Question Bank

Math

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Linear Inequalities (key)

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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 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 $35 \text{ miles per hour } (\text{mph})$, 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 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 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. $\dfrac{(G+85+78+98)}{4}\geq 90$

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

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 $\dfrac{G+85+78+98}{4}$. The inequality that expresses the condition that the mean score is at least 90 can therefore be written as $\dfrac{G+85+78+98}{4}\geq 90$.

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 915463e0

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

ID: 915463e0

Normal body temperature for an adult is between $97.8°F$ and $99°F$, inclusive. If Kevin, an adult male, has a body temperature that is considered to be normal, which of the following could be his body temperature?

A. $96.7°F$

B. $97.6°F$

C. $97.9°F$

D. $99.7°F$

ID: 915463e0 Answer

Correct Answer: C

Rationale

Choice C is correct. Normal body temperature must be greater than or equal to 97.8°F but less than or equal to 99°F. Of the given choices, 97.9°F is the only temperature that fits these restrictions.

Choices A and B are incorrect. These temperatures are less than 97.8°F, so they don't fit the given restrictions. Choice D is incorrect. This temperature is greater than 99°F, so it doesn't fit the given restrictions.

Question Difficulty: Easy

Question ID 89541f9b

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

ID: 89541f9b

Which of the following ordered pairs (x, y) satisfies the inequality $5x - 3y < 4$?

1. $(1, 1)$
2. $(2, 5)$
3. $(3, 2)$

A. I only

B. II only

C. I and II only

D. I and III only

ID: 89541f9b Answer

Correct Answer: C

Rationale

Choice C is correct. Substituting $(1,1)$ into the inequality gives $5(1) - 3(1) < 4$, or $2 < 4$, which is a true statement. Substituting $(2,5)$ into the inequality gives $5(2) - 3(5) < 4$, or $-5 < 4$, which is a true statement. Substituting $(3,2)$ into the inequality gives $5(3) - 3(2) < 4$, or $9 < 4$, which is not a true statement. Therefore, $(1,1)$ and $(2,5)$ are the only ordered pairs shown that satisfy the given inequality.

Choice A is incorrect because the ordered pair $(2,5)$ also satisfies the inequality. Choice B is incorrect because the ordered pair $(1,1)$ also satisfies the inequality. Choice D is incorrect because the ordered pair $(3,2)$ does not satisfy the inequality.

Question Difficulty: Easy

Question ID 84d0d07e

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

ID: 84d0d07e

A clothing store is having a sale on shirts and pants. During the sale, the cost of each shirt is $15 and the cost of each pair of pants is $25. Geoff can spend at most $120 at the store. If Geoff buys *s* shirts and *p* pairs of pants, which of the following must be true?

A. $15s + 25p \leq 120$

B. $15s + 25p \geq 120$

C. $25s + 15p \leq 120$

D. $25s + 15p \geq 120$

ID: 84d0d07e Answer

Correct Answer: A

Rationale

Choice A is correct. Since the cost of each shirt is $15 and Geoff buys s shirts, the expression $15s$ represents the amount Geoff spends on shirts. Since the cost of each pair of pants is $25 and Geoff buys p pairs of pants, the expression $25p$ represents the amount Geoff spends on pants. Therefore, the sum $15s + 25p$ represents the total amount Geoff spends at the store. Since Geoff can spend at most $120 at the store, the total amount he spends must be less than or equal to 120. Thus, $15s + 25p \leq 120$.

Choice B is incorrect. This represents the situation in which Geoff spends at least, rather than at most, $120 at the store. Choice C is incorrect and may result from reversing the cost of a shirt and that of a pair of paints. Choice D is incorrect and may result from both reversing the cost of a shirt and that of a pair of pants and from representing a situation in which Geoff spends at least, rather than at most, $120 at the store.

Question Difficulty: Easy

Question ID e744499e

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

ID: e744499e

An elementary school teacher is ordering x workbooks and y sets of flash cards for a math class. The teacher must order at least 20 items, but the total cost of the order must not be over \$80. If the workbooks cost \$3 each and the flash cards cost \$4 per set, which of the following systems of inequalities models this situation?

A. $\begin{aligned} x + y &\geq 20 \\ 3x + 4y &\leq 80 \end{aligned}$

B. $\begin{aligned} x + y &\geq 20 \\ 3x + 4y &\geq 80 \end{aligned}$

C. $\begin{aligned} 3x + 4y &\leq 20 \\ x + y &\geq 80 \end{aligned}$

D. $\begin{aligned} x + y &\leq 20 \\ 3x + 4y &\geq 80 \end{aligned}$

ID: e744499e Answer

Correct Answer: A

Rationale

Choice A is correct. The total number of workbooks and sets of flash cards ordered is represented by $x + y$. Since the teacher must order at least 20 items, it must be true that $x + y \geq 20$. Each workbook costs \$3; therefore, $3x$ represents the cost, in dollars, of x workbooks. Each set of flashcards costs \$4; therefore, $4y$ represents the cost, in dollars, of y sets of flashcards. It follows that the total cost for x workbooks and y sets of flashcards is $3x + 4y$. Since the total cost of the order must not be over \$80, it must also be true that $3x + 4y \leq 80$. Of the choices given, these inequalities are shown only in choice A.

Choice B is incorrect. The second inequality says that the total cost must be greater, not less than or equal to \$80. Choice C incorrectly limits the cost by the minimum number of items and the number of items with the maximum cost. Choice D is incorrect. The first inequality incorrectly says that at most 20 items must be ordered, and the second inequality says that the total cost of the order must be at least, not at most, \$80.

Question Difficulty: Easy

Question ID b75f7812

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

ID: b75f7812

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

ID: b75f7812 Answer

Rationale

The correct answer is 4. The equation $60h + 10 \leq 280$, where h is the number of hours the boat has been rented, can be written to represent the situation. Subtracting 10 from both sides and then dividing by 60 yields $h \leq 4.5$. Since the boat can be rented only for whole numbers of hours, the maximum number of hours for which Maria can rent the boat is 4.

Question Difficulty: Easy

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 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 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 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. $120 \leq H \leq 162$

B. $102 \leq H \leq 120$

C. $60 \leq H \leq 162$

D. $60 \leq H \leq 102$

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 $0.5 \leq p \leq 0.85$. 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 $120 \leq H \leq 162$.

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

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 $72(16)$ miles total. If one of these whales travels 77 miles each day for 16 days, then the whale travels $77(16)$ miles total. Therefore, the model estimates that in 16 days of its migration, a whale from the genus *Eschrichtius* could travel at least $72(16)$ and at most $77(16)$ miles total. Thus, the inequality $(72)(16) \leq x \leq (77)(16)$ 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

2.9

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

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 $\dfrac{4{,}332}{2{,}712}$ compares the average energy cost before installation and the average energy cost after installation; it does not represent the savings.

Question ID 948087f2

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

ID: 948087f2

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

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 $-1 \le 3(2) + 1$, or $-1 \le 7$, 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 $-1 \le 3(-2) + 1$, or $-1 \le -5$, 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

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 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 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 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 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 1035faea

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

ID: 1035faea

A psychologist set up an experiment to study the tendency of a person to select the first item when presented with a series of items. In the experiment, 300 people were presented with a set of five pictures arranged in random order. Each person was asked to choose the most appealing picture. Of the first 150 participants, 36 chose the first picture in the set. Among the remaining 150 participants, p people chose the first picture in the set. If more than 20% of all participants chose the first picture in the set, which of the following inequalities best describes the possible values of p ?

A. $p > 0.20(300 - 36)$, where $p \leq 150$

B. $p > 0.20(300 + 36)$, where $p \leq 150$

C. $p - 36 > 0.20(300)$, where $p \leq 150$

D. $p + 36 > 0.20(300)$, where $p \leq 150$

ID: 1035faea Answer

Correct Answer: D

Rationale

Choice D is correct. Of the first 150 participants, 36 chose the first picture in the set, and of the 150 remaining participants, p chose the first picture in the set. Hence, the proportion of the participants who chose the first picture in the set is $\frac{36+p}{300}$. Since more than 20% of all the participants chose the first picture, it follows that $\frac{36+p}{300} > 0.20$.

This inequality can be rewritten as $p + 36 > 0.20(300)$. Since p is a number of people among the remaining 150 participants, $p \leq 150$.

Choices A, B, and C are incorrect and may be the result of some incorrect interpretations of the given information or of computational errors.

Question Difficulty: Hard

Question ID 5bf5136d

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

ID: 5bf5136d

The triangle inequality theorem states that the sum of any two sides of a triangle must be greater than the length of the third side. If a triangle has side lengths of 6 and 12, which inequality represents the possible lengths, x, of the third side of the triangle?

A. $x < 18$

B. $x > 18$

C. $6 < x < 18$

D. $x < 6$ or $x > 18$

ID: 5bf5136d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a triangle has side lengths of 6 and 12, and x represents the length of the third side of the triangle. It's also given that the triangle inequality theorem states that the sum of any two sides of a triangle must be greater than the length of the third side. Therefore, the inequalities $6 + x > 12$, $6 + 12 > x$, and $12 + x > 6$ represent all possible values of x. Subtracting 6 from both sides of the inequality $6 + x > 12$ yields $x > 12 - 6$, or $x > 6$. Adding 6 and 12 in the inequality $6 + 12 > x$ yields $18 > x$, or $x < 18$. Subtracting 12 from both sides of the inequality $12 + x > 6$ yields $x > 6 - 12$, or $x > -6$. Since all x-values that satisfy the inequality $x > 6$ also satisfy the inequality $x > -6$, it follows that the inequalities $x > 6$ and $x < 18$ represent the possible values of x. Therefore, the inequality $6 < x < 18$ represents the possible lengths, x, of the third side of the triangle.

Choice A is incorrect. This inequality gives the upper bound for x but does not include its lower bound.

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 e8f9e117

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

ID: e8f9e117

$$I = \frac{V}{R}$$

The formula above is Ohm's law for an electric circuit with current *I*, in amperes, potential difference *V*, in volts, and resistance *R*, in ohms. A circuit has a resistance of 500 ohms, and its potential difference will be generated by *n* six-volt batteries that produce a total potential difference of $6n$ volts. If the circuit is to have a current of no more than 0.25 ampere, what is the greatest number, *n*, of six-volt batteries that can be used?

ID: e8f9e117 Answer

Rationale

The correct answer is 20. For the given circuit, the resistance R is 500 ohms, and the total potential difference V generated by n batteries is $6n$ volts. It's also given that the circuit is to have a current of no more than 0.25 ampere, which can be expressed as $I < 0.25$. Since Ohm's law says that $I = \frac{V}{R}$, the given values for V and R can be substituted for I in this inequality, which yields $\frac{6n}{500} < 0.25$. Multiplying both sides of this inequality by 500 yields $6n < 125$, and dividing both sides of this inequality by 6 yields $n < 20.833$. Since the number of batteries must be a whole number less than 20.833, the greatest number of batteries that can be used in this circuit is 20.

Question Difficulty: Hard

Question ID 963da34c

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

ID: 963da34c

A shipping service restricts the dimensions of the boxes it will ship for a certain type of service. The restriction states that for boxes shaped like rectangular prisms, the sum of the perimeter of the base of the box and the height of the box cannot exceed 130 inches. The perimeter of the base is determined using the width and length of the box. If a box has a height of 60 inches and its length is 2.5 times the width, which inequality shows the allowable width *x*, in inches, of the box?

A. $0 < x \leq 10$

B. $0 < x \leq 11\frac{2}{3}$

C. $0 < x \leq 17\frac{1}{2}$

D. $0 < x \leq 20$

ID: 963da34c Answer

Correct Answer: A

Rationale

Choice A is correct. If x is the width, in inches, of the box, then the length of the box is 2.5x inches. It follows that the perimeter of the base is $2(2.5x + x)$, or 7x inches. The height of the box is given to be 60 inches. According to the restriction, the sum of the perimeter of the base and the height of the box should not exceed 130 inches. Algebraically, this can be represented by $7x + 60 \leq 130$, or $7x \leq 70$. Dividing both sides of the inequality by 7 gives $x \leq 10$. Since x represents the width of the box, x must also be a positive number. Therefore, the inequality $0 < x \leq 10$ represents all the allowable values of x that satisfy the given conditions.

Choices B, C, and D are incorrect and may result from calculation errors or misreading the given information.

Question Difficulty: Hard

Question ID b8e73b5b

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

ID: b8e73b5b

Ken is working this summer as part of a crew on a farm. He earned $8 per hour for the first 10 hours he worked this week. Because of his performance, his crew leader raised his salary to $10 per hour for the rest of the week. Ken saves 90% of his earnings from each week. What is the least number of hours he must work the rest of the week to save at least $270 for the week?

A. 38

B. 33

C. 22

D. 16

ID: b8e73b5b Answer

Correct Answer: C

Rationale

Choice C is correct. Ken earned $8 per hour for the first 10 hours he worked, so he earned a total of $80 for the first 10 hours he worked. For the rest of the week, Ken was paid at the rate of $10 per hour. Let x be the number of hours he will work for the rest of the week. The total of Ken's earnings, in dollars, for the week will be $10x+80$. He saves 90% of his earnings each week, so this week he will save $0.9(10x+80)$ dollars. The inequality $0.9(10x+80)\ge 270$ represents the condition that he will save at least $270 for the week. Factoring 10 out of the expression $10x+80$ gives $10(x+8)$. The product of 10 and 0.9 is 9, so the inequality can be rewritten as $9(x+8)\ge 270$. Dividing both sides of this inequality by 9 yields $x+8\ge 30$, so $x\ge 22$. Therefore, the least number of hours Ken must work the rest of the week to save at least $270 for the week is 22.

Choices A and B are incorrect because Ken can save $270 by working fewer hours than 38 or 33 for the rest of the week. Choice D is incorrect. If Ken worked 16 hours for the rest of the week, his total earnings for the week will be $\$80+\$160=\$240$, which is less than $270. Since he saves only 90% of his earnings each week, he would save even less than $240 for the week.

Question Difficulty: Hard

Question ID 830120b0

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

ID: 830120b0

$$y > 2x - 1$$
$$2x > 5$$

Which of the following consists of the y-coordinates of all the points that satisfy the system of inequalities above?

A. $y > 6$

B. $y > 4$

C. $y > \frac{5}{2}$

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

ID: 830120b0 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting the same number from each side of an inequality gives an equivalent inequality. Hence, subtracting 1 from each side of the inequality $2x > 5$ gives $2x - 1 > 4$. So the given system of inequalities is equivalent to the system of inequalities $y > 2x - 1$ and $2x - 1 > 4$, which can be rewritten as $y > 2x - 1 > 4$. Using the transitive property of inequalities, it follows that $y > 4$.

Choice A is incorrect because there are points with a y-coordinate less than 6 that satisfy the given system of inequalities. For example, $(3, 5.5)$ satisfies both inequalities. Choice C is incorrect. This may result from solving the inequality $2x > 5$ for x, then replacing x with y. Choice D is incorrect because this inequality allows y-values that are not the y-coordinate of any point that satisfies both inequalities. For example, $y = 2$ is contained in the set $y > \frac{3}{2}$; however, if 2 is substituted into the first inequality for y, the result is $x < \frac{3}{2}$. This cannot be true because the second inequality gives $x > \frac{5}{2}$.