Question ID ac472881

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

ID: ac472881

$$\frac{12x+28}{4} - \frac{s}{13} = r(x-8)$$

In the given equation, s and r are constants, and $s > 0$. If the equation has infinitely many solutions, what is the value of s?

ID: ac472881 Answer

Correct Answer:
403

Rationale

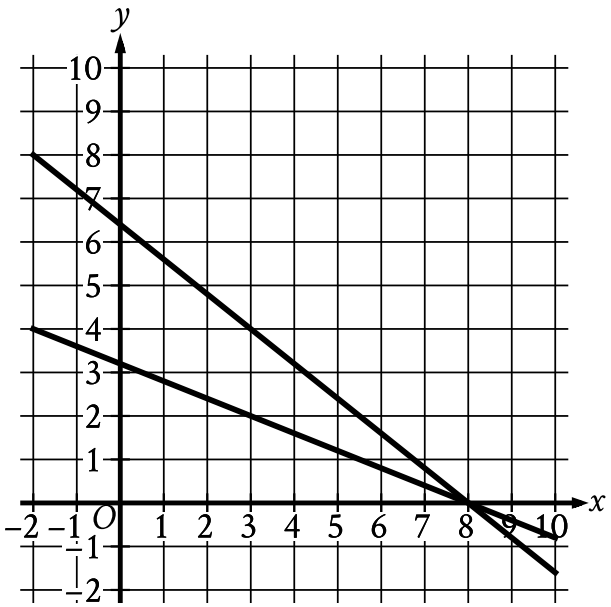
The correct answer is 403. For a linear equation in one variable to have infinitely many solutions, the coefficients of the variable must be equal on both sides of the equation and the constant terms must also be equal on both sides of the equation. The given equation can be rewritten as $\frac{4(3x+7)}{4} - \frac{s}{13} = r(x-8)$, or $3x + 7 - \frac{s}{13} = r(x-8)$. Applying the distributive property to the right-hand side of this equation yields $3x + 7 - \frac{s}{13} = rx - 8r$. For this equation to have infinitely many solutions, the coefficients of x must be equal, so it follows that $3 = r$. Additionally, the constant terms must be equal, which means $7 - \frac{s}{13} = -8r$. Substituting 3 for r in this equation yields $7 - \frac{s}{13} = -8(3)$, or $7 - \frac{s}{13} = -24$. Adding $\frac{s}{13}$ to both sides of this equation yields $7 = -24 + \frac{s}{13}$. Adding 24 to both sides of this equation yields $31 = \frac{s}{13}$. Multiplying both sides of this equation by 13 yields $403 = s$. Therefore, if the equation has infinitely many solutions, the value of s is 403.

Question Difficulty:
Hard

Question ID 3f5a3602

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

ID: 3f5a3602



What system of linear equations is represented by the lines shown?

A. $8x + 4y = 32$
$-10x - 4y = -64$

B. $8x - 4y = 32$
$-10x + 4y = -64$

C. $4x - 10y = 32$
$-8x + 10y = -64$

D. $4x + 10y = 32$
$-8x - 10y = -64$

ID: 3f5a3602 Answer

Correct Answer:
D

Rationale

Choice D is correct. A line in the *xy*-plane that passes through the points (x_1, y_1) and (x_2, y_2) has slope m, where $m = \frac{y_2 - y_1}{x_2 - x_1}$, and can be defined by an equation of the form $y - y_1 = m(x - x_1)$. One of the lines shown in the graph passes through the points $(8, 0)$ and $(3, 4)$. Substituting 8 for x_1, 0 for y_1, 3 for x_2, and 4 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{4 - 0}{3 - 8}$, or $m = -\frac{4}{5}$. Substituting $-\frac{4}{5}$ for m, 8 for x_1 and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{4}{5}(x - 8)$, which is equivalent to $y = -\frac{4}{5}x + \frac{32}{5}$. Adding $\frac{4}{5}x$ to both sides of this equation yields $\frac{4}{5}x + y = \frac{32}{5}$. Multiplying both sides of this equation by -10 yields $-8x - 10y = -64$. Therefore, an equation of this line is $-8x - 10y = -64$. Similarly, the other line shown in the graph passes through the points $(8, 0)$ and $(3, 2)$. Substituting 8 for x_1, 0 for y_1, 3 for x_2, and 2 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{2 - 0}{3 - 8}$, or $m = -\frac{2}{5}$. Substituting $-\frac{2}{5}$ for m, 8 for x_1, and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{2}{5}(x - 8)$, which is equivalent to $y = -\frac{2}{5}x + \frac{16}{5}$. Adding $\frac{2}{5}x$ to both sides of this equation yields $\frac{2}{5}x + y = \frac{16}{5}$. Multiplying both sides of this equation by 10 yields $4x + 10y = 32$. Therefore, an equation of this

line is $4x + 10y = 32$. So, the system of linear equations represented by the lines shown is $4x + 10y = 32$ and $-8x - 10y = -64$.

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 3d1070c9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 3d1070c9

The function f is defined by $f(x) = 25x + 30$. What is the value of $f(x)$ when $x = 2$?

A. 50

B. 57

C. 80

D. 110

ID: 3d1070c9 Answer

Correct Answer:
C

Rationale

Choice C is correct. It's given that the function f is defined by $f(x) = 25x + 30$. Substituting 2 for x in this equation yields $f(2) = 25(2) + 30$, which is equivalent to $f(2) = 50 + 30$, or $f(2) = 80$. Therefore, the value of $f(x)$ is 80 when $x = 2$.

Choice A is incorrect. This is the value of $25(2)$, not $25(2) + 30$.

Choice B is incorrect. This is the value of $25 + 2 + 30$, not $25(2) + 30$.

Choice D is incorrect. This is the value of $(25 + 30)(2)$, not $25(2) + 30$.

Question Difficulty:
Easy

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 edc1b7b7

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

ID: edc1b7b7

$$2(8x) + 4(7y) = 12$$
$$-2(8x) + 4(7y) = 12$$

The solution to the given system of equations is (x, y). What is the value of $8x + 7y$?

ID: edc1b7b7 Answer

Correct Answer:
3

Rationale

The correct answer is 3. Adding the second equation to the first equation in the given system of equations yields $(2(8x) - 2(8x)) + (4(7y) + 4(7y)) = 12 + 12$, or $8(7y) = 24$. Dividing both sides of this equation by 8 yields $7y = 3$. Substituting 3 for $7y$ in the first equation, $2(8x) + 4(7y) = 12$, yields $2(8x) + 4(3) = 12$, or $2(8x) + 12 = 12$. Subtracting 12 from both sides of this equation yields $2(8x) = 0$. Dividing both sides of this equation by 2 yields $8x = 0$. Substituting 0 for $8x$ and 3 for $7y$ in the expression $8x + 7y$ yields $0 + 3$, or 3. Therefore, the value of $8x + 7y$ is 3.

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 fa80893a

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

ID: fa80893a

If $2x + 3 = 9$, what is the value of $6x - 1$?

ID: fa80893a Answer

Correct Answer:
17

Rationale

The correct answer is 17. It's given that $2x + 3 = 9$. Multiplying each side of this equation by 3 yields $3(2x + 3) = 3(9)$, or $6x + 9 = 27$. Subtracting 10 from each side of this equation yields $6x + 9 - 10 = 27 - 10$, or $6x - 1 = 17$. Therefore, the value of $6x - 1$ is 17.

Question Difficulty:
Easy

Question ID bd9eb2b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: bd9eb2b5

The function f is defined by $f(x) = 8x$. For what value of x does $f(x) = 72$?

A. 8

B. 9

C. 64

D. 80

ID: bd9eb2b5 Answer

Correct Answer:
B

Rationale

Choice B is correct. Substituting 72 for $f(x)$ in the given function yields $72 = 8x$. Dividing each side of this equation by 8 yields $9 = x$. Therefore, $f(x) = 72$ when the value of x is 9.

Choice A is incorrect. This is the value of x for which $f(x) = 64$, not $f(x) = 72$.

Choice C is incorrect. This is the value of x for which $f(x) = 512$, not $f(x) = 72$.

Choice D is incorrect. This is the value of x for which $f(x) = 640$, not $f(x) = 72$.

Question Difficulty:
Easy

Question ID 1480dd5c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 1480dd5c

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

For the linear function f, b is a constant and $f(7) = 28$. What is the value of b?

A. 0

B. 1

C. 4

D. 7

ID: 1480dd5c Answer

Correct Answer:
A

Rationale

Choice A is correct. For the linear function f, it's given that $f(7) = 28$. Substituting 7 for x and 28 for $f(x)$ in the given function yields $28 = 4(7) + b$, or $28 = 28 + b$. Subtracting 28 from each side of this equation yields $0 = b$. Therefore, the value of b is 0.

Choice B is incorrect. Substituting 1 for b in the given function yields $f(x) = 4x + 1$. For this function, when the value of x is 7, the value of $f(x)$ is 29, not 28.

Choice C is incorrect. Substituting 4 for b in the given function yields $f(x) = 4x + 4$. For this function, when the value of x is 7, the value of $f(x)$ is 32, not 28.

Choice D is incorrect. Substituting 7 for b in the given function yields $f(x) = 4x + 7$. For this function, when the value of x is 7, the value of $f(x)$ is 35, not 28.

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 $-4 = \frac{13-b}{k-k+5}$, 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 0d6ab461

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 0d6ab461

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

A. 460

B. 635

C. 639

D. 740

ID: 0d6ab461 Answer

Correct Answer:
D

Rationale

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

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

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

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

Question Difficulty:
Easy

Question ID 4becad44

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

ID: 4becad44

$$3x = 36y - 45$$

One of the two equations in a system of linear equations is given. The system has no solution. Which equation could be the second equation in this system?

A. $x = 4y$

B. $\frac{1}{3}x = 4y$

C. $x = 12y - 15$

D. $\frac{1}{3}x = 12y - 15$

ID: 4becad44 Answer

Correct Answer:
B

Rationale

Choice B is correct. A system of two linear equations in two variables, x and y, has no solution when the lines in the *xy*-plane representing the equations are parallel and distinct. Two lines are parallel and distinct if their slopes are the same and their *y*-intercepts are different. The slope of the graph of the given equation, $3x = 36y - 45$, in the *xy*-plane can be found by rewriting the equation in the form $y = mx + b$, where m is the slope of the graph and $(0, b)$ is the *y*-intercept. Adding 45 to each side of the given equation yields $3x + 45 = 36y$. Dividing each side of this equation by 36 yields $\frac{1}{12}x + \frac{5}{4} = y$, or $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the slope of the graph of the given equation is $\frac{1}{12}$ and the *y*-intercept is $\left(0, \frac{5}{4}\right)$. Therefore, the graph of the second equation in the system must also have a slope of $\frac{1}{12}$, but must not have a *y*-intercept of $\left(0, \frac{5}{4}\right)$. Multiplying each side of the equation given in choice B by $\frac{1}{4}$ yields $\frac{1}{12}x = y$, or $y = \frac{1}{12}x$. It follows that the graph representing the equation in choice B has a slope of $\frac{1}{12}$ and a *y*-intercept of $(0, 0)$. Since the slopes of the graphs of the two equations are equal and the *y*-intercepts of the graphs of the two equations are different, the equation in choice B could be the second equation in the system.

Choice A is incorrect. This equation can be rewritten as $y = \frac{1}{4}x$. It follows that the graph of this equation has a slope of $\frac{1}{4}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Choice C is incorrect. This equation can be rewritten as $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{12}$ and a *y*-intercept of $\left(0, \frac{5}{4}\right)$, so the system consisting of this equation and the given equation has infinitely many solutions, rather than no solution.

Choice D is incorrect. This equation can be rewritten as $y = \frac{1}{36}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{36}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Question Difficulty:
Hard

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

$$\frac{1}{2}y = 4$$

$$x - \frac{1}{2}y = 2$$

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 332cd67b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: 332cd67b

$$3x^2 - 15x + 18 = 0$$

How many distinct real solutions are there to the given equation?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 332cd67b Answer

Correct Answer:
B

Rationale

Choice B is correct. The number of solutions to a quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. If the value of the discriminant is positive, then the quadratic equation has exactly two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is negative, then the quadratic equation has zero real solutions. In the given equation, $3x^2 - 15x + 18 = 0$, $a = 3$, $b = -15$, and $c = 18$. Substituting 3 for a, -15 for b, and 18 for c in $b^2 - 4ac$ yields $(-15)^2 - 4(3)(18)$, or 9. Since the value of the discriminant is positive, the given equation has exactly two distinct real solutions.

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 301faf80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 301faf80

The product of two positive integers is 462. If the first integer is 5 greater than twice the second integer, what is the smaller of the two integers?

ID: 301faf80 Answer

Correct Answer:
14

Rationale

The correct answer is 14. Let x represent the first integer and y represent the second integer. If the first integer is 5 greater than twice the second integer, then $x = 2y + 5$. It's given that the product of the two integers is 462; therefore $xy = 462$. Substituting $2y + 5$ for x in this equation yields $(2y + 5)(y) = 462$, which can be written as $2y^2 + 5y = 462$. Subtracting 462 from each side of this equation yields $2y^2 + 5y - 462 = 0$. The left-hand side of this equation can be factored by finding two values whose product is $2(-462)$, or -924, and whose sum is 5. The two values whose product is -924 and whose sum is 5 are 33 and -28. Thus, the equation $2y^2 + 5y - 462 = 0$ can be rewritten as $2y^2 - 28y + 33y - 462 = 0$, which is equivalent to $2y(y - 14) + 33(y - 14) = 0$, or $(2y + 33)(y - 14) = 0$. By the zero product property, it follows that $2y + 33 = 0$ or $y - 14 = 0$. Subtracting 33 from both sides of the equation $2y + 33 = 0$ yields $2y = -33$. Dividing both sides of this equation by 2 yields $y = -\frac{33}{2}$. Since y is a positive integer, the value of y isn't $-\frac{33}{2}$. Adding 14 to both sides of the equation $y - 14 = 0$ yields $y = 14$. Substituting 14 for y in the equation $xy = 462$ yields $x(14) = 462$. Dividing both sides of this equation by 14 yields $x = 33$. Therefore, the two integers are 14 and 33, so the smaller of the two integers is 14.

Question Difficulty:
Hard

Question ID 128c75e2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 128c75e2

The function g is defined by $g(x) = \frac{|x|}{a} - 14$, where $a < 0$. What is the product of $g(15a)$ and $g(7a)$?

ID: 128c75e2 Answer

Correct Answer:
609

Rationale

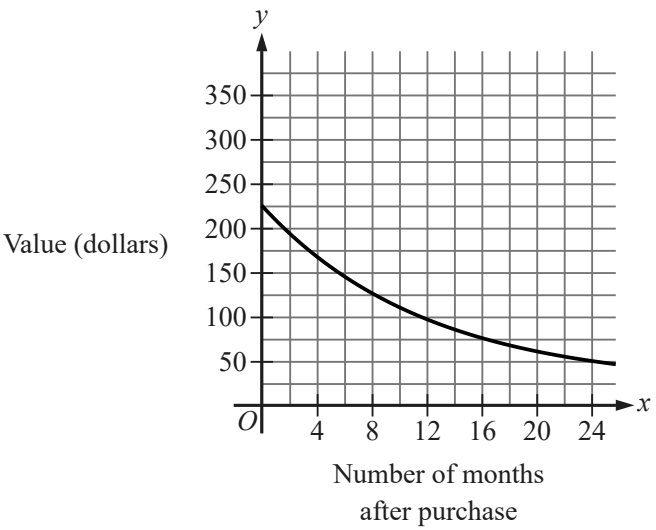
The correct answer is 609. It's given that the function g is defined by $g(x) = \frac{|x|}{a} - 14$, where $a < 0$. Substituting $15a$ for x in function g yields $g(15a) = \frac{|15a|}{a} - 14$. This function can be rewritten as $g(15a) = \frac{15|a|}{a} - 14$, or $g(15a) = 15\left(\frac{|a|}{a}\right) - 14$. Since $a < 0$, it follows that $\frac{|a|}{a} = -1$. Substituting -1 for $\frac{|a|}{a}$ in $g(15a) = 15\left(\frac{|a|}{a}\right) - 14$ yields $g(15a) = 15(-1) - 14$, or $g(15a) = -29$. Similarly, substituting $7a$ for x in function g yields $g(7a) = \frac{|7a|}{a} - 14$. This function can be rewritten as $g(7a) = \frac{7|a|}{a} - 14$, or $g(7a) = 7\left(\frac{|a|}{a}\right) - 14$. Since $a < 0$, it again follows that $\frac{|a|}{a} = -1$. Substituting -1 for $\frac{|a|}{a}$ in $g(7a) = 7\left(\frac{|a|}{a}\right) - 14$ yields $g(7a) = 7(-1) - 14$, or $g(7a) = -21$. Therefore, $g(15a) = -29$ and $g(7a) = -21$. Thus, the product of $g(15a)$ and $g(7a)$ is $(-29)(-21)$, or 609.

Question Difficulty:
Hard

Question ID 7f2524bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 7f2524bf



The graph shown gives the estimated value, in dollars, of a tablet as a function of the number of months since it was purchased. What is the best interpretation of the *y*-intercept of the graph in this context?

A. The estimated value of the tablet was $\$225$ when it was purchased.

B. The estimated value of the tablet 24 months after it was purchased was $\$225$.

C. The estimated value of the tablet had decreased by $\$225$ in the 24 months after it was purchased.

D. The estimated value of the tablet decreased by approximately 2.25% each year after it was purchased.

ID: 7f2524bf Answer

Correct Answer:
A

Rationale

Choice A is correct. It's given that the graph shown gives the estimated value y, in dollars, of a tablet as a function of the number of months since it was purchased, x. The *y*-intercept of a graph is the point at which the graph intersects the *y*-axis, or when x is 0. The graph shown intersects the *y*-axis at the point $(0, 225)$. It follows that 0 months after the tablet was purchased, or when the tablet was purchased, the estimated value of the tablet was 225 dollars. Therefore, the best interpretation of the *y*-intercept is that the estimated value of the tablet was $\$225$ when it was purchased.

Choice B is incorrect. The estimated value of the tablet 24 months after it was purchased was $\$50$, not $\$225$.

Choice C is incorrect. The estimated value of the tablet had decreased by $\$225 - \$50$, or $\$175$, not $\$225$, in the 24 months after it was purchased.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty:
Easy

Question ID e312081b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: e312081b

$(x+5)+(2x-3)$

Which of the following is equivalent to the given expression?

A. $3x-2$

B. $3x+2$

C. $3x-8$

D. $3x+8$

ID: e312081b Answer

Correct Answer:
B

Rationale

Choice B is correct. Using the associative and commutative properties of addition, the given expression $(x+5)+(2x-3)$ can be rewritten as $(x+2x)+(5-3)$. Adding these like terms results in $3x+2$.

Choice A is incorrect and may result from adding $(x-5)+(2x+3)$. Choice C is incorrect and may result from adding $(x-5)+(2x-3)$. Choice D is incorrect and may result from adding $(x+5)+(2x+3)$.

Question Difficulty:
Easy

Question ID 02060533

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 02060533

x	$g(x)$
-27	3
-9	0
21	5

The table shows three values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$ and f is a linear function. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 36)$

B. $(0, 12)$

C. $(0, 4)$

D. $(0, -9)$

ID: 02060533 Answer

Correct Answer:
A

Rationale

Choice A is correct. It's given that the table shows values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$. It's also given that f is a linear function. It follows that an equation that defines f can be written in the form $f(x) = mx + b$, where m represents the slope and b represents the *y*-coordinate of the *y*-intercept $(0, b)$ of the graph of $y = f(x)$ in the *xy*-plane. The slope of the graph of $y = f(x)$ can be found using two points, (x_1, y_1) and (x_2, y_2), that are on the graph of $y = f(x)$, and the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since the table shows values of x and their corresponding values of $g(x)$, substituting values of x and $g(x)$ in the equation $g(x) = \frac{f(x)}{x+3}$ can be used to define function f. Using the first pair of values from the table, $x = -27$ and $g(x) = 3$, yields $3 = \frac{f(-27)}{-27+3}$, or $3 = \frac{f(-27)}{-24}$. Multiplying each side of this equation by -24 yields $-72 = f(-27)$, so the point $(-27, -72)$ is on the graph of $y = f(x)$. Using the second pair of values from the table, $x = -9$ and $g(x) = 0$, yields $0 = \frac{f(-9)}{-9+3}$, or $0 = \frac{f(-9)}{-6}$. Multiplying each side of this equation by -6 yields $0 = f(-9)$, so the point $(-9, 0)$ is on the graph of $y = f(x)$. Substituting $(-27, -72)$ and $(-9, 0)$ for (x_1, y_1) and (x_2, y_2), respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{0 - (-72)}{-9 - (-27)}$, or $m = 4$. Substituting 4 for m in the equation $f(x) = mx + b$ yields $f(x) = 4x + b$. Since $0 = f(-9)$, substituting -9 for x and 0 for $f(x)$ in the equation $f(x) = 4x + b$ yields $0 = 4(-9) + b$, or $0 = -36 + b$. Adding 36 to both sides of this equation yields $36 = b$. It follows that 36 is the *y*-coordinate of the *y*-intercept $(0, b)$ of the graph of $y = f(x)$. Therefore, the *y*-intercept of the graph of $y = f(x)$ is $(0, 36)$.

Choice B is incorrect. 12 is the *y*-coordinate of the *y*-intercept of the graph of $y = g(x)$.

Choice C is incorrect. 4 is the slope of the graph of $y = f(x)$.

Choice D is incorrect. -9 is the *x*-coordinate of the *x*-intercept of the graph of $y = f(x)$.

Question Difficulty:
Hard

Question ID 52931bfa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: 52931bfa

Which expression is equivalent to $\frac{8x(x-7)-3(x-7)}{2x-14}$, where $x > 7$?

A. $\frac{x-7}{5}$

B. $\frac{8x-3}{2}$

C. $\frac{8x^2-3x-14}{2x-14}$

D. $\frac{8x^2-3x-77}{2x-14}$

ID: 52931bfa Answer

Correct Answer:
B

Rationale

Choice B is correct. The given expression has a common factor of 2 in the denominator, so the expression can be rewritten as $\frac{8x(x-7)-3(x-7)}{2(x-7)}$. The three terms in this expression have a common factor of $(x-7)$. Since it's given that $x > 7$, x can't be equal to 7, which means $(x-7)$ can't be equal to 0. Therefore, each term in the expression, $\frac{8x(x-7)-3(x-7)}{2(x-7)}$, can be divided by $(x-7)$, which gives $\frac{8x-3}{2}$.

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

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

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

Question Difficulty:
Medium

Question ID 1e003284

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: 1e003284

$$x = 49$$
$$y = \sqrt{x} + 9$$

The graphs of the given equations intersect at the point (x, y) in the *xy*-plane. What is the value of y?

A. 16

B. 40

C. 81

D. 130

ID: 1e003284 Answer

Correct Answer:
A

Rationale

Choice A is correct. It's given that the graphs of the given equations intersect at the point (x, y) in the *xy*-plane. It follows that (x, y) represents a solution to the system consisting of the given equations. The first equation given is $x = 49$. Substituting 49 for x in the second equation given, $y = \sqrt{x} + 9$, yields $y = \sqrt{49} + 9$, which is equivalent to $y = 7 + 9$, or $y = 16$. It follows that the graphs of the given equations intersect at the point $(49, 16)$. Therefore, the value of y is 16.

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 91e7ea5e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 91e7ea5e

$h(x)=2(x-4)^2-32$

The quadratic function *h* is defined as shown. In the *xy*-plane, the graph of $y=h(x)$ intersects the *x*-axis at the points $(0,0)$ and $(t,0)$, where *t* is a constant. What is the value of *t* ?

A. 1

B. 2

C. 4

D. 8

ID: 91e7ea5e Answer

Correct Answer:
D

Rationale

Choice D is correct. It's given that the graph of $y=h(x)$ intersects the x-axis at $(0,0)$ and $(t,0)$, where t is a constant. Since this graph intersects the x-axis when $y=0$ or when $h(x)=0$, it follows that $h(0)=0$ and $h(t)=0$. If $h(t)=0$, then $0=2(t-4)^2-32$. Adding 32 to both sides of this equation yields $32=2(t-4)^2$. Dividing both sides of this equation by 2 yields $16=(t-4)^2$. Taking the square root of both sides of this equation yields $4=t-4$. Adding 4 to both sides of this equation yields $8=t$. Therefore, the value of t is 8.

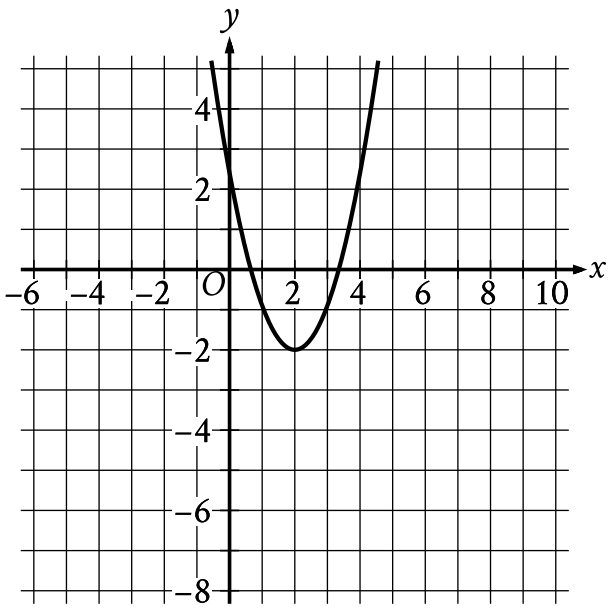
Choices A, B, and C are incorrect and may result from calculation errors.

Question Difficulty:
Hard

Question ID e9aed539

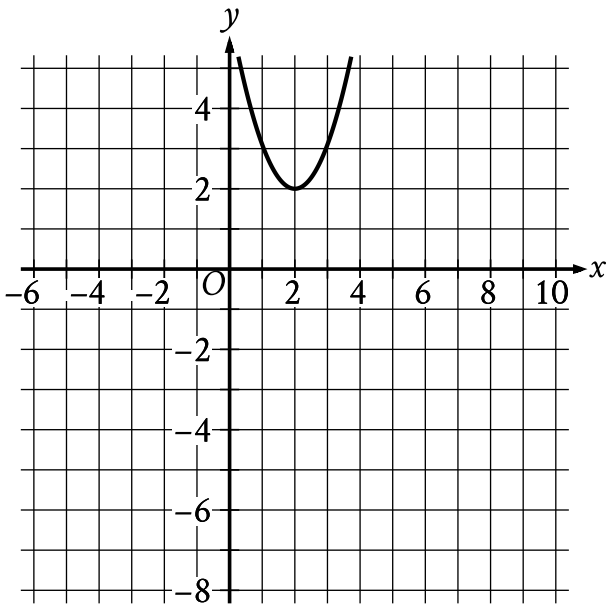
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: e9aed539

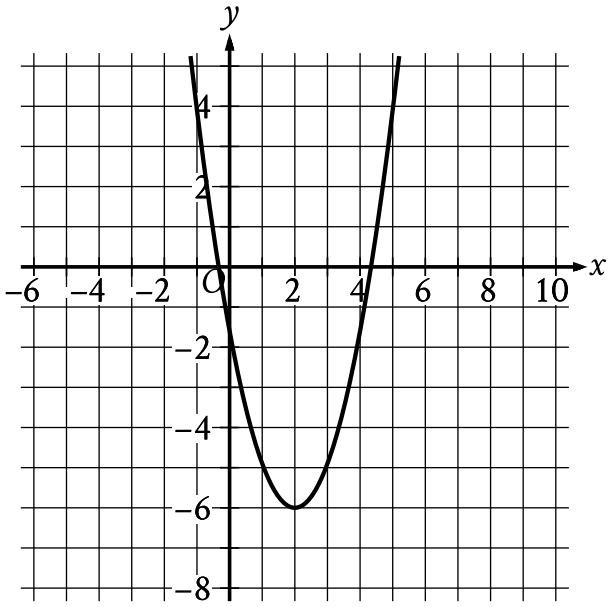


The graph shown will be translated up 4 units. Which of the following will be the resulting graph?

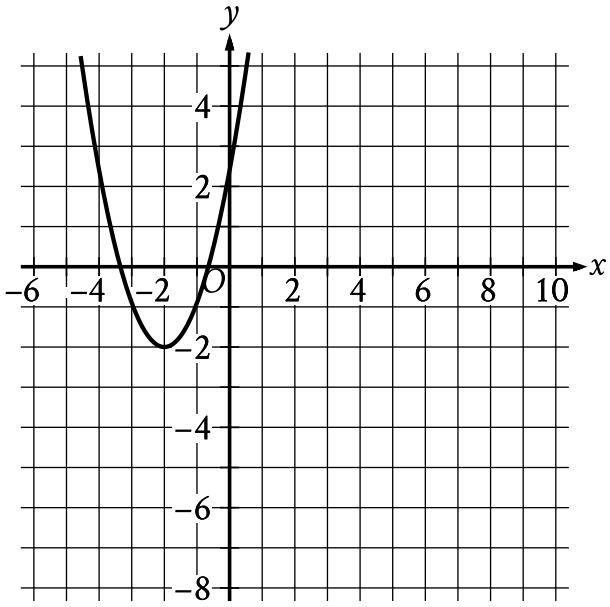
A.



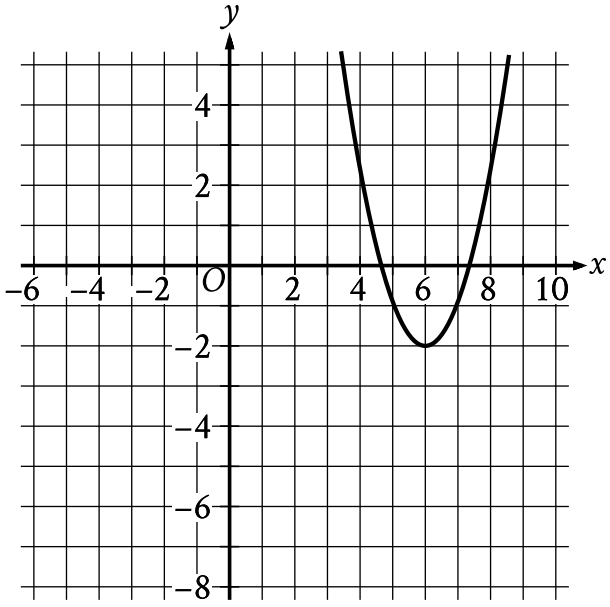
B.



C.



D.



ID: e9aed539 Answer

Correct Answer:

A

Rationale

Choice A is correct. When a graph is translated up 4 units, each point on the resulting graph is 4 units above the point on the original graph. In other words, the *y*-value of each point on the graph increases by 4. The graph shown passes through the points $(1, -1)$, $(2, -2)$, and $(3, -1)$. It follows that when the graph shown is translated up 4 units, the resulting graph will pass through the points $(1, -1 + 4)$, $(2, -2 + 4)$, and $(3, -1 + 4)$. These points are $(1, 3)$, $(2, 2)$, and $(3, 3)$, respectively. Of the given choices, only the graph in choice A passes through the points $(1, 3)$, $(2, 2)$, and $(3, 3)$.

Choice B is incorrect. This is the result of translating the graph down, rather than up, 4 units.

Choice C is incorrect. This is the result of translating the graph left, rather than up, 4 units.

Choice D is incorrect. This is the result of translating the graph right, rather than up, 4 units.

Question Difficulty:
Easy

Question ID 9ee22c16

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	

ID: 9ee22c16

A random sample of 400 town voters were asked if they plan to vote for Candidate A or Candidate B for mayor. The results were sorted by gender and are shown in the table below.

	Plan to vote for Candidate A	Plan to vote for Candidate B
Female	202	20
Male	34	144

The town has a total of 6,000 voters. Based on the table, what is the best estimate of the number of voters who plan to vote for Candidate A?

ID: 9ee22c16 Answer

Rationale

The correct answer is 3,540. According to the table, of 400 voters randomly sampled, the total number of men and women who plan to vote for Candidate A is $202+34=236$. The best estimate of the total number of voters in the town who plan to vote for Candidate A is the fraction of voters in the sample who plan to vote for Candidate A, $\frac{236}{400}$, multiplied by the total voter population of 6000. Therefore, the answer is $\left(\frac{236}{400}\right)(6{,}000)=3{,}540$.

Question Difficulty:
Medium

Question ID 41b71b4e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	

ID: 41b71b4e

What number is 20% greater than 60 ?

A. 50

B. 72

C. 75

D. 132

ID: 41b71b4e Answer

Correct Answer:
B

Rationale

Choice B is correct. The decimal equivalent of 20% is 0.2. The number that is 20% greater than 60 is also 120% of 60. The decimal equivalent of 120% is 1.2, and $1.2(60) = 72$.

Alternate approach: 10% of 60 is 6, and 20% of 60 is double that amount, or 12. It follows that the number that is 20% greater than 60 is 12 more than 60, or $60 + 12 = 72$.

Choice A is incorrect and may result from dividing, instead of multiplying, 60 by 1.2. Choice C is incorrect because it's 25% greater than 60, rather than 20% greater than 60. Choice D is incorrect and may result from multiplying 60 by 2.2 instead of 1.2.

Question Difficulty:
Easy

Question ID eaab8bc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	

ID: eaab8bc1

Out of 300 seeds that were planted, 80% sprouted. How many of these seeds sprouted?

ID: eaab8bc1 Answer

Correct Answer:
240

Rationale

The correct answer is 240. It's given that 80% of the 300 seeds sprouted. Therefore, the number of seeds that sprouted can be calculated by multiplying the number of seeds that were planted by $\frac{80}{100}$, which gives $300\left(\frac{80}{100}\right)$, or 240.

Question Difficulty:
Easy

Question ID 46b2e169

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	

ID: 46b2e169

A box contains 13 red pens and 37 blue pens. If one of these pens is selected at random, what is the probability of selecting a red pen? (Express your answer as a decimal or fraction, not as a percent.)

ID: 46b2e169 Answer

Correct Answer:
.26, 13/50

Rationale

The correct answer is $\frac{13}{50}$. It's given that a box contains 13 red pens and 37 blue pens. If one of these pens is selected at random, the probability of selecting a red pen is the number of red pens in the box divided by the number of red and blue pens in the box. The number of red and blue pens in the box is $13 + 37$, or 50. Since there are 13 red pens in the box, it follows that the probability of selecting a red pen is $\frac{13}{50}$. Note that 13/50 and .26 are examples of ways to enter a correct answer.

Question Difficulty:
Medium

Question ID 8213b1b3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	

ID: 8213b1b3

According to a set of standards, a certain type of substance can contain a maximum of 0.001% phosphorus by mass. If a sample of this substance has a mass of 140 grams, what is the maximum mass, in grams, of phosphorus the sample can contain to meet these standards?

ID: 8213b1b3 Answer

Correct Answer:
.0014

Rationale

The correct answer is $.0014$. It's given that a certain type of substance can contain a maximum of 0.001% phosphorus by mass to meet a set of standards. If a sample of the substance has a mass of 140 grams, it follows that the maximum mass, in grams, of phosphorus the sample can contain to meet the standards is 0.001% of 140, or $\frac{0.001}{100}(140)$, which is equivalent to $(0.00001)(140)$, or 0.0014. Note that .0014 and 0.001 are examples of ways to enter a correct answer.

Question Difficulty:
Hard

Question ID f8696cd8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	

ID: f8696cd8

	Human Resources	Accounting
Bachelor's degree	4	3
Master's degree	2	6

The table above shows the number of people who work in the Human Resources and Accounting departments of a company and the highest level of education they have completed. A person from one of these departments is to be chosen at random. If the person chosen works in the Human Resources department, what is the probability that the highest level of education the person completed is a master's degree?

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

B. $\frac{1}{3}$

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

D. $\frac{8}{15}$

ID: f8696cd8 Answer

Correct Answer:
B

Rationale

Choice B is correct. In total, there are 6 people in the Human Resources department. Of those 6, 2 have a master's degree as their highest level of education. Therefore, the probability of an employee selected at random from the Human Resources department having a master's degree is $\frac{2}{6}$, which simplifies to $\frac{1}{3}$.

Choice A is incorrect; it is the probability that an employee selected at random from either department will be in the Human Resources department and have a master's degree. Choice C is incorrect; it is the probability that an employee with a master's degree selected at random will be in the Human Resources department. Choice D is incorrect; it is the probability that an employee selected at random from either department will have a master's degree.

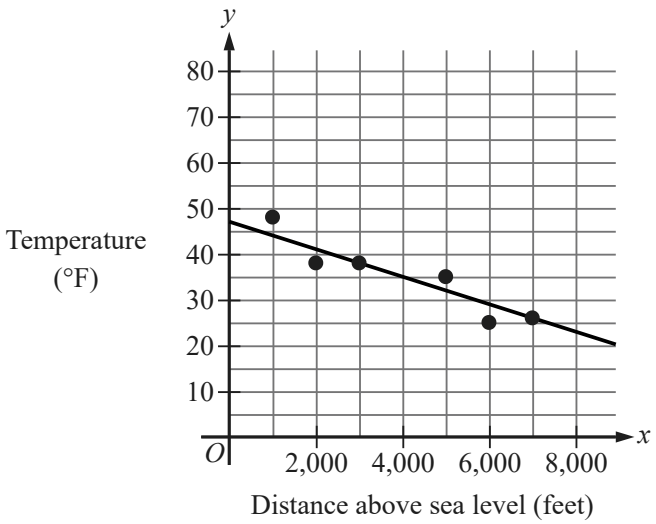
Question Difficulty:
Medium

Question ID bc59c2d9

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

ID: bc59c2d9

The scatterplot shows the temperature, in degrees Fahrenheit ($^\circ$F), and the distance above sea level, in feet, measured at 6 locations on Mount Jefferson. A line of best fit is also shown.



At a distance of $4{,}000$ feet above sea level, what is the temperature, in $^\circ$F, predicted by the line of best fit?

A. 47

B. 35

C. 25

D. 0

ID: bc59c2d9 Answer

Correct Answer:
B

Rationale

Choice B is correct. In the given scatterplot, the x-values represent the distance above sea level, in feet, and the y-values represent the temperature, in $^\circ$F. The point on the line of best fit with an x-value of $4{,}000$ has a corresponding y-value of 35. Therefore, at a distance of $4{,}000$ feet above sea level, the temperature predicted by the line of best fit is $35\,^\circ$F.

Choice A is incorrect. This is the temperature, in $^\circ$F, predicted by the line of best fit at a distance of 0 feet above sea level.

Choice C is incorrect. This is the measured temperature, in $^\circ$F, at a distance of $6{,}000$ feet above sea level.

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

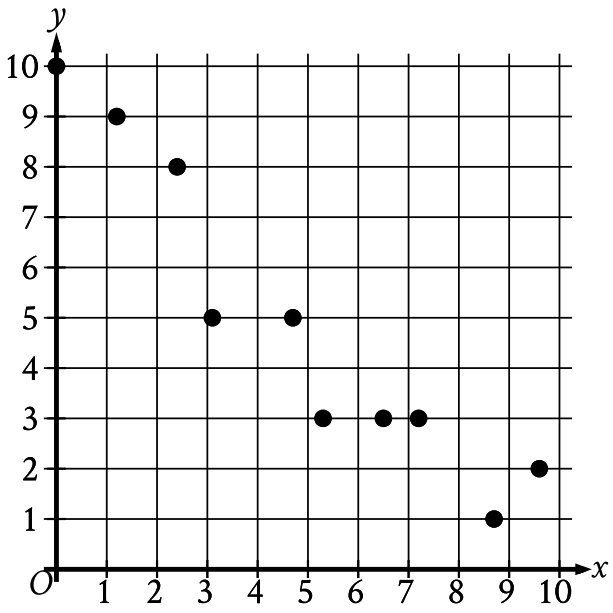
Question Difficulty:
Easy

Question ID 50b2807e

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

ID: 50b2807e

The scatterplot shows the relationship between two variables, x and y.



Which of the following equations is the most appropriate linear model for the data shown?

A. $y = 0.9 + 9.4x$

B. $y = 0.9 - 9.4x$

C. $y = 9.4 + 0.9x$

D. $y = 9.4 - 0.9x$

ID: 50b2807e Answer

Correct Answer:
D

Rationale

Choice D is correct. The data points suggest that as the variable x increases, the variable y decreases, which implies that an appropriate linear model for the data has a negative slope. The data points also show that when x is close to 0, y is greater than 9. Therefore, the *y*-intercept of the graph of an appropriate linear model has a *y*-coordinate greater than 9. The graph of an equation of the form $y = a + bx$, where a and b are constants, has a *y*-intercept with a *y*-coordinate of a and has a slope of b. Of the given choices, only choice D represents a graph that has a negative slope, -0.9, and a *y*-intercept with a *y*-coordinate greater than 9, 9.4.

Choice A is incorrect. The graph of this equation has a positive slope, not a negative slope, and a *y*-intercept with a *y*-coordinate less than 1, not greater than 9.

Choice B is incorrect. The graph of this equation has a *y*-intercept with a *y*-coordinate less than 1, not greater than 9.

Choice C is incorrect. The graph of this equation has a positive slope, not a negative slope.

Question Difficulty:
Medium

Question ID 34f8cd89

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	

ID: 34f8cd89

37% of the items in a box are green. Of those, 37% are also rectangular. Of the green rectangular items, 42% are also metal. Which of the following is closest to the percentage of the items in the box that are not rectangular green metal items?

A. 1.16%

B. 57.50%

C. 94.25%

D. 98.84%

ID: 34f8cd89 Answer

Correct Answer:
C

Rationale

Choice C is correct. It's given that 37% of the items in a box are green. Let x represent the total number of items in the box. It follows that $\frac{37}{100}x$, or $0.37x$, items in the box are green. It's also given that of those, 37% are also rectangular. Therefore, $\frac{37}{100}(0.37x)$, or $0.1369x$, items in the box are green rectangular items. It's also given that of the green rectangular items, 42% are also metal. Therefore, $\frac{42}{100}(0.1369x)$, or $0.057498x$, items in the box are rectangular green metal items. The number of the items in the box that are not rectangular green metal items is the total number of items in the box minus the number of rectangular green metal items in the box. Therefore, the number of items in the box that are not rectangular green metal items is $x - 0.057498x$, or $0.942502x$. The percentage of items in the box that are not rectangular green metal items is the percentage that $0.942502x$ is of x. If $p\%$ represents this percentage, the value of p is $100\left(\frac{0.942502x}{x}\right)$, or 94.2502. Of the given choices, 94.25% is closest to the percentage of items in the box that are not rectangular green metal items.

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 6fca0144

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	

ID: 6fca0144

For a baobab tree habitat in South Africa, a scientist randomly selected 50 baobab trees that were 17 years old and randomly assigned them to two groups. Each group was subjected to a different watering pattern for 2 consecutive years to observe whether the watering pattern affects the trees' growth rate. Based on the design of the study, what is the largest group to which these results can be applied?

A. All the 50 baobab trees that were selected in this habitat

B. All the baobab trees that were 19 years old in this habitat

C. All the baobab trees that were 17 years old in South Africa

D. All the baobab trees that were 17 years old in this habitat

ID: 6fca0144 Answer

Correct Answer:
D

Rationale

Choice D is correct. When a study uses a randomly selected sample, the largest group to which the results of the study can be applied is the population from which the sample was selected. It's given that the scientist randomly selected the trees from the baobab trees in a certain habitat that were 17 years old. Therefore, the largest group to which the results of this study can be applied is all the baobab trees that were 17 years old in this habitat.

Choice A is incorrect. Since the sample was randomly selected from a population, the results can be applied to a larger group than the sample.

Choice B is incorrect. The sample was selected from a population of baobab trees that were 17 years old, not 19 years old.

Choice C is incorrect. The sample was selected from a certain tree habitat in South Africa, not from all the baobab trees that were 17 years old in South Africa.

Question Difficulty:
Hard

Question ID 20b69297

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 20b69297

Anita created a batch of green paint by mixing 2 ounces of blue paint with 3 ounces of yellow paint. She must mix a second batch using the same ratio of blue and yellow paint as the first batch. If she uses 5 ounces of blue paint for the second batch, how much yellow paint should Anita use?

A. Exactly 5 ounces

B. 3 ounces more than the amount of yellow paint used in the first batch

C. 1.5 times the amount of yellow paint used in the first batch

D. 1.5 times the amount of blue paint used in the second batch

ID: 20b69297 Answer

Correct Answer:
D

Rationale

Choice D is correct. It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch. For any batch of paint that uses the same ratio, the amount of yellow paint used will be $\frac{3}{2}$, or 1.5, times the amount of blue paint used in the batch. Therefore, the amount of yellow paint Anita will use in the second batch will be 1.5 times the amount of blue paint used in the second batch.

Alternate approach: It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch and that she will use 5 ounces of blue paint for the second batch. A proportion can be set up to solve for x, the amount of yellow paint she will use for the second batch: $\frac{2}{3} = \frac{5}{x}$. Multiplying both sides of this equation by 3 yields $2 = \frac{15}{x}$, and multiplying both sides of this equation by x yields $2x = 15$. Dividing both sides of this equation by 2 yields $x = 7.5$. Since Anita will use 7.5 ounces of yellow paint for the second batch, this is $\frac{7.5}{5} = 1.5$ times the amount of blue paint (5 ounces) used in the second batch.

Choices A, B, and C are incorrect and may result from incorrectly interpreting the ratio of blue paint to yellow paint used.

Question Difficulty:
Hard

Question ID 94237701

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	

ID: 94237701

For a certain computer game, individuals receive an integer score that ranges from 2 through 10. The table below shows the frequency distribution of the scores of the 9 players in group A and the 11 players in group B.

Score	Score Frequencies	
	Group A	Group B
2	1	0
3	1	0
4	2	0
5	1	4
6	3	2
7	0	0
8	0	2
9	1	1
10	0	2
Total	9	11

The median of the scores for group B is how much greater than the median of the scores for group A?

ID: 94237701 Answer

Rationale

The correct answer is 1. When there are an odd number of values in a data set, the median of the data set is the middle number when the data values are ordered from least to greatest. The scores for group A, ordered from least to greatest, are 2, 3, 4, 4, 5, 6, 6, 6, and 9. The median of the scores for group A is therefore 5. The scores for group B, ordered from least to greatest, are 5, 5, 5, 5, 6, 6, 8, 8, 9, 10, and 10. The median of the scores for group B is therefore 6. The median score for group B is $6-5=1$ more than the median score for group A.

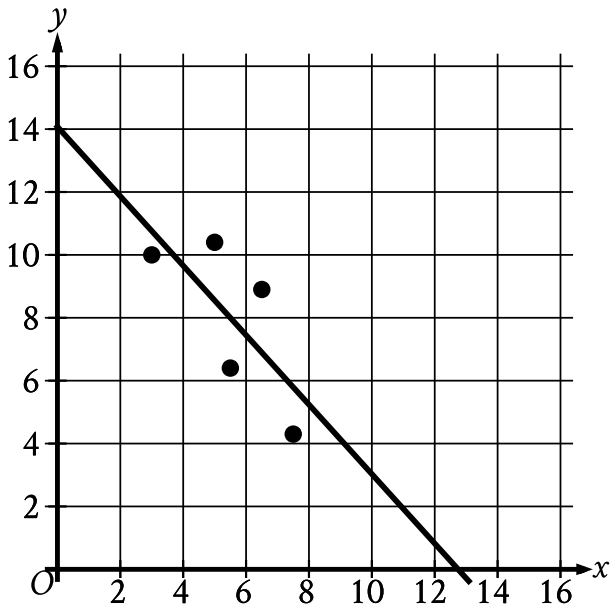
Question Difficulty:
Hard

Question ID 24a1e6a7

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

ID: 24a1e6a7

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



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

A. -3.3

B. -1.1

C. 1.1

D. 3.3

ID: 24a1e6a7 Answer

Correct Answer:
B

Rationale

Choice B is correct. A line in the *xy*-plane that passes through points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2-y_1}{x_2-x_1}$. The line of best fit shown passes approximately through the points $(0, 14)$ and $(13, 0)$. It follows that the slope of this line of best fit is approximately $\frac{0-14}{13-0}$, or $-\frac{14}{13}$. Of the given choices, -1.1 is closest to $-\frac{14}{13}$.

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

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

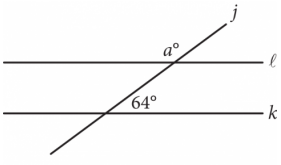
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty:
Medium

Question ID 992f4e93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	

ID: 992f4e93



Note: Figure not drawn to scale.

In the figure above, lines ℓ and k are parallel.

What is the value of a ?

A. 26

B. 64

C. 116

D. 154

ID: 992f4e93 Answer

Correct Answer:
C

Rationale

Choice C is correct. Since lines ℓ and k are parallel, corresponding angles formed by the intersection of line j with lines ℓ and k are congruent. Therefore, the angle with measure a° must be the supplement of the angle with measure 64°. The sum of two supplementary angles is 180°, so a = 180 − 64 = 116.

Choice A is incorrect and likely results from thinking the angle with measure a° is the complement of the angle with measure 64°. Choice B is incorrect and likely results from thinking the angle with measure a° is congruent to the angle with measure 64°. Choice D is incorrect and likely results from a conceptual or computational error.

Question Difficulty:
Easy

Question ID f1747a6a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	

ID: f1747a6a

In triangle ABC, the measure of angle B is 52° and the measure of angle C is 17°. What is the measure of angle A?

A. 21°

B. 35°

C. 69°

D. 111°

ID: f1747a6a Answer

Correct Answer:
D

Rationale

Choice D is correct. The sum of the angle measures of a triangle is 180°. Adding the measures of angles B and C gives $52 + 17 = 69^\circ$. Therefore, the measure of angle A is $180 - 69 = 111^\circ$.

Choice A is incorrect and may result from subtracting the sum of the measures of angles B and C from 90°, instead of from 180°.

Choice B is incorrect and may result from subtracting the measure of angle C from the measure of angle B.

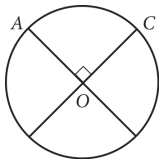
Choice C is incorrect and may result from adding the measures of angles B and C but not subtracting the result from 180°.

Question Difficulty:
Easy

Question ID 23c5fcce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	

ID: 23c5fcce



The circle above with center *O* has a circumference of 36.
What is the length of minor arc $\overset{\frown}{AC}$?

A. 9

B. 12

C. 18

D. 36

ID: 23c5fcce Answer

Correct Answer:
A

Rationale

Choice A is correct. A circle has 360 degrees of arc. In the circle shown, O is the center of the circle and $\angle AOC$ is a central angle of the circle. From the figure, the two diameters that meet to form $\angle AOC$ are perpendicular, so the measure of $\angle AOC$ is $90°$. Therefore, the length of minor arc $\overset{\frown}{AC}$ is $\frac{90}{360}$ of the circumference of the circle. Since the circumference of the circle is 36, the length of minor arc $\overset{\frown}{AC}$ is $\frac{90}{360} \times 36 = 9$.

Choices B, C, and D are incorrect. The perpendicular diameters divide the circumference of the circle into four equal arcs; therefore, minor arc $\overset{\frown}{AC}$ is $\frac{1}{4}$ of the circumference. However, the lengths in choices B and C are, respectively, $\frac{1}{3}$ and $\frac{1}{2}$ the circumference of the circle, and the length in choice D is the length of the entire circumference. None of these lengths is $\frac{1}{4}$ the circumference.

Question Difficulty:
Easy

Question ID f1c1e971

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	

ID: f1c1e971

The measure of angle R is $\frac{2\pi}{3}$ radians. The measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R. What is the measure of angle T, in degrees?

A. 75

B. 120

C. 195

D. 390

ID: f1c1e971 Answer

Correct Answer:
C

Rationale

Choice C is correct. It's given that the measure of angle R is $\frac{2\pi}{3}$ radians, and the measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R. Therefore, the measure of angle T is equal to $\frac{2\pi}{3} + \frac{5\pi}{12}$ radians. Multiplying $\frac{2\pi}{3}$ by $\frac{4}{4}$ to get a common denominator with $\frac{5\pi}{12}$ yields $\frac{8\pi}{12}$. Therefore, $\frac{2\pi}{3} + \frac{5\pi}{12}$ is equivalent to $\frac{8\pi}{12} + \frac{5\pi}{12}$, or $\frac{13\pi}{12}$. Therefore, the measure of angle T is $\frac{13\pi}{12}$ radians. The measure of angle T, in degrees, can be found by multiplying its measure, in radians, by $\frac{180}{\pi}$. This yields $\frac{13\pi}{12} \times \frac{180}{\pi}$, which is equivalent to 195 degrees. Therefore, the measure of angle T is 195 degrees.

Choice A is incorrect. This is the number of degrees that the measure of angle T is greater than the measure of angle R.

Choice B is incorrect. This is the measure of angle R, in degrees.

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

Question Difficulty:
Medium

Question ID 6ab30ce3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	

ID: 6ab30ce3

Triangle ABC is similar to triangle DEF, where A corresponds to D and C corresponds to F. Angles C and F are right angles. If $\tan(A) = \sqrt{3}$ and $DF = 125$, what is the length of $\overline{DE}$?

A. $125\frac{\sqrt{3}}{3}$

B. $125\frac{\sqrt{3}}{2}$

C. $125\sqrt{3}$

D. 250

ID: 6ab30ce3 Answer

Correct Answer:
D

Rationale

Choice D is correct. Corresponding angles in similar triangles have equal measures. It's given that triangle ABC is similar to triangle DEF, where A corresponds to D, so the measure of angle A is equal to the measure of angle D. Therefore, if $\tan(A) = \sqrt{3}$, then $\tan(D) = \sqrt{3}$. It's given that angles C and F are right angles, so triangles ABC and DEF are right triangles. The adjacent side of an acute angle in a right triangle is the side closest to the angle that is not the hypotenuse. It follows that the adjacent side of angle D is side DF. The opposite side of an acute angle in a right triangle is the side across from the acute angle. It follows that the opposite side of angle D is side EF. The tangent of an acute angle in a right triangle is the ratio of the length of the opposite side to the length of the adjacent side. Therefore, $\tan(D) = \frac{EF}{DF}$. If $DF = 125$, the length of side EF can be found by substituting $\sqrt{3}$ for $\tan(D)$ and 125 for DF in the equation $\tan(D) = \frac{EF}{DF}$, which yields $\sqrt{3} = \frac{EF}{125}$. Multiplying both sides of this equation by 125 yields $125\sqrt{3} = EF$. Since the length of side EF is $\sqrt{3}$ times the length of side DF, it follows that triangle DEF is a special right triangle with angle measures 30°, 60°, and 90°. Therefore, the length of the hypotenuse, $\overline{DE}$, is 2 times the length of side DF, or $DE = 2(DF)$. Substituting 125 for DF in this equation yields $DE = 2(125)$, or $DE = 250$. Thus, if $\tan(A) = \sqrt{3}$ and $DF = 125$, the length of $\overline{DE}$ is 250.

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

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

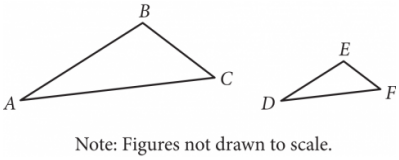
Choice C is incorrect. This is the length of $\overline{EF}$, not $\overline{DE}$.

Question Difficulty:
Hard

Question ID 1c3d613c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	

ID: 1c3d613c



Note: Figures not drawn to scale.

Triangle *ABC* and triangle *DEF* are shown. The relationship between the side lengths of the two triangles is such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = 3$. If the measure of angle *BAC* is 20°, what is the measure, in degrees, of angle *EDF*? (Disregard the degree symbol when gridding your answer.)

ID: 1c3d613c Answer

Rationale

The correct answer is 20. By the equality given, the three pairs of corresponding sides of the two triangles are in the same proportion. By the side-side-side (SSS) similarity theorem, triangle ABC is similar to triangle DEF. In similar triangles, the measures of corresponding angles are congruent. Since angle BAC corresponds to angle EDF, these two angles are congruent and their measures are equal. It's given that the measure of angle BAC is 20°, so the measure of angle EDF is also 20°.

Question Difficulty:
Medium

Question ID 2d521ca9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	

ID: 2d521ca9

The measure of angle Z is 60°. What is the measure, in radians, of angle Z?

A. $\frac{1}{6}\pi$

B. $\frac{1}{3}\pi$

C. $\frac{2}{3}\pi$

D. 1π

ID: 2d521ca9 Answer

Correct Answer:
B

Rationale

Choice B is correct. The measure of an angle, in radians, can be found by multiplying its measure, in degrees, by $\frac{\pi}{180}$. It's given that the measure of angle Z is 60°. It follows that the measure, in radians, of angle Z is $60\left(\frac{\pi}{180}\right)$, or $\frac{1}{3}\pi$.

Choice A is incorrect. This is the measure, in radians, of an angle whose measure is 30°, not 60°.

Choice C is incorrect. This is the measure, in radians, of an angle whose measure is 120°, not 60°.

Choice D is incorrect. This is the measure, in radians, of an angle whose measure is 180°, not 60°.

Question Difficulty:
Medium

Question ID 9acd101f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	

ID: 9acd101f

The equation $x^2 + (y-1)^2 = 49$ represents circle A. Circle B is obtained by shifting circle A down 2 units in the *xy*-plane. Which of the following equations represents circle B?

A. $(x-2)^2 + (y-1)^2 = 49$

B. $x^2 + (y-3)^2 = 49$

C. $(x+2)^2 + (y-1)^2 = 49$

D. $x^2 + (y+1)^2 = 49$

ID: 9acd101f Answer

Correct Answer:
D

Rationale

Choice D is correct. The graph in the *xy*-plane of an equation of the form $(x-h)^2 + (y-k)^2 = r^2$ is a circle with center (h, k) and a radius of length r. It's given that circle A is represented by $x^2 + (y-1)^2 = 49$, which can be rewritten as $x^2 + (y-1)^2 = 7^2$. Therefore, circle A has center $(0, 1)$ and a radius of length 7. Shifting circle A down two units is a rigid vertical translation of circle A that does not change its size or shape. Since circle B is obtained by shifting circle A down two units, it follows that circle B has the same radius as circle A, and for each point (x, y) on circle A, the point $(x, y-2)$ lies on circle B. Moreover, if (h, k) is the center of circle A, then $(h, k-2)$ is the center of circle B. Therefore, circle B has a radius of 7 and the center of circle B is $(0, 1-2)$, or $(0, -1)$. Thus, circle B can be represented by the equation $x^2 + (y+1)^2 = 7^2$, or $x^2 + (y+1)^2 = 49$.

Choice A is incorrect. This is the equation of a circle obtained by shifting circle A right 2 units.

Choice B is incorrect. This is the equation of a circle obtained by shifting circle A up 2 units.

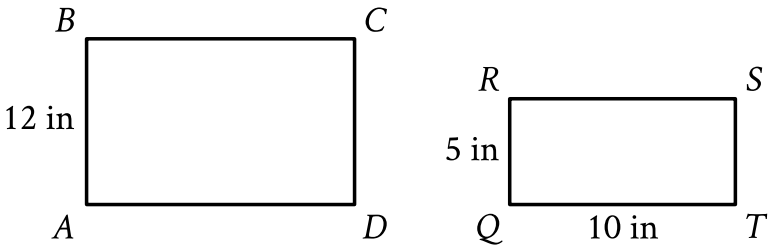
Choice C is incorrect. This is the equation of a circle obtained by shifting circle A left 2 units.

Question Difficulty:
Hard

Question ID e9c5bfb2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	

ID: e9c5bfb2



Note: Figure not drawn to scale.

Rectangles $ABCD$ and $QRST$ shown are similar, where A, B, C, and D correspond to Q, R, S, and T, respectively. What is the length, in inches (in), of $\overline{AD}$?

A. 60

B. 24

C. 17

D. 10

ID: e9c5bfb2 Answer

Correct Answer:
B

Rationale

Choice B is correct. It's given that rectangles $ABCD$ and $QRST$ are similar, where A, B, C, and D correspond to Q, R, S, and T, respectively. It follows that $\overline{AB}$ corresponds to $\overline{QR}$ and $\overline{AD}$ corresponds to $\overline{QT}$. If two rectangles are similar, then the lengths of their corresponding sides are proportional. It's given in the figure that the length of $\overline{AB}$ is 12 inches, the length of $\overline{QR}$ is 5 inches, and the length of $\overline{QT}$ is 10 inches. If x is the length, in inches, of $\overline{AD}$, then $\frac{12}{5}$ is equivalent to $\frac{x}{10}$. Therefore, the value of x can be found using the equation $\frac{12}{5} = \frac{x}{10}$. Multiplying each side of this equation by 10 yields $\frac{120}{5} = x$, or $24 = x$. Therefore, the length, in inches, of $\overline{AD}$ is 24.

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. This is the length, in inches, of $\overline{QT}$, not $\overline{AD}$.

Question Difficulty:
Medium

Question ID 48fb6483

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	

ID: 48fb6483

In triangle XYZ, angle Y is a right angle, point P lies on $\overline{XZ}$, and point Q lies on $\overline{YZ}$ such that $\overline{PQ}$ is parallel to $\overline{XY}$. If the measure of angle XZY is 63°, what is the measure, in degrees, of angle XPQ?

ID: 48fb6483 Answer

Correct Answer:
153

Rationale

The correct answer is 153. Since it's given that $\overline{PQ}$ is parallel to $\overline{XY}$ and angle Y is a right angle, angle ZQP is also a right angle. Angle ZPQ is complementary to angle XZY, which means its measure, in degrees, is $90 - 63$, or 27. Since angle XPQ is supplementary to angle ZPQ, its measure, in degrees, is $180 - 27$, or 153.

Question Difficulty:
Hard

Question ID 244ff6c4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	

ID: 244ff6c4

What is the value of $\tan \frac{92\pi}{3}$?

A. $-\sqrt{3}$

B. $-\frac{\sqrt{3}}{3}$

C. $\frac{\sqrt{3}}{3}$

D. $\sqrt{3}$

ID: 244ff6c4 Answer

Correct Answer:
A

Rationale

Choice A is correct. A trigonometric ratio can be found using the unit circle, that is, a circle with radius 1 unit. If a central angle of a unit circle in the *xy*-plane centered at the origin has its starting side on the positive *x*-axis and its terminal side intersects the circle at a point (x, y), then the value of the tangent of the central angle is equal to the *y*-coordinate divided by the *x*-coordinate. There are 2π radians in a circle. Dividing $\frac{92\pi}{3}$ by 2π yields $\frac{92}{6}$, which is equivalent to $15 + \frac{2}{3}$. It follows that on the unit circle centered at the origin in the *xy*-plane, the angle $\frac{92\pi}{3}$ is the result of 15 revolutions from its starting side on the positive *x*-axis followed by a rotation through $\frac{2\pi}{3}$ radians. Therefore, the angles $\frac{92\pi}{3}$ and $\frac{2\pi}{3}$ are coterminal angles and $\tan\left(\frac{92\pi}{3}\right)$ is equal to $\tan\left(\frac{2\pi}{3}\right)$. Since $\frac{2\pi}{3}$ is greater than $\frac{\pi}{2}$ and less than π, it follows that the terminal side of the angle is in quadrant II and forms an angle of $\frac{\pi}{3}$, or 60°, with the negative *x*-axis. Therefore, the terminal side of the angle intersects the unit circle at the point $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$. It follows that the value of $\tan\left(\frac{2\pi}{3}\right)$ is $\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}$, which is equivalent to $-\sqrt{3}$. Therefore, the value of $\tan\left(\frac{92\pi}{3}\right)$ is $-\sqrt{3}$.

Choice B is incorrect. This is the value of $\frac{1}{\tan\left(\frac{92\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$.

Choice C is incorrect. This is the value of $\frac{1}{\tan\left(\frac{\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$.

Choice D is incorrect. This is the value of $\tan\left(\frac{\pi}{3}\right)$, not $\tan\left(\frac{92\pi}{3}\right)$.

Question Difficulty:
Hard

Question ID 010243e6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	

ID: 010243e6

Triangles PQR and LMN are graphed in the *xy*-plane. Triangle PQR has vertices P, Q, and R at $(4, 5)$, $(4, 7)$, and $(6, 5)$, respectively. Triangle LMN has vertices L, M, and N at $(4, 5)$, $(4, 7 + k)$, and $(6 + k, 5)$, respectively, where k is a positive constant. If the measure of $\angle Q$ is t°, what is the measure of $\angle N$?

A. $(90 - (t - k))^\circ$

B. $(90 - (t + k))^\circ$

C. $(90 - t)^\circ$

D. $(90 + k)^\circ$

ID: 010243e6 Answer

Correct Answer:
C

Rationale

Choice C is correct. Since $P = (4, 5)$ and $Q = (4, 7)$, side PQ is parallel to the *y*-axis and has a length of 2. Since $P = (4, 5)$ and $R = (6, 5)$, side PR is parallel to the *x*-axis and has a length of 2. Therefore, triangle PQR is a right isosceles triangle, where $\angle P$ has measure 90° and $\angle Q$ and $\angle R$ each have measure 45°. It follows that if the measure of $\angle Q$ is t°, then $t = 45$. Since $L = (4, 5)$ and $M = (4, 7 + k)$, side LM is parallel to the *y*-axis and has a length of $k + 2$. Since $L = (4, 5)$ and $N = (6 + k, 5)$, side LN is parallel to the *x*-axis and has a length of $k + 2$. Therefore, triangle LMN is a right isosceles triangle, where $\angle L$ has measure 90° and $\angle M$ and $\angle N$ each have measure 45°. Of the given choices, only $(90 - t)^\circ$ is equal to 45°, so the measure of $\angle N$ is $(90 - t)^\circ$.

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 08b7a3f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	

ID: 08b7a3f5

A triangular prism has a height of 8 centimeters (cm) and a volume of 216 cm^3. What is the area, in cm^2, of the base of the prism? (The volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism.)

ID: 08b7a3f5 Answer

Correct Answer:
27

Rationale

The correct answer is 27. It's given that a triangular prism has a volume of 216 $\text{cubic centimeters (cm}^3\text{)}$ and the volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism. Therefore, $216 = Bh$. It's also given that the triangular prism has a height of 8 cm. Therefore, $h = 8$. Substituting 8 for h in the equation $216 = Bh$ yields $216 = B(8)$. Dividing both sides of this equation by 8 yields $27 = B$. Therefore, the area, in cm^2, of the base of the prism is 27.

Question Difficulty:
Medium