### Rationale

Choice C is correct. Since the graph of  $y = x + 3$  intersects the graph of  $y = 2x - 6$  at the point  $(a,b)$ , the ordered pair  $(a,b)$  is the solution to the system of linear equations consisting of  $y = x + 3$  and  $y = 2x - 6$ , and the value of  $a$  is the value of  $x$  in the solution of this system. Since both  $x + 3$  and  $2x - 6$  are equal to  $y$ , it follows that  $x + 3 = 2x - 6$ . Subtracting  $x$  from and adding 6 to both sides of the equation yields  $9 = x$ . Therefore, the value of  $a$  is 9.

Choices A and B are incorrect and may result from a calculation or conceptual error in solving the system of equations consisting of  $y = x + 3$  and  $y = 2x - 6$ . Choice D is incorrect. This is the value of  $b$ , not  $a$ .

**Question Difficulty:** Medium

# Question ID a775af14

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: a775af14

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: a775af14 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 db0107df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: db0107df

The  $y$ -intercept of the graph of  $12x + 2y = 18$  in the  $xy$ -plane is  $(0, y)$ . What is the value of  $y$ ?

ID: db0107df Answer

Correct Answer: 9

## Rationale

The correct answer is **9**. It's given that the  $y$ -intercept of the graph of  $12x + 2y = 18$  in the  $xy$ -plane is  $(0, y)$ . Substituting **0** for  $x$  in the equation  $12x + 2y = 18$  yields  $12(0) + 2y = 18$ , or  $2y = 18$ . Dividing both sides of this equation by **2** yields  $y = 9$ . Therefore, the value of  $y$  is **9**.

Question Difficulty: Easy

# Question ID b9835972

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: b9835972

In the  $xy$ -plane, line  $\ell$  passes through the point  $(0, 0)$  and is parallel to the line represented by the equation  $y = 8x + 2$ . If line  $\ell$  also passes through the point  $(3, d)$ , what is the value of  $d$ ?

ID: b9835972 Answer

Correct Answer: 24

## Rationale

The correct answer is **24**. A line in the  $xy$ -plane can be defined by the equation  $y = mx + b$ , where  $m$  is the slope of the line and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the line. It's given that line  $\ell$  passes through the point  $(0, 0)$ . Therefore, the  $y$ -coordinate of the  $y$ -intercept of line  $\ell$  is **0**. It's given that line  $\ell$  is parallel to the line represented by the equation  $y = 8x + 2$ . Since parallel lines have the same slope, it follows that the slope of line  $\ell$  is **8**. Therefore, line  $\ell$  can be defined by an equation in the form  $y = mx + b$ , where  $m = 8$  and  $b = 0$ . Substituting **8** for  $m$  and **0** for  $b$  in  $y = mx + b$  yields the equation  $y = 8x + 0$ , or  $y = 8x$ . If line  $\ell$  passes through the point  $(3, d)$ , then when  $x = 3$ ,  $y = d$  for the equation  $y = 8x$ . Substituting **3** for  $x$  and  $d$  for  $y$  in the equation  $y = 8x$  yields  $d = 8(3)$ , or  $d = 24$ .

Question Difficulty: Hard

# Question ID df32b09c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: df32b09c

Tom scored 85, 78, and 98 on his first three exams in history class. Solving which inequality gives the score,  $G$ , on Tom's fourth exam that will result in a mean score on all four exams of at least 90?

A.  $90 - (85 + 78 + 98) \leq 4G$

B.  $4G + 85 + 78 + 98 \geq 360$

C.  $\frac{(G + 85 + 78 + 98)}{4} \geq 90$

D.  $\frac{(85 + 78 + 98)}{4} \geq 90 - 4G$

ID: df32b09c Answer

Correct Answer: C

## Rationale

Choice C is correct. The mean of the four scores ( $G$ , 85, 78, and 98) can be expressed as

$$\frac{G + 85 + 78 + 98}{4}$$

that expresses the condition that the mean score is at least 90 can therefore be written as

$$\frac{G + 85 + 78 + 98}{4} \geq 90$$

Choice A is incorrect. The sum of the scores ( $G$ , 85, 78, and 98) isn't divided by 4 to express the mean. Choice B is incorrect and may be the result of an algebraic error when multiplying both sides of the inequality by 4. Choice D is incorrect because it doesn't include  $G$  in the mean with the other three scores.

Question Difficulty: Easy

# Question ID e1248a5c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: e1248a5c

$$\frac{1}{2}x + \frac{1}{3}y = \frac{1}{6}$$

In the system of equations below,  $a$  and  $c$  are constants.  $ax + y = c$

If the system of equations has an infinite number of solutions  $(x, y)$ , what is the value of  $a$ ?

A.  $-\frac{1}{2}$

B. 0

C.  $\frac{1}{2}$

D.  $\frac{3}{2}$

ID: e1248a5c Answer

Correct Answer: D

## Rationale

Choice D is correct. A system of two linear equations has infinitely many solutions if one equation is equivalent to the other. This means that when the two equations are written in the same form, each coefficient or constant in one equation is equal to the corresponding coefficient or constant in the other equation multiplied by the same number. The equations in the given system of equations are written in the same form, with  $x$  and  $y$  on the left-hand side and a constant on the right-hand side of the equation. The coefficient of  $y$  in the second equation is equal to the coefficient of  $y$  in the first equation multiplied by 3. Therefore,  $a$ , the coefficient of  $x$  in the second equation, must be equal to 3 times the coefficient of  $x$  in the first equation:

$$a = (\frac{1}{2})(3), \text{ or } a = \frac{3}{2}.$$

Choices A, B, and C are incorrect. When  $a = -\frac{1}{2}$ ,  $a = 0$ , or  $a = \frac{1}{2}$ , the given system of equations has one solution.

Question Difficulty: Hard

# Question ID b8cbe394

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: b8cbe394

Sean rents a tent at a cost of \$11 per day plus a onetime insurance fee of \$10. Which equation represents the total cost  $c$ , in dollars, to rent the tent with insurance for  $d$  days?

- A.  $c = 11(d + 10)$
- B.  $c = 10(d + 11)$
- C.  $c = 11d + 10$
- D.  $c = 10d + 11$

ID: b8cbe394 Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that the cost of renting a tent is \$11 per day for  $d$  days. Multiplying the rental cost by the number of days yields  $\$11d$ , which represents the cost of renting the tent for  $d$  days before the insurance is added. Adding the onetime insurance fee of \$10 to the rental cost of  $\$11d$  gives the total cost  $c$ , in dollars, which can be represented by the equation  $c = 11d + 10$ .

Choice A is incorrect. This equation represents the total cost to rent the tent if the insurance fee was charged every day.

Choice B is incorrect. This equation represents the total cost to rent the tent if the daily fee was  $\$(d + 11)$  for 10 days.

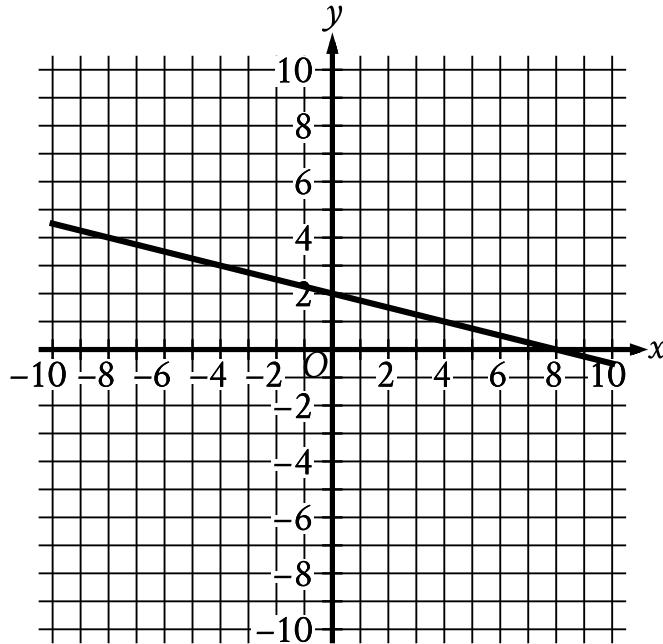
Choice D is incorrect. This equation represents the total cost to rent the tent if the daily fee was \$10 and the onetime fee was \$11.

Question Difficulty: Easy

# Question ID 05bb1af9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	3

ID: 05bb1af9



The graph of  $y = f(x) + 14$  is shown. Which equation defines function  $f$ ?

- A.  $f(x) = -\frac{1}{4}x - 12$
- B.  $f(x) = -\frac{1}{4}x + 16$
- C.  $f(x) = -\frac{1}{4}x + 2$
- D.  $f(x) = -\frac{1}{4}x - 14$

ID: 05bb1af9 Answer

Correct Answer: A

### Rationale

Choice A is correct. An equation for the graph shown can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of the graph and its  $y$ -intercept is  $(0, b)$ . Since the  $y$ -intercept of the graph shown is  $(0, 2)$ , the value of  $b$  is 2. Since the graph also passes through the point  $(4, 1)$ , the slope can be calculated as  $\frac{1-2}{4-0}$ , or  $-\frac{1}{4}$ . Therefore, the value of  $m$  is  $-\frac{1}{4}$ . Substituting  $-\frac{1}{4}$  for  $m$  and 2 for  $b$  in the equation  $y = mx + b$  yields  $y = -\frac{1}{4}x + 2$ . It's given that an equation for the graph shown is  $y = f(x) + 14$ . Substituting  $f(x) + 14$  for  $y$  in the equation  $y = -\frac{1}{4}x + 2$  yields  $f(x) + 14 = -\frac{1}{4}x + 2$ . Subtracting 14 from both sides of this equation yields  $f(x) = -\frac{1}{4}x - 12$ .

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

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

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

**Question Difficulty:** Hard

# Question ID cc7ffe02

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: cc7ffe02

Keenan made **32** cups of vegetable broth. Keenan then filled  $x$  small jars and  $y$  large jars with all the vegetable broth he made. The equation  $3x + 5y = 32$  represents this situation. Which is the best interpretation of  $5y$  in this context?

- A. The number of large jars Keenan filled
- B. The number of small jars Keenan filled
- C. The total number of cups of vegetable broth in the large jars
- D. The total number of cups of vegetable broth in the small jars

ID: cc7ffe02 Answer

Correct Answer: C

## Rationale

Choice C is correct. It's given that the equation  $3x + 5y = 32$  represents the situation where Keenan filled  $x$  small jars and  $y$  large jars with all the vegetable broth he made, which was **32** cups. Therefore,  $3x$  represents the total number of cups of vegetable broth in the small jars and  $5y$  represents the total number of cups of vegetable broth in the large jars.

Choice A is incorrect. The number of large jars Keenan filled is represented by  $y$ , not  $5y$ .

Choice B is incorrect. The number of small jars Keenan filled is represented by  $x$ , not  $5y$ .

Choice D is incorrect. The total number of cups of vegetable broth in the small jars is represented by  $3x$ , not  $5y$ .

Question Difficulty: Hard

# Question ID dae126d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: dae126d7

The boiling point of water at sea level is 212 degrees Fahrenheit ( $^{\circ}\text{F}$ ). For every 550 feet above sea level, the boiling point of water is lowered by about  $1^{\circ}\text{F}$ . Which of the following equations can be used to find the boiling point  $B$  of water, in  $^{\circ}\text{F}$ ,  $x$  feet above sea level?

- A.  $B = 550 + \frac{x}{212}$
- B.  $B = 550 - \frac{x}{212}$
- C.  $B = 212 + \frac{x}{550}$
- D.  $B = 212 - \frac{x}{550}$

ID: dae126d7 Answer

Correct Answer: D

## Rationale

Choice D is correct. It's given that the boiling point of water at sea level is  $212^{\circ}\text{F}$  and that for every 550 feet above sea level, the boiling point of water is lowered by about  $1^{\circ}\text{F}$ . Therefore, the change in the boiling point of water  $x$  feet above sea level is represented by the expression  $-\frac{x}{550}$ . Adding this expression to the boiling point of water at sea level gives the equation for the boiling point  $B$  of water, in  $^{\circ}\text{F}$ ,  $x$  feet above sea level:  $B = -\frac{x}{550} + 212$ , or  $B = 212 - \frac{x}{550}$ .

Choices A and B are incorrect and may result from using the boiling point of water at sea level as the rate of change and the rate of change as the initial boiling point of water at sea level. Choice C is incorrect and may result from representing the change in the boiling point of water as an increase rather than a decrease.

Question Difficulty: Medium

# Question ID bf5f80c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

ID: bf5f80c6

$y < -4x + 4$  Which point  $(x, y)$  is a solution to the given inequality in the  $xy$ -plane?

- A.  $(-4, 0)$
- B.  $(0, 5)$
- C.  $(2, 1)$
- D.  $(2, -1)$

ID: bf5f80c6 Answer

Correct Answer: A

## Rationale

Choice D is correct. For a point  $(x, y)$  to be a solution to the given inequality in the  $xy$ -plane, the value of the point's  $y$ -coordinate must be less than the value of  $-4x + 4$ , where  $x$  is the value of the  $x$ -coordinate of the point. This is true of the point  $(-4, 0)$  because  $0 < -4(-4) + 4$ , or  $0 < 20$ . Therefore, the point  $(-4, 0)$  is a solution to the given inequality.

Choices A, B, and C are incorrect. None of these points are a solution to the given inequality because each point's  $y$ -coordinate is greater than the value of  $-4x + 4$  for the point's  $x$ -coordinate.

Question Difficulty: Medium

# Question ID 12983c1e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 12983c1e

x	f(x)
1	5
3	13
5	21

Some values of the linear function  $f$  are shown in the table above.

Which of the following defines  $f$ ?

- A.  $f(x) = 2x + 3$
- B.  $f(x) = 3x + 2$
- C.  $f(x) = 4x + 1$
- D.  $f(x) = 5x$

ID: 12983c1e Answer

Correct Answer: C

## Rationale

Choice C is correct. Because  $f$  is a linear function of  $x$ , the equation  $f(x) = mx + b$ , where  $m$  and  $b$  are constants, can be used to define the relationship between  $x$  and  $f(x)$ . In this equation,  $m$  represents the increase in the value of  $f(x)$  for every increase in the value of  $x$  by 1. From the table, it can be determined that the value of  $f(x)$  increases by 8 for every increase in the value of  $x$  by 2. In other words, for the function  $f$  the value of  $m$  is  $\frac{8}{2}$ , or 4. The value of  $b$  can be found by substituting the values of  $x$  and  $f(x)$  from any row of the table and the value of  $m$  into the equation  $f(x) = mx + b$  and solving for  $b$ . For example, using  $x = 1$ ,  $f(x) = 5$ , and  $m = 4$  yields  $5 = 4(1) + b$ . Solving for  $b$  yields  $b = 1$ . Therefore, the equation defining the function  $f$  can be written in the form  $f(x) = 4x + 1$ .

Choices A, B, and D are incorrect. Any equation defining the linear function  $f$  must give values of  $f(x)$  for corresponding values of  $x$ , as shown in each row of the table. According to the table, if  $x = 3$ ,  $f(x) = 13$ . However, substituting  $x = 3$  into the equation given in choice A gives  $f(3) = 2(3) + 3$ , or  $f(3) = 9$ , not 13. Similarly, substituting  $x = 3$  into the equation given in choice B gives  $f(3) = 3(3) + 2$ , or  $f(3) = 11$ , not 13.

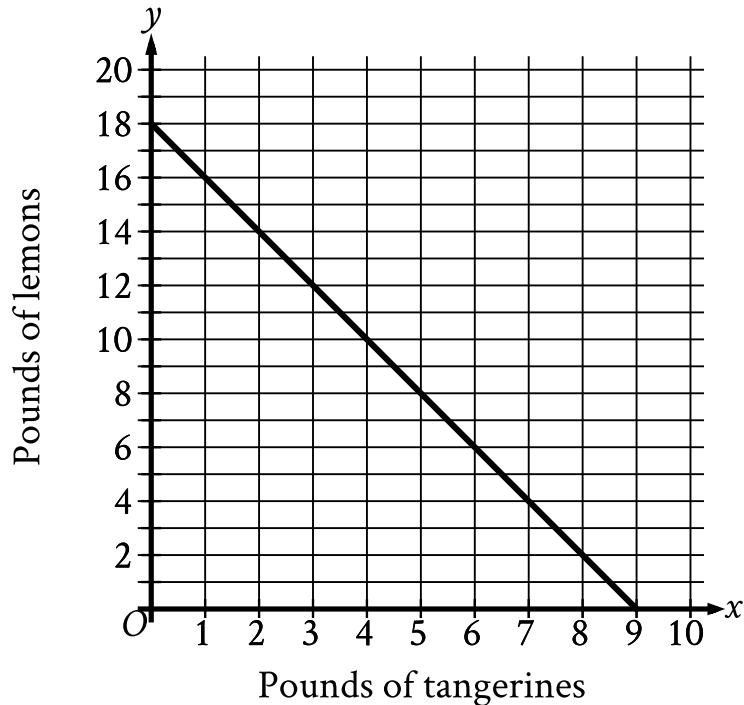
Lastly, substituting  $x = 3$  into the equation given in choice D gives  $f(3) = 5(3)$ , or  $f(3) = 15$ , not 13. Therefore, the equations in choices A, B, and D cannot define  $f$ .

**Question Difficulty:** Easy

# Question ID 8368afd1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: 8368afd1



The graph shows the possible combinations of the number of pounds of tangerines and lemons that could be purchased for \$18 at a certain store. If Melvin purchased lemons and 4 pounds of tangerines for a total of \$18, how many pounds of lemons did he purchase?

- A. 7
- B. 10
- C. 14
- D. 16

ID: 8368afd1 Answer

Correct Answer: B

### Rationale

Choice B is correct. It's given that the graph shows the possible combinations of the number of pounds of tangerines,  $x$ , and the number of pounds of lemons,  $y$ , that could be purchased for **\$18** at a certain store. If Melvin purchased lemons and **4** pounds of tangerines for a total of **\$18**, the number of pounds of lemons he purchased is represented by the  $y$ -coordinate of the point on the graph where  $x = 4$ . For the graph shown, when  $x = 4$ ,  $y = 10$ . Therefore, if Melvin purchased lemons and **4** pounds of tangerines for a total of **\$18**, then he purchased **10** pounds of lemons.

Choice A is incorrect. This is the number of pounds of tangerines Melvin purchased if he purchased tangerines and **4** pounds of lemons for a total of **\$18**.

Choice C is incorrect. This is the number of pounds of lemons Melvin purchased if he purchased lemons and **2** pounds of tangerines for a total of **\$18**.

Choice D is incorrect. This is the number of pounds of lemons Melvin purchased if he purchased lemons and **1** pound of tangerines for a total of **\$18**.

**Question Difficulty:** Easy

# Question ID ae2287e2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: ae2287e2

A certain product costs a company \$65 to make. The product is sold by a salesperson who earns a commission that is equal to 20% of the sales price of the product. The profit the company makes for each unit is equal to the sales price minus the combined cost of making the product and the commission. If the sales price of the product is \$100, which of the following equations gives the number of units,  $u$ , of the product the company sold to make a profit of \$6,840?

- A.  $(100(1 - 0.2) - 65)u = 6,840$
- B.  $(100 - 65)(1 - 0.8)u = 6,840$
- C.  $0.8(100) - 65u = 6,840$
- D.  $(0.2(100) + 65)u = 6,840$

ID: ae2287e2 Answer

Correct Answer: A

## Rationale

Choice A is correct. The sales price of one unit of the product is given as \$100. Because the salesperson is awarded a commission equal to 20% of the sales price, the expression  $100(1 - 0.2)$  gives the sales price of one unit after the commission is deducted. It is also given that the profit is equal to the sales price minus the combined cost of making the product, or \$65, and the commission:  $100(1 - 0.2) - 65$ . Multiplying this expression by  $u$  gives the profit of  $u$  units:  $(100(1 - 0.2) - 65)u$ . Finally, it is given that the profit for  $u$  units is \$6,840; therefore  $(100(1 - 0.2) - 65)u = \$6,840$ .

Choice B is incorrect. In this equation, cost is subtracted before commission and the equation gives the commission, not what the company retains after commission. Choice C is incorrect because the number of units is multiplied only by the cost but not by the sale price. Choice D is incorrect because the value 0.2 shows the commission, not what the company retains after commission.

Question Difficulty: Hard

# Question ID 70d9516e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 70d9516e

A bus is traveling at a constant speed along a straight portion of road. The equation  $d = 30t$  gives the distance  $d$ , in feet from a road marker, that the bus will be  $t$  seconds after passing the marker. How many feet from the marker will the bus be **2** seconds after passing the marker?

- A. **30**
- B. **32**
- C. **60**
- D. **90**

ID: 70d9516e Answer

**Correct Answer:** C

## Rationale

Choice C is correct. It's given that  $t$  represents the number of seconds after the bus passes the marker. Substituting **2** for  $t$  in the given equation  $d = 30t$  yields  $d = 30(2)$ , or  $d = 60$ . Therefore, the bus will be **60** feet from the marker **2** seconds after passing it.

Choice A is incorrect. This is the distance, in feet, the bus will be from the marker **1** second, not **2** seconds, after passing it.

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

Choice D is incorrect. This is the distance, in feet, the bus will be from the marker **3** seconds, not **2** seconds, after passing it.

**Question Difficulty:** Easy

# Question ID 1362ccde

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 1362ccde

$$y = 4x + 1$$

$4y = 15x - 8$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $x - y$ ?

ID: 1362ccde Answer

Correct Answer: 35

## Rationale

The correct answer is **35**. The first equation in the given system of equations defines  $y$  as  $4x + 1$ . Substituting  $4x + 1$  for  $y$  in the second equation in the given system of equations yields  $4(4x + 1) = 15x - 8$ . Applying the distributive property on the left-hand side of this equation yields  $16x + 4 = 15x - 8$ . Subtracting  $15x$  from each side of this equation yields  $x + 4 = -8$ . Subtracting 4 from each side of this equation yields  $x = -12$ . Substituting  $-12$  for  $x$  in the first equation of the given system of equations yields  $y = 4(-12) + 1$ , or  $y = -47$ . Substituting  $-12$  for  $x$  and  $-47$  for  $y$  into the expression  $x - y$  yields  $-12 - (-47)$ , or **35**.

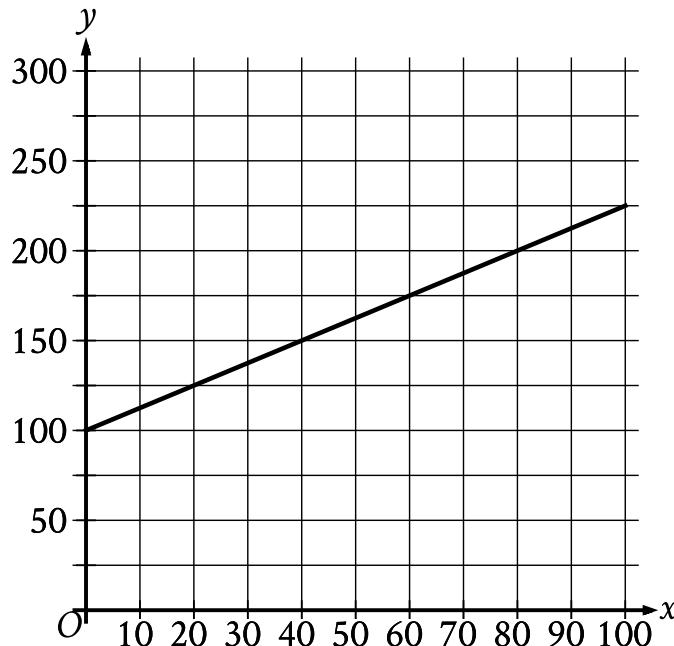
Question Difficulty: Hard

# Question ID 720e51ac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 720e51ac

The cost  $y$ , in dollars, for a manufacturer to make  $x$  rings is represented by the line shown.



What is the cost, in dollars, for the manufacturer to make 60 rings?

- A. 100
- B. 125
- C. 175
- D. 225

ID: 720e51ac Answer

Correct Answer: C

### Rationale

Choice C is correct. The line shown represents the cost  $y$ , in dollars, for a manufacturer to make  $x$  rings. For the line shown, the  $x$ -axis represents the number of rings made by the manufacturer and the  $y$ -axis represents the cost, in dollars. Therefore, the cost, in dollars, for the manufacturer to make **60** rings is represented by the  $y$ -coordinate of the point on the line that has an  $x$ -coordinate of **60**. The point on the line with an  $x$ -coordinate of **60** has a  $y$ -coordinate of **175**. Therefore, the cost, in dollars, for the manufacturer to make **60** rings is **175**.

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

Choice B is incorrect. This is the cost, in dollars, for the manufacturer to make **20** rings.

Choice D is incorrect. This is the cost, in dollars, for the manufacturer to make **100** rings.

**Question Difficulty:** Easy

# Question ID 4de87c9a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

## ID: 4de87c9a

3 more than 8 times a number  $x$  is equal to 83. Which equation represents this situation?

- A.  $(3)(8)x = 83$
- B.  $8x = 83 + 3$
- C.  $3x + 8 = 83$
- D.  $8x + 3 = 83$

## ID: 4de87c9a Answer

Correct Answer: D

### Rationale

Choice D is correct. The given phrase “8 times a number  $x$ ” can be represented by the expression  $8x$ . The given phrase “3 more than” indicates an increase of 3 to a quantity. Therefore “3 more than 8 times a number  $x$ ” can be represented by the expression  $8x + 3$ . Since it’s given that 3 more than 8 times a number  $x$  is equal to 83, it follows that  $8x + 3$  is equal to 83, or  $8x + 3 = 83$ . Therefore, the equation that represents this situation is  $8x + 3 = 83$ .

Choice A is incorrect. This equation represents 3 times the quantity 8 times a number  $x$  is equal to 83.

Choice B is incorrect. This equation represents 8 times a number  $x$  is equal to 3 more than 83.

Choice C is incorrect. This equation represents 8 more than 3 times a number  $x$  is equal to 83.

Question Difficulty: Easy

# Question ID 52cb8ea4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 52cb8ea4

$$7x - 5y = 4$$

$$4x - 8y = 9$$

If  $(x, y)$  is the solution to the system of equations above, what is the value of  $3x + 3y$ ?

- A.  $-13$
- B.  $-5$
- C.  $5$
- D.  $13$

ID: 52cb8ea4 Answer

Correct Answer: B

## Rationale

Choice B is correct. Subtracting the second equation,  $4x - 8y = 9$ , from the first equation,  $7x - 5y = 4$ , results in  $(7x - 5y) - (4x - 8y) = 4 - 9$ , or  $7x - 5y - 4x + 8y = 5$ . Combining like terms on the left-hand side of this equation yields  $3x + 3y = -5$ .

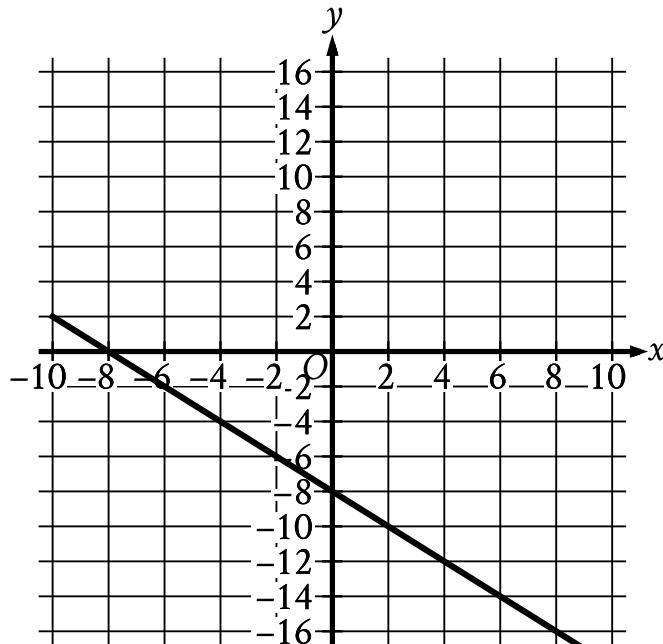
Choice A is incorrect and may result from miscalculating  $4 - 9$  as  $-13$ . Choice C is incorrect and may result from miscalculating  $4 - 9$  as  $5$ . Choice D is incorrect and may result from adding  $9$  to  $4$  instead of subtracting  $9$  from  $4$ .

Question Difficulty: Hard

# Question ID c307283c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	<span style="color: blue;">█</span> <span style="color: blue;">█</span> <span style="color: blue;">□</span>

ID: c307283c



What is an equation of the graph shown?

- A.  $y = -2x - 8$
- B.  $y = x - 8$
- C.  $y = -x - 8$
- D.  $y = 2x - 8$

ID: c307283c Answer

Correct Answer: C

### Rationale

Choice C is correct. An equation of a line can be written in the form  $y = mx + b$ , where  $m$  is the slope of the line and  $(0, b)$  is the  $y$ -intercept of the line. The line shown passes through the point  $(0, -8)$ , so  $b = -8$ . The line shown also passes through the point  $(-8, 0)$ . The slope,  $m$ , of a line passing through two points  $(x_1, y_1)$  and  $(x_2, y_2)$  can be calculated using the equation  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . For the points  $(0, -8)$  and  $(-8, 0)$ , this gives  $m = \frac{(-8) - 0}{0 - (-8)}$ , or  $m = -1$ . Substituting  $-8$  for  $b$  and  $-1$  for  $m$  in  $y = mx + b$  yields  $y = (-1)x + (-8)$ , or  $y = -x - 8$ . Therefore, an equation of the graph shown is  $y = -x - 8$ .

Choice A is incorrect. This is an equation of a line with a slope of  $-2$ , not  $-1$ .

Choice B is incorrect. This is an equation of a line with a slope of  $1$ , not  $-1$ .

Choice D is incorrect. This is an equation of a line with a slope of  $2$ , not  $-1$ .

**Question Difficulty:** Medium

# Question ID 8adf1335

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

## ID: 8adf1335

A city's total expense budget for one year was  $x$  million dollars. The city budgeted  $y$  million dollars for departmental expenses and 201 million dollars for all other expenses. Which of the following represents the relationship between  $x$  and  $y$  in this context?

- A.  $x + y = 201$
- B.  $x - y = 201$
- C.  $2x - y = 201$
- D.  $y - x = 201$

## ID: 8adf1335 Answer

**Correct Answer:** B

### Rationale

Choice B is correct. Of the city's total expense budget for one year, the city budgeted  $y$  million dollars for departmental expenses and 201 million dollars for all other expenses. This means that the expression  $y + 201$  represents the total expense budget, in millions of dollars, for one year. It's given that the total expense budget for one year is  $x$  million dollars. It follows then that the expression  $y + 201$  is equivalent to  $x$ , or  $y + 201 = x$ . Subtracting  $y$  from both sides of this equation yields  $201 = x - y$ . By the symmetric property of equality, this is the same as  $x - y = 201$ .

Choices A and C are incorrect. Because it's given that the total expense budget for one year,  $x$  million dollars, is comprised of the departmental expenses,  $y$  million dollars, and all other expenses, 201 million dollars, the expressions  $x + y$  and  $2x - y$  both must be equivalent to a value greater than 201 million dollars. Therefore, the equations  $x + y = 201$  and  $2x - y = 201$  aren't true. Choice D is incorrect. The value of  $x$  must be greater than the value of  $y$ . Therefore,  $y - x = 201$  can't represent this relationship.

**Question Difficulty:** Easy

# Question ID 9db5b5c1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

## ID: 9db5b5c1

$4x = 20$   $-3x + y = -7$  The solution to the given system of equations is  $(x, y)$ . What is the value of  $x + y$ ?

- A.  $-27$
- B.  $-13$
- C.  $13$
- D.  $27$

## ID: 9db5b5c1 Answer

Correct Answer: C

### Rationale

Choice C is correct. It's given that  $4x = 20$  and  $-3x + y = -7$  is a system of equations with a solution  $(x, y)$ . Adding the second equation in the given system to the first equation yields  $4x + (-3x + y) = 20 + (-7)$ , which is equivalent to  $x + y = 13$ . Thus, the value of  $x + y$  is  $13$ .

Choice A is incorrect. This represents the value of  $-2(x + y) - 1$ .

Choice B is incorrect. This represents the value of  $-(x + y)$ .

Choice D is incorrect. This represents the value of  $2(x + y) + 1$ .

Question Difficulty: Easy

# Question ID 80da233d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	

## ID: 80da233d

A certain elephant weighs 200 pounds at birth and gains more than 2 but less than 3 pounds per day during its first year. Which of the following inequalities represents all possible weights  $w$ , in pounds, for the elephant 365 days after birth?

- A.  $400 < w < 600$
- B.  $565 < w < 930$
- C.  $730 < w < 1,095$
- D.  $930 < w < 1,295$

## ID: 80da233d Answer

**Correct Answer:** D

### Rationale

Choice D is correct. It's given that the elephant weighs 200 pounds at birth and gains more than 2 pounds but less than 3 pounds per day during its first year. The inequality  $200 + 2d < w < 200 + 3d$  represents this situation, where  $d$  is the number of days after birth. Substituting 365 for  $d$  in the inequality gives  $200 + 2(365) < w < 200 + 3(365)$ , or  $930 < w < 1,295$ .

Choice A is incorrect and may result from solving the inequality  $200(2) < w < 200(3)$ . Choice B is incorrect and may result from solving the inequality for a weight range of more than 1 pound but less than 2 pounds:  $200 + 1(365) < w < 200 + 2(365)$ . Choice C is incorrect and may result from calculating the possible weight gained by the elephant during the first year without adding the 200 pounds the elephant weighed at birth.

**Question Difficulty:** Medium

# Question ID 271f7e3f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 271f7e3f

$$f(x) = \frac{(x + 7)}{4}$$

For the function  $f$  defined above, what is the value of  $f(9) - f(1)$ ?

A. 1

B. 2

C.  $\frac{1}{4}$

D.  $\frac{9}{4}$

ID: 271f7e3f Answer

Correct Answer: B

## Rationale

Choice B is correct. The value of  $f(9) - f(1)$  can be calculated by finding the values of  $f(9)$  and  $f(1)$ . The value of  $f(9)$

can be found by substituting 9 for  $x$  in the given function:  $f(9) = \frac{(9 + 7)}{4}$ . This equation can be rewritten as  $f(9) = \frac{16}{4}$ , or

4. Then, the value of  $f(1)$  can be found by substituting 1 for  $x$  in the given function:  $f(1) = \frac{(1 + 7)}{4}$ . This equation can be

rewritten as  $f(1) = \frac{8}{4}$ , or 2. Therefore,  $f(9) - f(1) = 4 - 2$ , which is equivalent to 2.

Choices A, C, and D are incorrect and may result from incorrectly substituting values of  $x$  in the given function or making computational errors.

Question Difficulty: Medium

# Question ID 70e29454

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 70e29454

$$a(3-x) - b = -1 - 2x$$

In the equation above,  $a$  and  $b$  are constants. If the equation has infinitely many solutions, what are the values of  $a$  and  $b$ ?

- A.  $a = 2$  and  $b = 1$
- B.  $a = 2$  and  $b = 7$
- C.  $a = -2$  and  $b = 5$
- D.  $a = -2$  and  $b = -5$

ID: 70e29454 Answer

Correct Answer: B

## Rationale

Choice B is correct. Distributing the  $a$  on the left-hand side of the equation gives  $3a - b - ax = -1 - 2x$ . Rearranging the terms in each side of the equation yields  $-ax + 3a - b = -2x - 1$ . Since the equation has infinitely many solutions, it follows that the coefficients of  $x$  and the free terms on both sides must be equal. That is,  $-a = -2$ , or  $a = 2$ , and  $3a - b = -1$ . Substituting 2 for  $a$  in the equation  $3a - b = -1$  gives  $3(2) - b = -1$ , so  $b = 7$ .

Choice A is incorrect and may be the result of a conceptual error when finding the value of  $b$ . Choices C and D are incorrect and may result from making a sign error when simplifying.

Question Difficulty: Medium

# Question ID e7b6f0d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: e7b6f0d1

$4x + 6 = 18$  Which equation has the same solution as the given equation?

- A.  $4x = 108$
- B.  $4x = 24$
- C.  $4x = 12$
- D.  $4x = 3$

ID: e7b6f0d1 Answer

Correct Answer: C

## Rationale

Choice C is correct. Subtracting 6 from both sides of the given equation yields  $4x = 12$ , which is the equation given in choice C. Since this equation is equivalent to the given equation, it has the same solution as the given equation.

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: Easy

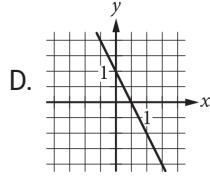
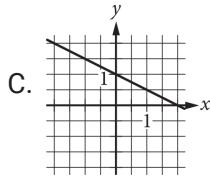
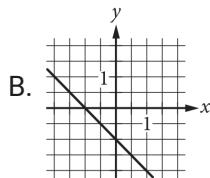
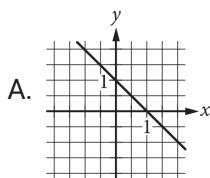
# Question ID 0b46bad5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	3

ID: 0b46bad5

$$ax + by = b$$

In the equation above,  $a$  and  $b$  are constants and  $0 < a < b$ . Which of the following could represent the graph of the equation in the  $xy$ -plane?



ID: 0b46bad5 Answer

Correct Answer: C

## Rationale

Choice C is correct. The given equation  $ax + by = b$  can be rewritten in slope-intercept form,  $y = mx + k$ , where  $m$  represents the slope of the line represented by the equation, and  $k$  represents the  $y$ -coordinate of the  $y$ -intercept of the line. Subtracting  $ax$  from both sides of the equation yields  $by = -ax + b$ , and dividing both sides of this equation by  $b$  yields  $y = -\frac{a}{b}x + \frac{b}{b}$ , or  $y = -\frac{a}{b}x + 1$ . With the equation now in slope-intercept form, it shows that  $k = 1$ , which means the  $y$ -coordinate of the  $y$ -intercept is 1. It's given that  $a$  and  $b$  are both greater than 0 (positive) and that  $a < b$ . Since  $m = -\frac{a}{b}$ , the slope of the line must be a value between  $-1$  and 0. Choice C is the only graph of a line that has a  $y$ -value of the  $y$ -intercept that is 1 and a slope that is between  $-1$  and 0.

Choices A, B, and D are incorrect because the slopes of the lines in these graphs aren't between  $-1$  and 0.

**Question Difficulty:** Hard