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 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?

A. $640x + 880y \geq 9{,}700$
$x + y \leq 10$
$x \geq 3$
$y \geq 1$

B. $640x + 880y \leq 9{,}700$
$x + y \geq 10$
$x \geq 3$
$y \geq 1$

C. $640x + 880y \geq 9{,}700$
$x + y \geq 10$
$x \leq 3$
$y \leq 1$

D. $640x + 880y \leq 9{,}700$
$x + y \leq 10$
$x \leq 3$
$y \leq 1$

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 968e9e51

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

ID: 968e9e51

$y \leq x$

$y \leq -x$

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 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 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. $18 \le n \le 135$

B. $7.5 \le n \le 9$

C. $15 \le n \le 135$

D. $15 \le n \le 18$

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 $15 \le n \le 18$.

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 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 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 b31c3117

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

ID: b31c3117

$H = 120p + 60$

The Karvonen formula above shows the relationship between Alice's target heart rate H, in beats per minute (bpm), and the intensity level p of different activities. When $p = 0$, Alice has a resting heart rate. When $p = 1$, Alice has her maximum heart rate. It is recommended that p be between 0.5 and 0.85 for Alice when she trains. Which of the following inequalities describes Alice's target training heart rate?

A. $120 \le H \le 162$

B. $102 \le H \le 120$

C. $60 \le H \le 162$

D. $60 \le H \le 102$

ID: b31c3117 Answer

Correct Answer: A

Rationale

Choice A is correct. When Alice trains, it's recommended that p be between 0.5 and 0.85. Therefore, her target training heart rate is represented by the values of H corresponding to $0.5 \le p \le 0.85$. When $p = 0.5$, $H = 120(0.5) + 60$, or $H = 120$. When $p = 0.85$, $H = 120(0.85) + 60$, or $H = 162$. Therefore, the inequality that describes Alice's target training heart rate is $120 \le H \le 162$.

Choice B is incorrect. This inequality describes Alice's target heart rate for $0.35 \le p \le 0.5$. Choice C is incorrect. This inequality describes her target heart rate for $0 \le p \le 0.85$. Choice D is incorrect. This inequality describes her target heart rate for $0 \le p \le 0.35$.

Question Difficulty: Medium

Question ID c17d9ba9

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

ID: c17d9ba9

A number x is at most 17 less than 5 times the value of y. If the value of y is 3, what is the greatest possible value of x?

ID: c17d9ba9 Answer

Correct Answer: -2

Rationale

The correct answer is -2. It's given that a number x is at most 17 less than 5 times the value of y, or $x \leq 5y - 17$. Substituting 3 for y in this inequality yields $x \leq 53 - 17$, or $x \leq -2$. Thus, if the value of y is 3, the greatest possible value of x is -2.

Question Difficulty: Medium

Question ID 74c98c82

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

ID: 74c98c82

An event planner is planning a party. It costs the event planner a onetime fee of $\$35$ to rent the venue and $\$10.25$ per attendee. The event planner has a budget of $\$200$. What is the greatest number of attendees possible without exceeding the budget?

ID: 74c98c82 Answer

Correct Answer: 16

Rationale

The correct answer is 16. The total cost of the party is found by adding the onetime fee of the venue to the cost per attendee times the number of attendees. Let x be the number of attendees. The expression $35 + 10.25x$ thus represents the total cost of the party. It's given that the budget is $\$\ 200$, so this situation can be represented by the inequality $35 + 10.25x \leq 200$. The greatest number of attendees can be found by solving this inequality for x. Subtracting 35 from both sides of this inequality gives $10.25x \leq 165$. Dividing both sides of this inequality by 10.25 results in approximately $x \leq 16.098$. Since the question is stated in terms of attendees, rounding x down to the nearest whole number, 16, gives the greatest number of attendees possible.

Question Difficulty: Medium

Question ID e9ef0e6b

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

ID: e9ef0e6b

A model estimates that whales from the genus *Eschrichtius* travel 72 to 77 miles in the ocean each day during their migration. Based on this model, which inequality represents the estimated total number of miles, x, a whale from the genus *Eschrichtius* could travel in 16 days of its migration?

A. $72 + 16 \leq x \leq 77 + 16$

B. $(72)(16) \leq x \leq (77)(16)$

C. $72 \leq 16 + x \leq 77$

D. $72 \leq 16x \leq 77$

ID: e9ef0e6b Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the model estimates that whales from the genus *Eschrichtius* travel 72 to 77 miles in the ocean each day during their migration. If one of these whales travels 72 miles each day for 16 days, then the whale travels 7216 miles total. If one of these whales travels 77 miles each day for 16 days, then the whale travels 7716 miles total. Therefore, the model estimates that in 16 days of its migration, a whale from the genus *Eschrichtius* could travel at least 7216 and at most 7716 miles total. Thus, the inequality $7216 \leq x \leq 7716$ represents the estimated total number of miles, x, a whale from the genus *Eschrichtius* could travel in 16 days of its migration.

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 90bd9ef8

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

ID: 90bd9ef8

The average annual energy cost for a certain home is \$4,334. The homeowner plans to spend \$25,000 to install a geothermal heating system. The homeowner estimates that the average annual energy cost will then be \$2,712. Which of the following inequalities can be solved to find *t*, the number of years after installation at which the total amount of energy cost savings will exceed the installation cost?

A. $25{,}000 > (4{,}334 - 2{,}712)t$

B. $25{,}000 < (4{,}334 - 2{,}712)t$

C. $25{,}000 - 4{,}334 > 2{,}712t$

D. $25{,}000 > \frac{4{,}332}{2{,}712}t$

ID: 90bd9ef8 Answer

Correct Answer: B

Rationale

Choice B is correct. The savings each year from installing the geothermal heating system will be the average annual energy cost for the home before the geothermal heating system installation minus the average annual energy cost after the geothermal heating system installation, which is $(4{,}334 - 2{,}712)$ dollars. In t years, the savings will be $(4{,}334 - 2{,}712)t$ dollars. Therefore, the inequality that can be solved to find the number of years after installation at which the total amount of energy cost savings will exceed (be greater than) the installation cost, \$25,000, is $25{,}000 < (4{,}334 - 2{,}712)t$.

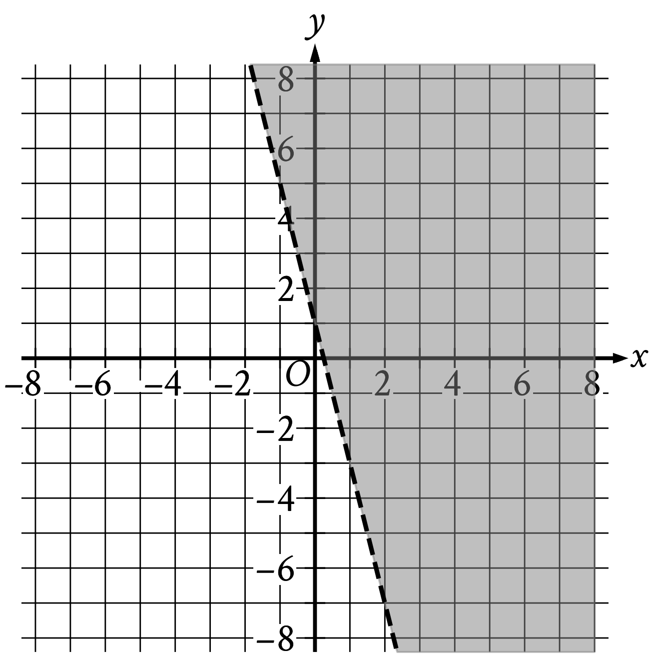
Choice A is incorrect. It gives the number of years after installation at which the total amount of energy cost savings will be less than the installation cost. Choice C is incorrect and may result from subtracting the average annual energy cost for the home from the onetime cost
of the geothermal heating system installation. To find the predicted total savings, the predicted average cost should be subtracted from the average annual energy cost before the installation, and the result should be multiplied by the number of years, t. Choice D is incorrect and may result from misunderstanding the context. The ratio $\frac{4{,}332}{2{,}712}$ compares the average energy cost before installation and the average energy cost after installation; it does not represent the savings.

Question Difficulty: Medium

Question ID d02193fb

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

ID: d02193fb



The shaded region shown represents the solutions to which inequality?

A. $y < 1 + 4x$

B. $y < 1 - 4x$

C. $y > 1 + 4x$

D. $y > 1 - 4x$

ID: d02193fb Answer

Correct Answer: D

Rationale

Choice D is correct. The equation for the line representing the boundary of the shaded region can be written in slope-intercept form $y = b + mx$, where m is the slope and $0, b$ is the y-intercept of the line. For the graph shown, the boundary line passes through the points $0, 1$ and $1, -3$. Given two points on a line, x_1, y_1 and x_2, y_2, the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $0, 1$ and $1, -3$ for x_1, y_1 and x_2, y_2 in this equation yields $m = \frac{-3 - 1}{1 - 0}$, which is equivalent to $m = \frac{-4}{1}$, or $m = -4$. Since the point $0, 1$ represents the y-intercept, it follows that $b = 1$. Substituting -4 for m and 1 for b in the equation $y = b + mx$ yields $y = 1 - 4x$ as the equation of the boundary line. Since the shaded region represents all the points above this boundary line, it follows that the shaded region shown represents the solutions to the inequality $y > 1 - 4x$.

Choice A is incorrect. This inequality represents a region below, not above, a boundary line with a slope of 4, not -4.

Choice B is incorrect. This inequality represents a region below, not above, the boundary line shown.

Choice C is incorrect. This inequality represents a region whose boundary line has a slope of 4, not -4.

Question Difficulty: Medium

Question ID 948087f2

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

ID: 948087f2

$y \leq 3x + 1$
$x - y > 1$

Which of the following ordered pairs (x, y) satisfies the system of inequalities above?

A. $(-2, -1)$

B. $(-1, 3)$

C. $(1, 5)$

D. $(2, -1)$

ID: 948087f2 Answer

Correct Answer: D

Rationale

Choice D is correct. Any point (x, y) that is a solution to the given system of inequalities must satisfy both inequalities in the system. The second inequality in the system can be rewritten as $x > y + 1$. Of the given answer choices, only choice D satisfies this inequality, because inequality $2 > -1 + 1$ is a true statement. The point $(2, -1)$ also satisfies the first inequality.

Alternate approach: Substituting $(2, -1)$ into the first inequality gives $-1 \leq 3(2) + 1$, or $-1 \leq 7$, which is a true statement. Substituting $(2, -1)$ into the second inequality gives $2 - (-1) > 1$, or $3 > 1$, which is a true statement. Therefore, since $(2, -1)$ satisfies both inequalities, it is a solution to the system.

Choice A is incorrect because substituting −2 for x and −1 for y in the first inequality gives $-1 \leq 3(-2) + 1$, or $-1 \leq -5$, which is false. Choice B is incorrect because substituting −1 for x and 3 for y in the first inequality gives $3 \leq 3(-1) + 1$, or $3 \leq -2$, which is false. Choice C is incorrect because substituting 1 for x and 5 for y in the first inequality gives $5 \leq 3(1) + 1$, or $5 \leq 4$, which is false.

Question Difficulty: Medium