Digital SAT Math

Prep Book Bundle 1~13

Digital SAT Math

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SAT Math Problems

1. What is the center of the circle in the xy-plane defined by the equation $(x + 5)^2 + (y - 3)^2 = 16$?

A. (-5, 3)

B. (5, -3)

C. (5, 3)

D. (-5, -3)

2. How many gallons are equivalent to 15 liters? (1 liter = 0.264172 gallons)

A. 3.9224

B. 3.9626

C. 4.0626

D. 3.8606

3. A school hosted a debate competition between three ideological teams representing different political viewpoints. There are a total of 200 students participating in the competition. If the probability of selecting a student from the leftist team is 0.55 and the probability of selecting a student from the centrist team is 0.25, how many students are representing the rightist team?

A. 30

B. 40

C. 50

D. 60

4. A country is investing in renewable energy technologies to produce solar power. If the government allocates a budget of $500, 000 to install solar panels at a cost of $25, 000 per installation, how many installations can the country afford?

A. 15

B. 18

C. 20

D. 22

5. A scientist is conducting an experiment involving two types of particles: electrons and photons. The total number of particles is 150. If the number of electrons is 5 times the number of photons, which of the following systems of equations represents this situation, where x is the number of electrons and y is the number of photons?

A. $x + y = 150$ and $x = 5y$

B. $x - y = 150$ and $x = 5y$

C. $x + y = 150$ and $y = 5x$

D. $x - y = 150$ and $y = \frac{x}{5}$

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

A. (3, 2)

B. (4, 2)

C. (2, 3)

D. (2, 2)

7. Square C has a perimeter of 64 inches. If each side of square C is decreased by a length of 4 inches, what will be the perimeter of square D?

8. A country has a linear relationship between its renewable energy production (measured in terawatt-hours, TWh) and the investment in renewable technologies (measured in millions of dollars, $\$m$). The equation representing this relationship is given by $y = 0.5x + 15$, where $30 \leq x \leq 200$. If a country invests \$70 million in renewable technologies, how much renewable energy can it produce?

A. 45

B. 50

C. 55

D. 60

9. In the xy-plane, circle A is represented by the equation $(x + 1)^2 + (y - 4)^2 = 9$. Circle B has the same center as circle A but has a radius that is three times the radius of circle A. Which equation represents circle B?

A. $(x + 1)^2 + (y - 4)^2 = 81$

B. $(x - 1)^2 + (y + 4)^2 = 81$

C. $(x + 1)^2 + (y - 4)^2 = 27$

D. $(x + 1)^2 + (y + 4)^2 = 81$

10. In $\triangle ABC$, $\angle B$ is a right angle and the length of AC is 180 millimeters. If $cos(A) = \frac{4}{5}$, what is the length, in millimeters, of AB?

A. 120

B. 135

C. 144

D. 150

SAT Math Solutions

1. What is the center of the circle in the xy-plane defined by the equation $(x + 5)^2 + (y - 3)^2 = 16$?

A. (-5, 3)

B. (5, -3)

C. (5, 3)

D. (-5, -3)

Answer

A

Solution

This problem tests the student's understanding of the standard form of a circle's equation in the coordinate plane, and their ability to identify the center and radius from that equation.
The student should recognize that the equation is in the standard form of a circle, $(x - k)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius. Here, $(x + 5)^2$ can be rewritten as $(x - (- 5))^2$, identifying h as -5, and $(y - 3)^2$ already shows k as 3. Therefore, the center is (-5, 3).
Remember that the signs inside the parentheses are opposite to the values of h and k in the center (h, k). This is a common point of confusion, so always double-check by converting the equation into the standard form.
A common mistake is to overlook the signs in the equation. Ensure that you are attentive to the negative signs when identifying the center. Another potential error is confusing the coefficient of x and y inside the squared terms as the center directly without considering the equation format.
This type of problem is fundamental in understanding circle equations and is frequently tested on the SAT. Mastery of identifying the center and radius from the standard form will be beneficial not only for geometry questions but also in problems that integrate algebraic manipulation. Practice with various equations to ensure confidence.

The equation $(x + 5)^2 + (y - 3)^2 = 16$ is in the form $(x - (- 5))^2 + (y - 3)^2 = 16$.
By comparing with $(x - k)^2 + (y - k)^2 = r^2$, we see that $h =- 5$ and $k = 3$.
Thus, the center of the circle is $(- 5, 3)$.

2. How many gallons are equivalent to 15 liters? (1 liter = 0.264172 gallons)

A. 3.9224

B. 3.9626

C. 4.0626

D. 3.8606

Answer

B

Solution

The problem is designed to test the student's ability to perform basic unit conversion between liters and gallons, which is a fundamental skill in understanding and interpreting real-world data.
To approach this problem, the student should recognize that they need to convert liters to gallons using the given conversion factor. They should multiply the number of liters (15) by the conversion rate (0.264172 gallons per liter) to find the equivalent number of gallons.
When performing unit conversions, always double-check that you are using the correct conversion factor and that you are multiplying or dividing in the correct order. Also, keep track of your units throughout the calculation to ensure they cancel out appropriately.
Be careful with rounding. The conversion factor is given to six decimal places, so maintain this level of precision in your calculations to avoid errors. Additionally, ensure that you are multiplying rather than dividing by the conversion factor.
This problem assesses a student's ability to apply unit conversion skills, which are crucial in both academic and real-world contexts. Being proficient in unit conversions aids in understanding various scientific, engineering, and everyday scenarios. Ensuring accuracy in conversions helps prevent common mistakes, making this a valuable skill to master for SAT and beyond.

To convert 15 liters into gallons, use the conversion factor: 1 liter = 0.264172 gallons.
Multiply the number of liters by the conversion factor: 15 liters × 0.264172 gallons/liter = 3.96258 gallons.
Round the result to the fourth decimal place: 3.9626 gallons.

3. A school hosted a debate competition between three ideological teams representing different political viewpoints. There are a total of 200 students participating in the competition. If the probability of selecting a student from the leftist team is 0.55 and the probability of selecting a student from the centrist team is 0.25, how many students are representing the rightist team?

A. 30

B. 40

C. 50

D. 60

Answer

B

Solution

This problem is designed to test the student's understanding of basic probability concepts and their ability to apply these concepts to calculate the number of outcomes when probabilities are given.
To solve this problem, the student needs to understand that the sum of probabilities for all possible outcomes must equal 1. First, calculate the number of students in the leftist and centrist teams using the given probabilities. Then, use the total probability to find the probability of selecting a student from the rightist team and subsequently calculate the number of students in that team.
Remember that the sum of all probabilities should be 1. Use this information to find the missing probability for the rightist team. Then, multiply this probability by the total number of students to find the number of students in the rightist team.
Be careful with rounding errors. Ensure that probabilities add exactly to 1 before proceeding with calculations. Double-check your calculations to avoid simple arithmetic mistakes.
This problem is a classic example of assessing a student's ability to work with probabilities and relative frequencies. It requires careful attention to detail in ensuring that all probabilities correctly sum to 1 and that calculations are performed accurately. Mastery of these skills is crucial for success in the SAT math section, particularly in the domain of Problem Solving and Data Analysis.

Calculate the total probability of selecting a student from either the leftist or centrist team.
Probability from leftist team + Probability from centrist team = 0.55 + 0.25 = 0.80
Since the total probability must be 1, the probability of selecting a student from the rightist team is: 1 - 0.80 = 0.20

Now, calculate the number of students in the rightist team.
$Number\ of\ rightist\ team\ students$

$= Total\ number\ of\ students\ \times\ Probability\ of\ rightist\ team$

$= 200\ \times\ 0.20\ =\ 40$

4. A country is investing in renewable energy technologies to produce solar power. If the government allocates a budget of $\$500,000$ to install solar panels at a cost of $\$25,000$ per installation, how many installations can the country afford?

A. 15

B. 18

C. 20

D. 22

Answer

C

Solution

This problem aims to test the student's ability to understand and solve a linear equation derived from a word problem. It assesses the student's proficiency in translating a real-world scenario into a mathematical model and solving for the unknown variable.
To solve this problem, the student needs to set up a simple linear equation based on the given information. The student should start by identifying the total budget and the cost per installation. The equation can be formed by dividing the total budget by the cost per installation: $500,000 \div 25,000$.
Break down the problem into smaller parts for clarity. First, understand what each number represents: the total budget and the cost per installation. Write down the equation step by step and simplify it to find the answer. Remember that dividing the total budget by the cost per installation gives the number of installations.
Ensure that you correctly interpret the units and the given values. Misinterpreting the budget or the cost per installation can lead to incorrect answers. Also, be careful with arithmetic operations, especially division.
This type of problem is common in the SAT and assesses the student's ability to apply basic algebra to real-world situations. Successful solving of this problem shows that the student can translate word problems into mathematical equations and solve them accurately. Developing a systematic approach to breaking down and solving word problems is crucial for the SAT.

To find the number of installations, we divide the total budget by the cost per installation: $500,000 \div 25,000 = 20$
So, the country can afford 20 installations of solar panels.

5. A scientist is conducting an experiment involving two types of particles: electrons and photons. The total number of particles is 150. If the number of electrons is 5 times the number of photons, which of the following systems of equations represents this situation, where x is the number of electrons and y is the number of photons?

A. $x + y = 150$ and $x = 5y$

B. $x - y = 150$ and $x = 5y$

C. $x + y = 150$ and $y = 5x$

D. $x - y = 150$ and $y = \frac{x}{5}$

Answer

A

Solution

This problem tests the student's ability to translate a word problem into a system of linear equations. It evaluates the understanding of basic algebraic concepts such as variables, coefficients, and the structure of linear equations.
To approach this problem, the student needs to identify the variables and set up two equations based on the given information. The total number of particles is given as 150, and the relationship between electrons (x) and photons (y) is given as $x = 5y$. The system of equations can be established as follows: 1) $x + y = 150$ and 2) $x = 5y$. First, clearly define your variables. Let x be the number of electrons and y be the number of photons. Next, carefully translate the word problem into mathematical equations. The total number of particles equation is straightforward, and the relationship given directly translates into the second equation.
Be careful not to mix up the variables or the relationship between them. Ensure that the coefficients are correctly placed according to the problem statement.
Double-check that the equations correctly represent the situation described in the problem.
This type of SAT problem is designed to assess the student's ability to interpret and set up systems of linear equations from word problems, a fundamental skill in algebra. Successfully solving this problem demonstrates a solid understanding of variable relationships and equation formation, which are critical for more advanced algebraic concepts.

First, we need to express the total number of particles in terms of x and y.
This can be done with the equation: $x + y = 150$.
Next, the condition that the number of electrons is 5 times the number of photons

can be expressed as: $x = 5y$.
Thus, the system of equations representing this situation is: $x + y = 150, x = 5y$

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

A. (3, 2)

B. (4, 2)

C. (2, 3)

D. (2, 2)

Answer

A

Solution

This problem aims to assess the student's ability to solve a system of linear equations, which is a fundamental concept in algebra. The student should be able to substitute and solve for the variables to find the solution. First, identify that the second equation provides a direct value for y. Substitute this value into the first equation to solve for x. The steps are as follows: 1. Recognize that $y = 2$ from the second equation. 2. Substitute $y = 2$ into the first equation: $2x + 3(2) = 12$. 3. Simplify and solve for x.
When you have one of the variables directly given (like $y = 2$), always substitute it into the other equation first. This simplifies the problem and reduces potential errors. Don't forget to check your solution by substituting both values back into the original equations. Make sure you substitute the value of y correctly and perform arithmetic operations carefully.
Pay attention to signs and coefficients to avoid simple mistakes. This type of problem is straightforward if you follow the correct steps of substitution and solving. It tests your understanding of basic algebraic manipulation and solving systems of equations. These skills are crucial for more complex algebra problems and are frequently tested in SAT. Practice similar problems to improve your speed and accuracy.

Substitute$y = 2$ into the equation $2x + 3y = 12$.
This gives us: $2x + 3(2) = 12$.
Simplify the equation: $2x + 6 = 12$.
Subtract 6 from both sides: $2x = 12 - 6$., $2x = 6$.
Divide both sides by 2 to solve for x: $x = 3$.
Therefore, the solution is $(x, y) = (3, 2)$.

7. Square C has a perimeter of 64 inches. If each side of square C is decreased by a length of 4 inches, what will be the perimeter of square D?

Answer

48

Solution

This question tests the student's understanding of how the perimeter of a square relates to its side length, particularly when the side length is changed. It checks the ability to apply basic arithmetic operations and understanding of geometric properties.

First, determine the side length of square C using its perimeter. Since the perimeter of a square is 4 times the length of one side, divide the given perimeter by 4 to find the side length of square C. Next, subtract 4 inches from this side length to find the new side length for square D. Finally, calculate the perimeter of square D by multiplying its side length by 4.

Remember that the perimeter of a square is simply 4 times the length of one side. This makes it straightforward to find the side length when given the perimeter. Once you have the side length, adjusting it as per the problem's conditions is a direct calculation.

Be careful with subtracting the length. Ensure that you subtract exactly 4 inches and then use the new side length to calculate the perimeter, avoiding any arithmetic errors. Also, remember that the perimeter changes proportionally with the change in side length.

This type of problem is common in testing basic geometric principles combined with arithmetic skills. It assesses the student's ability to manipulate simple algebraic expressions related to geometry, a skill essential for problem-solving and data analysis tasks on the SAT. The problem is designed to be straightforward if the student understands the relationship between the side length and perimeter of a square.

1. Calculate the side length of square C: $Side\ of\ square\ C = \frac{64}{4} = 16\ inches.$

2. Calculate the side length of square D: $Side\ of\ square\ D = 16 - 4 = 12\ inches.$

3. Calculate the perimeter of square D:
$Perimeter\ of\ square\ D = 4 \times 12 = 48\ inches.$

8. A country has a linear relationship between its renewable energy production (measured in terawatt-hours, TWh) and the investment in renewable technologies (measured in millions of dollars, $\$m$). The equation representing this relationship is given by $y = 0.5x + 15$, where $30 \leq x \leq 200$. If a country invests \$70 million in renewable technologies, how much renewable energy can it produce?

A. 45

B. 50

C. 55

D. 60

Answer

B

Solution

This problem aims to test the student's ability to understand and apply linear relationships in a real-world context. The student needs to use the given linear equation to find the corresponding value of renewable energy production for a given investment amount.
To solve this problem, the student should substitute the given investment value ($x = 70$) into the linear equation $y = 0.5x + 15$ and solve for y. This will give the renewable energy production corresponding to the investment of \$70 million.
First, carefully identify the variables and their units. Here, x represents the investment in millions of dollars, and y represents the renewable energy production in TWh. Substitute $x = 70$ into the equation and perform the arithmetic step-by-step to avoid errors.
Ensure that the value of x falls within the given range ($30 \leq x \leq 200$). In this problem, $x = 70$ falls within the range, so the substitution is valid. Double-check your arithmetic calculations to avoid simple mistakes.
This type of problem is common in SAT algebra sections where students are asked to apply linear equations to real-world scenarios. It assesses the student's ability to interpret and manipulate linear relationships and reinforces the importance of understanding unit conversions and constraints. By following a structured approach and being cautious with calculations, students can effectively solve these types of problems.

Substitute $x = 70$ into the equation $y = 0.5x + 15$.
Calculate: $y = 0.5(70) + 15$.
Perform the multiplication: $0.5 \times 70 = 35$.
Add 15 to the result: $35 + 15 = 50$.
So, when the investment is \$70 million, the renewable energy production is 50 TWh.

9. In the xy-plane, circle A is represented by the equation $(x + 1)^2 + (y - 4)^2 = 9$. Circle B has the same center as circle A but has a radius that is three times the radius of circle A. Which equation represents circle B?

A. $(x + 1)^2 + (y - 4)^2 = 81$

B. $(x - 1)^2 + (y + 4)^2 = 81$

C. $(x + 1)^2 + (y - 4)^2 = 27$

D. $(x + 1)^2 + (y + 4)^2 = 81$

Answer

A

Solution

This problem aims to test the student's understanding of the standard equation of a circle, how to identify the center and radius from the equation, and how to modify the equation for a circle with a different radius but the same center.
First, identify the center and radius of circle A from its equation. The equation given is in the standard form $(x - h)^2 + (y - k)^2 = r^2$.
By comparing, we find the center (h, k) and radius r of circle A. Next, calculate the new radius for circle B, which is three times the radius of circle A. Use the same center and the new radius to write the equation for circle B.
Recall the standard form of a circle's equation and be comfortable with extracting the center and radius from it. Once you have the center, focus on correctly calculating and substituting the new radius into the equation.
Be careful with the sign changes when extracting the center from the equation. Double-check your calculations for the new radius to avoid simple multiplication errors.
This problem is a classic example of manipulating the standard form of a circle's equation. It tests the student's ability to interpret and modify geometric equations, an essential skill for the SAT. Being methodical in your approach and double-checking your work can help avoid common mistakes.

Circle A is given by $(x + 1)^2 + (y - 4)^2 = 9$. This means that circle A is centered at $(-1, 4)$ with a radius of 3.
Since circle B has the same center as circle A, its center is $(-1, 4)$. The radius of circle B is three times that of circle A, which means the radius is $3 \times 3 = 9$.
The general equation for a circle with center (h, k) and radius r is $(x - h)^2 + (y - k)^2 = r^2$.

Circle B, having a radius of 9 and centered at $(-1, 4)$, will have the equation: $(x + 1)^2 + (y - 4)^2 = 9^2$.
Calculate 9^2: it equals 81.
Therefore, the equation for circle B is $(x + 1)^2 + (y - 4)^2 = 81$.

10. In $\triangle ABC$, $\angle B$ is a right angle and the length of AC is 180 millimeters. If $cos(A) = \frac{4}{5}$, what is the length, in millimeters, of AB?

A. 120

B. 135

C. 144

D. 150

Answer

C

Solution

This problem aims to assess the student's understanding of right angle trigonometry, specifically the use of the cosine ratio to find the length of a side in a right triangle.
To solve this problem, the student needs to apply the definition of cosine in the context of a right triangle. The cosine of angle A ($cos(A)$) is the ratio of the adjacent side (AB) to the hypotenuse (AC). Using the given cosine value and the length of the hypotenuse, the student can solve for the length of AB.
Remember that the cosine ratio is defined as $cos(\theta) = \frac{adjacent}{hypotenuse}$. Rearrange this formula to solve for the adjacent side: $adjacent = hypotenuse \times cos(\theta)$.
Substitute the given values: $AB = 180 \times \frac{4}{5}$.
Be cautious when performing the multiplication and ensure that you simplify the fraction correctly. Additionally, make sure you are using the correct sides for the cosine ratio; confusing the sides can lead to incorrect results.
This problem is a classic example of how trigonometric ratios are used in right triangles. It tests the student's ability to correctly apply the cosine ratio to find a side length. Mastering problems like this is crucial for performing well in the geometry and trigonometry sections of the SAT. The key is to clearly understand the definitions and relationships of trigonometric functions in right triangles.

Since $cos(A) = \frac{adjacent}{hypotenuse}$, and we know the hypotenuse $AC = 180mm$, we can use the formula: $cos(A) = \frac{AB}{AC} = \frac{4}{5}$
Substitute $AC = 180mm$ into the equation: $\frac{4}{5} = \frac{AB}{180}$
Solving for AB, multiply both sides by 180:, $AB = \frac{4}{5} \times 180$, $AB = 144$
Therefore, the length of AB is 144 millimeters.

Digital

SAT Math

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SAT Math Problems

1. For two acute angles, $\angle$A and $\angle$B, $sin(A) = cos(B)$. The measures, in degrees, of $\angle$A and $\angle$B are $2x + 10$ and $70 - x$, respectively. What is the value of x?

2. Circle C has a radius of $5x$ and circle D has a radius of $25x$. The area of circle D is how many times the area of circle C?

A. 10

B. 15

C. 20

D. 25

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

A. $(2, \frac{8}{3})$

B. $(2, 3)$

C. $(1, \frac{10}{3})$

D. $(0, 4)$

4. In the xy-plane, line m has a slope of -2 and a y-intercept of (0, 10). What is the x-coordinate of the x-intercept of line m?

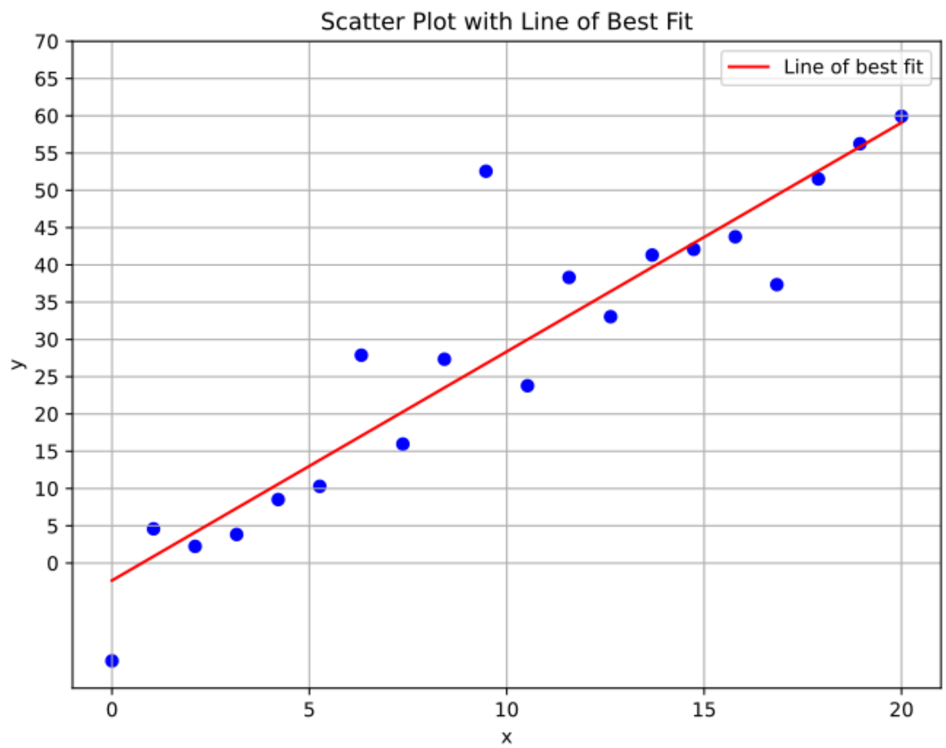
A. -5

B. 0

C. 5

D. 10

5. The scatterplot shows the relationship between two variables, x and y, for data set C. A line of best fit for the data is also shown in red. If the line of best fit has a slope of approximately 3 and a y-intercept of b, what is the y-coordinate of the y-intercept of the line of best fit for data set C?



A. -5

B. 0

C. 5

D. 10

6. The function N models the number of cyberattacks detected, in thousands, on a Managed Service Provider (MSP) t years after 2020. According to the model, the number of cyberattacks is predicted to increase by $n\%$ every 6 months. What is the value of n? $N(t) = 150(1.02)^{2t}$

A. 1%

B. 2%

C. 3%

D. 4%

7. A renewable energy company is analyzing its solar panel installations, which are designed to cover a square area. If the side length of the square area is represented by 's' meters and the total energy output is modeled by the function $E(s) = 5s^2 + 3s + 2$, where E(s) is the energy output in kilowatts, what is the energy output of the solar panels if the side length of the installation area is 4 meters?

A. 88

B. 92

C. 94

D. 98

8. One solution to the given equation can be written as $x = \frac{-8+\sqrt{m}}{2}$, where m is a constant. What is the value of m? $x^2 + 8x + 12 = 0$

9. Which expression is equivalent to $(5x^2 + 8x + 3) - (2x^2 + 4x)$?

A. $3x^2 + 4x + 3$

B. $7x^2 + 12x + 3$

C. $3x^2 + 8x + 3$

D. $7x^2 + 4x + 3$

10. The table shows the linear relationship between the number of regions, r, and their corresponding influence score on geopolitics, s. Which equation best represents the linear relationship between r and s?

Number of regions	Influence score on geopolitics
3	120
5	220
7	320

A. $s = 45r + 20$

B. $s = 50r - 30$

C. $s = 40r + 10$

D. $s = 55r - 25$

SAT Math Solutions

1. For two acute angles, $\angle A$ and $\angle B$, $sin(A) = cos(B)$. The measures, in degrees, of $\angle A$ and $\angle B$ are $2x + 10$ and $70 - x$, respectively. What is the value of x?

Answer

10

Solution

This problem tests the student's understanding of the relationship between sine and cosine for complementary angles and their ability to solve equations involving variable expressions for angle measures.
Recognize that $sin(A) = cos(B)$ implies that angles A and B are complementary, meaning $A + B = 90^\circ$. Use this relationship to set up the equation with the given expressions for angles A and B: $(2x + 10) + (70 - x) = 90$. Solve for x.
Remember the complementary angle identity: $sin(\theta) = cos(90^\circ - \theta)$. Also, ensure that you simplify the equation carefully by combining like terms to make the solving process straightforward.
Be careful not to confuse the identities or make algebraic errors when solving the equation. Double-check your calculations, especially when simplifying the expressions.
This problem assesses your knowledge of trigonometric identities and algebraic manipulation. It is a typical SAT question that requires you to connect geometric properties with algebraic equations. Mastery of these foundational concepts is crucial for success in the SAT Math section, particularly under the Geometry and Trigonometry category.

Since $sin(A) = cos(B)$, it follows that $A = 90^\circ - B$.
Substituting the expressions for $\angle A$ and $\angle B$:
$2x + 10 = 90 - (70 - x)$
Simplify the equation: $2x + 10 = 90 - 70 + x$
$2x + 10 = 20 + x$
Subtract x from both sides to get: $x + 10 = 20$
Subtract 10 from both sides to find x: $x = 10$

2. Circle C has a radius of $5x$ and circle D has a radius of $25x$. The area of circle D is how many times the area of circle C?

A. 10

B. 15

C. 20

D. 25

Answer

D

Solution

This problem aims to assess the student's understanding of the relationship between the radius and the area of a circle. Specifically, it examines the ability to apply the formula for the area of a circle and to work with ratios.
To solve this problem, the student should start by recalling the formula for the area of a circle, which is $A = \pi r^2$. Calculate the area of both circles using their respective radii, then compare the two areas by forming a ratio.
Remember that the area of a circle increases with the square of its radius. When comparing areas of circles, you can often simplify your work by setting up a ratio instead of calculating exact areas. In this problem, simplify the ratio of the radii first to see the effect on the area.
Be careful not to confuse the ratio of the radii with the ratio of the areas. The radius is linear, while the area is quadratic. Also, ensure that you square the radii correctly and apply the π factor consistently.
This type of problem is common in SAT geometry questions and tests the ability to understand and manipulate geometric formulas, specifically circles. It also assesses the student's skill in working with proportions and recognizing how changes in one dimension (radius) affect another dimension (area). Mastery of these concepts is crucial not only for geometry but also for more advanced topics in mathematics.

Calculate the area of circle C: $A_C = \pi(5x)^2 = 25\pi x^2$

Calculate the area of circle D: $A_D = \pi(25x)^2 = 625\pi x^2$

The ratio of the area of circle D to circle C is: $\frac{A_D}{A_C} = \frac{625\pi x^2}{25\pi x^2} = 25.$

Thus, the area of circle D is 25 times the area of circle C.

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

A. $(2, \frac{8}{3})$

B. $(2, 3)$

C. $(1, \frac{10}{3})$

D. $(0, 4)$

Answer

A

Solution

This problem is designed to assess the student's ability to solve a system of linear equations, specifically to find the point of intersection of two lines, which represents the solution of the system when there is one unique solution.
Start by substituting the given value of x from the second equation into the first equation. This substitution simplifies the system to a single equation in one variable (y), which can then be solved easily. Once y is found, the solution (x, y) can be stated. Since one of the equations directly provides the value of x, make sure to use this to simplify the process. Substitute $x = 2$ into the first equation immediately to find y without additional steps.
Be careful with the arithmetic when solving for y after substitution. Double-check the calculations to ensure accuracy, especially when involving basic operations like addition, subtraction, and division.
This type of problem is straightforward and tests basic algebraic manipulation skills. The key is recognizing the direct substitution opportunity that simplifies the problem significantly. By practicing more problems of this type, students can improve their speed and accuracy in solving systems of equations. This problem showcases the SAT's focus on assessing problem-solving skills and understanding of algebraic concepts.

Given the system of equations:
1. $2x + 3y = 12$
2. $x = 2$, Substitute $x = 2$ into the first equation: $2(2) + 3y = 12, 4 + 3y = 12$
Subtract 4 from both sides: $3y = 8$, Divide both sides by 3: $y = \frac{8}{3}$
Thus, the solution to the system is $(x, y) = (2, \frac{8}{3})$.

4. In the xy-plane, line m has a slope of -2 and a y-intercept of (0, 10). What is the x-coordinate of the x-intercept of line m?

A. -5

B. 0

C. 5

D. 10

Answer

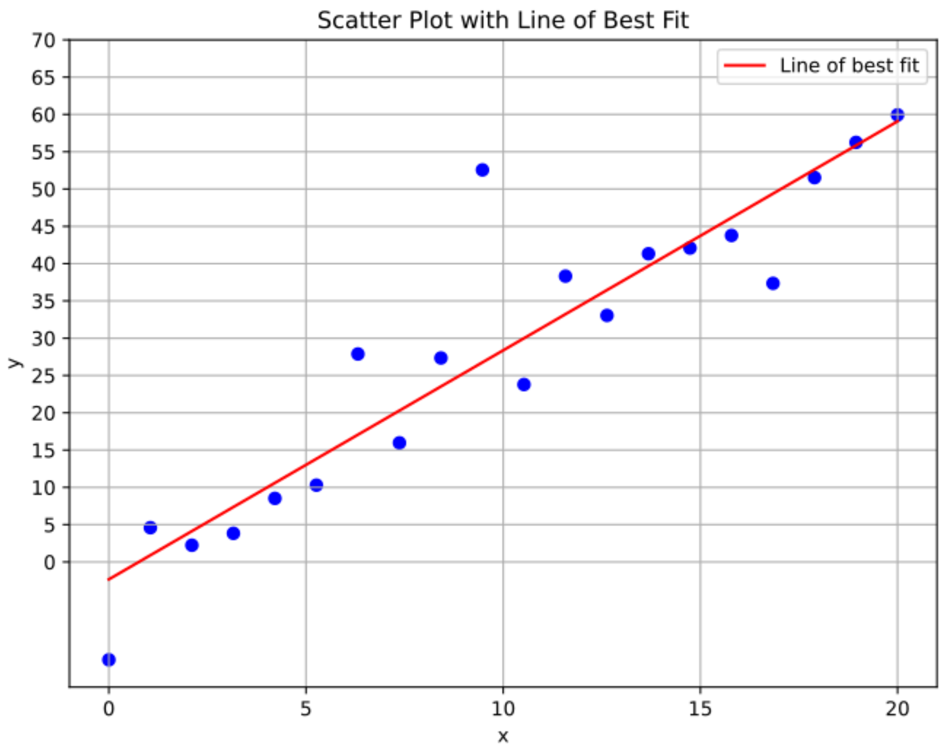
C

Solution

This problem tests the student's understanding of the equation of a line in slope-intercept form, specifically their ability to use the given slope and y-intercept to find the x-intercept.
To solve this problem, use the slope-intercept form of a line, $y = mx + b$, where m is the slope and b is the y-intercept. Substitute the given slope (-2) and y-intercept (10) into the equation to get $y = -2x + 10$. To find the x-intercept, set y to 0 and solve for x.
Remember that the x-intercept occurs where the graph of the line crosses the x-axis, which means $y = 0$ at that point. Use this information to simplify the equation and solve for x. Be careful with the signs while solving the equation. A common mistake is to misinterpret the slope or miscalculate when isolating x.
This type of problem is fundamental in understanding linear equations and their graphs. It assesses your ability to manipulate and solve linear equations using given parameters. Mastery of these concepts is crucial as they form the basis for more advanced algebraic topics.

The general equation of a line in slope-intercept form is $y = mx + b$.
Here, $m = -2$ and $b = 10$, so the equation of the line is $y = -2x + 10$.
To find the x-intercept, set $y = 0$ and solve for x:, $0 = -2x + 10$, $2x = 10$, $x = 5$
Therefore, the x-coordinate of the x-intercept is 5.

5. The scatterplot shows the relationship between two variables, x and y, for data set C. A line of best fit for the data is also shown in red. If the line of best fit has a slope of approximately 3 and a y-intercept of b, what is the y-coordinate of the y-intercept of the line of best fit for data set C?



A. -5

B. 0

C. 5

D. 10

Answer

A

Solution

This problem assesses the student's ability to understand the concept of a line of best fit in a scatter plot, particularly focusing on identifying the y-intercept from the line's equation.

To solve this problem, you need to recognize that the line of best fit is represented by

the equation $y = mx + b$, where m is the slope and b is the y-intercept. The problem provides the slope ($m = 3$) and asks for the y-intercept (b). If the scatter plot or additional information like a specific point on the line is given, use it to solve for b.
If there is a point on the line of best fit provided in the scatter plot, substitute the x and y values of this point into the equation $y = 3x + b$ to solve for b. Alternatively, if the plot shows where the line crosses the y-axis, that coordinate is directly the y-intercept.
Be careful not to confuse the slope with the y-intercept. Remember that the y-intercept is where the line crosses the y-axis, which corresponds to the x-value of 0. Ensure you correctly interpret the graph to identify this point.
This type of problem is standard in the SAT to test students' ability to interpret scatter plots and understand linear relationships. It evaluates how well students can apply the equation of a line to real-world data. Mastery of this concept is essential, as it forms the basis for more complex data analysis questions. In the SAT context, being able to quickly and accurately identify components of a linear equation from a graph is a valuable skill.

The equation for the line of best fit is generally given by $y = mx + b$, where m is the slope, and b is the y-intercept.
Given $m = 3$, we substitute this into the line equation: $y = 3x + b$.
We can interpret the graph ; y-intercept is a negative value.
So, A) -5 is reasonable answer.

6. The function N models the number of cyberattacks detected, in thousands, on a Managed Service Provider (MSP) t years after 2020. According to the model, the number of cyberattacks is predicted to increase by $n\%$ every 6 months. What is the value of n? $N(t) = 150(1.02)^{2t}$

A. 1%

B. 2%

C. 3%

D. 4%

Answer

B

Solution

This problem is designed to test the student's understanding of exponential growth, specifically how to interpret and manipulate exponential functions to find the rate of increase, given a specific time frame (in this case, every 6 months).

To solve this problem, recognize that the function provided, $N(t) = 150(1.02)^{2t}$, is an exponential function where the base, 1.02, represents the growth factor for each 6-month period. The task is to find the percentage increase, $n\%$, which corresponds to this growth factor.
Remember that the base of the exponential function, 1.02 in this case, is equal to 1 plus the rate of increase expressed as a decimal. So, to find $n\%$, you need to subtract 1 from the base and then multiply by 100 to convert it to a percentage. Therefore, $n\% = (1.02 - 1) \times 100\%$.
Be careful not to confuse the growth factor with the percentage increase. The growth factor is 1.02, which means the actual percentage increase is slightly more than 2% per 6 months, not 2% itself. Also, ensure you understand that the exponent 2t indicates doubling the growth period to account for annual growth.
This type of problem is fundamental in the SAT as it assesses the student's ability to interpret exponential models and understand the concept of compounding growth over different time frames. Mastery of these concepts is crucial for handling more complex real-world problems involving exponential growth or decay. Practice converting between growth factors and percentage increases to become more comfortable with these calculations.

Given the formula for exponential growth, the growth factor is 1 plus the rate of growth expressed as a decimal.
If the growth factor is 1.02, then this implies a growth rate of 0.02.

To convert the growth rate into a percentage, multiply by 100.
So, $0.02 \times 100 = 2$, which means the growth rate is 2% every 6 months.

7. A renewable energy company is analyzing its solar panel installations, which are designed to cover a square area. If the side length of the square area is represented by 's' meters and the total energy output is modeled by the function $E(s) = 5s^2 + 3s + 2$, where E(s) is the energy output in kilowatts, what is the energy output of the solar panels if the side length of the installation area is 4 meters?

A. 88

B. 92

C. 94

D. 98

Answer

C

Solution

This problem tests the student's understanding of polynomial functions, specifically higher-degree polynomials, and their ability to evaluate these functions given a specific value for the variable.
To solve this problem, the student needs to substitute the given side length 's' into the polynomial function $E(s)$ and perform the arithmetic operations to find the energy output.
Firstly, plug the given side length ($s = 4$) into the function $E(s)$. Make sure to follow the order of operations ($\frac{PEMDAS}{BODMAS}$) carefully: calculate the square term first, then the linear term, and finally add the constant term. Simplify step by step to avoid mistakes.
Be careful with the operations, especially squaring the side length and adding the terms in the correct order. Common mistakes include forgetting to square the side length or misplacing the decimal points. Double-check your calculations to ensure accuracy.
This type of problem is common in the SAT Advanced Math section and aims to evaluate the student's ability to work with polynomial functions and apply them to real-world contexts. Developing proficiency in these types of problems requires practice in substituting values into polynomial expressions and performing arithmetic operations accurately. Being meticulous and systematic in your approach will help minimize errors and improve efficiency.

Substitute $s = 4$ into the function $E(s)$.

Calculate $E(4) = 5(4)^2 + 3(4) + 2$.

First, calculate $4^2 = 16$.

Next, calculate $5 \times 16 = 80$.
Then, calculate $3 \times 4 = 12$.
Now, sum these results: $80 + 12 + 2 = 94$.
So, the energy output when the side length is 4 meters is 94 kilowatts.

8. One solution to the given equation can be written as $x = \frac{-8+\sqrt{m}}{2}$, where m is a constant. What is the value of m? $x^2 + 8x + 12 = 0$

Answer

16

Solution

The problem tests the student's ability to use the quadratic formula to find the roots of a quadratic equation. It assesses understanding of the formula's components and how they relate to the coefficients of the quadratic equation.
To solve this problem, the student should identify the coefficients a, b, and c from the quadratic equation $x^2 + 8x + 12 = 0$, where $a = 1, b = 8,$ $and\ c = 12$. Then, they should apply the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to determine the expression under the square root, which is the discriminant $(b^2 - 4ac)$.
Remember, the discriminant $(b^2 - 4ac)$ determines the nature of the roots of a quadratic equation. For this problem, since the solution is given in the form $x = \frac{-b+\sqrt{m}}{2}$, calculate $(b^2 - 4ac)$ to find the value of m directly.
Be careful with calculations involving the square root and ensure you use the correct values for a, b, and c in the quadratic formula. Double-check your arithmetic to avoid errors, particularly when calculating $(b^2 - 4ac)$.
This problem is a classic example of using the quadratic formula, a fundamental skill in algebra. Understanding how to manipulate and solve quadratic equations using this formula is crucial for success in more advanced mathematics. The SAT often includes questions that require detailed understanding and application of quadratic equations, so mastering this technique can significantly benefit students.

Apply the quadratic formula to the equation $x^2 + 8x + 12 = 0$.
Identify $a = 1, b = 8, c = 12$.
Compute the discriminant: $b^2 - 4ac = 8^2 - 4(1)(12) = 64 - 48 = 16$.
Substitute into the quadratic formula: $x = \frac{-8\pm\sqrt{16}}{2}$.
Hence, $m = 16$.

9. Which expression is equivalent to $(5x^2 + 8x + 3) - (2x^2 + 4x)$?

A. $3x^2 + 4x + 3$

B. $7x^2 + 12x + 3$

C. $3x^2 + 8x + 3$

D. $7x^2 + 4x + 3$

Answer

A

Solution

The problem aims to test the student's understanding of polynomial operations, specifically subtraction of quadratic polynomials. It assesses the student's ability to correctly apply the distributive property and combine like terms.
To solve this problem, students should first distribute the negative sign through the second polynomial, then combine like terms to simplify the expression.
Here are the steps:
1. Distribute the negative sign:
$(5x^2 + 8x + 3) - (2x^2 + 4x) = 5x^2 + 8x + 3 - 2x^2 - 4x.$
2. Combine like terms: $5x^2 - 2x^2 + 8x - 4x + 3 = 3x^2 + 4x + 3$
Make sure to carefully distribute the negative sign to both terms in the second polynomial. It's often helpful to write out each step clearly to avoid mistakes. Always double-check that you have combined all like terms correctly.
One common mistake is forgetting to distribute the negative sign to the second polynomial, which can lead to incorrect terms. Another potential error is incorrectly combining the like terms, especially with the coefficients. Pay close attention to the signs and coefficients of each term. This problem is a fundamental exercise in polynomial operations, specifically subtraction. It evaluates a student's ability to manage algebraic expressions accurately by distributing signs and combining like terms. Mastery of these skills is crucial for more advanced algebraic manipulations and is frequently tested in the SAT. Taking systematic steps and being cautious of sign changes are key strategies to avoid errors.

Start with the given expression: $(5x^2 + 8x + 3) - (2x^2 + 4x)$.
Distribute the negative sign across the second polynomial:
$5x^2 + 8x + 3 - 2x^2 - 4x.$
Combine like terms: $5x^2 - 2x^2 = 3x^2$, $8x - 4x = 4x$, 3 remains as a constant term.
The simplified expression is $3x^2 + 4x + 3$.

10. The table shows the linear relationship between the number of regions, r, and their corresponding influence score on geopolitics, s. Which equation best represents the linear relationship between r and s?

Number of regions	Influence score on geopolitics
3	120
5	220
7	320

A. $s = 45r + 20$

B. $s = 50r - 30$

C. $s = 40r + 10$

D. $s = 55r - 25$

Answer

B

Solution

This problem assesses the student's ability to interpret data from a table and derive a linear equation that represents the relationship between two variables. It tests understanding of linear functions, slope, and y-intercept.
To approach this problem, examine the table to identify the change in the influence score, s, as the number of regions, r, changes. Calculate the slope (rate of change) by finding the difference in the scores divided by the difference in the corresponding regions. Use one of the data points to solve for the y-intercept by substituting known values into the linear equation format, $y = mx + b$, where m is the slope and b is the y-intercept.
Start by carefully examining the table to determine the pattern or consistent change between the variables. The slope is consistent in a linear relationship, so look for this regular increase or decrease. After finding the slope, don't forget to use a point to find the y-intercept to complete the equation. This ensures the equation is accurate for all points in the table.
Double-check your calculations for the slope and y-intercept. Ensure you are consistent with the units and that you have accurately interpreted the table.
Common mistakes include using incorrect data points or miscalculating the slope by confusing the change in regions with the change in scores.
This type of problem is common in the SAT Algebra section, where understanding linear relationships is crucial. It combines data interpretation and algebraic skills, requiring students to transition from tabular data to a mathematical equation.

Mastery of these problems involves recognizing patterns and accurately applying the slope-intercept form of a line. Practice with various datasets will improve speed and accuracy.

Using the points (3, 120) and (5, 220) to calculate the slope (m):
$m = \frac{220-120}{5-3} = \frac{100}{2} = 50$
Using the slope and one of the points to find the y-intercept (b).
$s = mr + b, 120 = 50 \times 3 + b, 120 = 150 + b, b = 120 - 150, b =- 30$
Therefore, the equation of the line is $s = 50r - 30$.

Digital

SAT Math

3

SAT Math Problems

1. A cylindrical water tank has a diameter of 10 feet and a height of 8 feet. If the tank is filled to a height of 5 feet, what is the volume of the water in the tank, in cubic feet?

2. The ratio of a to b is equivalent to the ratio 5 to 8. If $a = 15s$, what is the value of b in terms of s?

3. Which expression is equivalent to $4x^4(3x^3 + 7x - 2) + 5x^4$?

A. $12x^7 + 28x^5 - 8x^4 + 5x^4$

B. $12x^7 + 28x^5 - 8x^4$

C. $12x^7 + 28x^5 + x^4$

D. $12x^7 + 28x^5 - 3x^4$

4. How many liters are equivalent to 3.5 gallons? (1 gallon = 3.78541 liters)

5. The positive number x is 3500% of the number y, and y is 40% of the number z. If $x - z = ky$, where k is a constant, what is the value of k?

A. 30

B. 32.5

C. 35

D. 37.5

6. Triangles XYZ and PQR are congruent, where X corresponds to P, and Y corresponds to Q. If the measure of angle Y is 65° and angle P is a right angle, what is the measure, in degrees, of angle R?

7. A city is experiencing rapid urbanization, and its population is modeled by the linear equation $P(t) = 120000 + 5000t$, where $P(t)$ represents the population in the year t, and t is the number of years since 2020. According to the model, how many new residents are added to the city each year?

A. 5000

B. 120000

C. 10000

D. 125000

8. What is the y-intercept of the function $f(x) = 3(2)^x + 5$ in the xy-plane?

A. 3

B. 5

C. 8

D. 10

9. Each side of rectangle C has a length of 10 feet and a width of 4 feet. If both dimensions of rectangle C are multiplied by a scale factor of 2 to create rectangle D, what is the length, in feet, of each side of rectangle D?

A. 20 feet

B. 8 feet

C. 16 feet

D. 12 feet

10. The function g is defined by $g(x) = \frac{5}{8}x + 40$. What is the value of $g(32)$?

A. 40

B. 50

C. 60

D. 70

SAT Math Solutions

1. A cylindrical water tank has a diameter of 10 feet and a height of 8 feet. If the tank is filled to a height of 5 feet, what is the volume of the water in the tank, in cubic feet?

Answer

392.7

Solution

This problem is designed to assess the student's understanding of how to calculate the volume of a cylinder, particularly focusing on applying the formula for the volume of a cylinder in a real-world context. It tests the student's ability to interpret the dimensions given in the problem and apply the formula correctly.
To solve this problem, first recognize that you need to find the volume of a cylinder. The formula for the volume of a cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. Given the diameter of the cylinder is 10 feet, the radius would be half of that, which is 5 feet. Since the water fills the tank to a height of 5 feet, this is the height you use in the formula. Substitute these values into the formula to find the volume.
Remember that the diameter is twice the radius, so always divide the diameter by 2 to get the radius when working with circles. Also, be sure to use the correct height for the volume calculation; in this case, it is the height to which the tank is filled with water, not the total height of the tank.
A common mistake might be to use the full height of the tank (8 feet) instead of the height to which it is filled (5 feet). Be careful to use the correct height, as it directly affects the volume calculation. Also, ensure that your calculations are precise, especially when dealing with π, as rounding errors can occur.
This problem is a typical example of how geometric concepts are applied in practical scenarios, a common theme on the SAT. It evaluates the student's ability to apply formulas correctly and interpret word problems accurately. Mastery of these types of problems involves careful reading of the problem statement and accurate mathematical calculation. Developing these skills will be beneficial not only for the SAT but also in solving real-world mathematical problems.

Step 1: Calculate the radius of the cylinder.
Since the diameter is 10 feet, the radius r is $\frac{10}{2} = 5 feet$.

Step 2: Use the formula for the volume of a cylinder $V = \pi r^2 h$.

Substitute the values into the formula: $V = \pi(5)^2(5)$.
Step 3: Calculate the volume., $V = \pi(25)(5) = 125\pi \, cubic\ feet$.

Using $\pi \approx 3.1416$ for more precision, $V = 125 \times 3.1416 = 392.7$ cubic feet.
Hence, the volume of the water in the tank is approximately 392.7 cubic feet.

2. The ratio of a to b is equivalent to the ratio 5 to 8. If $a = 15s$, what is the value of b in terms of s?

Answer

$b = 24s$

Solution

This problem assesses the student's understanding of ratios and their ability to solve for one variable in terms of another, given a proportional relationship. It tests the student's ability to manipulate and equate ratios correctly.

To solve this problem, the student needs to understand that if the ratio of a to b is 5 to 8, then $\frac{a}{b} = \frac{5}{8}$. Given that $a = 15s$, the student can substitute this into the equation to find b in terms of s. Set up the equation $\frac{15s}{b} = \frac{5}{8}$ and solve for b by cross-multiplying to find $b = \frac{5}{8} \times 15s$.

When dealing with ratios, always remember to set up the equation correctly by ensuring the corresponding terms are in the correct positions. Cross-multiplication is a powerful tool to solve such equations efficiently.

Be careful with the order of terms in the ratio. Mistakenly reversing the ratio can lead to incorrect answers. Also, ensure that you simplify the ratios correctly and perform arithmetic operations with care.

This type of problem is a classic example of testing a student's ability to apply their knowledge of ratios and proportions in practical scenarios. It is important for students to become comfortable with these concepts, as they frequently appear in the SAT's Problem Solving and Data Analysis section. Mastery of these skills will aid in solving a wide range of problems efficiently.

In a ratio problem, the ratio of 'a' to 'b' can be written as a fraction: $\frac{a}{b} = \frac{5}{8}$.

Given $a = 15s$

we substitute this into the equation: $\frac{15s}{b} = \frac{5}{8}$.

To find 'b', cross-multiply: $15s \times 8 = 5 \times b$

$120s = 5b$

Solve for 'b' by dividing both sides by 5: $b = \frac{120s}{5}$

Simplify the fraction by dividing the numerator by 5: $b = 24s$.

3. Which expression is equivalent to $4x^4(3x^3 + 7x - 2) + 5x^4$?

A. $12x^7 + 28x^5 - 8x^4 + 5x^4$

B. $12x^7 + 28x^5 - 8x^4$

C. $12x^7 + 28x^5 + x^4$

D. $12x^7 + 28x^5 - 3x^4$

Answer

D

Solution

This question aims to evaluate the student's understanding and manipulation of polynomial expressions, particularly focusing on operations with higher-degree polynomials. The student needs to apply their knowledge of polynomial distribution and combining like terms.
First, distribute the polynomial term outside the parentheses, which in this case is $4x^4$, to each term inside the parentheses $(3x^3 + 7x - 2)$. Then, combine the resulting terms with the additional polynomial term $5x^4$. Finally, simplify the expression by combining like terms.
Carefully distribute the $4x^4$ to each term inside the parentheses individually. Write down each step to avoid mistakes and ensure all terms are accounted for.
Double-check your final expression for any like terms that can be combined to simplify the expression further.
Common mistakes include incorrect distribution of the polynomial term and failing to combine like terms properly. Ensure that the exponent rules are correctly applied — when multiplying powers of x, remember to add the exponents. Double-check the arithmetic operations to avoid simple errors. This problem is a good example of testing the ability to handle higher-degree polynomials, which is a crucial skill in advanced math. The question assesses the student's accuracy in polynomial distribution and simplification of expressions. Mastery of these skills is essential for success in more complex algebraic manipulations and higher-level math courses. The ability to methodically approach and simplify polynomial expressions will be beneficial in a wide range of mathematical problems encountered in the SAT and beyond.

Step 1: Distribute $4x^4$ to each term in the polynomial $(3x^3 + 7x - 2)$.,
$4x^4 \times 3x^3 = 12x^7$.
$4x^4 \times 7x = 28x^5$., $4x^4 \times (-2) =- 8x^4$.

The expression now becomes: $12x^7 + 28x^5 - 8x^4 + 5x^4$.
Step 2: Combine like terms.
Combine $-\ 8x^4$ and $5x^4$., $-\ 8x^4 + 5x^4 =-\ 3x^4$.
The simplified expression is: $12x^7 + 28x^5 - 3x^4$

4. How many liters are equivalent to 3.5 gallons? (1 gallon = 3.78541 liters)

Answer

13.2489

Solution

This problem aims to test the student's understanding of unit conversion, specifically converting from gallons to liters using a given conversion factor.
To solve this problem, students need to multiply the number of gallons by the conversion factor to find the equivalent amount in liters. Thus, they should calculate $3.5 gallons \times 3.78541 liters/gallon$.
Always write down the units and ensure they cancel out correctly in the conversion process. This will help you keep track of the conversion you are performing and avoid errors.
Make sure to use the exact conversion factor provided in the problem. Also, be careful with multiplication and ensure you are not missing any decimal points which could lead to incorrect answers.
This type of problem assesses your ability to perform basic unit conversions, a vital skill in the Problem Solving and Data Analysis section. It requires careful attention to detail and precision in calculations. Practicing unit conversions with various units can help improve speed and accuracy on such questions in the SAT.

1. Use the conversion factor: $1 gallon = 3.78541 liters$.
2. Multiply the number of gallons by the conversion factor to find the equivalent number of liters.
3. Calculation: $3.5 gallons \times 3.78541 liters/gallon = 13.248935 liters$.
4. According to the guidelines, round the decimal to the fourth digit: 13.2489.
5. Therefore, 3.5 gallons is approximately 13.2489 liters.

5. The positive number x is 3500% of the number y, and y is 40% of the number z. If $x - z = ky$, where k is a constant, what is the value of k?

A. 30

B. 32.5

C. 35

D. 37.5

Answer

B

Solution

This problem tests the student's understanding of percentages and their ability to manipulate algebraic expressions involving percentages. The student needs to know how to convert percentages to decimal form and how to set up and solve equations based on given relationships.
First, translate the percentage relationships into algebraic equations. For the first relationship, $x = 35y$, as 3500% translates to 35 in decimal form. For the second relationship, $y = 0.4z$, since 40% translates to 0.4. Substitute the second equation into the first to express x in terms of z. Then, substitute these expressions into the equation $x - z = ky$ to solve for k.
Remember to convert percentages to their decimal forms by dividing by 100. When substituting one equation into another, be careful with algebraic manipulation to avoid mistakes.
Ensure that you do not make any calculation errors when converting percentages to decimals. Double-check your algebraic steps to make sure you have correctly substituted and simplified the equations.
This problem is a good test of basic percentage and algebraic manipulation skills. It requires careful translation of word problems into algebraic expressions and solving for unknown constants. Such problems are common in the SAT and practicing them can help improve speed and accuracy in the math section.

Substitute $y = 0.4z$ into the equation $x = 35y$ to express x in terms of z:
$x = 35(0.4z) = 14z$
Now, substitute $x = 14z$ into $x - z = ky$: $14z - z = k(0.4z)$, $13z = 0.4kz$
Divide both sides by z (assuming $z \neq 0$): $13 = 0.4k$
Solve for k by dividing both sides by 0.4: $k = \frac{13}{0.4} = 32.5$

6. Triangles XYZ and PQR are congruent, where X corresponds to P, and Y corresponds to Q. If the measure of angle Y is 65° and angle P is a right angle, what is the measure, in degrees, of angle R?

Answer

25°

Solution

This problem is designed to test the student's understanding of congruent triangles and the properties of their corresponding angles. It evaluates the ability to apply the concept of congruence and angle relationships in triangles.
First, recognize that congruent triangles have corresponding angles that are equal. Since triangles XYZ and PQR are congruent, angle Y in triangle XYZ corresponds to angle Q in triangle PQR. Thus, angle Q is also 65°. Knowing that angle P is a right angle (90°), use the triangle angle sum property (the sum of angles in a triangle is 180°) to find angle R by subtracting the measures of angles P and Q from 180°.
Remember the properties of congruent triangles: corresponding angles are equal, and the sum of interior angles in any triangle is always 180°. Use these facts to systematically solve for the unknown angle.
Be careful to correctly identify corresponding angles and ensure you subtract the correct angle measures from 180°. Watch out for misinterpreting which angles are equal due to congruence.
This problem assesses a student's ability to apply fundamental principles of geometry, specifically congruent triangles and angle relationships. Understanding these concepts is crucial for solving more complex geometry problems on the SAT. Mastery of triangle properties, such as the angle sum theorem, is essential for success in this area.

The sum of angles in triangle PQR is 180°.
Angle P = 90° and angle Q = 65°.
Let angle R be denoted as R.
Using the angle sum property: 90° + 65° + R = 180°.
This simplifies to 155° + R = 180°.
Subtract 155° from both sides: R = 180° - 155°.
Thus, R = 25°.

7. A city is experiencing rapid urbanization, and its population is modeled by the linear equation $P(t) = 120000 + 5000t$, where $P(t)$ represents the population in the year t, and t is the number of years since 2020. According to the model, how many new residents are added to the city each year?

A. 5000

B. 120000

C. 10000

D. 125000

Answer

A

Solution

The problem aims to assess the student's ability to interpret a linear equation in the context of a real-world scenario. It requires understanding how the slope of the equation represents the rate of change in population over time.
To solve this problem, students should identify the coefficient of the variable 't' in the equation $P(t) = 120000 + 5000t$. This coefficient represents the rate at which the population changes per year, which is the number of new residents added annually.
Focus on the structure of the linear equation, particularly the term with the variable 't'. The coefficient of 't' will always represent the rate of change in problems involving linear growth or decay.
Be careful not to confuse the constant term with the rate of change. The constant term in this equation represents the initial population at the starting point (year 2020), not the number of new residents added each year.
This problem is a classic example of how linear equations can model real-world scenarios. It tests the student's ability to extract meaningful information from mathematical expressions, a skill that is crucial for problem-solving on the SAT. Understanding the components of a linear equation and their real-world implications is essential for tackling similar problems efficiently.

The equation given is $P(t) = 120000 + 5000t$.
In a linear equation of the form $y = mx + b$, the coefficient of x (or t in this case) represents the rate of change.
Here, the coefficient of t is 5000.
This coefficient 5000 indicates that the population increases by 5000 each year.
Therefore, 5000 new residents are added to the city each year.

8. What is the y-intercept of the function $f(x) = 3(2)^x + 5$ in the xy-plane?

A. 3

B. 5

C. 8

D. 10

Answer

C

Solution

The problem aims to test the student's understanding of exponential functions and their ability to determine the y-intercept of such a function. Specifically, it checks whether the student knows that the y-intercept occurs when x equals zero.
To find the y-intercept of the function, set x to 0 and solve for $f(x)$. This is because the y-intercept occurs where the graph crosses the y-axis, which is at $x = 0$.
Remember that the y-intercept can be found by evaluating the function at $x = 0$.
Substitute $x = 0$ directly into the function and simplify the expression to find the y-coordinate.
Be careful not to confuse the y-intercept with the x-intercept. Also, ensure that all arithmetic operations, especially those involving exponents, are performed correctly.
This type of problem is a straightforward test of understanding basic properties of exponential functions and their graphs. It assesses the student's ability to apply the concept of y-intercepts in the context of exponential equations. Mastery of these basic properties is crucial for solving more complex problems involving nonlinear functions on the SAT.

Substitute $x = 0$ into the function: $f(0) = 3(2)^0 + 5$.

Since any non-zero number raised to the power of 0 is 1, we have $2^0 = 1$.
Therefore, $f(0) = 3(1) + 5 = 3 + 5 = 8$.
Thus, the y-intercept is 8.

9. Each side of rectangle C has a length of 10 feet and a width of 4 feet. If both dimensions of rectangle C are multiplied by a scale factor of 2 to create rectangle D, what is the length, in feet, of each side of rectangle D?

A. 20 feet

B. 8 feet

C. 16 feet

D. 12 feet

Answer

A

Solution

This problem intends to assess the student's understanding of how scale factors affect the dimensions of geometric figures, specifically rectangles, and requires knowledge of basic multiplication and properties of rectangles.
To solve this problem, students should recognize that multiplying each dimension of rectangle C by a given scale factor will yield the dimensions of rectangle D. The length and width of rectangle C are 10 feet and 4 feet, respectively. By multiplying these dimensions by the scale factor of 2, students can find the new dimensions of rectangle D.
Remember that when you multiply both the length and width by a scale factor, you are essentially enlarging the rectangle proportionally. Make sure to apply the scale factor to both dimensions separately.
Be careful not to confuse the scale factor with addition. It's important to multiply each dimension by the scale factor, not add it. Additionally, ensure that you apply the scale factor to both the length and the width.
This problem is a straightforward application of scaling, a fundamental concept in geometry and proportional reasoning. It tests the student's ability to apply multiplication to geometric figures and understand the properties of similar shapes. Mastery of this type of problem is essential for success in the SAT's Problem Solving and Data Analysis category, as it reflects a student's ability to handle real-world mathematical situations.

Calculate the new length: $10\ feet\ \times 2 = 20\ feet$
Calculate the new width: $4\ feet\ \times 2 = 8\ feet$
Both sides of rectangle D are calculated.

10. The function g is defined by $g(x) = \frac{5}{8}x + 40$. What is the value of $g(32)$?

A. 40

B. 50

C. 60

D. 70

Answer

C

Solution

This problem aims to test the student's understanding of linear functions and their ability to evaluate a function at a given point. Specifically, it assesses the ability to substitute a value into the function and perform simple arithmetic operations.
To solve this problem, you should substitute the given value, 32, for x in the function $g(x)$. This means you'll replace x with 32 in the equation $g(x) = \frac{5}{8}x + 40$. After substituting, perform the arithmetic operations to find the value of $g(32)$.
Start by writing down the function and the value to be substituted. Carefully substitute the value and follow the order of operations ($\frac{PEMDAS}{BODMAS}$). Simplify step by step to avoid mistakes. Be cautious with fraction multiplication and addition. Ensure that you correctly multiply $\frac{5}{8}$ by 32 before adding the result to 40. Double-check your arithmetic calculations to avoid simple errors.
This type of problem is common in SAT algebra questions and is designed to test basic function evaluation skills. Successfully solving this problem demonstrates proficiency in substituting values into linear functions and performing the necessary arithmetic operations. Mastery of these skills is crucial for more complex algebraic problems on the SAT.

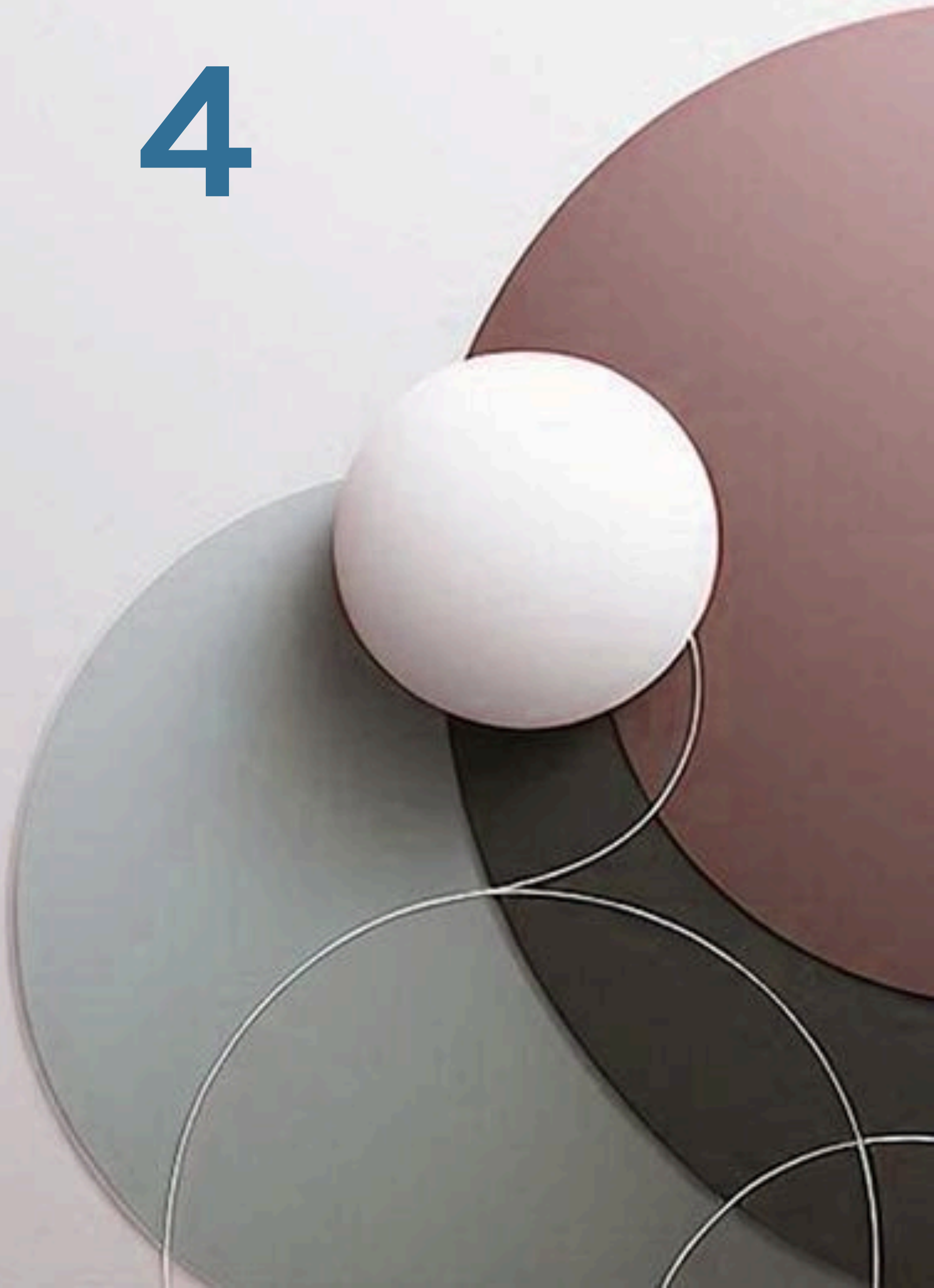
Substitute $x = 32$ into the function: $g(32) = \frac{5}{8} \times 32 + 40$.

Calculate $\frac{5}{8} \times 32$:
$\frac{5}{8} \times 32 = \frac{5 \times 32}{8} = \frac{160}{8} = 20$.
Add 40 to the result: $20 + 40 = 60$.

Digital

SAT Math

4



SAT Math Problems

1. For the polynomial function defined by $f(x) = 3x^4 - 5x^3 + 2x - 8$, what is the value of b if the graph of $y = f(x)$ passes through the point $(0, b)$?

2. If $\frac{3x}{y} = 9$ and $\frac{x}{zy} = 15$, what is the value of z?

A. 0.1

B. 0.2

C. 0.3

D. 0.4

3. How many times does the graph of the given equation in the xy-plane cross the x-axis, where a, b, and c are positive constants such that $a > 4$? $y = 5\left(\frac{a}{4}\right)^{x+c} - b$

A. 0

B. 1

C. 2

D. 3

4. A local art company is planning to sell two types of cultural products: handmade crafts and digital artwork. The revenue from handmade crafts is \$50 per item, and the revenue from digital artwork is \$30 per item. If the company sells a total of 200 items for a total revenue of \$7, 000, which of the following systems of equations represents this situation, where x is the number of handmade crafts and y is the number of digital artworks sold?

A. $x + y = 200, 50x + 30y = 7000$

B. $x + y = 200, 30x + 50y = 7000$

C. $50x + y = 200, 30x + y = 7000$

D. $x + 50y = 200, y + 30x = 7000$

5. A wooden cube is cut from a tree trunk for a woodworking project. If the edge of the cube measures 4 centimeters, and it has a mass of 10.24 grams, what is the density of the cube, in grams per cubic centimeter?

6. A non-profit organization is distributing funds to two different community projects aimed at improving healthcare access. Project A receives \$1, 200, and Project B receives \$1, 800. Considering the total budget of \$6, 000 for these projects, what ratio of funding is allocated to Project A compared to Project B?

A. 2:3

B. 1:2

C. 1:1.5

D. 3:4

7. For the given polynomial function $f(x) = 2x^3 - 5x^2 + 3x - 7$, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, b)$, where b is a constant. What is the value of b?

A. -7

B. -5

C. 0

D. 3

8. Line p is defined by the equation $3x - 5y = 12$. Line q is parallel to line p in the xy-plane. What is the slope of line q?

9. In a survey of 70 individuals regarding their support for international policies, the results indicated that 12 supported Country A, 25 supported Country B, and 33 supported Country C. If one individual is selected at random, what is the probability that the individual supports Country B?

Type	Frequency
Country A	12
Country B	25
Country C	33

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

B. $\frac{3}{5}$

C. $\frac{5}{14}$

D. $\frac{33}{70}$

10. Circle C has a radius of $4y$ and circle D has a radius of $120y$. The area of circle D is how many times the area of circle C?

SAT Math Solutions

1. For the polynomial function defined by $f(x) = 3x^4 - 5x^3 + 2x - 8$, what is the value of b if the graph of $y = f(x)$ passes through the point $(0, b)$?

Answer

-8

Solution

This problem aims to test the student's understanding of polynomial functions, specifically how to find the y-intercept of a higher-degree polynomial function. The student should recognize that the y-intercept occurs where the input, x, is zero.
To find the y-intercept of the polynomial function, substitute $x = 0$ into the function $f(x) = 3x^4 - 5x^3 + 2x - 8$. This will simplify the expression, leaving only the constant term, which represents the y-intercept.
Remember that the y-intercept of a function is simply the value of the function when x is 0. Therefore, for any polynomial function, you just need to evaluate the constant term.
Be careful not to overlook the fact that higher-degree terms disappear when x = 0. Only the constant term remains, which is the y-intercept. Also, ensure calculations are accurate to avoid simple arithmetic mistakes.
This type of problem is straightforward if you understand the concept of the y-intercept for polynomial functions. It assesses the student's ability to recognize and apply the concept of evaluating a polynomial at x = 0. In the context of the SAT, practicing these types of problems can help improve speed and accuracy, as recognizing patterns and applying basic concepts quickly is often rewarded.

To find b, we substitute x = 0 into the polynomial f(x)., $f(0) = 3(0)^4 - 5(0)^4 + 2(0) - 8$, Simplifying the expression: f(0) = 0 - 0 + 0 - 8, f(0) = -8, Therefore, the value of b is -8.

2. If $\frac{3x}{y} = 9$ and $\frac{x}{zy} = 15$, what is the value of z?

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer

B

Solution

This problem tests the student's understanding of working with ratios and proportions. The student needs to understand how to manipulate and solve equations involving ratios to find the value of an unknown variable.
First, simplify the given equations to find the value of x in terms of y. Then, substitute this value into the second equation to solve for z.
Isolate variables step-by-step and keep your work organized. Double-check each step to ensure that the algebraic manipulations are correct
Be careful with the algebraic manipulations and make sure not to lose or incorrectly handle any variables. Also, ensure that the value you find for z is consistent with the given equations.
This problem is a good example of how SAT questions often require students to apply multiple algebraic steps to find a solution. It tests a student's ability to understand and manipulate ratios and proportions, which are essential skills for the SAT Math section. By practicing problems like this, students can improve their problem-solving efficiency and accuracy.

From Equation 1, $\frac{3x}{y} = 9$.
Multiply both sides by y to solve for x: $3x = 9y$.
Divide both sides by 3 to get $x = 3y$.
Substitute $x = 3y$ into Equation 2: $\frac{3y}{zy} = 15$.
Simplifying, $\frac{3}{z} = 15$.
Multiply both sides by z to get $3 = 15z$.
Divide both sides by 15 to solve for z: $z = \frac{3}{15}$.
Simplify $\frac{3}{15}$ to $\frac{1}{5}$.
The value of z is $\frac{1}{5}$.

3. How many times does the graph of the given equation in the xy-plane cross the x-axis, where a, b, and c are positive constants such that $a > 4$? $y = 5\left(\frac{a}{4}\right)^{x+c} - b$

A. 0

B. 1

C. 2

D. 3

Answer

B

Solution

This problem tests the student's understanding of exponential functions and their graphical behavior, particularly how to determine the number of x-intercepts of an exponential graph.
To solve this problem, the student needs to identify the x-intercepts of the given equation. This involves setting $y = 0$ and solving for x. Specifically, they must solve the equation $0 = 5\left(\frac{a}{4}\right)^{x+c} - b$ for x.
Remember that an exponential function of the form $y = ka^{x} + c$ has a horizontal asymptote. For the given equation, as x approaches infinity or negative infinity, the term $\left(\frac{a}{4}\right)^{(x+c)}$ will either grow or decay exponentially depending on the value of $\frac{a}{4}$. This can help you determine whether the function crosses the x-axis.
Be careful with the base of the exponential function. Since $a > 4$, $\frac{a}{4}$ is greater than 1, meaning the function grows exponentially. Also, check the signs and values of b and how it affects the crossing points. Ensure not to confuse the behavior of the function based on whether the base is greater than or less than 1.
This type of problem assesses the student's ability to analyze the behavior of exponential functions and their graphs. It requires understanding how to manipulate exponential equations and determine their intercepts. The primary skill tested is the ability to discern the number of times a given exponential graph will intersect the x-axis, considering the transformations applied to the function. Understanding these concepts is crucial for success in advanced math sections of the SAT.

Set $y = 0$ in the equation: $0 = 5\left(\frac{a}{4}\right)^{x+c} - b$.

This simplifies to: $5\left(\frac{a}{4}\right)^{x+c} = b$.

Divide both sides by 5: $\left(\frac{a}{4}\right)^{x+c} = \frac{b}{5}$.

Since $a > 4, \frac{a}{4} > 1$, indicating an increasing exponential function.

The equation $\left(\frac{a}{4}\right)^{(x+c)} = \frac{b}{5}$ has a solution for x if and only if $\frac{b}{5} > 0$.

Thus, the equation has one solution for x, meaning the graph crosses the x-axis once.

4. A local art company is planning to sell two types of cultural products: handmade crafts and digital artwork. The revenue from handmade crafts is \$50 per item, and the revenue from digital artwork is \$30 per item. If the company sells a total of 200 items for a total revenue of \$7, 000, which of the following systems of equations represents this situation, where x is the number of handmade crafts and y is the number of digital artworks sold?

A. $x + y = 200, 50x + 30y = 7000$

B. $x + y = 200, 30x + 50y = 7000$

C. $50x + y = 200, 30x + y = 7000$

D. $x + 50y = 200, y + 30x = 7000$

Answer

A

Solution

The problem is designed to assess the student's ability to interpret and formulate a real-world scenario into a system of linear equations. It tests understanding of how to create equations from word problems, particularly in the context of revenue and quantity.

To solve this problem, the student needs to identify the key information given: the price per item for handmade crafts and digital artwork, the total number of items sold, and the total revenue. The student should then set up two equations: one for the total number of items and one for the total revenue. The first equation will be $x + y = 200$, representing the total number of items sold, and the second equation will be $50x + 30y = 7000$, representing the total revenue.

Identify what x and y represent early on, and make sure to carefully translate the word problem into mathematical equations. Double-check that the coefficients in your equations correctly match the context of the problem, such as the price per item and total counts.

Be cautious about mixing up the coefficients for x and y in the revenue equation. Sometimes students mistakenly reverse the values or misunderstand the relationship between the total number of items and the individual prices. Also, ensure that you correctly interpret the total revenue as the sum of revenues from both products.

This type of problem is common in SAT Algebra sections, where translating word problems into equations is crucial. It tests a student's ability to understand and apply linear equations in practical contexts. Successfully solving these problems typically requires careful reading and precise translation of the scenario into mathematical terms. It is an essential skill for SAT success, as it demonstrates the ability to apply algebraic concepts to real-world situations.

Set up the first equation for the total number of items: $x + y = 200$
Set up the second equation for the total revenue: $50x + 30y = 7000$
Thus, the system of equations is: $x + y = 200$ and $50x + 30y = 7000$

5. A wooden cube is cut from a tree trunk for a woodworking project. If the edge of the cube measures 4 centimeters, and it has a mass of 10.24 grams, what is the density of the cube, in grams per cubic centimeter?

Answer

0.16

Solution

This problem tests the student's understanding of geometric concepts related to volume and their ability to apply the formula for density. The student needs to connect the physical property of density with geometric measurements.
To solve this problem, the student should first calculate the volume of the cube using the formula for the volume of a cube ($V = (side)^3$). With the volume determined, the next step is to apply the formula for density ($Density = \frac{mass}{Volume}$) to find the density of the cube.
Remember that the volume of a cube can be calculated by cubing the length of one of its edges. After finding the volume, use the given mass to find the density by dividing the mass by the volume. Keep units consistent to avoid any confusion.
A common mistake is to forget to cube the edge length when calculating the volume. Ensure that you correctly use the units of measure throughout the calculation to avoid errors in the final density calculation.
This problem is a classic example of integrating geometric and physical concepts, which is often seen in SAT problems. It not only assesses the student's ability to perform basic geometric calculations but also their understanding of physical properties and their application in real-world scenarios. Such problems are designed to test a student's analytical skills and ability to connect different areas of mathematics.

Step 1: Calculate the Volume of the Cube, The formula for the volume of a cube is: $Volume = (edge)^3$, For a cube with an edge of 4 centimeters, $Volume = 4^3 = 64$ cubic centimeters.
Step 2: Calculate the Density, Density is given by the formula: $Density = \frac{Mass}{Volume}$, Substitute the given values: $Density = \frac{10.24\ grams}{64\ cubic\ centimeters}$.
Calculate the density: Density = 0.16 grams per cubic centimeter.

6. A non-profit organization is distributing funds to two different community projects aimed at improving healthcare access. Project A receives $1, 200, and Project B receives $1, 800. Considering the total budget of $6, 000 for these projects, what ratio of funding is allocated to Project A compared to Project B?

A. 2:3

B. 1:2

C. 1:1.5

D. 3:4

Answer

A

Solution

This problem tests the student's ability to understand and apply the concept of ratios in a real-world context, specifically in the distribution of funds. It assesses the student's ability to calculate ratios and understand their meaning in terms of proportions.
To solve this problem, first identify the amount of money allocated to each project. Then, express this allocation as a ratio of Project A's funds to Project B's funds. The ratio can be found by dividing the amount allocated to Project A by the amount allocated to Project B, and simplifying the result.
Remember that a ratio is a way to compare two quantities. To find the ratio of funding for Project A to Project B, divide the amount for Project A ($1, 200) by the amount for Project B ($1, 800). Simplify the fraction to get the simplest form, which represents the ratio.
Be careful not to confuse the ratio of funding with the total budget amount. The problem asks for the ratio between the funds allocated to the two projects, not their relation to the total budget. Additionally, ensure that the ratio is simplified to its smallest form.
This type of problem is common in SAT as it tests not only mathematical skills but also the ability to apply these skills to real-world scenarios. Understanding ratios and their simplification is crucial as it is a fundamental concept in problem-solving and data analysis. Pay attention to the details in the problem statement and practice simplifying fractions to avoid common pitfalls.

To find the ratio of funding for Project A to Project B, we use the formula:
$Ratio = \frac{Funding\ for\ Project\ A}{Funding\ for\ Project\ B}$
Substituting the given values, we have: $Ratio = \frac{\$1,200}{\$1,800}$

Simplifying the fraction: $\frac{\$1,200}{\$1,800} = \frac{12}{18}$
Divide both the numerator and denominator by their greatest common divisor, which is 6: $\frac{\frac{12}{6}}{\frac{18}{6}} = \frac{2}{3}$
Thus, the simplified ratio of funding allocated to Project A compared to Project B is 2:3.

7. For the given polynomial function $f(x) = 2x^3 - 5x^2 + 3x - 7$, the graph of $y = f(x)$ in the xy-plane passes through the point $(0, b)$, where b is a constant. What is the value of b?

A. -7

B. -5

C. 0

D. 3

Answer

A

Solution

This problem aims to test the student's understanding of how to find the y-intercept of a polynomial function. It assesses the ability to substitute specific values into polynomial functions and understand the resulting outputs.
To find the y-intercept of the function, students need to substitute $x = 0$ into the polynomial function and simplify the expression to find the value of y. In this case, substitute $x = 0$ into $f(x) = 2x^3 - 5x^2 + 3x - 7$.
Remember that the y-intercept of any function is found by evaluating the function at $x = 0$. By substituting $x = 0$ into the polynomial, all terms containing x will be zero, simplifying the calculation.
Be careful with the signs when substituting and simplifying the expression. Ensure that all terms are correctly evaluated and combined. It's common to make mistakes with negative signs or arithmetic during simplification.
This problem is a straightforward application of finding the y-intercept in polynomial functions, a common concept in advanced math. It tests basic algebraic manipulation skills and the understanding of function properties. Such problems are standard in SAT to ensure students can handle polynomial functions and their graphical representations.

Substitute $x = 0$ into $f(x)$: $f(0) = 2(0)^3 - 5(0)^2 + 3(0) - 7$
Calculate each term: $2(0)^3 = 0, - 5(0)^2 = 0, 3(0) = 0$, and the constant term is -7.
Add these results: $0 + 0 + 0 - 7 = - 7$.
Thus, $b = f(0) = - 7$.

8. Line p is defined by the equation $3x - 5y = 12$. Line q is parallel to line p in the xy-plane. What is the slope of line q?

Answer

$\frac{3}{5}$

Solution

This problem tests the student's understanding of the concept of parallel lines and their slopes. Specifically, it assesses whether the student can identify the slope of a line from a given linear equation and apply this knowledge to find the slope of another line that is parallel to it.
To solve this problem, the student should first convert the given equation of line p into the slope-intercept form ($y = mx + b$), where m represents the slope. This can be done by isolating y on one side of the equation. Once the equation is in the proper form, the slope (m) can be identified. Since line q is parallel to line p, it will have the same slope as line p.
Remember that parallel lines have identical slopes. Focus on rearranging the equation into the slope-intercept form, as this is the quickest way to identify the slope. Practice converting equations between different forms to become more efficient.
Be careful with algebraic manipulation; simple arithmetic errors can lead to incorrect results. Ensure that you correctly isolate y to find the slope accurately. Double-check your rearrangement of the equation to avoid any mistakes.
This type of problem is common in SAT algebra sections and evaluates the student's ability to manipulate linear equations and understand the properties of parallel lines. Mastery of converting equations to the slope-intercept form and recognizing that parallel lines share the same slope is crucial for success in these questions. Practice and familiarity with these concepts will aid in quickly and accurately solving similar problems.

To find the slope of line p, let's rewrite its equation in slope-intercept form, which is $y = mx + b$, where m is the slope.
Start with the equation: $3x - 5y = 12$.
Subtract 3x from both sides to get: $- 5y =- 3x + 12$.
Divide every term by -5 to solve for y: $y = \frac{3}{5}x - \frac{12}{5}$.
From this equation in slope-intercept form, we see that the slope of line p is $\frac{3}{5}$.
Since line q is parallel to line p, it will have the same slope.
Therefore, the slope of line q is also $\frac{3}{5}$.

9. In a survey of 70 individuals regarding their support for international policies, the results indicated that 12 supported Country A, 25 supported Country B, and 33 supported Country C. If one individual is selected at random, what is the probability that the individual supports Country B?

Type	Frequency
Country A	12
Country B	25
Country C	33

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

B. $\frac{3}{5}$

C. $\frac{5}{14}$

D. $\frac{33}{70}$

Answer

C

Solution

This problem tests the student's understanding of basic probability concepts and their ability to interpret and use frequency data to calculate probabilities.
To approach this problem, students need to identify the total number of individuals surveyed, which is 70, and the number of individuals who support Country B, which is 25. The probability that a randomly selected individual supports Country B is the ratio of the number of supporters of Country B to the total number of individuals surveyed.
Remember that probability is calculated as the number of favorable outcomes divided by the total number of possible outcomes. Always double-check the numbers given in the problem to ensure accuracy.
A common mistake is to incorrectly sum the frequencies or misinterpret the question, such as finding the probability for the wrong country. Pay close attention to the details provided in the problem.
This type of problem is straightforward and requires a solid understanding of basic probability concepts. It evaluates the student's ability to interpret data and apply probability formulas accurately. In SAT exams, being adept at these kinds of problems can lead to quick wins, freeing up time for more complex questions.

To find the probability that an individual supports Country B, we use the formula:
$Probability \ = \frac{Number\ of\ individuals\ supporting\ Country\ B}{Total\ number\ of\ individuals\ surveyed}$
Substitute the given values into the formula: $Probability \ = \frac{25}{70}$
Simplify the fraction: $Probability \ = \frac{5}{14}$

10. Circle C has a radius of $4y$ and circle D has a radius of $120y$. The area of circle D is how many times the area of circle C?

Answer

900

Solution

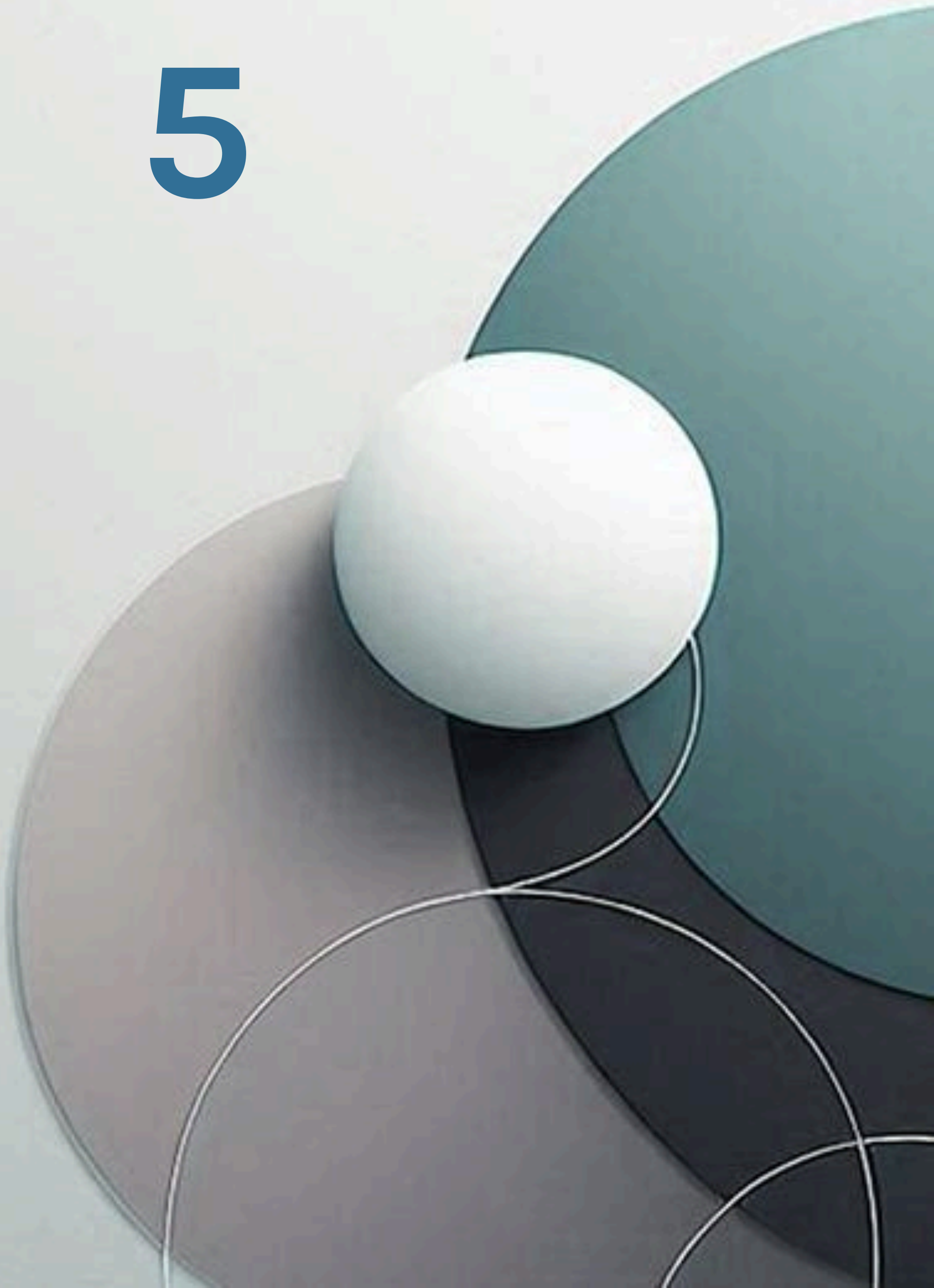
This question tests the student's understanding of the relationship between the radius and area of a circle, and how to apply this understanding to find ratios.
To solve this problem, students should use the formula for the area of a circle, $A = \pi r^2$, to find the areas of both circles. Then, they should calculate the ratio of the area of circle D to the area of circle C by dividing the area of D by the area of C.
Remember that the area of a circle is proportional to the square of its radius. So, if you know the ratio of the radii, you can square that ratio to find the ratio of the areas directly.
Be careful to correctly square the radius values to avoid calculation mistakes. Also, ensure you are comparing the areas in the correct order as per the question.
This type of problem is common in SAT geometry sections, where understanding the relationship between dimensions and derived measures like area or volume is crucial. It tests your ability to manipulate formulas and understand proportional relationships, which are essential skills for the SAT.

1. Calculate the area of circle C using the formula $A = \pi r^2$.
- The radius of circle C is 4y., - $Area\ of\ circle\ C = \pi(4y)^2 = \pi(16y^2)$.
2. Calculate the area of circle D using the formula $A = \pi r^2$.
- The radius of circle D is $120y$.
- $Area\ of\ circle\ D = \pi(120y)^2 = \pi(14400y^2)$.
3. Find the ratio of the area of circle D to circle C.
- $Ratio = \frac{Area\ of\ circle\ D}{Area\ of\ circle\ C} = \frac{\pi(14400y^2)}{\pi(16y^2)}$.
4. Simplify the expression by canceling π and y^2.
- $Ratio = \frac{14400}{16} = 900$.
5. The area of circle D is 900 times the area of circle C.

Digital

SAT Math

5



SAT Math Problems

1. The table shows two values of x and their corresponding values of y. The graph of the linear equation representing this relationship passes through the point $(\frac{1}{2}, b)$. What is the value of b?

x	y
-5	20
10	-25

2. If $5(y - 2) = 2(y - 2) + 27$, what is the value of y - 2?

3. A scholarly journal plans to implement an annual increase in its publication fees following a model where the cost in year x is given by the function $f(x) = 300(1.33)^x$, where x represents the number of years after 2024. What is the interpretation of 300 in this context?

A. The total publication fee after 3 years of increases.

B. The publication fee at the start of 2024.

C. The projected increase in publication fees each year after 2024.

D. The average publication fee across all years.

4. What is the center of the circle in the xy-plane defined by the equation $(x + 5)^2 + (y - 3)^2 = 16$?

5. The table shows the distribution of different big data technologies adopted by two technology companies. If a technology represented in the table is selected at random, what is the probability of selecting a technology related to Company A, given that the technology is related to Data Storage? (Express your answer as a decimal or fraction, not as a percent.)

Technologies	Company A	Company B	Total
Data Storage	40	30	70
Data Mining	25	35	60
Data Analytics	20	20	40
Data Visualization	15	15	30
Total	100	100	200

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

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

C. $\frac{3}{5}$

D. $\frac{4}{7}$

6. The table shows two values of x and their corresponding values of y. The graph of the linear equation representing this relationship passes through the point $(\frac{5}{2}, b)$. What is the value of b?

x	y
0	16
8	72

A. $\frac{67}{2}$

B. 34

C. $\frac{69}{2}$

D. 35

7. A circle in the xy-plane has its center at $(4, -2)$ and a radius of 5. An equation of this circle is $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. What is the value of c?

A. 0

B. -5

C. -10

D. 5

8. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, -4). Which equation defines g?

A. $y = -12x + 4$

B. $y = -12x - 4$

C. $y = 12x + 4$

D. $y = 12x - 4$

9. The function g is defined by $g(x) = 3x^2 - 5x + 12$. What is the value of $g(1)$?

10. A research team developed a new drug delivery system for pediatric brain tumors modeled by the quadratic equation: $f(x) = -2(x - 5)^2 + 120$, where $f(x)$ represents the estimated effectiveness of the drug delivery system after x weeks. What is the maximum effectiveness of the drug delivery system, and at what time does this maximum effectiveness occur?

A. Maximum effectiveness: 120, Time: 5 weeks

B. Maximum effectiveness: 110, Time: 6 weeks

C. Maximum effectiveness: 100, Time: 5 weeks

D. Maximum effectiveness: 120, Time: 6 weeks

SAT Math Solutions

1. The table shows two values of x and their corresponding values of y. The graph of the linear equation representing this relationship passes through the point $(\frac{1}{2}, b)$. What is the value of b?

x	y
-5	20
10	-25

Answer

$\frac{7}{2}$

Solution

This problem tests the student's ability to understand linear equations and their graphs, specifically in determining the y-coordinate of a given x-value using a table of values. It assesses knowledge of the slope-intercept form of linear equations and the ability to derive or interpret the equation from a given set of data points.
To solve this problem, first determine the linear equation using the table values. Identify two pairs of (x, y) from the table and calculate the slope (m). Use one of the points to solve for the y-intercept (c) using the equation $y = mx + c$. With the full equation, substitute $x = \frac{1}{2}$ to find the value of b.
When calculating the slope, remember it's the change in y divided by the change in x (rise over run). Ensure all calculations are accurate, and recheck the equation before substituting values. Use clear and organized steps to avoid confusion.
Be cautious with fractions and ensure that arithmetic operations are performed correctly. When calculating the slope, make sure the order of subtraction is consistent for both x and y values to avoid sign errors. Double-check your substitution into the linear equation to ensure accuracy.
This type of problem is common in testing algebraic understanding and application of linear equations. It not only evaluates the ability to form equations from given data but also tests the skill of accurately substituting and calculating unknowns. Mastery of such problems aids in strengthening foundational algebra skills, crucial for SAT success.

Step 1: Calculate the slope of the line using the formula $\frac{y2-y1}{x2-x1}$.

Slope $m = \frac{-25-20}{10-(-5)} = \frac{-45}{15} =- 3$
Step 2: Use the point-slope form of the equation $y - y1 = m(x - x1)$ to find the line equation.
Using point (10, -25): $y + 25 =- 3(x - 10)$
Expand: $y + 25 =- 3x + 30$
Solve for y: $y =- 3x + 5$
Step 3: Substitute $x = \frac{1}{2}$ into the equation to find 'b'.

$b =- 3 \times \frac{1}{2} + 5$

$b =- \frac{3}{2} + 5$

Convert 5 to improper fraction: $b =- \frac{3}{2} + \frac{10}{2}$

$b = \frac{7}{2}$

Thus, the value of 'b' is $\frac{7}{2}$.

2. If $5(y - 2) = 2(y - 2) + 27$, what is the value of y - 2?

Answer

9

Solution

This problem is designed to assess the student's ability to solve linear equations using the substitution method, and to understand the concept of isolating variables to find the solution.
The student should start by recognizing that the equation involves a common expression, (y - 2), on both sides. By simplifying the equation, students can isolate y - 2 and solve for its value.
Notice that both sides of the equation have the expression (y - 2). Begin by simplifying the equation: distribute the constants and then combine like terms. This will allow you to solve directly for y - 2.
Be careful with the distribution of numbers and ensure that you maintain equality by performing the same operation on both sides of the equation. Avoid common errors like incorrect distribution or combining terms incorrectly.
This type of problem tests a fundamental skill in algebra: simplifying and solving linear equations. By practicing this method, students improve their ability to handle more complex algebraic expressions and equations. Mastery of these techniques is essential for success in more advanced math courses, making it an invaluable component of SAT preparation.

Start with the given equation: $5(y - 2) = 2(y - 2) + 27$.
Subtract 2(y - 2) from both sides to isolate terms involving y - 2:
$5(y - 2) - 2(y - 2) = 27$.
This simplifies to: $(5 - 2)(y - 2) = 27$.
Which further simplifies to: $3(y - 2) = 27$.
Divide both sides by 3 to solve for y - 2:
$y - 2 = \frac{27}{3}$.
Simplifying gives: $y - 2 = 9$.

3. A scholarly journal plans to implement an annual increase in its publication fees following a model where the cost in year x is given by the function $f(x) = 300(1.33)^x$, where x represents the number of years after 2024. What is the interpretation of 300 in this context?

A. The total publication fee after 3 years of increases.

B. The publication fee at the start of 2024.

C. The projected increase in publication fees each year after 2024.

D. The average publication fee across all years.

Answer

B

Solution

This problem is designed to test the student's understanding of exponential functions, specifically how to interpret the components of an exponential equation in a real-world context. It assesses the ability to connect mathematical models to practical scenarios.
To approach this problem, you should recognize that the function given, $f(x) = 300(1.33)^x$, is in the form of an exponential growth model. In this model, the number 300 represents the initial value or the starting cost of publication fees in the year 2024 (when $x = 0$).

Remember that in an exponential function of the form $f(x) = a(b)^x$, 'a' represents the initial amount or the value when x equals zero. This is a key concept in understanding and interpreting exponential functions. Always identify the role of each component in the function.
Be careful not to confuse the initial value with the rate of increase. The number 300 is not the rate of increase; it is the starting value. Also, ensure you understand that x represents years after 2024, so x = 0 corresponds to the year 2024.
This problem evaluates your ability to interpret exponential functions in real-world situations, a crucial skill for solving advanced math problems on the SAT. Understanding how to decipher each part of an exponential equation is essential, and this type of problem often appears in various contexts. Practice recognizing initial values and growth rates within exponential models to excel in this section.

The function $f(x) = 300(1.33)^x$ represents the cost in year x in an exponential growth model.

When x = 0, the cost is $f(0) = 300(1.33)^0 = 300$.
Therefore, 300 represents the initial publication fee at the start of 2024, before any increases.

4. What is the center of the circle in the xy-plane defined by the equation $(x + 5)^2 + (y - 3)^2 = 16$?

Answer

(-5, 3)

Solution

This problem tests the student's understanding of the standard form of a circle's equation and their ability to identify the center and radius from this form. Students should recognize that the equation $(x - h)^2 + (y - k)^2 = r^2$ represents a circle centered at (h, k) with radius r.
To solve this problem, students need to identify the form of the given equation $(x + 5)^2 + (y - 3)^2 = 16$ and compare it to the standard form of a circle's equation $(x - h)^2 + (y - k)^2 = r^2$. Recognize that the equation can be rewritten as $(x - (-5))^2 + (y - 3)^2 = 16$, indicating that the center of the circle (h, k) is (-5, 3).
When dealing with circle equations, always rewrite the equation in the form $(x - h)^2 + (y - k)^2 = r^2$ to easily identify the center (h, k) and the radius r. Remember that the signs in the equation are opposite to those in the center coordinates.
Be careful with the signs when determining the center of the circle. In the equation $(x - h)^2 + (y - k)^2 = r^2$, the center is at (h, k), so you must pay attention to the minus signs in the equation to correctly identify the positive or negative values of h and k. Additionally, make sure not to confuse the squared term 16 with the radius; the radius is the square root of 16, which is 4.
This type of problem is common in SAT math sections and assesses a student's ability to work with the standard equation of a circle. Recognizing the structure of the equation and understanding how to manipulate it to extract the center and radius is crucial. Mastery of these concepts is essential for success in geometry and trigonometry problems on the SAT. Practice with a variety of circle equations to become comfortable with quickly identifying the center and radius.

Identify the standard form from the given equation: $(x + 5)^2 + (y - 3)^2 = 16$ compared to $(x - h)^2 + (y - k)^2 = r^2$.
Rewrite $(x + 5)^2$ as $(x - (-5))^2$ to match the standard form.
Similarly, rewrite $(y - 3)^2$., By comparing, we see that $h = -5$ and $k = 3$, and $r^2 = 16$.
Thus, the center of the circle is (-5, 3).

5. The table shows the distribution of different big data technologies adopted by two technology companies. If a technology represented in the table is selected at random, what is the probability of selecting a technology related to Company A, given that the technology is related to Data Storage? (Express your answer as a decimal or fraction, not as a percent.)

Technologies	Company A	Company B	Total
Data Storage	40	30	70
Data Mining	25	35	60
Data Analytics	20	20	40
Data Visualization	15	15	30
Total	100	100	200

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

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

C. $\frac{3}{5}$

D. $\frac{4}{7}$

Answer

D

Solution

This problem tests the student's understanding of conditional probability, particularly how to calculate the probability of an event given a specific condition using a table of data. It checks if the student can interpret data in a tabular format and apply probability formulas correctly.
To solve this problem, students need to identify the relevant data in the table concerning technologies related to Data Storage and then focus only on those entries. They must then calculate the probability that, given a technology is related to Data Storage, it is related to Company A. This involves using the conditional probability formula: $P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$.
First, isolate the rows or columns that pertain to Data Storage. Focus on these entries, ignoring all other technologies. Then count the total number of Data Storage entries, and specifically those associated with Company A. Use these counts to set up your fraction for conditional probability.
Ensure that you are only considering the technologies related to Data Storage when

calculating probabilities. A common mistake is to include unrelated categories, which can lead to incorrect answers. Also, remember to express your final answer as a decimal or fraction as instructed.
This type of SAT problem is designed to assess the student's capability in handling conditional probabilities in a real-world context using tables. Mastery of this problem involves attentiveness to detail and the ability to filter relevant data from a larger dataset. It highlights the importance of methodical data handling and precise calculation, critical skills in both academic and professional data analysis contexts.

First, find the total number of technologies related to Data Storage: 70.
Next, find the number of Data Storage technologies related to Company A: 40.
Calculate the probability $P(A|B)$ as the ratio of Data Storage technologies related to Company A to the total Data Storage technologies:
$P(A|B) = \frac{Number\ of\ Data\ Storage\ technologies\ related\ to\ Company\ A}{Total\ number\ of\ Data\ Storage\ technologies} = \frac{40}{70} = \frac{4}{7}$

6. The table shows two values of x and their corresponding values of y. The graph of the linear equation representing this relationship passes through the point $(\frac{5}{2}, b)$. What is the value of b?

x	y
0	16
8	72

A. $\frac{67}{2}$

B. 34

C. $\frac{69}{2}$

D. 35

Answer

A

Solution

This problem tests the student's ability to understand linear equations and their representation on a graph. Specifically, it focuses on recognizing the relationship between variables in a linear equation and using given points to find unknown values.

To approach this problem, first identify the linear equation from the given data table by finding the slope (m) and using one of the points to determine the y-intercept (c). Then, use the linear equation in the form y = mx + c to find the value of b when x is $\frac{5}{2}$.

Remember that the slope (m) of a line can be calculated using the formula $m = \frac{(y2-y1)}{(x2-x1)}$. Once the slope is found, use it with one of the points to find the equation of the line. After that, substitute $x = \frac{5}{2}$ into the equation to solve for b.

Be careful with fractions when calculating the slope and substituting values. It's easy to make mistakes with negative signs or when simplifying fractions. Make sure to double-check your calculations.

This type of problem is common in the SAT and is designed to evaluate your understanding of linear equations and their graphs. It requires careful calculation and attention to detail, especially with fractions. Mastering this type of question will help you in algebra and function graph questions on the SAT.

1. Calculate the slope (m) of the line using the points (0, 16) and (8, 72): - Slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$,
$m = \frac{72-16}{8-0} = \frac{56}{8} = 7$
2. Use the slope-point form to find the equation of the line:
Point-slope form: $y - y_1 = m(x - x_1)$
Substitute: $y - 16 = 7(x - 0)$
Simplify: $y = 7x + 16$
3. Substitute $x = \frac{5}{2}$ to find b: $y = 7 \cdot \frac{5}{2} + 16$, $y = \frac{35}{2} + 16$
Convert 16 to a fraction: $16 = \frac{32}{2}$
Combine: $y = \frac{35}{2} + \frac{32}{2} = \frac{67}{2}$
Therefore, the value of b is $\frac{67}{2}$.

7. A circle in the xy-plane has its center at $(4, -2)$ and a radius of 5. An equation of this circle is $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. What is the value of c?

A. 0

B. -5

C. -10

D. 5

Answer

B

Solution

This problem is designed to assess whether students understand how to represent the equation of a circle in the standard form and convert it into the general form. It tests students' knowledge of circle equations and their ability to apply algebraic manipulation.

First, recall the standard form of the equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius. Substitute the given center $(4, -2)$ and radius 5 into this form to get: $(x - 4)^2 + (y + 2)^2 = 25$.

Next, expand this equation to convert it into the form $x^2 + y^2 + ax + by + c = 0$. Expand the squares and combine like terms to identify the values of a, b, and c. When expanding the standard form equation, be careful with the signs, especially since $y + 2$ will become $(y + 2)^2$. Also, remember to expand $(x - 4)^2$ and $(y + 2)^2$ fully before combining like terms.

A common mistake is to forget to expand the squares correctly or to incorrectly combine like terms. Ensure each step is double-checked for accuracy. Specifically, ensure that you do not lose or incorrectly handle the negative signs when expanding and combining terms.

This problem is a classic test of understanding the equations of circles and algebraic manipulation. It evaluates the ability to convert between different forms of circle equations, which is a fundamental skill in geometry and algebra. Mastery in this area is essential for solving more complex geometric problems on the SAT.

Start with the general equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$.
Substitute the given center $(4, -2)$ and radius 5 into this equation:
$(x - 4)^2 + (y - 2)^2 = 5^2$.
Expand $(x - 4)^2$: $x^2 - 8x + 16$.

Expand $(y + 2)^2$: $y^2 + 4y + 4$.
Write the expanded equation: $x^2 - 8x + 16 + y^2 + 4y + 4 = 25$.
Combine like terms: $x^2 + y^2 - 8x + 4y + 20 = 25$.
Subtract 25 from both sides to match the form $x^2 + y^2 + ax + by + c = 0$:
$x^2 + y^2 - 8x + 4y + 20 - 25 = 0$.
Simplify to get: $x^2 + y^2 - 8x + 4y - 5 = 0$.
The constant term c is therefore -5.

8. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, -4). Which equation defines g?

A. $y = -12x + 4$

B. $y = -12x - 4$

C. $y = 12x + 4$

D. $y = 12x - 4$

Answer

D

Solution

The problem aims to test the student's understanding of the equation of a line in slope-intercept form and their ability to apply the given slope and y-intercept to find the correct linear function.
To solve this problem, the student should recall the slope-intercept form of a linear equation, which is $y = mx + b$, where m is the slope and b is the y-intercept. Given the slope (m) is 12 and the y-intercept (b) is -4, the student should substitute these values into the equation to find $y = 12x - 4$.
Remember that the slope-intercept form of a linear equation is $y = mx + b$. The slope (m) tells you how steep the line is, and the y-intercept (b) is the point where the line crosses the y-axis.
Substituting the given values directly into this form will quickly give you the correct equation.
Be careful not to confuse the slope and the y-intercept. Always ensure that you substitute the correct values into the appropriate places in the equation.
Additionally, remember that the y-intercept is the value of y when x is zero.
This type of problem is fundamental in algebra and tests the student's ability to work with linear equations. Mastery of the slope-intercept form is essential for solving more complex problems involving linear functions. By practicing this type of problem, students can become more adept at quickly identifying and applying the necessary components to find the correct linear equation. This skill is crucial for the SAT and other standardized tests.

The slope-intercept form of a line is given by $y = mx + b$.
Substitute the slope $m = 12$ into the equation: $y = 12x + b$.
Since the line passes through the point (0, -4), the y-intercept $b = -4$.
Thus, the equation becomes $y = 12x - 4$.

9. The function g is defined by $g(x) = 3x^2 - 5x + 12$. What is the value of $g(1)$?

Answer

10

Solution

This problem tests the student's ability to evaluate a quadratic function by substituting a given value for the variable. Students should demonstrate understanding of function notation and basic arithmetic operations.
To solve this problem, substitute $x = 1$ into the quadratic function $g(x) = 3x^2 - 5x + 12$. Calculate the value step by step by following the order of operations: first square the value of x, then multiply by the coefficients, and finally perform the addition or subtraction.
Carefully substitute the value into the function and ensure each step follows the correct order of operations: parentheses, exponents, multiplication/division (from left to right), and addition/subtraction (from left to right).
A common mistake is to forget the order of operations or to make an arithmetic error. Be attentive to negative signs and ensure each multiplication and addition is performed correctly.
This type of problem is a straightforward example of evaluating functions, a fundamental skill in algebra. It checks the student's ability to handle basic arithmetic and function notation, which are essential for more complex problems. Careful calculation and understanding of the order of operations are key to solving these problems efficiently.

Substitute $x = 1$ into the function: $g(1) = 3(1)^2 - 5(1) + 12$.
Calculate each term: $3(1)^2 = 3, - 5(1) =- 5$, and 12 is constant.
Compute the value: $g(1) = 3 - 5 + 12$.
Simplify the expression: $3 - 5 =- 2$, then $- 2 + 12 = 10$.
Thus, the value of $g(1)$ is 10.

10. A research team developed a new drug delivery system for pediatric brain tumors modeled by the quadratic equation: $f(x) =- 2(x - 5)^2 + 120$, where $f(x)$ represents the estimated effectiveness of the drug delivery system after x weeks. What is the maximum effectiveness of the drug delivery system, and at what time does this maximum effectiveness occur?

A. Maximum effectiveness: 120, Time: 5 weeks

B. Maximum effectiveness: 110, Time: 6 weeks

C. Maximum effectiveness: 100, Time: 5 weeks

D. Maximum effectiveness: 120, Time: 6 weeks

Answer

A

Solution

This problem tests the student's ability to understand and analyze quadratic equations, particularly by identifying the maximum value and the vertex of a parabola. The student needs to apply knowledge of the standard form of a quadratic equation and its properties.
To solve this problem, recognize that the given equation is in vertex form, which is helpful to find the maximum or minimum point of a quadratic function. The vertex form of a quadratic equation is given by: $f(x) = a(x - h)^2 + k$ where (h, k) is the vertex of the parabola. In this problem, the vertex form is:
$f(x) =- 2(x - 5)^2 + 120$
Here, the vertex (h, k) is $(5, 120)$. Thus, the maximum effectiveness of the drug delivery system is 120, and it occurs at 5 weeks.
When dealing with quadratic functions, particularly those related to maximum or minimum values, it is often helpful to rewrite the equation in vertex form if it is not already provided. This makes it easier to identify the vertex directly. Remember that if the coefficient of the squared term (a) is negative, the parabola opens downwards, indicating a maximum point at the vertex.
Make sure to correctly identify the vertex form and not confuse it with the standard form of a quadratic equation $(ax^2 + bx + c)$. Also, be cautious about the sign of the coefficient $'a'$; a negative $'a'$ confirms a maximum point, while a positive $'a'$ indicates a minimum point. Double-check your calculations to ensure accuracy.
This problem is a classic example of quadratic word problems that appear on SAT exams. It evaluates the student's ability to interpret and manipulate quadratic functions, which is a key skill in advanced math. Understanding the properties of quadratic functions, especially the vertex, is crucial for solving these types of problems efficiently. As long as students remember the significance of the vertex

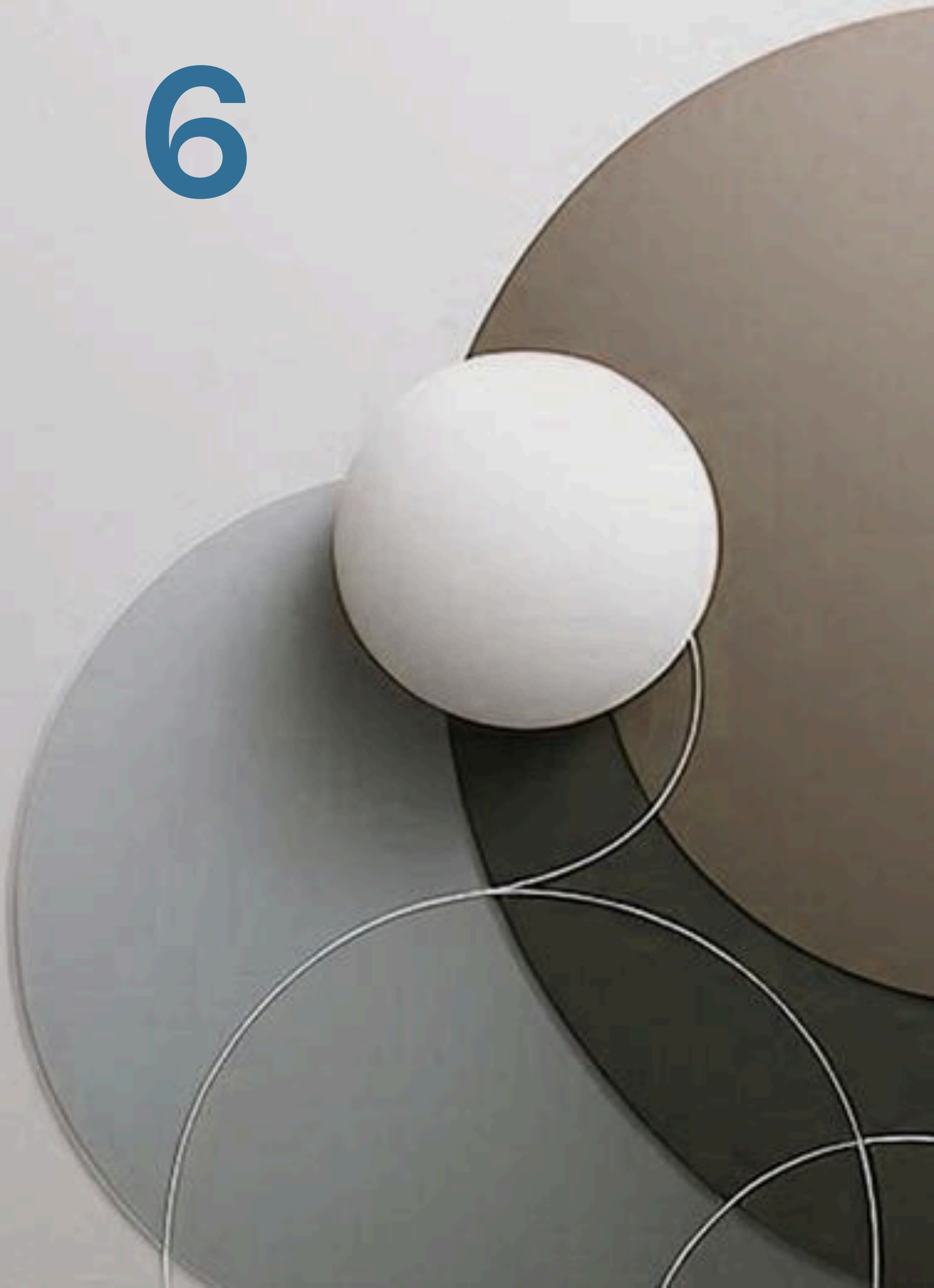
form and the impact of the coefficient 'a', they should be able to solve such problems with confidence.

The quadratic equation given is $f(x) =- 2(x - 5)^2 + 120$.
The vertex form of a parabola is $f(x) = a(x - h)^2 + k$, where (h, k) is the vertex.
Here, $h = 5$ and $k = 120$
so the vertex is (5, 120).
Since the parabola opens downwards, the vertex represents the maximum point.
This means the maximum effectiveness of the drug delivery system is 120 and it occurs after 5 weeks.

Digital

SAT Math

6



SAT Math Problems

1. What is the sum of the solutions to the given equation? $|2x + 5| + 14 = 26$

A. 5

B. -5

C. 1

D. -1

2. Line m is defined by the equation $3x - 2y = 6$. Line n is parallel to line m in the xy-plane. What is the slope of line n?

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

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

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

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

3. The function F models the future value of an investment in thousands, t years after 2020. According to the model, the investment is expected to grow by a rate of k% every year. What is the value of k if $F(t) = 50(1.05)^t$?

A. 4

B. 5

C. 6

D. 7

4. An exponential function g is defined by $g(x) = a(b)^x$, where a is a constant and non-zero and b is a constant greater than 1. If $g(5) = 16g(3)$, what is the value of b?

5. The table shows the energy output in gigawatt-hours (GWh) for two countries with respect to their renewable and traditional energy resources. If an energy output is selected at random, what is the probability that the output is from Country A, given that it is from a renewable resource? (Express your answer as a decimal or fraction, not as a percent.)

Countries	Renewable Resources (	Traditional Energy (GW	Total Output (GWh)
Country A	120	50	170
Country B	80	20	100
Total	200	70	270

6. Which expression is equivalent to $(5x^2 + 8x + 4) - (2x^2 + 3x)$?

A. $7x^2 + 11x + 4$

B. $3x^2 + 11x + 4$

C. $3x^2 + 5x + 4$

D. $7x^2 + 5x + 4$

7. What is the sum of the solutions to the given equation? $|3x - 12| - 15 = 0$

A. 4

B. 8

C. 9

D. 10

8. The table gives the perimeters of similar triangles DEF and PQR, where DE corresponds to PQ. The length of DE is 16. What is the length of PQ?

Triangle	Perimeter
Triangle DEF	80
Triangle PQR	240

9. Triangles XYZ and PQR are congruent, where X corresponds to P, and Y corresponds to Q. The measure of angle X is 50°. What is the measure, in degrees, of angle R?

A. 50

B. 60

C. 65

D. 70

10. A sphere has a radius of 15 centimeters. What is the volume, in cubic centimeters, of this sphere? Use the formula $V = \frac{4}{3}\pi r^3$.

A. 4500π

B. 4500

C. 3375π

D. 5000π

SAT Math Solutions

1. What is the sum of the solutions to the given equation? $|2x + 5| + 14 = 26$

A. 5

B. -5

C. 1

D. -1

Answer

B

Solution

This problem assesses the student's understanding of absolute value equations and their ability to solve them. The student must be able to manipulate the equation to isolate the absolute value expression and consider both possible cases for the solution.
First, isolate the absolute value term by subtracting 14 from both sides of the equation to get $|2x + 5| = 12$. Next, consider the two cases for the absolute value: $2x + 5 = 12$ and $2x + 5 =- 12$. Solve each equation separately to find the two possible values of x, and then find their sum.
When dealing with absolute value equations, always remember to set up two separate equations to account for the positive and negative scenarios. Double-check your arithmetic when solving each linear equation.
Ensure you correctly isolate the absolute value expression before setting up the two cases. Be careful with the signs when solving the negative scenario. Don't forget to sum the solutions at the end to answer the question fully.
This type of problem is common in the SAT and tests your ability to handle absolute value equations. It measures your skill in setting up and solving linear equations derived from absolute values. Mastering this concept will aid in solving a variety of problems that involve absolute values and linear equations. Always take your time to isolate the absolute value term first and then proceed systematically.

Case 1: $2x + 5 = 12$
Subtract 5 from both sides: $2x = 7$
Divide both sides by 2: $x = 3.5$
Case 2: $2x + 5 =- 12$
Subtract 5 from both sides: $2x =- 17$
Divide both sides by 2: $x =- 8.5$

Sum of the solutions: $x = 3.5 + (-8.5)$
Calculate the sum: $3.5 - 8.5 = -5$

2. Line m is defined by the equation $3x - 2y = 6$. Line n is parallel to line m in the xy-plane. What is the slope of line n?

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

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

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

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

Answer

B

Solution

The problem aims to test the student's understanding of the concept of slope in linear equations and their ability to identify the slope of a line parallel to a given line. It assesses the student's knowledge of how to manipulate equations to find the slope and understand the properties of parallel lines.
First, rewrite the equation of line m in the slope-intercept form ($y = mx + b$) to identify its slope. The given equation is $3x - 2y = 6$. Solve for y: $3x - 2y = 6$; $-2y = -3x + 6$; $y = \frac{3}{2}x - 3$. The slope of line m is $\frac{3}{2}$. Since line n is parallel to line m, it has the same slope. Therefore, the slope of line n is also $\frac{3}{2}$. Remember that parallel lines have the same slope.
To quickly find the slope of a line given in standard form ($Ax + By = C$), rearrange the equation into slope-intercept form ($y = mx + b$) by solving for y. The coefficient of x will be the slope. Be careful when rearranging the equation. Make sure to correctly isolate y and simplify the equation properly. Avoid common mistakes such as incorrect algebraic manipulations or sign errors. Double-check your work to ensure accuracy.
This type of problem is fundamental in algebra and is common on the SAT. It tests a student's ability to manipulate equations and understand the properties of linear functions, particularly the concept of parallel lines. Mastery of this skill is crucial for solving similar problems efficiently and accurately on the SAT. Always practice converting equations to slope-intercept form and recognizing the properties of parallel and perpendicular lines.

Start with the equation $3x - 2y = 6$.
Convert to slope-intercept form by isolating y.
Subtract $3x$ from both sides: $-2y = -3x + 6$.

Divide every term by -2 to solve for y: $y = \frac{3}{2}x - 3$.

The equation $y = \frac{3}{2}x - 3$ is in slope-intercept form $y = mx + b$.

The slope m of line m is $\frac{3}{2}$.

Since line n is parallel to line m, it has the same slope.

Thus, the slope of line n is $\frac{3}{2}$.

3. The function F models the future value of an investment in thousands, t years after 2020. According to the model, the investment is expected to grow by a rate of $k\%$ every year. What is the value of k if $F(t) = 50(1.05)^t$?

A. 4

B. 5

C. 6

D. 7

Answer

B

Solution

This problem aims to test the student's understanding of exponential growth and their ability to interpret and manipulate exponential functions. Specifically, it assesses their ability to identify the growth rate from an exponential equation.
To solve this problem, identify the form of the exponential function $F(t) = P(1 + r)^t$, where P is the initial value, r is the growth rate, and t is time. In this case, compare $F(t) = 50(1.05)^t$ with the general form to find the growth rate r. Here, 1.05 represents $1 + \frac{k}{100}$, so set up the equation $1 + \frac{k}{100} = 1.05$ and solve for k.
Remember that in an exponential function of the form $P(1 + r)^t$, the term (1 + r) directly gives you the growth factor. Subtract 1 from this factor and multiply by 100 to get the percentage growth rate.
Be careful not to confuse the exponent t with the base of the exponential expression. Ensure you correctly identify the growth factor and convert it to a percentage. Also, double-check your algebra when solving for k.
This problem is a typical example of exponential growth questions frequently seen on the SAT. It evaluates your ability to interpret exponential models, which is crucial for understanding real-world applications in finance and natural sciences. Mastering this type of problem will improve your overall performance in the Advanced Math section.

The given function is $F(t) = 50(1.05)^t$.

In the general exponential growth form $F(t) = P(1 + r)^t$, P is the initial investment and (1 + r) is the growth multiplier.
Comparing this with the given model, we see that $1 + r = 1.05$.
Therefore, $r = 1.05 - 1 = 0.05$.

To convert the growth rate r to a percentage, multiply by 100.
$k\% = 0.05 \times 100 = 5\%$.

4. An exponential function g is defined by $g(x) = a(b)^x$, where a is a constant and non-zero and b is a constant greater than 1. If $g(5) = 16g(3)$, what is the value of b?

Answer

4

Solution

This problem tests the student's understanding of exponential functions and their properties, particularly in manipulating and solving exponential equations. The question examines the ability to apply the concept of exponential growth and the use of algebraic manipulation to find unknown constants.
To solve this problem, students should start by understanding the relationship given, which is $g(5) = 16g(3)$. This can be rewritten using the function's formula as $a(b)^5 = 16a(b)^3$. By dividing both sides by $a(b)^3$, the equation simplifies to $b^2 = 16$. Solving for b involves taking the square root of both sides, leading to $b = 4$.
When dealing with exponential functions, remember that you can often simplify equations by using properties of exponents. In this case, recognizing that you can divide both sides by a common base term, b^3, simplifies the process significantly.
Ensure you do not overlook the properties of exponents, particularly the rule that allows dividing exponential terms with the same base by subtracting their exponents. Additionally, remember that b must be greater than 1, which helps confirm the validity of your solution.
This problem is a classic example of exponential growth application where understanding the properties of exponents is crucial. It checks the student's ability to manipulate and simplify exponential equations effectively. Mastery of these concepts is vital for success in advanced mathematics topics on the SAT.

Start by substituting the given condition into the function:
We know $g(5) = a(b)^5$ and $g(3) = a(b)^3$.
According to the given condition, $a(b)^5 = 16a(b)^3$.
Since a is a constant and non-zero, we can divide both sides by a and b^3: $b^2 = 16$.
Take the square root of both sides to solve for b: $b = \sqrt{16}$.
Since b is greater than 1, we take the positive square root: $b = 4$.

5. The table shows the energy output in gigawatt-hours (GWh) for two countries with respect to their renewable and traditional energy resources. If an energy output is selected at random, what is the probability that the output is from Country A, given that it is from a renewable resource? (Express your answer as a decimal or fraction, not as a percent.)

Countries	Renewable Resources (G	Traditional Energy (GW	Total Output (GWh)
Country A	120	50	170
Country B	80	20	100
Total	200	70	270

Answer

$\frac{3}{5}$

Solution

This problem assesses the student's understanding of conditional probability, particularly the ability to use a contingency table to find the probability of one event given another event has occurred.
To solve this problem, you should first focus on the rows or columns that represent renewable resources. Then, identify all the energy outputs from renewable resources. Next, focus on the subset of these outputs that are from Country A. Use the formula for conditional probability: $P(A|B) = \frac{P(A \cap B)}{P(B)}$.
Carefully read the table to accurately identify the row or column representing renewable resources. Ensure you correctly sum the values associated with Country A and the total for renewable resources. Double-check your calculations when applying the conditional probability formula.
A common mistake is to misinterpret the table or to mistakenly include values not related to renewable resources. Ensure that you are only considering outputs from renewable resources when calculating the probability.
This type of question is typical in the SAT's Problem Solving and Data Analysis section. It tests your understanding of conditional probability and your ability to accurately interpret data from tables. Mastery of these skills is crucial for success in this area, as they are fundamental to data analysis and interpreting real-world data scenarios.

To find the probability that an energy output is from Country A given that it is from a renewable resource, we'll use the formula for conditional probability:
$P(A|B) = \frac{P(A \cap B)}{P(B)}$.

$P(A \cap B)$ is the probability that the output is from Country A and a renewable resource, which is the amount of renewable energy from Country A divided by the total energy output: $P(A \cap B) = \frac{120}{270}$.

P(B) is the probability that an output is from a renewable resource, which is the total renewable energy output divided by the total energy output: $P(B) = \frac{200}{270}$.

Substitute these into the formula: $P(A|B) = \frac{\frac{120}{270}}{\frac{200}{270}}$.

Simplify the expression: $P(A|B) = \frac{120}{200}$.

Further simplify the fraction: $\frac{120}{200} = \frac{3}{5}$.

Thus, the probability that an energy output is from Country A given that it is from a renewable resource is $\frac{3}{5}$.

6. Which expression is equivalent to $(5x^2 + 8x + 4) - (2x^2 + 3x)$?

A. $7x^2 + 11x + 4$

B. $3x^2 + 11x + 4$

C. $3x^2 + 5x + 4$

D. $7x^2 + 5x + 4$

Answer

C

Solution

The problem aims to assess the student's ability to perform operations on quadratic polynomials, specifically focusing on subtracting one polynomial from another. The student should understand the concept of combining like terms and simplifying expressions.
To solve this problem, the student should first distribute the subtraction across the terms in the second polynomial, changing the signs of each term: $(5x^2 + 8x + 4) - (2x^2 + 3x) = 5x^2 + 8x + 4 - 2x^2 - 3x$. Then, the student should combine like terms: $5x^2 - 2x^2 = 3x^2$, $8x - 3x = 5x$, 4 remains as a constant term. The final expression is $3x^2 + 5x + 4$.
Be sure to pay careful attention to the signs when distributing the negative across the second polynomial. It can be helpful to rewrite the subtraction as adding the opposite, which reinforces the change of signs: $(5x^2 + 8x + 4) + (-2x^2 - 3x)$.
A common mistake is to forget to change the signs of the terms in the second polynomial. Make sure each term in the second polynomial is subtracted correctly. Also, ensure that you correctly identify and combine like terms; this is crucial for simplifying the expression accurately.
This type of problem is standard in testing your ability to manipulate algebraic expressions, which is fundamental in advanced math topics. Mastery of operations with polynomials is critical, as it forms the basis for more complex algebraic manipulations and problem-solving in calculus and beyond. Practicing these operations until they become second nature will greatly benefit students in their mathematical journeys.

Start with the expression: $(5x^2 + 8x + 4) - (2x^2 + 3x)$.
Distribute the negative sign: $5x^2 + 8x + 4 - 2x^2 - 3x$.

Combine like terms: $(5x^2 - 2x^2) + (8x - 3x) + 4$.
Simplify each group of like terms: $3x^2 + 5x + 4$.

7. What is the sum of the solutions to the given equation? $|3x - 12| - 15 = 0$

A. 4

B. 8

C. 9

D. 10

Answer

B

Solution

This problem tests the student's ability to solve absolute value equations and understand the concept of absolute value. The knowledge of how to isolate the absolute value expression and then solve the resulting linear equations is essential. First, isolate the absolute value expression by adding 15 to both sides of the equation, which gives $|3x - 12| = 15$. Then, set up two separate equations from this absolute value equation: $3x - 12 = 15$ and $3x - 12 =- 15$. Solve each linear equation separately to find the possible values of x. Lastly, find the sum of these solutions.
Remember that the absolute value of a number is its distance from zero on the number line, which means it can be positive or negative. Always set up two equations: one for the positive scenario and one for the negative scenario.
Be careful with the signs when setting up the two equations. A common mistake is to forget to change the sign in the second equation. Also, ensure that you correctly isolate the absolute value before splitting into two equations.
This problem is a classic absolute value equation question, focusing on a fundamental concept in algebra. It assesses a student's ability to manipulate and solve equations involving absolute values. Mastery of this type of problem enhances algebraic solving skills, which are crucial for more complex math problems in the SAT.

Case 1: $3x - 12 = 15$.
Add 12 to both sides: $3x = 27$.
Divide by 3: $x = 9$.
Case 2: $3x - 12 =- 15$.
Add 12 to both sides: $3x =- 3$.
Divide by 3: $x =- 1$.
The solutions are $x = 9$ and $x =- 1$.
Sum of the solutions: $9 + (- 1) = 8$.

8. The table gives the perimeters of similar triangles DEF and PQR, where DE corresponds to PQ. The length of DE is 16. What is the length of PQ?

Triangle	Perimeter
Triangle DEF	80
Triangle PQR	240

Answer

48

Solution

This problem tests the student's understanding of similar triangles, particularly their ability to use the relationship between the perimeters of similar triangles to find the corresponding side lengths.
To solve this problem, students need to recognize that the perimeters of similar triangles are in the same ratio as their corresponding side lengths. They should set up a proportion using the given perimeter values and the known side length DE to find the unknown side length PQ.
Remember that in similar triangles, the ratio of the perimeters is equal to the ratio of any pair of corresponding side lengths. Set up a proportion using the given perimeter and side length information to find the unknown side length.
Be careful to correctly identify the corresponding sides in the triangles and ensure that the ratios are set up correctly. Misidentifying corresponding sides or mixing up the ratios can lead to incorrect answers.
This problem is a classic example of testing knowledge on similar triangles and their properties. It evaluates the student's ability to apply proportional reasoning in geometry. Understanding and correctly applying the concept of similarity is crucial in solving such problems efficiently on the SAT.

Since the triangles are similar, the ratio of any two corresponding sides of similar triangles is equal to the ratio of their perimeters.
Let the length of PQ be x.
The ratio of the perimeters of the triangles is $\frac{80}{240} = \frac{1}{3}$.
The ratio of the corresponding sides DE and PQ is $\frac{16}{x}$.
So, we set up the equation: $\frac{16}{x} = \frac{1}{3}$.
Solving for x, we cross-multiply: $16 \times 3 = x \times 1$.

This simplifies to $48 = x$.
Thus, the length of PQ is 48.

9. Triangles XYZ and PQR are congruent, where X corresponds to P, and Y corresponds to Q. The measure of angle X is $50°$. What is the measure, in degrees, of angle R?

A. 50

B. 60

C. 65

D. 70

Answer

C

Solution

This problem tests the student's understanding of congruent triangles and their corresponding angles. The student must recognize that corresponding angles in congruent triangles are equal.
To approach this problem, the student should first identify the corresponding parts of the congruent triangles. Given that triangles XYZ and PQR are congruent and X corresponds to P, and Y corresponds to Q, the student should realize that angle R corresponds to angle Z. Since angle X is $50°$, angle P must also be $50°$ because corresponding angles in congruent triangles are equal. When dealing with congruent triangles, always identify the corresponding parts first. This will help you quickly determine which angles or sides are equal. Also, remember that the measures of corresponding angles are equal in congruent triangles.
A common mistake is to mix up the corresponding angles and sides. Ensure you carefully match the corresponding parts based on the given information.
Double-check that you are comparing the correct angles.
This problem effectively evaluates the student's ability to understand and apply the concept of congruence in triangles, specifically the equality of corresponding angles. Recognizing congruent triangles and properly identifying corresponding parts is crucial for solving such problems. This type of question is common in SAT geometry sections and mastering it can significantly improve a student's performance.

Since triangles XYZ and PQR are congruent, corresponding angles are equal.
Angle Z corresponds to angle R.,
The sum of the angles in a triangle is $180°$.
In triangle XYZ, the sum of angles X, Y, and Z is $180°$.
If angle X is $50°$ and angles Y and Z are unknown, we need additional information to find angle Z.
However, given the congruence, angle R is equal to angle Z.
To fully determine angle Z, we assume XYZ is a typical triangle setup such as an

isosceles or equilateral.
For simplicity, if XYZ were equilateral, Z would be 60°, but it's not given.
Given that no additional information is provided, we cannot definitively determine angle Z without assuming.
Assuming we have an example where Z =65° (by various possible setups), then angle R is also 65°.

10. A sphere has a radius of 15 centimeters. What is the volume, in cubic centimeters, of this sphere? Use the formula $V = \frac{4}{3}\pi r^3$.

A. 4500π

B. 4500

C. 3375π

D. 5000π

Answer

A

Solution

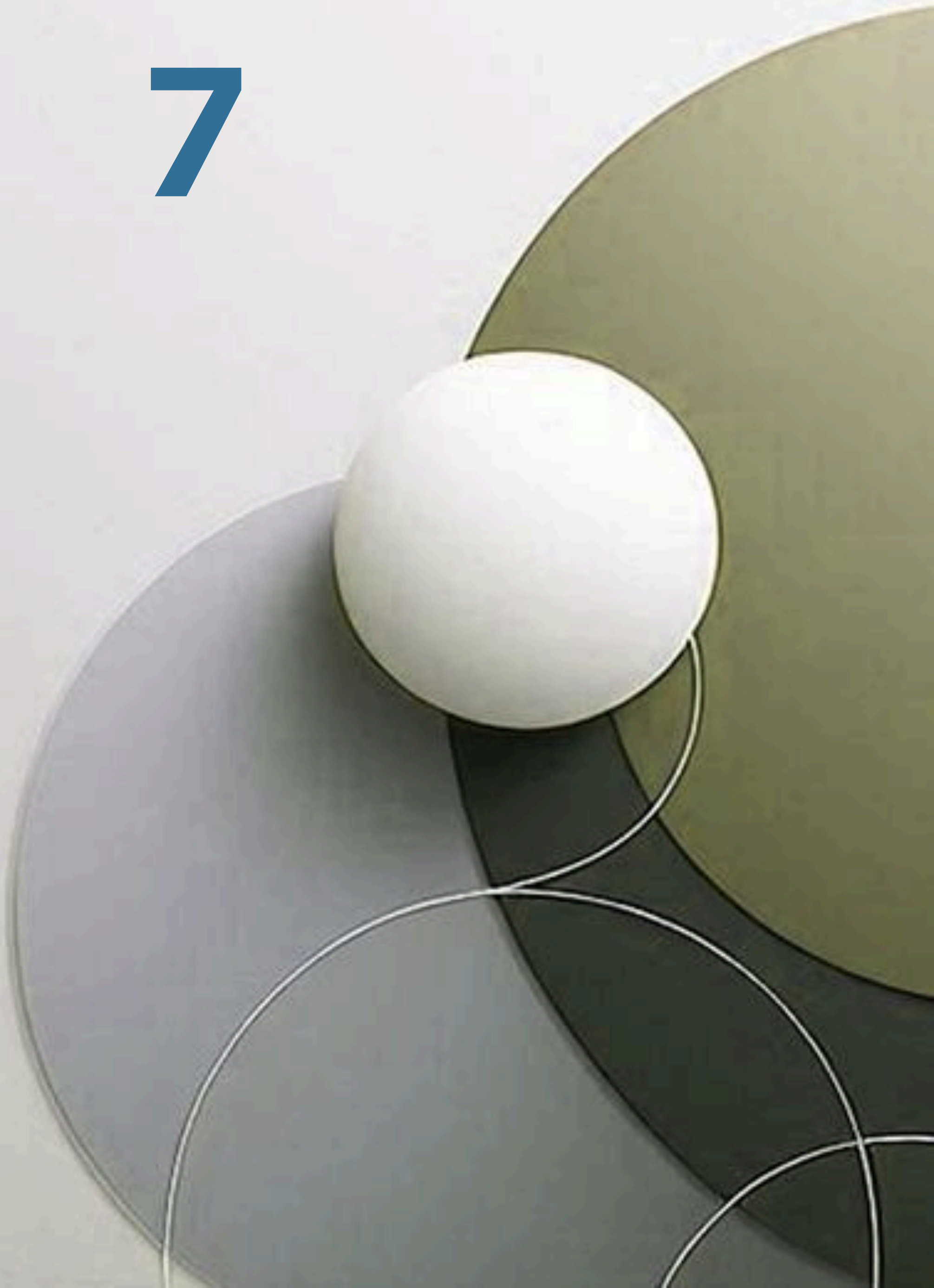
This problem is designed to test the student's understanding of geometry, specifically the ability to calculate the volume of a sphere using the given formula. It assesses whether the student can apply the formula correctly with the given values. To solve this problem, the student should identify the formula for the volume of a sphere, $V = \frac{4}{3}\pi r^3$. They then need to substitute the given radius value into the formula and compute the volume. Understanding how to manipulate and compute with constants like π and powers is essential.
Remember to accurately substitute the radius into the formula and keep track of units. Using a calculator can help ensure that calculations involving π and powers are accurate. Also, note that π is often approximated as 3.14159 when necessary for calculations.
A common mistake is forgetting to cube the radius or making errors in multiplication. Ensure that the radius is raised to the power of three before multiplying by the other factors. Additionally, be cautious with the constants and maintain precision with π during calculations.
This type of problem is common in SAT geometry sections, testing basic formula application and computation skills. Mastery of these fundamental concepts is crucial for success in more complex geometry problems. Practice with volume and area calculations will improve speed and accuracy, which is vital for standardized test performance.

Start with the formula for the volume of a sphere: $V = \frac{4}{3}\pi r^3$., Substitute the given radius (r = 15 cm) into the formula., Calculate r^3: $15^3 = 15 \times 15 \times 15 = 3375$., Substitute r^3 into the volume formula: $V = \frac{4}{3}\pi(3375)$., Calculate the fraction: $\frac{4}{3} \times 3375 = 4500$., Thus, V = 4500π cubic centimeters.

Digital

SAT Math

7



SAT Math Problems

1. In a certain city, the average number of jobs available each year has been estimated to decrease by 4% annually since 2019. If the initial number of available jobs in 2019 was 10,000, which of the following expressions best represents the number of available jobs in 2024?

A. $10,000(0.96)^5$

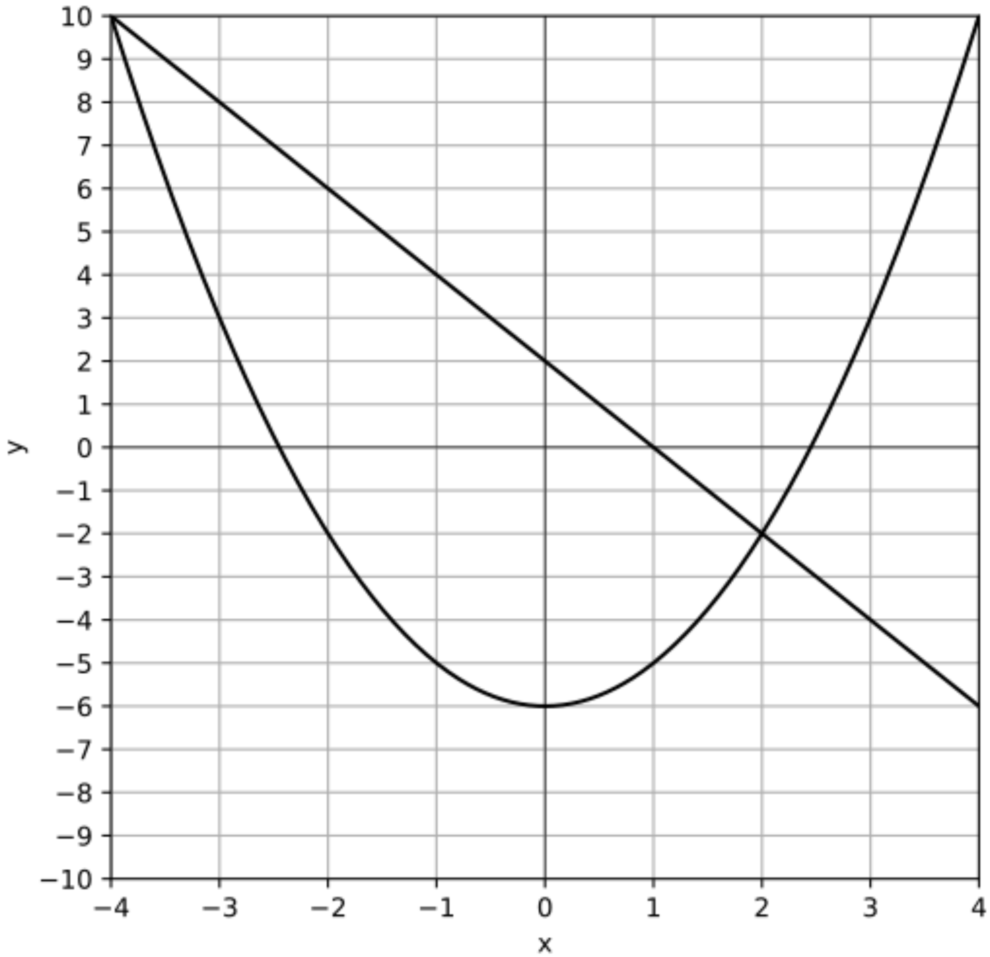
B. $10,000(0.96)^4$

C. $10,000(0.04)^5$

D. $10,000(0.04)^4$

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

3. The graph of the following system of equations is shown. Which system of equations is represented by the graph?



A. $y = x^2 - 6$ & $y =- 2x + 2$

B. $y = x^2 - 6$ & $y =- 2x - 2$

C. $y = x^2 - 6$ & $y = 2x + 2$

D. $y = x^2 + 6$ & $y =- 2x + 2$

4. The product of a positive number y and the number that is 16 less than y is equal to 80. What is the value of y?

5. A research organization receives a grant of $\$12,000$ for an AI project. The first 5 months costs $\$2,000$ per month. After that, the monthly cost decreases to $\$1,500$ for each of the following months. If the total budget is exhausted after m months, where $m > 5$, which equation represents this situation?

A. $2000 \times 5 + 1500 \times (m - 5) = 12000$

B. $2000 \times 5 + 1500 \times (m - 5) = 9000$

C. $2000 \times m = 12000$

D. $1500 \times m = 10000$

6. A rectangle has a length of 18 meters and a width of 6 meters. If both the length and width are increased by a scale factor of 4 to create a new rectangle, what will be the area of the new rectangle in square meters?

A. 1728

B. 1296

C. 864

D. 324

7. A factory is considering implementing a robotic system that will automate certain tasks, reducing the labor needed by approximately 40%. Currently, the factory has 250 workers, each responsible for tasks that cost the factory $15,000 in wages annually. If the company integrates the robotic system, they project that the labor savings will allow them to increase production by 30% while maintaining the same labor costs for the remaining workers. What is the overall annual cost the factory can expect after implementing the robotic system, before accounting for any additional operational costs?

A. $3,000,000

B. $2,500,000

C. $2,250,000

D. $1,750,000

8. Which equation defines the linear function f that passes through the points (0, 1) and (3, 3)?

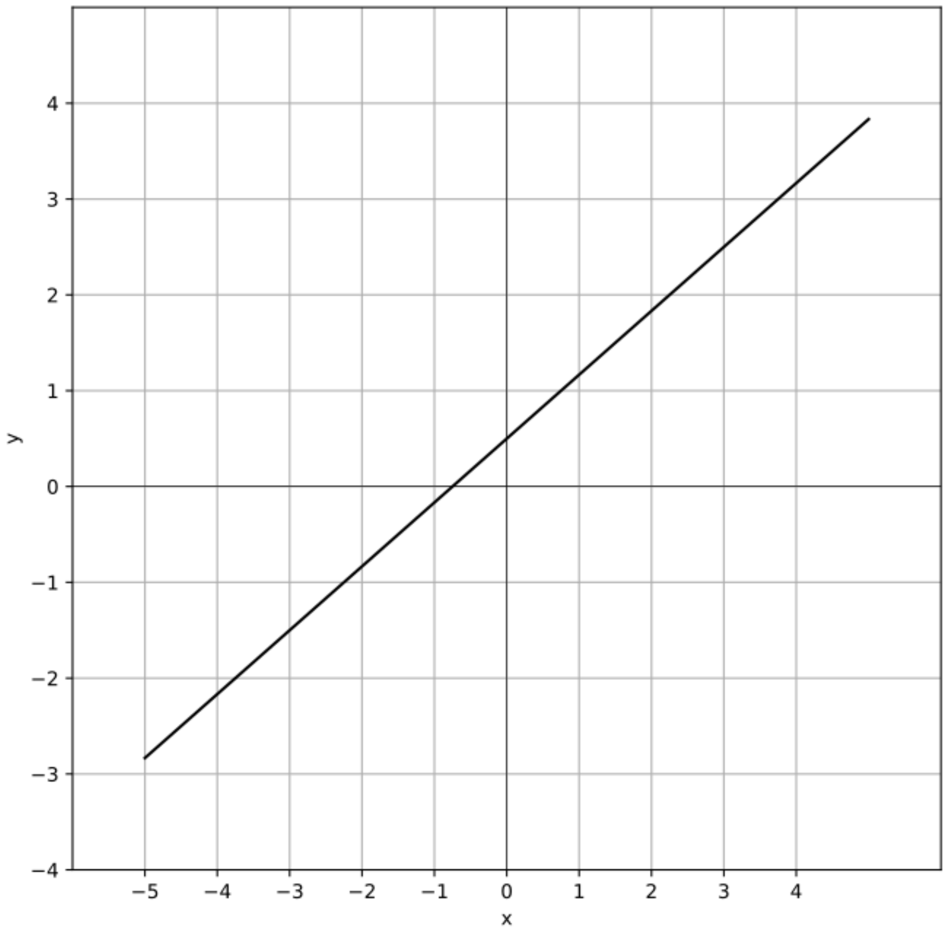
A. $f(x) = \frac{2}{3}x - 1$

B. $f(x) = \frac{2}{3}x + 1$

C. $f(x) = \frac{1}{2}x + 1$

D. $f(x) = \frac{1}{3}x + 3$

9. Which equation represents the linear function that passes through the y-intercept at $(0, \frac{1}{2})$ and has a slope of $\frac{2}{3}$?



A. $f(x) = \frac{2}{3}x - \frac{1}{2}$

B. $f(x) = \frac{2}{3}x + \frac{1}{2}$

C. $f(x) =- \frac{2}{3}x + \frac{1}{2}$

D. $f(x) =- \frac{2}{3}x - \frac{1}{2}$

10. In ΔABC, $\angle B$ is a right angle and the length of BC is 180 millimeters. If $cos(A) = \frac{4}{5}$, what is the length, in millimeters, of AB?

A. 200

B. 220

C. 240

D. 260

SAT Math Solutions

1. In a certain city, the average number of jobs available each year has been estimated to decrease by 4% annually since 2019. If the initial number of available jobs in 2019 was 10,000, which of the following expressions best represents the number of available jobs in 2024?

A. $10,000(0.96)^5$

B. $10,000(0.96)^4$

C. $10,000(0.04)^5$

D. $10,000(0.04)^4$

Answer

A

Solution

This problem tests the student's understanding of exponential decay and their ability to apply the formula to a real-world context. The student needs to know how to use the decay formula and understand the concept of annual percentage decrease. To solve this problem, the student should identify the initial value (10,000 jobs) and the decay rate (4%). They should then use the exponential decay formula:
$A = P(1 - r)^t$, where A is the amount after time t, P is the initial amount, r is the rate of decay, and t is the time in years. Here, $P = 10,000$, $r = 0.04$, and $t = 2024 - 2019 = 5$ years.
Remember to convert the percentage into a decimal by dividing by 100 (4% becomes 0.04). Use a calculator to ensure accuracy when raising numbers to a power and when performing multiplication.
Be careful with the exponent; make sure to correctly calculate the number of years ($2024 - 2019 = 5$). Also, ensure that you subtract the decay rate from 1 to get the correct base for the exponent. This problem is a typical example of exponential decay in a real-world scenario. It assesses the student's ability to apply mathematical concepts to practical situations, a key skill for the SAT.
Mastery of exponential functions and decay rates is crucial for tackling advanced math problems effectively.

Since the jobs decrease by 4% each year, the decay factor is $1 - 0.04 = 0.96$. The formula for the number of jobs after n years with a decrease rate of r% is

$J = J0 \star (1 - r)^{n}$.

Here, $J_0 = 10,000$, $r = 0.04$, and $n = 5$ (from 2019 to 2024): $J = 10,000(0.96)^5$

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

Answer

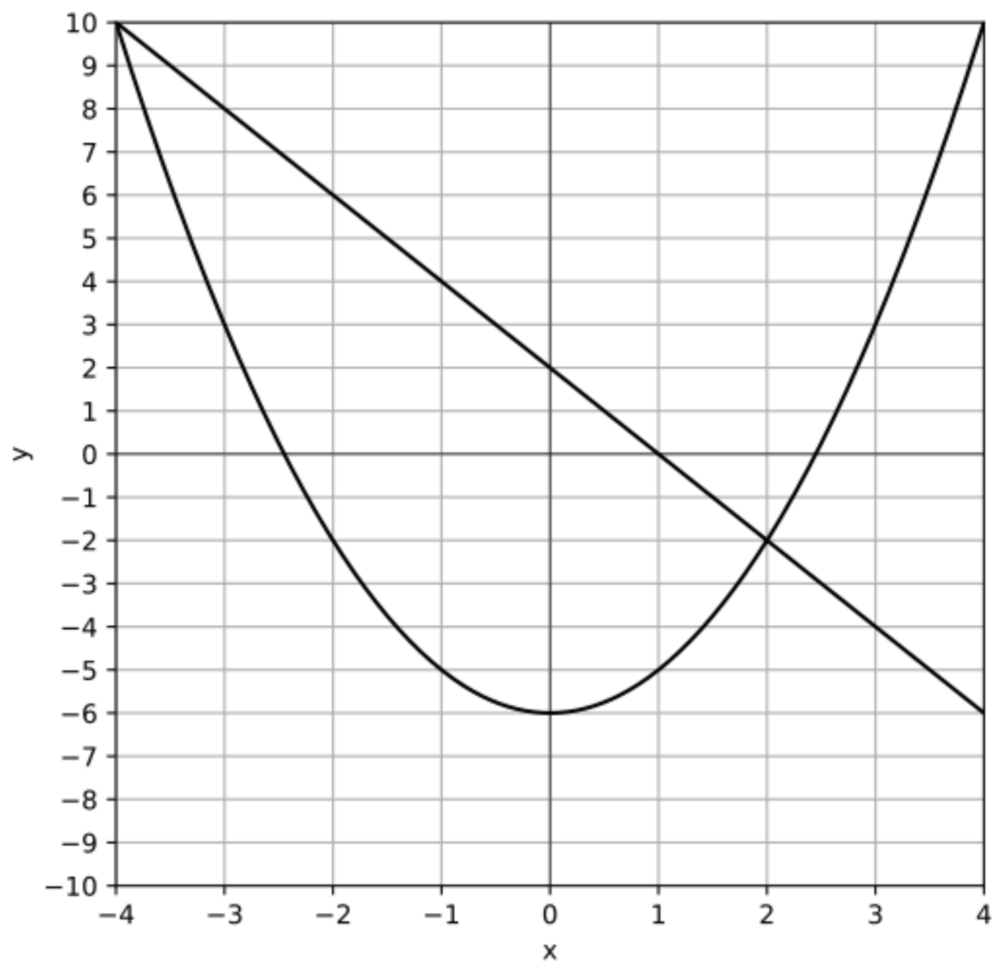
$(2, \frac{8}{3})$

Solution

This problem is designed to test the student's ability to solve systems of linear equations, specifically when one equation is already solved for one variable. It assesses understanding of substitution and basic algebraic manipulation.
To solve this system of equations, substitute the value of x from the second equation into the first equation. Then solve for y. Once y is found, combine it with the given x to form the solution as an ordered pair (x, y).
Since one of the equations is already solved for x, substitution is straightforward. Remember to keep your work organized and substitute carefully to avoid mistakes. Be careful with arithmetic operations when substituting and solving for y. Also, ensure that you correctly substitute the entire value of x into the first equation to avoid any errors.
This type of problem is a straightforward test of your ability to handle systems of linear equations where one variable is already isolated. It's essential to understand substitution and ensure each step is meticulously followed to avoid simple arithmetic errors. Mastery of this concept is crucial as it forms the foundation for more complex algebraic problem-solving on the SAT.

Substitute $x = 2$ into the first equation:
$2(2) + 3y = 12$
$4 + 3y = 12$
Subtract 4 from both sides to isolate the term with y:
$3y = 12 - 4$
$3y = 8$
Divide both sides by 3 to solve for y:
$y = \frac{8}{3}$

3. The graph of the following system of equations is shown. Which system of equations is represented by the graph?



A. $y = x^2 - 6 ; y =- 2x + 2$

B. $y = x^2 - 6 ; y =- 2x - 2$

C. $y = x^2 - 6 ; y = 2x + 2$

D. $y = x^2 + 6 ; y =- 2x + 2$

Answer

A

Solution

This problem is designed to test students' understanding of graphing quadratic and linear equations and their ability to identify these equations from a given graph. It evaluates whether students can recognize the visual representation of different types of functions and systems of equations.
To approach this problem, students should first understand that the graph includes a quadratic equation and a linear equation. They need to identify these from the given options. First, find the vertex and the direction of the parabola described by the quadratic function, then confirm the slope and y-intercept of the linear equation. The intersection points, if any, should be consistent with the graph of the system.
Review the shapes and properties of graphs of quadratic and linear equations. Quadratics form parabolas, typically opening upwards or downwards. Linear functions form straight lines with a constant slope. Visualizing or sketching the graph can help confirm the correct equations.
Be careful with the signs and coefficients in the functions. It is easy to misinterpret the slope or y-intercept of the linear equation or the a, b, and c coefficients in the quadratic equation. Ensure that your identified equations match the graph precisely.
This type of SAT question assesses the ability to connect algebraic equations to their graphical representations. Mastery of this skill is crucial for solving a wide range of math problems, both in SAT and real-world applications. Recognizing the characteristics of different types of equations on a graph is key to efficiently solving these types of problems.

To solve, we need to plot the functions and observe the graph.
The intersections of the quadratic and linear functions occur where their values are equal.
By setting $y = x^2 - 6$ equal to $y = -2x + 2$, we find the points of intersection.

4. The product of a positive number y and the number that is 16 less than y is equal to 80. What is the value of y?

Answer

20

Solution

This problem tests the student's ability to set up and solve a quadratic equation derived from a word problem. The student must understand how to translate a verbal description into a mathematical expression and solve for the unknown variable.
To solve the problem, start by defining the variable: let y be the positive number. According to the problem, the product of y and (y - 16) is 80. Set up the equation $y(y - 16) = 80$. Expand this to get $y^2 - 16y = 80$, then rearrange it to form a standard quadratic equation: $y^2 - 16y - 80 = 0$. Solve this equation using the quadratic formula, factoring, or completing the square.
Try factoring first, as it's often quicker if the equation is factorable. Look for two numbers that multiply to -80 and add up to -16. If factoring is cumbersome, use the quadratic formula: $y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
Be sure to check both solutions of the quadratic equation, but remember that only the positive solution is valid since y is a positive number. Also, double-check your arithmetic when expanding and rearranging the equation.
This problem is a typical example of how SAT tests a student's ability to handle quadratic equations, especially those derived from word problems. Understanding how to translate a problem statement into a mathematical expression and correctly solving quadratic equations are key skills. Practicing these will help you solve such problems more efficiently and accurately, which is crucial under the time constraints of the SAT.

1. Set up the equation: $y(y - 16) = 80$.
2. Expand the equation: $y^2 - 16y = 80$.
3. Rearrange the equation to standard quadratic form: $y^2 - 16y - 80 = 0$.
4. Use the factorization: $y^2 - 16y - 80 = (y - 20)(y + 4) = 0$
5. Find the roots: $(y - 20)(y + 4) = 0 \rightarrow y = 20 \; or \; y = - 4$.
6. Since y must be positive, the value of y is 20.

5. A research organization receives a grant of $12, 000 for an AI project. The first 5 months costs $2, 000 per month. After that, the monthly cost decreases to $1, 500 for each of the following months. If the total budget is exhausted after m months, where $m > 5$, which equation represents this situation?

A. $2000 \times 5 + 1500 \times (m - 5) = 12000$

B. $2000 \times 5 + 1500 \times (m - 5) = 9000$

C. $2000 \times m = 12000$

D. $1500 \times m = 10000$

Answer

A

Solution

This problem aims to test the student's ability to translate a real-world scenario into a linear equation. It evaluates the understanding of piecewise functions and how to represent changing rates within a single equation.
First, identify the cost for the first 5 months and then for the remaining months. Use this information to formulate a piecewise linear equation that describes the total cost as a function of the number of months, m.
Break down the problem into two parts: the first 5 months and the months after that. Calculate the total cost for the first 5 months and then add the cost for the remaining months.
Ensure you correctly apply the conditions: $m > 5$. Also, be cautious about correctly calculating the transition point at 5 months and applying the correct rate for the subsequent months.
This type of problem is common on the SAT to test algebraic reasoning and the ability to model real-world situations. Mastering this will help you handle similar problems efficiently. Always break down the problem into manageable parts and carefully apply the given conditions to avoid errors.

For the first 5 months, the cost is $\$2,000 \times 5 = \$10,000$.
The total budget is $12, 000, so the remaining months should not exceed the given budget.
The equation representing the total cost after m months is:
$2000 \times 5 + 1500 \times (m - 5) = 12000$.

6. A rectangle has a length of 18 meters and a width of 6 meters. If both the length and width are increased by a scale factor of 4 to create a new rectangle, what will be the area of the new rectangle in square meters?

A. 1728

B. 1296

C. 864

D. 324

Answer

A

Solution

This question aims to test the student's understanding of scale factors and how they affect the dimensions and area of geometric shapes. The student needs to apply the concept of ratios and proportional relationships to solve the problem.
To solve this problem, the student should first recognize that increasing both the length and width of the rectangle by a scale factor of 4 means multiplying each dimension by 4. Then, the student should calculate the new dimensions and use the formula for the area of a rectangle (length × width) to find the area of the new rectangle.
Remember that when scaling dimensions of a shape, all linear dimensions are multiplied by the scale factor. For areas, the scale factor is squared. Also, double-check your calculations to ensure accuracy.
A common mistake is to confuse the scaling of dimensions with the scaling of area. Ensure you apply the scale factor correctly to each dimension first before calculating the area. Avoid directly multiplying the original area by the scale factor, as this will give an incorrect result.
This type of problem is typical of SAT questions focused on ratios, rates, and proportions. It assesses your ability to apply geometric scaling principles accurately. Mastery of these concepts is crucial for performing well in the Problem Solving and Data Analysis category. Practice similar problems to become familiar with the steps and to minimize errors during the actual test.

1. Calculate the new length using the scale factor: New length = Original length × Scale factor = $18 \times 4 = 72$ meters.
2. Calculate the new width using the scale factor: New width = Original width × Scale factor = $6 \times 4 = 24$ meters.
3. Calculate the area of the new rectangle: Area = New length × New width = $72 \times 24 = 1728$ square meters.

7. A factory is considering implementing a robotic system that will automate certain tasks, reducing the labor needed by approximately 40%. Currently, the factory has 250 workers, each responsible for tasks that cost the factory $\$15,000$ in wages annually. If the company integrates the robotic system, they project that the labor savings will allow them to increase production by 30% while maintaining the same labor costs for the remaining workers. What is the overall annual cost the factory can expect after implementing the robotic system, before accounting for any additional operational costs?

A. $\$3,000,000$

B. $\$2,500,000$

C. $\$2,250,000$

D. $\$1,750,000$

Answer

C

Solution

The problem is designed to test the student's ability to understand and manipulate exponential functions and percentage changes in a real-world context. It requires understanding of percentage reduction and increase, and how they affect cost calculations in a factory setting.
First, calculate the number of workers reduced by the robotic system (40% of 250). Subtract this number from the current workforce to find the remaining number of workers. Calculate the total labor cost for these remaining workers. Since production increases by 30% with the same labor cost, the overall annual cost will simply be the cost of the remaining workers' wages, which remains unchanged.
Break down the problem into smaller parts: calculate the number of workers reduced, then calculate the labor cost of remaining workers. Remember that the production increase doesn't affect labor cost directly in the given scenario.
Be careful not to confuse the percentage reduction in workers with the percentage increase in production. Also, ensure that calculations for percentage changes are accurate and do not mix up percentage with decimal form.
This problem type is common in SAT exams as it assesses critical thinking and the application of mathematical concepts to realistic scenarios. It evaluates the student's ability to manage percentage changes and their impacts on costs, which is an essential skill in both academic and real-world settings. Mastery of these concepts can significantly aid in solving similar word problems efficiently.

Calculate the number of workers after implementing the robotic system:
$250 - (250 \times 0.40) = 250 - 100 = 150$ workers.

Calculate the total labor cost for the remaining workers: 150 workers $\times$ \$15, 000 per worker = \$2, 250, 000.
The overall annual cost the factory can expect after implementing the robotic system, before accounting for any additional operational costs, is \$2, 250, 000.

8. Which equation defines the linear function f that passes through the points $(0, 1)$ and $(3, 3)$?

A. $f(x) = \frac{2}{3}x - 1$

B. $f(x) = \frac{2}{3}x + 1$

C. $f(x) = \frac{1}{2}x + 1$

D. $f(x) = \frac{1}{3}x + 3$

Answer

B

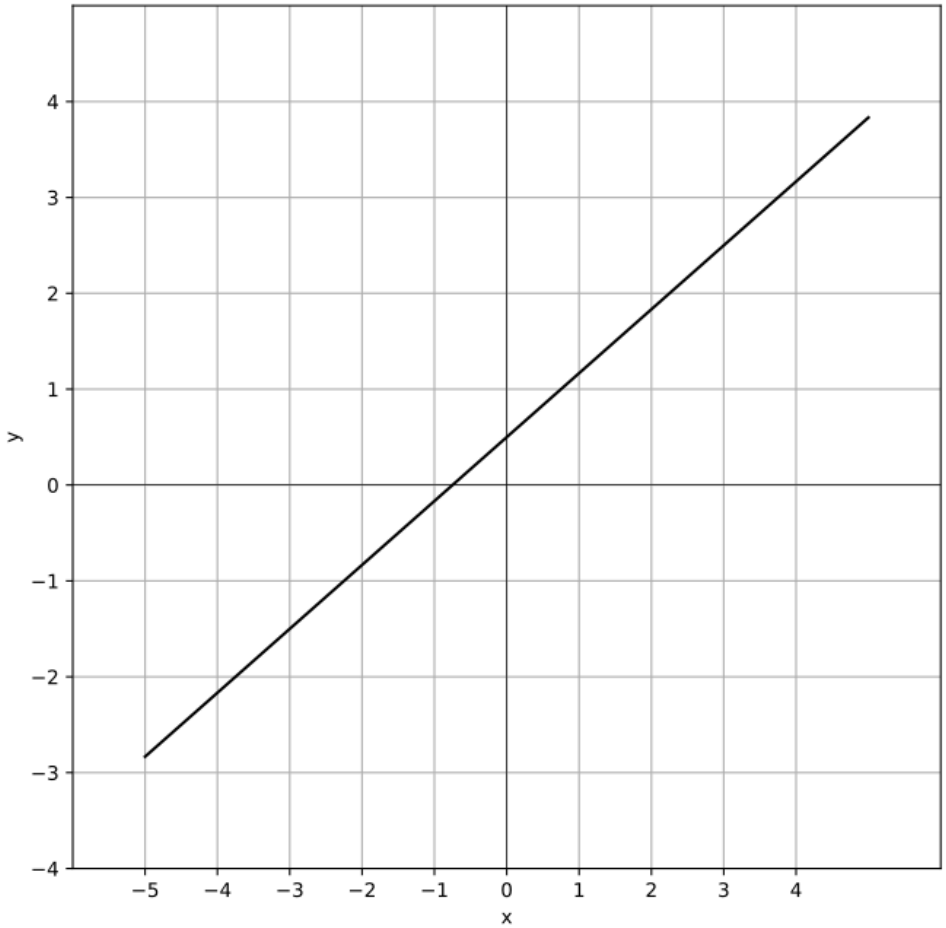
Solution

The problem is designed to test the student's ability to determine the equation of a linear function from given points on a graph. It assesses understanding of the slope-intercept form and the ability to calculate slope and y-intercept.
To solve this problem, first find the slope (m) of the line using the formula $\frac{(y2-y1)}{(x2-x1)}$.
Next, use the slope-intercept form of a linear equation ($y = mx + b$) and substitute one of the given points to solve for the y-intercept (b). Finally, write the equation of the line using the calculated slope and y-intercept.
Remember to always check your points and slope calculations carefully. Use the formula for the slope and plug in the points accurately. Double-check your work by substituting both points into the final equation to ensure they satisfy the equation.
Be careful with arithmetic errors when calculating the slope and y-intercept. Ensure that you correctly identify the coordinates of the points and plug them into the formula correctly. Also, remember that the slope-intercept form is $y = mx + b$, not $y = mx - b$ or any other variation.
This type of problem is common in SAT algebra sections and effectively tests your understanding of linear equations and their graphs. The ability to determine the equation of a line from points is a fundamental skill in algebra. Mastery of this concept will aid in solving a variety of problems involving linear functions and graph interpretations on the SAT.

Step 1: Calculate the slope (m) using the two points (0, 1) and (3, 3):, $m = \frac{3-1}{3-0} = \frac{2}{3}$
Step 2: Use the point-slope form to find the equation of the line.
We can use the point (0, 1) because it is the y-intercept.
The equation becomes: $f(x) = \frac{2}{3}x + 1$

Thus, the correct equation is Option 2: $f(x) = \frac{2}{3}x + 1$.

9. Which equation represents the linear function that passes through the y-intercept at $(0, \frac{1}{2})$ and has a slope of $\frac{2}{3}$?



A. $f(x) = \frac{2}{3}x - \frac{1}{2}$

B. $f(x) = \frac{2}{3}x + \frac{1}{2}$

C. $f(x) = -\frac{2}{3}x + \frac{1}{2}$

D. $f(x) = -\frac{2}{3}x - \frac{1}{2}$

Answer

B

Solution

The problem tests the student's ability to understand and apply the concept of linear equations, particularly focusing on identifying the slope-intercept form of a line from given parameters.
Students should recognize that the equation of a line in slope-intercept form is given by $y = mx + b$, where m is the slope and b is the y-intercept. They should substitute the given slope and y-intercept into this formula to find the correct equation.
Remember the slope-intercept form $y = mx + b$. Directly substitute the given slope ($\frac{2}{3}$) and y-intercept ($\frac{1}{2}$) into the equation to quickly find the answer.
Be careful not to confuse the slope with the y-intercept. Ensure you place the correct values into the form $y = mx + b$. Also, make sure to correctly simplify fractions if needed.
This problem assesses a fundamental understanding of linear equations, a critical skill in algebra. Mastery of identifying and manipulating the slope-intercept form is essential for success in more complex algebraic problems. Practicing these types of questions will enhance your ability to quickly and accurately translate between graphical and algebraic representations of lines.

Substitute the slope (m) and y-intercept (b) into the equation of a line:
$f(x) = \frac{2}{3}x + \frac{1}{2}$, This equation matches the format of option B.

Therefore, the correct equation representing the linear function is $f(x) = \frac{2}{3}x + \frac{1}{2}$.

10. In ΔABC, $\angle B$ is a right angle and the length of BC is 180 millimeters. If $cos(A) = \frac{4}{5}$, what is the length, in millimeters, of AB?

A. 200

B. 220

C. 240

D. 260

Answer

C

Solution

This problem is designed to test the student's understanding of right-angle trigonometry, specifically the ability to use the cosine function to find the length of a side in a right triangle.
The student should recognize that in right triangle ΔABC, with $\angle B$ as the right angle, the cosine of angle A is defined as the ratio of the adjacent side (AB) to the hypotenuse (AC). Given that $cos(A) = \frac{4}{5}$, the student needs to set up the equation $\frac{AB}{AC} = \frac{4}{5}$. Since BC is given as 180 millimeters, and BC is the side opposite angle A, the student can use the Pythagorean theorem to find AC first before finding AB. Remember that the Pythagorean theorem can be used to find the hypotenuse when you have one side and the cosine ratio. Set up a ratio equation using $cos(A) = \frac{adjacent}{hypotenuse}$, and solve for the unknown side. Double-check your calculations by ensuring the triangle's side lengths satisfy the Pythagorean theorem. Be careful not to confuse the sides of the triangle. Ensure you correctly identify which side is opposite and which is adjacent to angle A. Also, ensure that your calculations are exact, and consider simplifying fractions or square roots accurately. This problem assesses the student's proficiency in applying trigonometric ratios to solve for missing side lengths in right triangles. Mastery of this concept is essential for solving more complex trigonometry problems in the SAT. The ability to correctly interpret and apply the cosine function is a crucial skill in the geometry section of the test.

Since $cos(A) = \frac{4}{5}$, we have $\frac{AB}{AC} = \frac{4}{5}$., We need to find the length of AB., Since BC is 180 millimeters, BC is opposite to angle A., In a right triangle, we use the Pythagorean identity: $(sin)^2(A) + (cos)^2(A) = 1.$, Given $cos(A) = \frac{4}{5}$, find $(sin)^2(A)$: $\left(\frac{4}{5}\right)^2 + (sin)^2(A) = 1.$, $\frac{16}{25} + (sin)^2(A) = 1.$, $(sin)^2(A) = \frac{9}{25}$, therefore

$sin(A) = \frac{3}{5}$., Using $sin(A)$, we have $sin(A) = \frac{BC}{AC} = \frac{3}{5}$.,
$AC = \frac{BC}{sin(A)} = \frac{180}{\frac{3}{5}} = 180 \times \frac{5}{3} = 300\, millimeters$., Now, using $cos(A) = \frac{4}{5}$, solve for AB: $AB = cos(A) \times AC = \frac{4}{5} \times 300 = 240\, millimeters$.

Digital
SAT Math
8

SAT Math Problems

1. If x and y are numbers greater than 1 and $\sqrt[4]{x^3}$ is equivalent to $\sqrt[6]{y^4}$, for what value of b is x^{3b-2} equal to y?

A. $\frac{5}{24}$

B. 1

C. $\frac{25}{24}$

D. $\frac{5}{8}$

2. A circle in the xy-plane has its center at (2, -5) and has a radius of 7. An equation of this circle is represented by the form $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. What is the value of c?

3. A solution to the given system of equations is (x, y). What is a possible value of x?
$y = \frac{1}{2}(x - 4)^2 + 7 , y = 2x + 5$

A. 4

B. 6

C. 8

D. 10

4. A wooden cube is carved from a log, and its edges measure 4 centimeters. If the cube is then sanded down, causing each edge to decrease in length by 0.5 centimeters, what will be the volume of the newly shaped cube, in cubic centimeters?

5. An exponential function f is defined by $f(x) = a(b)^x$, where a is a constant greater than 0 and b is a constant greater than 1. If $f(3) = 16f(1)$, what is the value of b?

A. 2

B. 3

C. 4

D. 5

6. For two acute angles, ∠A and ∠B, sin(A) = cos(B). The measures, in degrees, of ∠A and ∠B are 2x + 30 and 5x - 10, respectively. What is the value of x?

A. 8

B. 9

C. 10

D. 11

7. For the polynomial function defined as $f(x) = 3x^4 - 5x^3 + 2x^2 + 7$, what is the value of the y-intercept?

8. If m and p are numbers greater than 1 and $\sqrt[4]{m^3}$ is equivalent to $\sqrt[6]{p^4}$, for what value of b is m^{3b-2} equal to p?

9. One solution to the given equation can be expressed as $x = \frac{-9+\sqrt{m}}{2}$, where m is a constant. What is the value of m? $x^2 + 9x + 6 = 0$

10. In the xy-plane, line m has a slope of -3 and a y-intercept of (0, 12). What is the x-coordinate of the x-intercept of line m?

SAT Math Solutions

1. If x and y are numbers greater than 1 and $\sqrt[4]{x^3}$ is equivalent to $\sqrt[6]{y^4}$, for what value of b is x^{3b-2} equal to y?

A. $\frac{5}{24}$

B. 1

C. $\frac{25}{24}$

D. $\frac{5}{8}$

Answer

C

Solution

This problem aims to test students' understanding of equations involving radical and rational exponents and their ability to manipulate and simplify such expressions.
First, rewrite the given expressions with rational exponents:
$\sqrt[4]{x^3} = x^{\frac{3}{4}}$ and $\sqrt[6]{y^4} = y^{\frac{4}{6}} = y^{\frac{2}{3}}$. Set these equal to each other: $x^{\frac{3}{4}} = y^{\frac{2}{3}}$. Next, express y in terms of x: $y = \left(x^{\frac{3}{4}}\right)^{\frac{3}{2}} = x^{\frac{9}{8}}$.

Now, set the given equation $x^{(3b-2)} = y$: $x^{(3b-2)} = x^{\frac{9}{8}}$.
Equate the exponents: $3b - 2 = \frac{9}{8}$.
Solve for b: $3b = \frac{9}{8} + 2 = \frac{9}{8} + \frac{16}{8} = \frac{25}{8}$, $b = \frac{25}{24}$.
When dealing with radical and rational exponents, it is often helpful to convert all expressions to rational exponents. This simplifies the process of comparing and manipulating the equations.
Be careful with the arithmetic operations, especially when adding fractions. Ensure that you correctly find a common denominator before performing the addition. Also, double-check your exponent rules to avoid mistakes.
This problem effectively gauges a student's proficiency in handling radical and rational exponents. It requires a solid understanding of exponent laws and careful algebraic manipulation. Mastery of these concepts is crucial for solving advanced mathematics problems efficiently on the SAT.

Start with the equation: $\sqrt[4]{x^3} = \sqrt[6]{y^4}$.

Rewrite each side using fractional exponents: $\left(x^3\right)^{\frac{1}{4}} = \left(y^4\right)^{\frac{1}{6}}$., Simplify: $x^{\frac{3}{4}} = y^{\frac{2}{3}}$.

Raise both sides to the power of 12 to eliminate the fractions: $\left(x^{\frac{3}{4}}\right)^{12} = \left(y^{\frac{2}{3}}\right)^{12}$.

This becomes $x^9 = y^8$.

We now know $y = x^{\frac{9}{8}}$., Set $x^{3b-2} = y = x^{\frac{9}{8}}$.

Since the bases are the same, equate the exponents: $3b - 2 = \frac{9}{8}$.

Solve for b: $3b = \frac{9}{8} + 2$.

Convert 2 to a fraction: $2 = \frac{16}{8}$., So, $3b = \frac{9}{8} + \frac{16}{8} = \frac{25}{8}$.

Solve for b by dividing both sides by 3: $b = \frac{25}{8} \times \frac{1}{3} = \frac{25}{24}$.

Therefore, the value of b is $\frac{25}{24}$.

2. A circle in the xy-plane has its center at (2, -5) and has a radius of 7. An equation of this circle is represented by the form $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. What is the value of c?

Answer

-20

Solution

This problem is designed to test the student's ability to understand and manipulate the standard equation of a circle. It assesses the student's skills in expanding the equation and identifying constants when given the center and radius of a circle.
First, recall the standard equation of a circle in the form $(x - h)^2 + (y - k)^2 = r^2$, where h, k is the center and r is the radius. Substitute the given center (2, -5) and radius 7 into this equation to obtain $(x - 2)^2 + (y + 5)^2 = 49$. Expand this equation to match the given form $x^2 + y^2 + ax + by + c = 0$.
When expanding $(x - 2)^2 + (y + 5)^2 = 49$, remember to carefully expand each square: $(x - 2)^2 = x^2 - 4x + 4$ and $(y + 5)^2 = y^2 + 10y + 25$. Combine these and compare with the given form to find a, b, and c.
Avoid common mistakes such as incorrectly expanding the binomials or losing negative signs. Double-check your algebra as missing a sign or number can lead to incorrect constants.
This problem is a classic application of circle equations and requires algebraic manipulation skills. Understanding how to transition from the standard form to the general form is crucial. Such problems often appear on the SAT to evaluate both conceptual understanding and procedural fluency in algebra and geometry. Mastery of these skills will aid in solving similar problems efficiently.

The standard form of the equation of a circle with center (h, k) and radius r is:
$(x - h)^2 + (y - k)^2 = r^2$.
Substitute the given center and radius into the standard form equation:
$(x - 2)^2 + (y + 5)^2 = 49$.
Expand the terms: $(x - 2)^2 = x^2 - 4x + 4$ and $(y + 5)^2 = y^2 + 10y + 25$.
Now, combine these expanded terms:
$x^2 - 4x + 4 + y^2 + 10y + 25 = 49$.
Rearrange the equation to match the given form $x^2 + y^2 + ax + by + c = 0$:
$x^2 + y^2 - 4x + 10y + 4 + 25 - 49 = 0$.
Simplify the constant terms: $4 + 25 - 49 = - 20$.

The equation of the circle in the desired form is: $x^2 + y^2 - 4x + 10y - 20 = 0$.
Thus, the value of c is -20.

3. A solution to the given system of equations is (x, y). What is a possible value of x?
$y = \frac{1}{2}(x - 4)^2 + 7, y = 2x + 5$

A. 4

B. 6

C. 8

D. 10

Answer

D

Solution

This problem is designed to test the student's ability to solve a system of equations involving a quadratic and a linear equation. It checks the understanding of graph intersections and algebraic solutions.
To solve this problem, students should set the equations equal to each other since both are equal to y, and then solve for x. This involves expanding the quadratic equation, setting up a quadratic equation in standard form, and then using methods such as factoring, completing the square, or the quadratic formula to find the possible values of x.
When dealing with quadratic and linear systems, remember that solutions correspond to the intersection points of a parabola and a line. It might be helpful to sketch the graphs to visualize potential solutions before solving algebraically. Also, check if the quadratic equation can be easily factored after expansion to simplify calculations.
Be careful when expanding the quadratic expression and ensure that all terms are correctly simplified. Additionally, check all potential solutions in the original equations to verify they are valid, as extraneous solutions can sometimes arise.
This type of problem is common in SAT's advanced math section, as it assesses not only algebraic manipulation skills but also conceptual understanding of graph intersections and their physical interpretations. Mastery of these concepts can be beneficial, as it combines different branches of mathematics into a single problem, which is a frequent characteristic of SAT questions.

Set $\frac{1}{2}(x - 4)^2 + 7$ equal to $2x + 5$: $\frac{1}{2}(x - 4)^2 + 7 = 2x + 5$

Subtract 7 from both sides: $\frac{1}{2}(x - 4)^2 = 2x - 2$

Multiply every term by 2 to eliminate the fraction: $(x - 4)^2 = 4x - 4$
Expand $(x - 4)^2$: $x^2 - 8x + 16 = 4x - 4$

Rearrange all terms to one side: $x^2 - 8x + 16 - 4x + 4 = 0$
Combine like terms: $x^2 - 12x + 20 = 0$
Use the quadratic formula to solve for x, where $a = 1, b =- 12,\ and\ c = 20$:
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4 \cdot 1 \cdot 20}}{2 \cdot 1}, x = \frac{12 \pm \sqrt{144 - 80}}{2}, x = \frac{12 \pm \sqrt{64}}{2}, x = \frac{12 \pm 8}{2}$
Calculate the possible values: $x = \frac{12+8}{2} = 10, x = \frac{12-8}{2} = 2$
Possible values of x are 10 and 2.

4. A wooden cube is carved from a log, and its edges measure 4 centimeters. If the cube is then sanded down, causing each edge to decrease in length by 0.5 centimeters, what will be the volume of the newly shaped cube, in cubic centimeters?

Answer

42.875 cubic centimeters

Solution

This problem tests the student's understanding of volume calculations for geometric shapes, specifically cubes, and requires the ability to apply volume formulas after modifying dimensions.
To solve this problem, first, calculate the original volume of the cube using the formula for the volume of a cube ($V = (side)^3$). Then, adjust the edge length by subtracting 0.5 cm to account for the sanding down process. Finally, calculate the new volume using the adjusted edge length.
Remember that when the dimensions of a cube change, even slightly, it can significantly impact the volume due to the cubic relationship. Always perform the calculations step by step to ensure accuracy.
Be careful not to confuse the reduction in edge length with a reduction in volume. Ensure that you subtract the 0.5 cm from each edge before recalculating the volume. Also, double-check your arithmetic to ensure that cube calculations are correct.
This type of problem is a classic example of testing geometric reasoning and arithmetic skills. It requires students to accurately apply a formula and understand how dimensional changes affect the volume. Being able to handle such problems efficiently is crucial for the SAT, as it demonstrates a solid grasp of basic geometry and measurement principles.

Determine the new edge length by subtracting 0.5 cm from the original length of each edge., New edge length = 4 cm - 0.5 cm = 3.5 cm., Calculate the volume of the new cube using the formula for the volume of a cube, $V = a^3$, where 'a' is the edge length., Substitute the new edge length into the formula: $V = (3.5cm)^3$., Calculate the cube of the new edge length: $V = 3.5cm \times 3.5cm \times 3.5cm$., V = 42.875 cubic centimeters.

5. An exponential function f is defined by $f(x) = a(b)^x$, where a is a constant greater than 0 and b is a constant greater than 1. If $f(3) = 16f(1)$, what is the value of b?

A. 2

B. 3

C. 4

D. 5

Answer

C

Solution

This problem tests the student's understanding of exponential functions, specifically manipulating and solving equations involving exponential growth. The student must recognize how to apply properties of exponents and solve for the base of the exponential function.
To solve this problem, start by expressing the given information in terms of the function. Given the function $f(x) = a(b)^x$ and the condition $f(3) = 16f(1)$, substitute $x = 3$ and $x = 1$ into the function to create two equations. Then, set up a ratio or an equation to solve for the unknown variable b.
Remember that you can express the function at different points in terms of the same base and exponent. Since $f(3) = ab^3$ and $f(1) = ab^1$, you can set up the equation $a(b)^3 = 16a(b)^1$. Dividing both sides by $a(b)^1$ simplifies the equation and helps isolate b.
Be careful with algebraic manipulations, especially when dividing both sides of the equation. Ensure you maintain the properties of exponents correctly and do not lose any terms in the process. Also, remember that since a is a constant greater than 0, it will cancel out easily.
This problem is a good test of understanding and manipulating exponential functions, which is a critical skill in advanced mathematics. It requires students to apply properties of exponents and solve equations systematically. Ensuring accuracy in algebraic steps is crucial to avoid simple mistakes. Mastery of these concepts is essential for success in the SAT Math section, particularly in more challenging problems involving nonlinear functions.

Starting with the equation $b^3 = 16b$.
Divide both sides by b (since $b > 1$, b is not zero): $b^2 = 16$.

Taking the square root of both sides gives $b = \sqrt{16}$.
Therefore, $b = 4$.

6. For two acute angles, $\angle A$ and $\angle B$, $\sin(A) = \cos(B)$. The measures, in degrees, of $\angle A$ and $\angle B$ are $2x + 30$ and $5x - 10$, respectively. What is the value of x?

A. 8

B. 9

C. 10

D. 11

Answer

C

Solution

This problem tests the student's understanding of the complementary angle relationship between sine and cosine, where $\sin(A) = \cos(B)$ implies $A + B = 90$ degrees. It also examines their algebraic manipulation skills to solve for the variable x.
To solve this problem, first apply the trigonometric identity that $\sin(A) = \cos(B)$ means $A + B = 90$ degrees. Set up the equation $(2x + 30) + (5x - 10) = 90$. Simplify and solve this linear equation for x.
Remember the relationship between the sine and cosine of complementary angles: $\sin(\theta) = \cos(90° - \theta)$. This is crucial for setting up the correct equation. Also, carefully combine like terms when solving the equation.
Be cautious with the angle measures' expressions. Ensure you correctly combine and simplify the terms in the equation. Double-check your arithmetic when solving for x to avoid simple calculation errors.
This problem is a classic example of testing fundamental trigonometric identities and algebraic skills in one. It assesses your ability to connect geometric angle relationships with algebraic equations, which is essential for solving trigonometry-related problems on the SAT. Mastery of these concepts and careful calculation will help you excel in this section.

Combine the expressions for A and B: $(2x + 30) + (5x - 10) = 90$
Simplify: $2x + 30 + 5x - 10 = 90$
Combine like terms: $7x + 20 = 90$
Subtract 20 from both sides: $7x = 70$
Divide both sides by 7: $x = 10$

7. For the polynomial function defined as $f(x) = 3x^4 - 5x^3 + 2x^2 + 7$, what is the value of the y-intercept?

Answer

7

Solution

The question is designed to test the student's understanding of polynomial functions, specifically how to find the y-intercept of a polynomial graph. It assesses the student's ability to substitute values into a polynomial function and evaluate the expression correctly.
To find the y-intercept of the polynomial function, substitute $x = 0$ into the function $f(x)$ since the y-intercept occurs where the graph crosses the y-axis. Evaluate $f(0)$ to find the constant term, which will be the y-intercept.
Remember that the y-intercept of any function is found by setting $x = 0$. This simplifies the polynomial since all terms involving x will become zero, leaving only the constant term. This term is the y-intercept.
Be careful when substituting $x = 0$ into the polynomial. Ensure that each term involving x is correctly evaluated to zero, and only the constant term is considered. Avoid making arithmetic errors when evaluating the polynomial function.
This type of question is a straightforward test of a student's ability to work with polynomial functions. It focuses on evaluating a function at a particular point, which is a fundamental skill in algebra. Understanding how to find the y-intercept is crucial, as it provides insight into the behavior of a graph. In the context of the SAT, being able to quickly identify and compute the y-intercept can save valuable time during the test.

To find the y-intercept, evaluate $f(0)$.

Substitute $x = 0$ into the function: $f(0) = 3(0)^4 - 5(0)^3 + 2(0)^2 + 7$.
Simplify each term: $3(0) = 0, - 5(0) = 0, 2(0) = 0$.
Thus, $f(0) = 0 + 0 + 0 + 7 = 7$.
The y-intercept is the value of f(x) when $x = 0$, which is 7.

8. If m and p are numbers greater than 1 and $\sqrt[4]{m^3}$ is equivalent to $\sqrt[6]{p^4}$, for what value of b is m^{3b-2} equal to p?

Answer

$\frac{25}{24}$

Solution

This problem tests the student's understanding of radical and rational exponents and their ability to manipulate and equate expressions involving these concepts.
To solve this problem, students need to express both sides of the equation in terms of rational exponents. Recognize that $\frac{3}{4}$ is the exponent for m and $\frac{4}{6} = \frac{2}{3}$ is the exponent for p. Equate these two expressions to find a relationship between m and p. Once the relationship is established, use it to solve for the value of b in $m^{3b-2} = p$.
Convert all radical expressions to expressions with rational exponents. Then, set the exponents equal to each other. Remember to simplify fractions when possible to make calculations easier.
Be careful with the manipulation of exponents and ensure that all expressions are simplified correctly. It's easy to make mistakes when converting radicals to rational exponents, especially when dealing with fractional exponents.
This problem is a classic example of testing the manipulation of radical and rational exponents, which is a common skill in advanced mathematics. It assesses the student's ability to simplify and equate expressions involving these exponents.
Mastery of converting between different forms of exponents and solving equations is crucial for success in similar SAT math problems.

Start by expressing the radical expressions in exponential form:
$m^{\frac{3}{4}} = p^{\frac{4}{6}}$, Simplify the exponent on the right:
$p^{\frac{4}{6}} = p^{\frac{2}{3}}$
Thus, $m^{\frac{3}{4}} = p^{\frac{2}{3}}$.
Isolate the p:
$m^{\frac{3}{4}} = p^{\frac{2}{3}} \rightarrow p^{\frac{2}{3}\times\frac{3}{2}} = m^{\frac{3}{4}\times\frac{3}{2}} \rightarrow p = m^{\frac{9}{8}}$
Since $p = m^{3b-2}$, $m^{\frac{9}{8}} = m^{3b-2} \rightarrow \frac{9}{8} = 3b - 2$
Calculate the equation:
$3b - 2 = \frac{9}{8} \rightarrow 3b = \frac{9}{8} + 2 \rightarrow 3b = \frac{9}{8} + \frac{16}{8} = \frac{25}{8} \rightarrow b = \frac{25}{24}$
Thus, $b = \frac{25}{24}$

9. One solution to the given equation can be expressed as $x = \frac{-9+\sqrt{m}}{2}$, where m is a constant. What is the value of m? $x^2 + 9x + 6 = 0$

Answer

57

Solution

The problem tests the student's ability to solve quadratic equations using the quadratic formula and understand how the discriminant affects the solutions of the equation.
First, recognize that the equation is a quadratic in the standard form $ax^2 + bx + c = 0$. Identify a = 1, b = 7, and c = 6. Use the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to find the roots. Compare the given expression $x = \frac{-7+\sqrt{m}}{2}$ with the formula's roots to find m.
Focus on the discriminant part of the quadratic formula, $b^2 - 4ac$, since it is the part under the square root and affects the value of m. Calculate it carefully to determine m.
Be careful with the signs when comparing the roots from the quadratic formula to the given expression. Ensure that you match the correct part of the formula to the given form, as a sign error could lead to an incorrect value of m.
This problem evaluates your understanding of the quadratic formula and your ability to manipulate and compare algebraic expressions. It emphasizes the importance of the discriminant in determining the nature of the solutions. Mastery of this type of problem is crucial for success in advanced math sections of standardized tests like the SAT.

Step 1: Identify the parameters in the quadratic equation. Here, a = 1, b = 7, c = 6.

Step 2: Use the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$.

Step 3: Substitute a, b, and c into the quadratic formula: $x = \frac{-(9)\pm\sqrt{9^2-4(1)(6)}}{2(1)}$.

Step 4: Calculate the discriminant: $b^2 - 4ac = 81 - 24 = 57$

Step 5: Substitute the discriminant back into the formula: $x = \frac{-9\pm\sqrt{57}}{2}$.

Step 6: Compare with the given form $x = \frac{-9+\sqrt{m}}{2}$

Therefore, $m = 57$

10. In the xy-plane, line m has a slope of -3 and a y-intercept of (0, 12). What is the x-coordinate of the x-intercept of line m?

Answer

4

Solution

This problem tests the student's understanding of the equation of a line in slope-intercept form $y = mx + b$ and their ability to determine the x-intercept from this equation.
To find the x-coordinate of the x-intercept, the student must set y = 0 in the equation of the line and solve for x. The equation of the line can be written as $y = - 3x + 12$. Setting y to 0 gives the equation $0 = - 3x + 12$. Solving for x will yield the x-intercept.
Remember that the x-intercept is where the line crosses the x-axis, which means y is zero at this point. You can always use the slope-intercept form of the equation to find intercepts quickly.
Be careful with the signs when solving the equation. It's easy to make a mistake with negative slopes or intercepts, so double-check your calculations.
This problem is a classic test of understanding linear equations and their intercepts. It assesses the ability to manipulate algebraic equations and understand the geometric interpretation of a line's slope and intercepts. Mastery of these concepts is essential for success on the SAT, as they are fundamental to algebra and graph interpretation.

Start with the equation: $0 = - 3x + 12$.
Subtract 12 from both sides: $- 12 = - 3x$.
Divide both sides by -3: $x = \frac{-12}{-3}$.
Simplify the fraction: $x = 4$.

Digital

SAT Math

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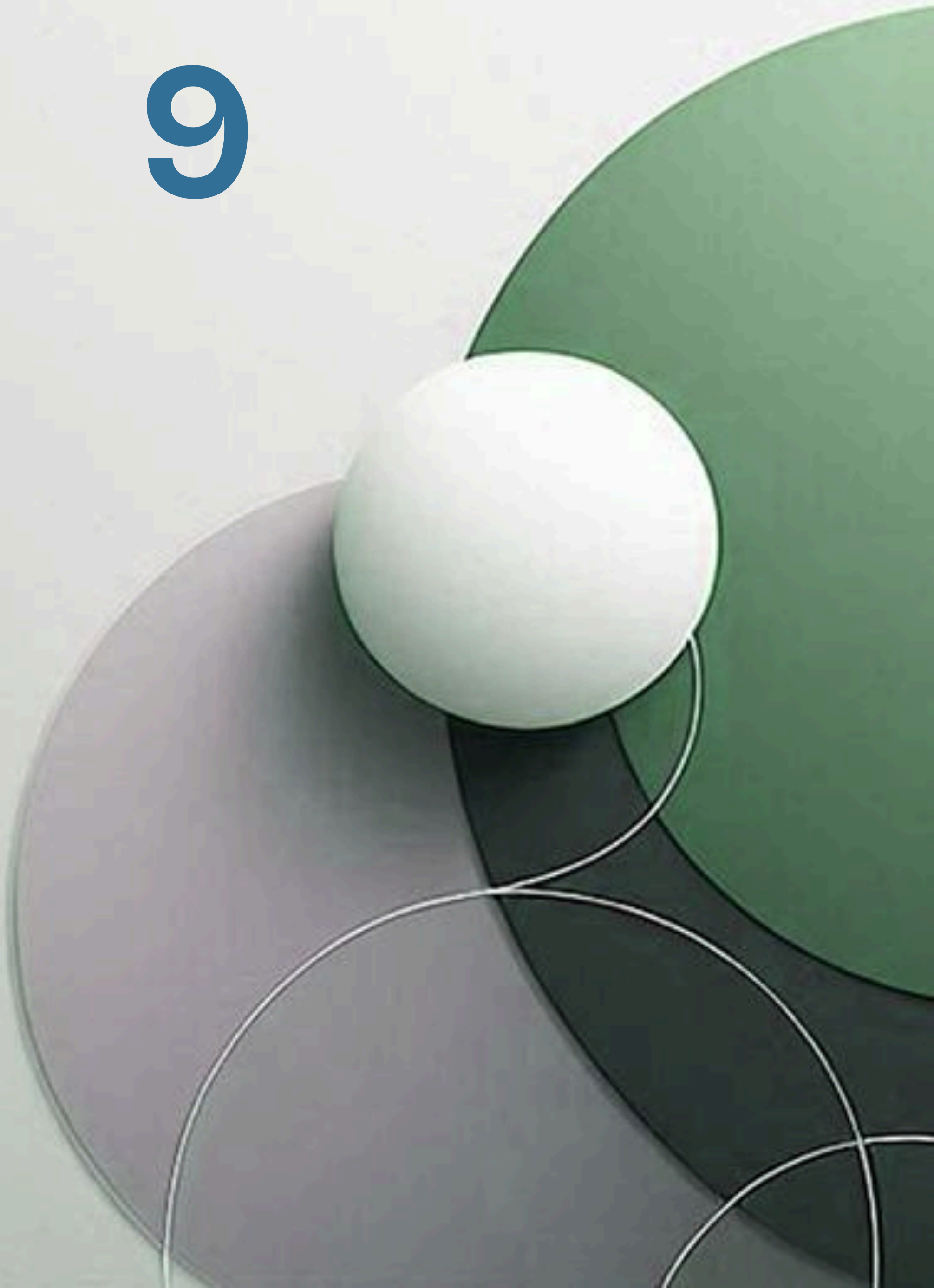

SAT Math Problems

1. What is the y-coordinate of the y-intercept of the graph of $y = f(x) + 3$ in the xy-plane? $f(x) = 4(2x - \frac{5}{3})$

A. $-\frac{11}{3}$

B. $-\frac{10}{3}$

C. -3

D. $-\frac{8}{3}$

2. Which expression is equivalent to $3x^4 + 9x^3y + 6x^2y^2 + 18y^4$?

A. $(3x^2 + 6y)(x^2 + 3y^2)$

B. $(3x^2 + 2y)(x^2 + 9y^2)$

C. $(3x^3 + 3y^2)(x + 6y)$

D. $(3x^2 + 3y)(x^2 + 6y^2)$

3. A tech startup is designing a new app. The initial cost of development is represented by the equation $y = 15000 + 300x$, where y is the total cost in dollars and x is the number of app features added. If the startup plans to include 10 features, what is the total projected cost of the app?

A. $16000

B. $17000

C. $18000

D. $19000

4. A community decided to implement a new policy to sustainably manage their water supply, reducing the withdrawal rate by 25%. After this reduction, they found that 300,000 gallons of water were available for use. How much water was being withdrawn before the reduction?

A. 200,000

B. 250,000

C. 300,000

D. 400,000

5. A school is considering investing in a new virtual reality (VR) system for its classrooms. The initial cost for the VR equipment is $1, 200. Additionally, the school plans to spend $300 for each training session needed to teach teachers how to use the equipment. If the total amount spent on the VR system after training sessions is $2, 400, how many training sessions did the school schedule?

A. 3

B. 4

C. 5

D. 6

6. The function g is defined by $g(x) = \frac{3}{5}x + 45$. What is the value of g(25)?

7. A local activist group organized a rally to protest social justice issues. They initially planned to have 720 participants. After a week of outreach, they found that 15% of the planned participants had to withdraw due to scheduling conflicts. How many participants remained for the rally?

A. 612

B. 620

C. 630

D. 640

8. The function g is defined by $g(x) = 3x^2 - 5x + 8$. What is the value of $g(1)$?

A. 2

B. 4

C. 6

D. 8

9. What is the median of the data set shown? data set = [4, 50, 8, 23, 15, 42, 16]

10. In ΔABC, $\angle B$ is a right angle and the length of BC is 180 millimeters. If cos(A) = $\frac{4}{5}$, what is the length, in millimeters, of AB?

SAT Math Solutions

1. What is the y-coordinate of the y-intercept of the graph of $y = f(x) + 3$ in the xy -plane? $f(x) = 4(2x - \frac{5}{3})$

A. $-\frac{11}{3}$

B. $-\frac{10}{3}$

C. -3

D. $-\frac{8}{3}$

Answer

A

Solution

This problem tests a student's understanding of linear functions and how transformations affect their graphs, specifically focusing on the y-intercept. It checks if the student can manipulate and evaluate functions to find specific points on the graph.
First, simplify the given function $f(x) = 4(2x - \frac{5}{3})$ to find its expression. Then, determine the y-intercept of the graph $y = f(x) + 3$ by evaluating the function at $x = 0$. Simplify the resulting expression to find the y-coordinate.
Remember that the y-intercept occurs where x equals zero. Substitute $x = 0$ into the function to find the initial y-value, then account for any vertical shifts due to additional constants such as +3.
Be careful with the arithmetic when simplifying expressions. Pay attention to distributing and combining terms, especially with fractions and constants. It's easy to make mistakes with signs and arithmetic involving fractions.
This type of problem is typical for SAT algebra questions, focusing on understanding function transformations and intercepts. It requires students to be comfortable with function notation and basic algebraic manipulation. Successfully solving this problem demonstrates a good grasp of fundamental algebraic concepts and transformations.

First, calculate $f(0)$: $f(0) = 4(2(0) - \frac{5}{3}) = 4(0 - \frac{5}{3}) = 4(-\frac{5}{3})$, Multiply: $4 \times -\frac{5}{3} = -\frac{20}{3}$

The y-coordinate of the y-intercept of $y = f(x)$ is $-\frac{20}{3}$.
To find the y-intercept of $y = f(x) + 3$, add 3 to $-\frac{20}{3}$: $y =- \frac{20}{3} + 3$, Convert 3 to a fraction: $3 = \frac{9}{3}$, Add the fractions: $-\frac{20}{3} + \frac{9}{3} =- \frac{11}{3}$
Therefore, the y-coordinate of the y-intercept is $-\frac{11}{3}$.

2. Which expression is equivalent to $3x^4 + 9x^3y + 6x^2y^2 + 18y^4$?

A. $(3x^2 + 6y)(x^2 + 3y^2)$

B. $(3x^2 + 2y)(x^2 + 9y^2)$

C. $(3x^3 + 3y^2)(x + 6y)$

D. $(3x^2 + 3y)(x^2 + 6y^2)$

Answer

A

Solution

The problem aims to test the student's ability to factor polynomial expressions, specifically focusing on recognizing common factors and applying the distributive property to simplify the expression.
To solve this problem, the student should first identify any common factors in all the terms. Once the common factor is determined, they should factor it out and look for patterns or other factoring techniques that can further simplify the expression.
Start by identifying the greatest common factor (GCF) of all the terms in the polynomial. Factor out the GCF, then check if the remaining polynomial can be factored further. Look for patterns such as the difference of squares, perfect square trinomials, or grouping.
Be careful not to miss any common factors and double-check each term to ensure nothing is left out. Also, after factoring out the GCF, make sure to simplify the remaining polynomial correctly. Misidentifying the GCF or incorrect simplification can lead to errors.
This type of problem evaluates a student's understanding of polynomial factoring and their ability to apply factoring techniques effectively. It's essential to practice recognizing common factors and applying factoring methods accurately to solve these problems efficiently. Mastery of these skills is crucial for success in the Advanced Math section of the SAT.

Step 1: Identify the common factor in all the terms.
Notice that each term is divisible by 3.
Factor 3 out of the entire expression: $3(x^4 + 3x^3y + 2x^2y^2 + 6y^4)$.
Step 2: Look at the remaining expression: $x^4 + 3x^3y + 2x^2y^2 + 6y^4$.
Attempt to factor by grouping: Group the terms as $(x^4 + 3x^3y) + (2x^2y^2 + 6y^4)$.
Step 3: Factor each group separately.
From the first group: $x^3(x + 3y)$.

From the second group: $2y^2(x^2 + 3y^2)$.
Notice that direct factoring doesn't match any of the options clearly. Re-evaluate the approach and terms.
Step 4: Re-examine the entire set of expressions and test each option for validity by expanding.
Option A: $(3x^2 + 6y)(x^2 + 3y^2)$ expands to: $3x^2x^2 + 3x^23y^2 + 6yx^2 + 6y3y^2$, This simplifies to: $3x^4 + 9x^2y^2 + 6x^2y + 18y^4$.
This matches the original polynomial structure after rearranging terms.
Verification: The factorization matches by multiplication, confirming the equivalency.

3. A tech startup is designing a new app. The initial cost of development is represented by the equation $y = 15000 + 300x$, where y is the total cost in dollars and x is the number of app features added. If the startup plans to include 10 features, what is the total projected cost of the app?

A. $16000

B. $17000

C. $18000

D. $19000

Answer

C

Solution

This problem is designed to test the student's understanding of linear equations and their ability to apply algebraic concepts to word problems. Specifically, it evaluates the student's capability to substitute a given value into a linear equation to find the corresponding output.
To solve this problem, students need to identify the linear relationship given in the equation. They should recognize that the equation represents the cost as a function of the number of features. By substituting the value of x (the number of features) with 10 into the equation, they can calculate the total projected cost.
Remember to carefully read the problem and identify what each variable represents. In this case, x is the number of features and y is the total cost. Substitute the given value of x directly into the equation and simplify to find y.
Avoid common mistakes such as misinterpreting the variables or substituting the wrong value. Ensure that you perform the arithmetic operations step by step to avoid calculation errors.
This type of problem is common in SAT algebra sections, focusing on the ability to apply linear equations to real-world scenarios. It measures skills in algebraic substitution and arithmetic operations. Mastery of these skills is crucial as they form the foundation for more complex algebraic problems. In SAT, being methodical and checking your work can greatly reduce errors and improve accuracy.

Start by substituting $x = 10$ into the given equation: $y = 15000 + 300x$.
Calculate the additional cost for 10 features: $300 \times 10 = 3000$.
Add the additional cost to the initial cost: $15000 + 3000 = 18000$.
Thus, the total projected cost of the app is $18000.

4. A community decided to implement a new policy to sustainably manage their water supply, reducing the withdrawal rate by 25%. After this reduction, they found that 300,000 gallons of water were available for use. How much water was being withdrawn before the reduction?

A. 200,000

B. 250,000

C. 300,000

D. 400,000

Answer

D

Solution

This problem tests the student's understanding of percentage reduction and their ability to reverse-calculate the original amount before the reduction. It assesses their ability to interpret word problems and apply percentage formulas correctly.
To solve this problem, the student needs to recognize that the 300,000 gallons represent 75%$(100\% - 25\%)$ of the original amount. Let the original amount be X. Then, 75% of X equals 300,000 gallons. Formulate the equation $0.75X = 300,000$ and solve for X.
Remember that if a certain percentage of the original amount is given, you can set up an equation with the percentage as a decimal. Also, double-check the conversion between percentages and decimals to avoid errors.
Be careful with the percentage conversion. Ensure you subtract correctly to find the remaining percentage and correctly convert this percentage to a decimal. Misinterpreting the problem could lead to incorrect equations.
This type of problem is common in the SAT and tests your ability to handle percentage calculations in a real-world context. By practicing such problems, you can improve your ability to quickly set up and solve equations involving percentages. Always break down the problem into smaller parts and ensure each step is logically sound to avoid mistakes.

Let the original withdrawal amount be denoted by W.
After a 25% reduction, the withdrawal amount is 75% of W.
The equation representing this situation is $0.75 \times W = 300,000$.
To find W, divide both sides by 0.75: $W = \frac{300,000}{0.75}$.
Perform the division: W = 400,000.
Thus, the original withdrawal amount was 400,000 gallons.

5. A school is considering investing in a new virtual reality (VR) system for its classrooms. The initial cost for the VR equipment is $\$1,200$. Additionally, the school plans to spend $\$300$ for each training session needed to teach teachers how to use the equipment. If the total amount spent on the VR system after training sessions is $\$2,400$, how many training sessions did the school schedule?

A. 3

B. 4

C. 5

D. 6

Answer

B

Solution

This question tests students' ability to translate a real-world scenario into a linear equation and solve it. It assesses understanding of linear relationships and basic algebraic manipulation.
Students should first identify the unknown, which is the number of training sessions. They should then set up a linear equation based on the given information: the fixed initial cost and the variable cost per training session. The equation will be $1200 + 300x = 2400$, where x represents the number of training sessions. Solving for x will give the answer.
Focus on identifying all the constants and variables in the problem: the initial cost of $\$1,200$ is a constant, each training session costs $\$300$, and the total cost is $\$2,400$. Set up the equation carefully by combining these elements. Always double-check the problem to ensure all parts are included in your equation.
Be cautious not to confuse the fixed initial cost with the variable cost per session. Also, ensure that you perform the arithmetic operations correctly when solving for x. Double-check your equation setup to ensure it accurately reflects the problem's scenario.
This type of problem is common in the SAT and tests the critical skill of forming equations from word problems. The ability to translate real-world problems into algebraic expressions is essential for success in algebra. Ensure that you practice similar problems to become efficient in identifying and setting up equations from word problems.

We can set up an equation to solve for the number of training sessions, denoted as n. The total cost equation can be expressed as: Cost of VR equipment + (Cost per training session) × (Number of training sessions) = Total amount spent
Substitute the known values into the equation: $1200 + 300n = 2400$

Subtract 1200 from both sides: $300n = 2400 - 1200$
Simplify: $300n = 1200$
Divide both sides by 300 to solve for n: $n = \frac{1200}{300}$
Simplify the fraction: n = 4

6. The function g is defined by $g(x) = \frac{3}{5}x + 45$. What is the value of g(25)?

Answer

60

Solution

This problem assesses the student's ability to understand function notation and evaluate a function at a given point. It tests their comprehension of linear functions and basic arithmetic operations.
To solve this problem, substitute the given value into the function. Here, you need to replace 'x' with 25 in the function $g(x) = \frac{3}{5}x + 45$, and then perform the arithmetic operations to find $g(25)$.
When evaluating a function at a specific point, carefully substitute the given number into the function and perform each step methodically. Double-check your arithmetic to avoid small errors.
A common mistake is to miscalculate the multiplication or the fraction operation. Ensure that you correctly multiply $\frac{3}{5}$ by 25 and then add 45.
This type of problem is fundamental in algebra and serves as a basis for understanding more complex functions and graphs. It helps students practice function evaluation, which is a crucial skill in algebra and calculus. In SAT math, being comfortable with function notation and evaluation can save time and avoid mistakes in more complex problems.

Substitute $x = 25$ into the function $g(x)$: $g(25) = \frac{3}{5} \times 25 + 45$
Calculate $\frac{3}{5} \times 25$: Multiply 3 and 25 to get 75. Divide 75 by 5 to get 15.
Add 15 to 45, which results in 60.
Thus, the value of $g(25)$ is 60.

7. A local activist group organized a rally to protest social justice issues. They initially planned to have 720 participants. After a week of outreach, they found that 15% of the planned participants had to withdraw due to scheduling conflicts. How many participants remained for the rally?

A. 612

B. 620

C. 630

D. 640

Answer

A

Solution

This question tests the student's ability to understand and work with percentages, particularly in the context of a word problem. It assesses the student's proficiency in calculating percentages and subtracting the result from an initial quantity.
First, determine the number of participants who withdrew by calculating 15% of the initially planned 720 participants. Then, subtract that number from 720 to find out how many participants remained.
Remember that 'percent' means 'per hundred,' so 15% can be converted to a decimal by dividing by 100, which is 0.15. Multiply this decimal by the total number of participants to find the number who withdrew. Finally, subtract this from the initial total.
Be careful with the percentage calculation. Ensure that you correctly convert the percentage to a decimal form before multiplying. Also, double-check your subtraction to avoid minor mistakes that could lead to the wrong answer.
This problem is a typical example of a rates word problem that is common in the SAT. It checks the student's ability to handle percentages and basic arithmetic operations within a real-world context. Mastery of these types of problems is crucial for doing well in the 'Problem Solving and Data Analysis' category of the SAT.

To find the number of participants who withdrew, calculate 15% of 720.
15% of 720 is calculated as $\frac{15}{100} \times 720$.
This simplifies to 0.15×720.
$0.15 \times 720 = 108$ participants withdrew.
Subtract the number of participants who withdrew from the initial number:
$720 - 108 = 612$.
Thus, 612 participants remained for the rally.

8. The function g is defined by $g(x) = 3x^2 - 5x + 8$. What is the value of $g(1)$?

A. 2

B. 4

C. 6

D. 8

Answer

C

Solution

This problem tests the student's ability to evaluate a quadratic function by substituting a specific value for the variable x. It assesses the understanding of basic algebraic manipulation and function evaluation.
To solve this problem, the student should substitute the given value of x (which is 1) into the quadratic function $g(x)$ and then simplify the resulting expression.
Carefully substitute $x = 1$ into the function. Make sure to follow the order of operations: first square the value, then multiply by coefficients, and finally add or subtract the constant terms. Be attentive to arithmetic errors, especially during multiplication and addition/subtraction steps. Also, ensure that you do not skip any steps in the order of operations.
This problem is a straightforward evaluation of a quadratic function, a fundamental skill in algebra. It assesses the student's ability to correctly substitute values and perform basic arithmetic operations. Mastery of this type of problem is crucial for more advanced topics in mathematics, and accuracy is essential. Practicing similar problems can help improve speed and reduce errors in function evaluation tasks commonly found in the SAT.

Substitute $x = 1$ into the function $g(x)$.

Calculate $g(1) = 3(1)^2 - 5(1) + 8$.
Simplify: $g(1) = 3(1) - 5 + 8$.
Further simplify: $g(1) = 3 - 5 + 8$.
Finally calculate: $g(1) = 6$.

9. What is the median of the data set shown? data set = [4, 50, 8, 23, 15, 42, 16]

Answer

16

Solution

The problem is designed to test the student's understanding of how to find the median in a data set. It assesses the student's ability to organize data and identify the middle value.
To solve the problem, the student needs to first ensure the data set is in numerical order, which it already is. Then, since there are seven numbers, the median is the one in the fourth position when the numbers are listed in order.
Remember that the median is the middle number in a list of numbers. If the list has an odd number of entries, the median is the exact middle number. If it has an even number of entries, you would take the average of the two middle numbers.
Be careful not to confuse the median with the mean or mode. They are different measures of central tendency. Ensure the data is sorted before attempting to find the median.
This type of problem is fundamental in understanding statistical data analysis. Finding the median is a basic skill that helps in understanding the distribution of data. On the SAT, this type of problem tests your ability to work with and interpret data accurately, which is essential for data analysis.

Count the numbers in the data set: 7 numbers.
Identify the middle position: $\frac{7+1}{2} = 4$, The median is the fourth number in the list.
Looking at the data set: [4, 50, 8, 23, 15, 42, 16], sorting the data set: [4, 8, 15, 16, 23, 42, 50], The fourth number is 16.

10. In ΔABC, ∠B is a right angle and the length of BC is 180 millimeters. If cos(A) = $\frac{4}{5}$, what is the length, in millimeters, of AB?

Answer

240

Solution

This problem assesses the student's understanding of right angle trigonometry, specifically their ability to apply the cosine function to find the length of a side in a right triangle.
To solve this problem, recognize that in a right triangle, the cosine of an angle is the ratio of the adjacent side to the hypotenuse. Here, angle A is given, and you need to identify the adjacent side (AB) and the hypotenuse (AC). Use the formula $cos(A) = \frac{adjacent}{hypotenuse}$. Plug in the given values: $cos(A) = \frac{4}{5}$ and $BC = 180$ millimeters. Set up the equation $\frac{4}{5} = \frac{AB}{AC}$ and solve for AB.
Remember the mnemonic SOHCAHTOA to quickly recall that cosine is the ratio of the adjacent side over the hypotenuse. When setting up your equation, make sure to clearly identify which sides of the triangle correspond to these terms based on the given angle.
Be careful not to confuse the sides of the triangle and the angle being referenced. Double-check that you are using the correct sides for cosine (adjacent and hypotenuse) and ensure your algebraic manipulation is accurate when solving for AB.
This problem is a classic example of right angle trigonometry, testing a student's ability to apply fundamental trigonometric ratios in practical scenarios. Mastery of these concepts is crucial, as they form the basis for more advanced topics in geometry and trigonometry. Being comfortable with the relationships between angles and sides in right triangles is vital for success in SAT geometry problems.

We know that $cos(A) = \frac{AB}{AC} = \frac{4}{5}$.
Since BC is 180 mm
we first find AC using Pythagorean identity and given cosine value.
Use the identity: $sin^2(A) + cos^2(A) = 1$.
$sin^2(A) = 1 - cos^2(A) = 1 - \left(\frac{4}{5}\right)^2 = 1 - \frac{16}{25} = \frac{9}{25}$.
Thus, $sin(A) = \sqrt{\frac{9}{25}} = \frac{3}{5}$.
Using $sin(A) = \frac{BC}{AC}$, we have $\frac{3}{5} = \frac{180mm}{AC}$.
Solving for AC gives $AC = 180mm \times \frac{5}{3} = 300mm$.

Now, use cos(A) to find AB: $cos(A) = \frac{AB}{AC} = \frac{4}{5} = \frac{AB}{300mm}$.
Solve for AB: $AB = \frac{4}{5} \times 300mm = 240mm$.

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SAT Math

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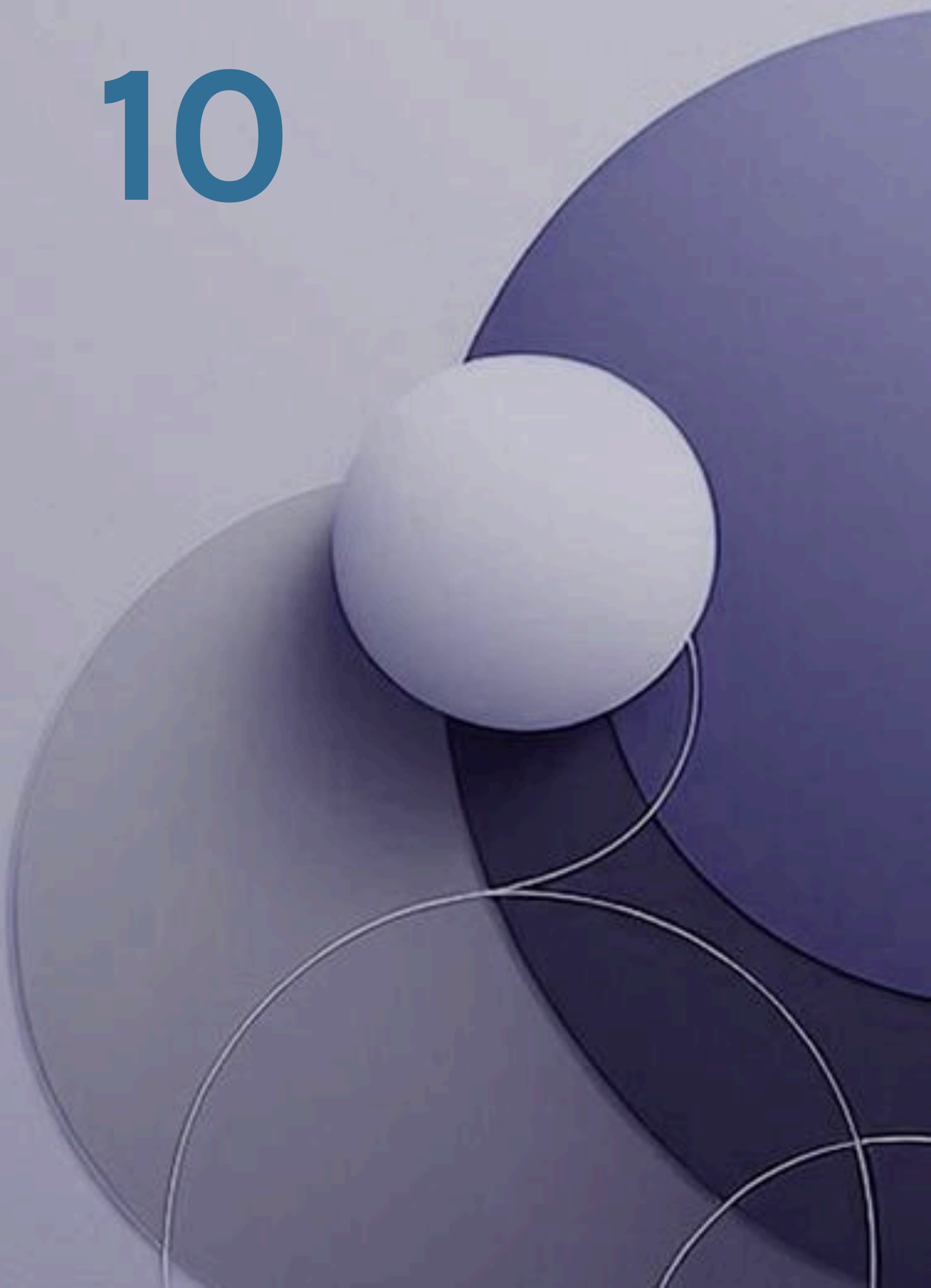


SAT Math Problems

1. In triangle DEF, the measure of angle D is 60°, the measure of angle E is 80°, and the measure of angle F is $\left(\frac{m}{3}\right)^{\circ}$. What is the value of m?

A. 100

B. 110

C. 120

D. 130

2. For two acute angles, $\angle A$ and $\angle B$, $sin(A) = cos(B)$. The measures, in degrees, of $\angle A$ and $\angle B$ are $2x + 30$ and $5x - 10$, respectively. What is the value of x?

A. 8

B. 9

C. 10

D. 11

3. In a factory that has recently implemented automated machines, there are currently 200 workers. Following automation, the company found that the probability of a worker being reassigned to a new role in the automation process is 0.25, while the probability of a worker remaining in their current role is 0.55. What is the probability that a randomly selected worker will either be reassigned or remain in their current role?

A. 0.75

B. 0.80

C. 1.00

D. 0.85

4. If x and y are numbers greater than 1 and $\sqrt[4]{x^5}$ is equivalent to $\sqrt[6]{y^3}$, for what value of b is x^{3b+2} equal to y?

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

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

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

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

5. A city implemented a new public policy aiming to reduce air pollution. The estimated reduction in air pollution levels, measured in tons, in the first five years after the policy is modeled by the function $f(x) = 500(0.90)^x$, where x is the number of years since the policy was enacted. What does the value 500 represent in this context?

A. The amount of air pollution measured in tons after 5 years

B. The estimated air pollution level in tons during the baseline year before the policy was enacted

C. The percentage decrease in air pollution level each year

D. The total reduction in air pollution expected after 5 years

6. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, 5). Which equation defines g?

7. For a polynomial function, the graph of $y = f(x)$ in the xy-plane contains the points $(-4, 0)$, $(0, 0)$, $(3, 0)$, and $(5, 0)$. Which of the following must be a factor of $f(x)$?

A. $x^2 + 2x - 8$

B. $x^2 - 8x + 15$

C. $x^2 - 3x - 10$

D. $x^2 - 5x$

8. What is the center of the circle in the xy-plane defined by the equation $(x + 3)^2 + (y - 4)^2 = 16$?

A. $(-3, 4)$

B. $(3, -4)$

C. $(4, 3)$

D. $(-4, 3)$

9. In triangle DEF, the measure of angle D is 55°, the measure of angle E is 90°, and the measure of angle F is $\frac{m}{3}^\circ$. What is the value of m?

10. One solution to the given equation can be written as $x = \frac{-7+\sqrt{k}}{2}$, where k is a constant. What is the value of k? $x^2 + 7x + 10 = 0$

A. 9

B. 16

C. 25

D. 36

SAT Math Solutions

1. In triangle DEF, the measure of angle D is 60°, the measure of angle E is 80°, and the measure of angle F is $\left(\frac{m}{3}\right)^{\circ}$. What is the value of m?

A. 100

B. 110

C. 120

D. 130

Answer

C

Solution

This problem tests the student's understanding of the angle sum property of triangles and their ability to use algebra to solve for an unknown variable.
To solve this problem, the student needs to apply the angle sum property of a triangle, which states that the sum of the interior angles of a triangle is 180°. Set up an equation where the sum of the given angles equals 180°, and solve for the unknown variable m.
Remember that the sum of the angles in any triangle is always 180°. Use this property to set up your equation. Also, be careful with your algebraic manipulation when solving for m.
Ensure that you correctly interpret the given angle measures and carefully solve the equation step by step. It's easy to make mistakes with simple arithmetic or algebraic manipulation, so double-check your work.
This type of problem is common in SAT geometry questions. It assesses the student's ability to apply fundamental properties of triangles and perform basic algebra. Mastering these types of problems will help students improve their problem-solving speed and accuracy, which is crucial for the SAT.

Step 1:

Substitute the given angle measures into the equation: $60° + 80° + \left(\frac{m}{3}\right)^{\circ} = 180°$.

Step 2: Combine the known angle measures: $140° + \left(\frac{m}{3}\right)^{\circ} = 180°$.

Step 3: Subtract 140° from both sides to isolate the term with m: $\left(\frac{m}{3}\right)^{\circ} = 40°$.

Step 4: Multiply both sides by 3 to solve for m: $m = 40 \times 3$.
Step 5: Simplify: $m = 120$.

2. For two acute angles, $\angle A$ and $\angle B$, $sin(A) = cos(B)$. The measures, in degrees, of $\angle A$ and $\angle B$ are $2x + 30$ and $5x - 10$, respectively. What is the value of x?

A. 8

B. 9

C. 10

D. 11

Answer

C

Solution

This problem aims to assess the student's understanding of trigonometric identities, specifically the relationship between sine and cosine for complementary angles, and their ability to solve for unknown variables in angle measures.
The key to solving this problem is knowing the trigonometric identity $sin(A) = cos(90° - A)$. Since $sin(A) = cos(B)$, we can set up the equation $A = 90° - B$.
Substitute the given expressions for $\angle A$ and $\angle B$ and solve for x.
Remember that for any angle θ, $sin(\theta) = cos(90° - \theta)$. Use this identity to set up your equation. Carefully substitute the given expressions for $\angle A$ and $\angle B$ into the equation $A = 90° - B$ and solve for x step-by-step.
Be careful with your algebra when solving for x. Ensure you correctly distribute and combine like terms. Also, double-check your trigonometric identity and make sure you are substituting correctly.
This problem is a classic example of using trigonometric identities to find unknown values. It tests the student's knowledge of the complementary angle relationship between sine and cosine, as well as their algebraic manipulation skills. Being familiar with these identities and solving equations accurately is essential for success in the SAT math section.

Start by setting up the equation from the condition $A + B = 90$ degrees.
Substitute the expressions for A and B:, $2x + 30 + 5x - 10 = 90$
Combine like terms: $7x + 20 = 90$
Subtract 20 from both sides to isolate the term with x: $7x = 70$
Divide both sides by 7 to solve for x: $x = 10$

3. In a factory that has recently implemented automated machines, there are currently 200 workers. Following automation, the company found that the probability of a worker being reassigned to a new role in the automation process is 0.25, while the probability of a worker remaining in their current role is 0.55. What is the probability that a randomly selected worker will either be reassigned or remain in their current role?

A. 0.75

B. 0.80

C. 1.00

D. 0.85

Answer

B

Solution

This problem tests the student's understanding of basic probability concepts, particularly the ability to calculate the probability of combined events using addition rules. It assesses their ability to interpret word problems and convert them into mathematical expressions.
To solve this problem, students need to recognize that the probability of a worker being reassigned or remaining in their current role can be found by adding the individual probabilities of these events. Specifically, they need to add the probability of being reassigned (0.25) to the probability of remaining in the current role (0.55). Remember that probabilities are always between 0 and 1, and the sum of probabilities for all possible outcomes must equal 1. Since the problem states the probabilities directly, your task is simply to add them together. Be careful with the arithmetic to avoid simple mistakes.
Be sure to only add the probabilities of mutually exclusive events. In this problem, being reassigned and remaining in the current role are mutually exclusive, so their probabilities can be added directly. Also, ensure that you read the problem carefully to understand which probabilities are given and what is being asked.
This problem is a straightforward application of basic probability rules, specifically the addition rule for mutually exclusive events. It evaluates the student's ability to interpret and solve word problems involving probability. Mastery of this type of problem is essential for success in the SAT math section, as it requires both conceptual understanding and attention to detail.

Since the events 'being reassigned' and 'remaining in the current role' are mutually exclusive, their combined probability can be calculated by adding their individual probabilities.

$P(reassigned\ or\ remaining)$
$= P(reassigned) + P(remaining), P(reassigned\ or\ remaining) = 0.25 + 0.55$
$P(reassigned\ or\ remaining) = 0.80$

4. If x and y are numbers greater than 1 and $\sqrt[4]{x^5}$ is equivalent to $\sqrt[6]{y^3}$, for what value of b is x^{3b+2} equal to y?

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

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

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

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

Answer

A

Solution

This problem intends to assess the student's understanding of how to manipulate and solve equations involving radical and rational exponents. It evaluates the ability to equate expressions with different bases and exponents by finding a common ground and applying algebraic principles.
To approach this problem, first express each radical in terms of rational exponents: $\sqrt[4]{x^5} = x^{\frac{5}{4}}$, $\sqrt[6]{y^3} = y^{\frac{1}{2}}$. Since these are equal, set $x^{\frac{5}{4}} = y^{\frac{1}{2}}$. Then express y in terms of x: $y = \left(x^{\frac{5}{4}}\right)^2 = x^{\frac{5}{2}}$. Next, equate x^{3b+2} to y: $x^{3b+2} = x^{\frac{5}{2}}$. Solve for b by setting the exponents equal: $3b + 2 = \frac{5}{2}$.
When working with equations involving radicals and rational exponents, always convert the radicals to rational exponents first. This simplifies the comparison and manipulation of the expressions. Ensure all expressions are in terms of the same base or can be manipulated into a common base.
Be cautious with the exponent rules, especially when equating two expressions. A common mistake is to miscalculate or overlook the conversion between radicals and rational exponents. Double-check the algebraic manipulation to ensure the exponents are correctly equated.
This type of problem is common in advanced math sections of standardized tests like the SAT. It assesses your ability to handle radicals and rational exponents systematically. Mastery of these concepts is crucial as they form the foundation for more complex algebraic problems. Practice converting between radicals and exponents and solving equations to improve speed and accuracy in this topic.

Start by expressing the roots as exponents. $\sqrt[4]{x^5} = x^{\frac{5}{4}}$ and $\sqrt[6]{y^3} = y^{\frac{1}{2}}$.

We have the equation: $x^{\frac{5}{4}} = y^{\frac{1}{2}}$.
Raise both sides to the power of 4 to eliminate the fourth root on the left:
$\left(x^{\frac{5}{4}}\right)^4 = \left(y^{\frac{1}{2}}\right)^4$.
This simplifies to $x^5 = y^2$.
We need to find b such that $x^{3b+2} = y$.
Substituting $y = x^{\frac{5}{2}}$ into $x^{3b+2} = x^{\frac{5}{2}}$, we equate the exponents: $3b + 2 = \frac{5}{2}$.
Solve for b: $3b + 2 = \frac{5}{2}$.
Subtract 2 from both sides: $3b = \frac{5}{2} - 2$.
Substitute to get: $3b = \frac{1}{2}$.
Divide by 3: $b = \frac{1}{2} \div 3 = \frac{1}{6}$.
The value of b is $\frac{1}{6}$.

5. A city implemented a new public policy aiming to reduce air pollution. The estimated reduction in air pollution levels, measured in tons, in the first five years after the policy is modeled by the function $f(x) = 500(0.90)^x$, where x is the number of years since the policy was enacted. What does the value 500 represent in this context?

A. The amount of air pollution measured in tons after 5 years

B. The estimated air pollution level in tons during the baseline year before the policy was enacted

C. The percentage decrease in air pollution level each year

D. The total reduction in air pollution expected after 5 years

Answer

B

Solution

This problem aims to test students' understanding of exponential functions and their ability to interpret parameters in real-world contexts. Specifically, it evaluates whether students can identify what the initial value in an exponential decay function represents.
To solve this problem, you should focus on understanding the components of the exponential function given. Recognize that in the context of the function, the term '500' represents the initial value or starting amount at year zero (when the policy was first enacted).
Remember that in an exponential function of the form $y = a(b)^x$, the 'a' term represents the initial value before any changes occur as a result of the exponential process. In this problem, identify what the situation was at the start (year 0).
Be careful not to confuse the initial value with the rate of change or the decay factor. The initial value is the amount present at the beginning ($x = 0$), while the decay factor in this problem is 0.90. This problem is a good example of how SAT math questions often require both an understanding of mathematical concepts and the ability to apply these concepts to real-world scenarios.
Recognizing the meaning of parameters in an exponential function is crucial. To excel in such problems, practice identifying and interpreting each component of the function accurately.

The initial value of the function is 500. In exponential decay functions, the initial value represents the starting amount before any decay has occurred.
In this context, 500 represents the air pollution level measured in tons during the baseline year before the policy was enacted.

As the function models a reduction, and 500 is the amount without decay applied, it is the amount before any reduction.

6. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, 5). Which equation defines g?

Answer

1

Solution

This problem tests the student's ability to understand and apply the concept of a linear equation in slope-intercept form. The student needs to identify the slope and y-intercept to form the equation of the line.
The student should recognize that the equation of a line in slope-intercept form is y = mx + b, where m is the slope and b is the y-intercept. Given the slope (m = 12) and the y-intercept (b = 5, as the line passes through the point (0, 5)), the student should substitute these values into the slope-intercept form to find the equation g(x) = 12x + 5.
Remember the slope-intercept form y = mx + b as this is critical for quickly forming the equation of a line when given the slope and y-intercept. Recognize points like (0, b) as the y-intercept when given directly.
Be careful not to confuse the slope with the y-intercept. Also, ensure you substitute the correct values into the equation. Double-check that the point given is indeed the y-intercept (x=0), which simplifies identifying the equation.
This problem is a classic example of testing foundational algebra skills, focusing on the application of the slope-intercept form. Mastery of this concept is essential as it frequently appears in SAT math sections. Quickly identifying and using the slope and y-intercept to formulate linear equations is a valuable skill that will aid in efficiently solving similar problems.

Since the line passes through the point (0, 5), this point is the y-intercept of the line. Therefore, b = 5., With a slope of m = 12, and the y-intercept b = 5, the equation of the line can be written in slope-intercept form as:, y = 12x + 5, This equation defines the linear function g, as it incorporates both the given slope and the point through which the line passes.

7. For a polynomial function, the graph of $y = f(x)$ in the xy-plane contains the points $(-4, 0)$, $(0, 0)$, $(3, 0)$, and $(5, 0)$. Which of the following must be a factor of $f(x)$?

A. $x^2 + 2x - 8$

B. $x^2 - 8x + 15$

C. $x^2 - 3x - 10$

D. $x^2 - 5x$

Answer

B

Solution

This problem is designed to test students' understanding of polynomial functions and their roots. Specifically, it checks if students can identify the factors of a polynomial given its zeros.
To solve this problem, students need to recognize that the x-coordinates of the points where the function intersects the x-axis correspond to the zeros of the polynomial function. Therefore, for each zero, there is a corresponding factor of the polynomial.
Remember that if a polynomial function has zeros at $x = a$, $x = b$, and $x = c$, then $(x - a)$, $(x - b)$, and $(x - c)$ are factors of the polynomial. In this case, you should identify the zeros from the given points and then write the corresponding factors.
Be careful not to confuse the x-coordinates of the points with the y-coordinates. The zeros of the polynomial are the x-values where $y = 0$, which are the x-intercepts.
Also, ensure you consider all given points to avoid missing any factors.
This type of problem is common in the SAT as it evaluates a student's ability to analyze polynomial graphs and understand the relationship between the roots and factors of polynomial functions. By mastering this skill, students can efficiently handle similar problems on the test. Always double-check the zeros and corresponding factors to avoid simple mistakes.

Factors of the polynomial based on the roots are $(x + 4)$, x, $(x - 3)$, and $(x - 5)$.
We check each option to see if they match any of these factors or a product of them:

Option A: $x^2 + 2x - 8$.
Factoring gives $(x + 4)(x - 2)$, which has roots $x =- 4$ and $x = 2$.
Hence, not all roots match.

Option B: $x^2 - 8x + 15$.
Factoring gives $(x - 3)(x - 5)$, which has roots $x = 3$ and $x = 5$.

These match the roots of the polynomial.

Option C: $x^2 - 3x - 10$.

Factoring gives $(x - 5)(x + 2)$, which has roots $x = 5$ and $x =- 2$.

Not all roots match.

Option D: $x^2 - 5x$. Factoring gives $x(x - 5)$, which has roots $x = 0$ and $x = 5$.

Not all roots match.

The correct factor that corresponds to the given roots is found in Option B, which provides the factors $(x - 3)$ and $(x - 5)$, matching two of the roots.

8. What is the center of the circle in the xy-plane defined by the equation $(x + 3)^2 + (y - 4)^2 = 16$?

A. $(-3, 4)$

B. $(3, -4)$

C. $(4, 3)$

D. $(-4, 3)$

Answer

A

Solution

This problem tests the student's understanding of the standard form of a circle's equation in the xy-plane and their ability to identify the center and radius from this form.

The standard form of a circle's equation is $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius of the circle. In the given equation $(x + 3)^2 + (y - 4)^2 = 16$, compare it to the standard form to identify the center and radius. Here, $h = -3$ and $k = 4$, so the center of the circle is $(-3, 4)$.

Remember that in the equation $(x - h)^2 + (y - k)^2 = r^2$, the values of h and k are taken directly but with opposite signs.

This is because the equation is written as $(x - h)$ and $(y - k)$.

Be careful with the signs when identifying h and k. In this problem, since the equation has $(x + 3)$, it means $h = -3$. Similarly, $(y - 4)$ means $k = 4$. Students often make mistakes with these signs.

This problem is a fundamental exercise in understanding and working with the standard form of a circle's equation. Mastery of this concept is crucial, as it frequently appears in various forms on the SAT. Being able to quickly and accurately identify the center and radius will save valuable time and reduce errors on the exam.

The equation is $(x + 3)^2 + (y - 4)^2 = 16$.

This can be rewritten as $(x - (-3))^2 + (y - 4)^2 = 16$.

From the standard form $(x - h)^2 + (y - k)^2 = r^2$, $h = -3$ and $k = 4$.

Thus, the center of the circle is at the point $(-3, 4)$.

9. In triangle DEF, the measure of angle D is 55°, the measure of angle E is 90°, and the measure of angle F is $\frac{m}{3}°$. What is the value of m?

Answer

105

Solution

This problem aims to test the student's understanding of the properties of angles in a triangle, specifically the fact that the sum of the angles in a triangle is always 180°. To solve this problem, a student needs to recall that the sum of the angles in a triangle is 180°. Given the measures of angles D and E, the student should set up an equation: $55° + 90° + \frac{m}{3}° = 180°$. Solving this equation will yield the value of m.
Remember to first add the known angles together. Once you have their sum, subtract it from 180° to find the measure of angle F. Then, solve for m by multiplying both sides of the equation by 3.
Be careful with arithmetic operations, especially when dealing with fractions. Ensure that you correctly perform the multiplication step to solve for m.
This type of problem reinforces the fundamental concept of the sum of angles in a triangle being 180°. It also assesses basic algebraic manipulation skills. On the SAT, such problems test both your geometric knowledge and your ability to apply algebraic techniques efficiently. Practice problems like these to enhance your speed and accuracy.

Calculate the sum of angles D and E: $55° + 90° = 145°$.
Set up the equation for the sum of angles in the triangle: $145° + \frac{m}{3}° = 180°$.
Subtract 145° from both sides to isolate $\frac{m}{3}$: $\frac{m}{3} \circ = 180 \circ - 145 \circ$.
This simplifies to $\frac{m}{3} \circ = 35 \circ$.
Multiply both sides by 3 to solve for m: $m = 35 \times 3$.
This results in $m = 105$.

10. One solution to the given equation can be written as $x = \frac{-7+\sqrt{k}}{2}$, where k is a constant. What is the value of k? $x^2 + 7x + 10 = 0$

A. 9

B. 16

C. 25

D. 36

Answer

A

Solution

The problem aims to test the student's understanding of solving quadratic equations using the quadratic formula. It specifically evaluates the student's ability to identify and manipulate the components of the formula, and to recognize the relationship between the given solution and the quadratic equation.
To solve the problem, follow these steps:
1. Recognize that the given equation is in the standard quadratic form, $ax^2 + bx + c = 0$.
2. Use the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to solve for x.
3. Compare the given solution form with the quadratic formula to identify the discriminant $\sqrt{k}$ and solve for the value of k.

Remember that the quadratic formula is derived from completing the square of a quadratic equation. The discriminant $b^2 - 4ac$ under the square root sign determines the nature of the roots. In this case, equate the discriminant to k and solve for it.
Be careful with signs when working with the quadratic formula. It's easy to make mistakes with negative signs, especially when dealing with the term $-b$ and the discriminant. Also, ensure you correctly identify the values of a, b, and c from the quadratic equation.
This type of problem is common on the SAT and tests a student's ability to apply the quadratic formula accurately. The key skills evaluated include recognizing the standard form of a quadratic equation, correctly applying the quadratic formula, and manipulating algebraic expressions. Mastery of these skills is essential for success in advanced mathematics topics on the SAT.

The standard form of the quadratic equation is $ax^2 + bx + c = 0$ where a=1, b=7, c=10.

Using the quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Substitute values: $x = \frac{-7 \pm \sqrt{7^2 - 4 \times 1 \times 10}}{2 \times 1}$.

Calculate the discriminant: $b^2 - 4ac = 7^2 - 4 \times 1 \times 10 = 49 - 40 = 9$.

Complete the formula: x = $\frac{-7 \pm \sqrt{9}}{2}$.

Thus, k = 9.

Digital

SAT Math

11

SAT Math Problems

1. A car travels at a speed of 5.2 meters per second. What is this speed in kilometers per hour, rounded to the nearest tenth? (Use 1 kilometer = 1,000 meters.)

A. 18.5 km/h

B. 18.6 km/h

C. 18.7 km/h

D. 18.8 km/h

2. A car is traveling at a speed of 5.6 meters per second. What is this speed in kilometers per hour, rounded to the nearest tenth? (Use 1 kilometer = 1,000 meters)

3. The given equation relates the positive numbers a, x, and b. Which equation correctly expresses x in terms of a and b? $a + 20 = \frac{x}{b}$

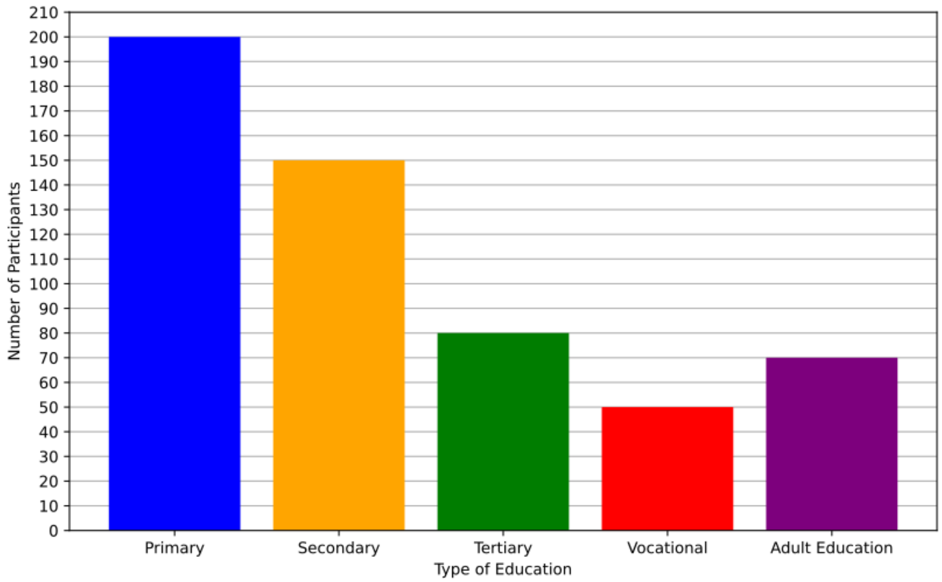
A. $x = ab$

B. $x = ab + 20b$

C. $x = a + 20b$

D. $x = \frac{a}{b} + 20$

4. Refer to the bar graph above. Which two categories of education combined represent exactly 40% of the total number of participants in the study?



A. Primary and Tertiary

B. Secondary and Adult Education

C. Primary and Vocational

D. Primary and Secondary

5. What value of x is the solution to the equation $15x - 5 = 10x + 30$?

A. 5

B. 6

C. 7

D. 8

6. Carlos runs a small bakery and sold 250 pastries this week. He plans to save 15% of these pastries to donate to a local shelter. How many pastries will Carlos save for donation?

A. 35

B. 37

C. 38

D. 40

7. In triangle DEF, the measure of angle D is 32°, the measure of angle E is 90°, and the measure of angle F is $\frac{m}{3}$°. What is the value of m?

A. 162

B. 168

C. 174

D. 180

8. After a space survey of Mars, 30% of the estimated resources were deemed suitable for extraction. If 1400 units of suitable resources were found, how many units of resources were initially estimated?

A. 4667 units

B. 4800 units

C. 4500 units

D. 4200 units

9. What is the median of the following data set? data set = [15, 22, 8, 34, 10]

A. 10

B. 15

C. 22

D. 34

10. A city government decides to invest in a new public transportation system to boost the local economy. The growth of the local economy, measured in millions of dollars, can be modeled by the function $f(t) = 500(1.05)^{\frac{t}{2}}$, where t is the number of years since the investment was made. What will be the approximate growth of the local economy after 6 years?

SAT Math Solutions

1. A car travels at a speed of 5.2 meters per second. What is this speed in kilometers per hour, rounded to the nearest tenth? (Use 1 kilometer = 1,000 meters.)

A. 18.5 km/h

B. 18.6 km/h

C. 18.7 km/h

D. 18.8 km/h

Answer

C

Solution

This problem tests the student's ability to convert units of speed from meters per second to kilometers per hour. It assesses understanding of unit conversion principles and multiplication skills.
To solve this problem, students need to first understand the conversion factor between meters and kilometers, and seconds and hours. The speed is given in meters per second, and it needs to be converted to kilometers per hour. This requires multiplying the speed by the conversion factors: 1,000 meters per kilometer and 3,600 seconds per hour.
Remember that 1 kilometer is 1,000 meters and there are 3,600 seconds in an hour. To convert from meters per second to kilometers per hour, multiply the speed by 3.6 (since $\frac{3{,}600}{1{,}000} = 3.6$).
A common mistake is to forget to convert both the meters to kilometers and the seconds to hours. Ensure to multiply by 3.6, not 3,600 or 1,000, as this already accounts for both conversions.
This type of problem is common in SAT exams as it evaluates the student's ability to perform unit conversions, which is essential in solving real-world problems. By practicing such questions, students can improve their accuracy and speed in handling unit conversion tasks, which are key skills in the Problem Solving and Data Analysis section.

Start with the speed in meters per second: 5.2 m/s.
Convert meters to kilometers by multiplying by 0.001: 5.2 m/s × 0.001 km/m = 0.0052 km/s.
Convert seconds to hours by multiplying by 3,600: 0.0052 km/s × 3600 s/h = 18.72 km/h.

The speed in kilometers per hour is 18.72 km/h, which is rounded to the nearest tenth as 18.7 km/h.

2. A car is traveling at a speed of 5.6 meters per second. What is this speed in kilometers per hour, rounded to the nearest tenth? (Use 1 kilometer = 1,000 meters)

Answer

20.2

Solution

This problem tests the student's ability to convert units, specifically from meters per second to kilometers per hour. It examines their understanding of basic unit conversion and multiplication principles.
To solve this problem, the student should first recognize that they need to convert meters per second to kilometers per hour. They should multiply the given speed by 3.6, as there are 1,000 meters in a kilometer and 3,600 seconds in an hour. This conversion factor (3.6) is derived from dividing 3,600 by 1,000.
Remember that converting from meters per second to kilometers per hour involves a simple multiplication by 3.6. This is a common conversion factor and can save time if memorized. Additionally, ensure that you round the final answer to the nearest tenth as required by the problem.
Be careful not to confuse meters with kilometers or seconds with hours. Ensure that each step of the conversion is clear and that the multiplication is accurate. Watch out for rounding errors; check whether you are rounding to the nearest tenth as the problem specifies.
This problem is a straightforward test of unit conversion skills, which is a fundamental aspect of the 'Problem Solving and Data Analysis' category on the SAT. It's important to be familiar with common unit conversions and practice them regularly to improve speed and accuracy. Such problems assess practical math skills that are applicable in real-world scenarios, making them essential for SAT success.

To convert 5.6 meters per second to kilometers per hour, we first convert meters to kilometers.
$5.6 meters = 5.6 \times 0.001 kilometers = 0.0056 kilometers$.
Next, we convert the speed from per second to per hour by multiplying by the number of seconds in an hour.
$0.0056 kilometers/second \times 3600\ seconds/hour = 20.16 kilometers/hour$.
Rounding 20.16 to the nearest tenth gives us 20.2 kilometers/hour.

3. The given equation relates the positive numbers a, x, and b. Which equation correctly expresses x in terms of a and b? $a + 20 = \frac{x}{b}$

A. $x = ab$

B. $x = ab + 20b$

C. $x = a + 20b$

D. $x = \frac{a}{b} + 20$

Answer

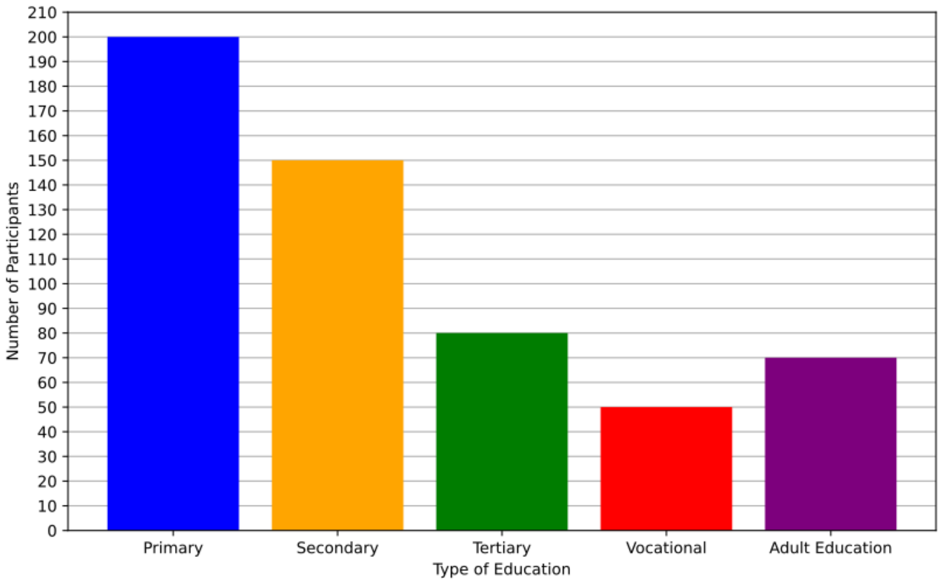
B

Solution

This question tests the student's ability to isolate a variable in an equation. Specifically, it assesses their skills in algebraic manipulation and operations with polynomials.
To isolate x, we need to perform algebraic operations to get x on one side of the equation by itself. Starting with the given equation, we should first eliminate the fraction by multiplying both sides by b.
When you encounter an equation with a fraction, a good first step is to eliminate the fraction by multiplying every term by the denominator. This often simplifies the equation and makes it easier to isolate the desired variable.
Be careful with the signs and operations when multiplying or dividing both sides of the equation. Also, ensure that you correctly apply the distributive property if needed.
This problem is a classic example of isolating a variable, a fundamental skill in algebra. It tests your ability to manipulate equations and understand algebraic relationships. Mastering this concept is crucial for higher-level math problems and is frequently tested in the SAT.

Start with the given equation: $a + 20 = \frac{x}{b}$.
Multiply both sides of the equation by b to eliminate the fraction: $b(a + 20) = x$.
Distribute b on the left-hand side: $x = ab + 20b$.
Thus, the expression for x in terms of a and b is $x = ab + 20b$.

4. Refer to the bar graph above. Which two categories of education combined represent exactly 40% of the total number of participants in the study?



A. Primary and Tertiary

B. Secondary and Adult Education

C. Primary and Vocational

D. Primary and Secondary

Answer

B

Solution

This problem tests the student's ability to interpret and analyze data presented in a bar graph. The student must understand how to calculate percentages and combine data from different categories to reach a specific target percentage.
To solve this problem, the student should first determine the total number of participants by summing up the values for all categories shown in the bar graph. Next, calculate the individual percentages for each category. The student should then look for two categories whose combined percentage equals 40% of the total number of participants.
Start by carefully writing down the values for each category as shown in the bar graph. Make sure you accurately calculate the total and the percentages for each category. It may be helpful to list all the percentages in order so that you can easily

identify pairs that sum to 40%.
Be cautious not to overlook any category when calculating the total participants. Double-check your addition and percentage calculations to ensure accuracy. Remember that small errors in these calculations can lead to incorrect conclusions. This problem is a classic example of interpreting graphical data, a common skill tested in SAT's Problem Solving and Data Analysis section. It requires careful reading of the graph and precise arithmetic skills. Mastery of these skills demonstrates an ability to interpret and work with data, a key competency for academic and real-world problem solving.

First, calculate the total number of participants: 200 (Primary) + 150 (Secondary) + 80 (Tertiary) + 50 (Vocational) + 70 (Adult Education) = 550.
Calculate 40% of the total: $0.40 \times 550 = 220$.
Check combinations:
Option A: Primary (200) + Tertiary (80) = 280, which is not equal to 220.
Option B: Secondary (150) + Adult Education (70) = 220, which is equal to 320.
Option C: Primary (200) + Vocational (50) = 250, which is not equal to 220.
Option D: Primary (200) + Secondary (150) = 350, which is equal to 350, not 220.
Therefore, Answer is B) Secondary and Adult Education

5. What value of x is the solution to the equation $15x - 5 = 10x + 30$?

A. 5

B. 6

C. 7

D. 8

Answer

C

Solution

This problem is designed to assess the student's ability to solve basic linear equations. It tests the understanding of isolating the variable on one side of the equation and simplifying expressions.
To solve the equation $15x - 5 = 10x + 30$, the student should first move all terms involving x to one side and constant terms to the other side. This can be done by subtracting $10x$ from both sides, resulting in $5x - 5 = 30$. Then, add 5 to both sides to isolate the term with x, resulting in $5x = 35$. Finally, divide both sides by 5 to solve for x, giving $x = 7$.
A useful tip is to always perform the same operation on both sides of the equation to maintain equality. Keeping track of positive and negative signs while rearranging terms is crucial. It might be helpful to write down each step to avoid mistakes.
Be cautious about sign errors when moving terms across the equals sign. Common mistakes include forgetting to change the sign of terms or not simplifying completely. Also, ensure that you divide correctly at the last step to find the correct value of x.
This type of problem is fundamental in algebra and is commonly found on the SAT. It evaluates a student's ability to manipulate and solve linear equations accurately. Mastery of these basic algebraic skills is essential as they are the building blocks for more complex math problems on the test. Practicing problems like this enhances precision and speed, which are crucial in a timed test environment.

Step 1: Start with the equation $15x - 5 = 10x + 30$.
Step 2: Subtract 10x from both sides to get $15x - 10x - 5 = 30$.
Step 3: Simplify the equation to $5x - 5 = 30$.
Step 4: Add 5 to both sides to get $5x = 35$.
Step 5: Divide both sides by 5 to isolate x, giving $x = 7$.

6. Carlos runs a small bakery and sold 250 pastries this week. He plans to save 15% of these pastries to donate to a local shelter. How many pastries will Carlos save for donation?

A. 35

B. 37

C. 38

D. 40

Answer

C

Solution

This problem aims to assess the student's ability to work with percentages, specifically calculating a given percentage of a total quantity. It tests their understanding of basic percentage concepts and their ability to apply these concepts in a real-world context.
To solve this problem, the student needs to calculate 15% of 250 pastries. This can be done by converting the percentage to a decimal and multiplying it by the total number of pastries. The steps are as follows: (1) Convert 15% to a decimal (0.15), (2) Multiply 0.15 by 250.
A quick way to calculate percentages is to use the formula: $\frac{Percentage}{100} \times Total$. In this case, you can also break it down into simpler steps: first, find 10% of 250, which is 25, and then find 5% of 250, which is half of 10%, hence 12.5. Adding these two results $(25 + 12.5)$ gives you the final answer.
Be careful when converting percentages to decimals. A common mistake is to forget to move the decimal point two places to the left. Also, double-check your multiplication to ensure accuracy. This problem is a straightforward percentage calculation, a fundamental skill in problem-solving and data analysis. Mastery of this type of question is crucial as it forms the basis for more complex percentage-related problems. Practice and familiarity with percentage conversions and calculations will make these questions easier and faster to solve on the SAT.

Step 1: Convert percentage to a decimal: $15\% = 0.15$.
Step 2: Multiply the total number of pastries by the decimal to find the number to be saved.
Calculation: 250 pastries × 0.15 = 37.5.
Step 3: Since Carlos cannot save half a pastry, we round the number to the nearest whole number, which is 38.

7. In triangle DEF, the measure of angle D is 32°, the measure of angle E is 90°, and the measure of angle F is $\frac{m}{3}$°. What is the value of m?

A. 162

B. 168

C. 174

D. 180

Answer

C

Solution

This problem tests the student's understanding of the properties of angles in a triangle, particularly the fact that the sum of the interior angles in a triangle is always 180 degrees. It also requires the student to solve for a variable within a given expression.
To solve this problem, recognize that the sum of the angles in any triangle is 180 degrees. Given that angle E is 90 degrees, angle D is 32 degrees, and angle F is expressed as $\frac{m}{3}$ degrees, set up an equation: $32 + 90 + \frac{m}{3} = 180$. Solve this equation for m by first combining the known angles and then isolating the variable.
Remember that for any triangle, the sum of the interior angles is always 180 degrees. Also, pay attention to how the angle F is expressed in terms of m. Rearranging and solving linear equations accurately will help you find the correct value of m.
Be careful with arithmetic operations, especially when working with fractions. Ensure that you properly isolate the variable m after combining like terms. Common mistakes include arithmetic errors or miscalculating the value of expressions.
This problem is a classic example of testing the understanding of basic geometric principles such as the sum of interior angles in a triangle. It requires algebraic manipulation skills to isolate and solve for a variable. Such questions are designed to evaluate both geometric understanding and algebraic problem-solving abilities. Mastery of these concepts is crucial for success in the SAT math section.
The sum of the angles in triangle DEF is: 32° + 90° + F = 180°

Substituting the given measures: 32° + 90° + $\frac{m}{3}$° = 180°

Combine the known angles: 122° + $\frac{m}{3}$° = 180°

Subtract 122° from both sides: $\frac{m}{3}$° = 58°

Solve for m by multiplying both sides by 3: m = 58° $\times$ 3 Calculate m: m = 174°

8. After a space survey of Mars, 30% of the estimated resources were deemed suitable for extraction. If 1400 units of suitable resources were found, how many units of resources were initially estimated?

A. 4667 units

B. 4800 units

C. 4500 units

D. 4200 units

Answer

A

Solution

This question tests the student's ability to understand and manipulate percentages in a real-world context. Specifically, it requires knowledge of how to reverse engineer percentage calculations to find an original quantity based on a given part.
The student should recognize that the 1400 units represent 30% of the total estimated resources. To find the total estimated resources, the student can set up the equation $0.30 \times Total\ Resources = 1400$ and solve for Total Resources.
To find the total from a percentage, divide the given part (1400 units) by the percentage (as a decimal). So, calculate $\frac{1400}{0.30}$ to find the total estimated resources.
Be careful not to confuse 30% as a decimal. Remember to convert percentages to decimals by dividing by 100. Additionally, ensure that calculations are done accurately to avoid simple arithmetic errors.
This problem is a classic example of percentage problems that require reversing the calculation process to find the original quantity. It assesses the student's ability to convert percentages to decimals and solve equations. Mastery of such problems is crucial as it often appears in various real-world applications, making it an essential skill for SAT problem-solving sections.

Set up the equation: $0.30 \times x = 1400$.
Divide both sides by 0.30 to solve for x.
$x = \frac{1400}{0.30}$.
x = 4666.6666666667.
Round x to the nearest integer (or whole unit): x = 4667.

9. What is the median of the following data set? data set = [15, 22, 8, 34, 10]

A. 10

B. 15

C. 22

D. 34

Answer

B

Solution

This problem tests the student's understanding of how to find the median of a data set. It requires the student to know the steps involved in arranging the data in ascending order and identifying the middle value.
To find the median, the student must first arrange the given data set in ascending order. After arranging, the student should identify the middle value in the ordered list. If the number of data points is odd, the median is the middle number. If the number of data points is even, the median is the average of the two middle numbers.
When arranging the data set, ensure each number is placed correctly in ascending order. Count the total number of data points to determine whether the number of points is odd or even. If even, remember to calculate the average of the two middle numbers to find the median.
A common mistake is to forget to arrange the data in ascending order before identifying the median. Another error to watch out for is miscalculating the average if the number of data points is even. Double-check your ordered list and calculations.
This type of problem is fundamental in understanding data analysis and statistics. Accurately identifying the median is a crucial skill, as it helps in understanding the center of a data distribution. Practicing such problems can improve attention to detail and accuracy in data handling, which are essential skills for the SAT.

Step 1: Arrange the numbers in ascending order: [8, 10, 15, 22, 34].
Step 2: Identify the middle value. Since there are 5 numbers (an odd number), the median is the third number in the ordered set.
Step 3: Therefore, the median is 15.

10. A city government decides to invest in a new public transportation system to boost the local economy. The growth of the local economy, measured in millions of dollars, can be modeled by the function $f(t) = 500(1.05)^{\frac{t}{2}}$, where t is the number of years since the investment was made. What will be the approximate growth of the local economy after 6 years?

Answer

578.8125

Solution

This problem tests the student's ability to understand and work with exponential growth models, specifically applying the exponential function to calculate the future value of an investment over time. It assesses the student's understanding of evaluating exponential functions and interpreting the parameters of the exponential model in a real-world context.
To solve this problem, recognize that you need to evaluate the given exponential function at $t = 6$. Substitute $t = 6$ into the function $f(t) = 500(1.05)^{\frac{t}{2}}$ to calculate the growth of the local economy after 6 years. Simplify the exponent first, which involves division, and then calculate the power of 1.05 before multiplying by 500.
First, simplify the exponent by dividing the number of years, 6, by 2 to make it easier to handle: $\frac{6}{2} = 3$. Then calculate $(1.05)^3$. Use a calculator for accuracy to ensure you get the precise value. Finally, multiply the result by 500 to find the approximate growth.
Be careful with the order of operations. Ensure you handle the exponentiation before multiplication. Additionally, remember to use a calculator for accurate calculations, especially since exponential computations can be prone to error if done manually. Double-check the division and exponentiation steps as they are crucial.
This problem is representative of typical SAT questions involving exponential growth models. It is designed to evaluate a student's proficiency in interpreting and manipulating exponential equations, an essential skill in advanced math.
Successfully solving this problem demonstrates the ability to apply mathematical concepts to real-world scenarios, which is a key objective of the SAT Math section.

Substitute $t = 6$ into the function: $f(6) = 500(1.05)^{\frac{6}{2}}$.
Simplify the exponent: $\frac{6}{2} = 3$.
Calculate $f(6) = 500(1.05)^{\frac{6}{2}}$.
First, calculate $(1.05)^3 = 1.05 \times 1.05 \times 1.05 = 1.157625$.
Multiply by 500: $f(6) = 500 \times 1.157625 = 578.8125$.
Thus, the approximate growth of the local economy after 6 years is 578.8125 million dollars.

Digital

SAT Math

12

SAT Math Problems

1. What value of x is the solution to the equation $15x - 9 = 6x + 12$?

2. A city is planning to build a series of parks to accommodate the rising urban population. Each park will be in the shape of a rectangular prism, with a height of 15 feet. If the length of the park's base is represented by the variable y feet, and its width is 2 feet less than the length, which function P gives the volume of the park in cubic feet in terms of the length of the park's base?

A. $P(y) = 15y^2 + 30y$

B. $P(y) = 15(y - 2)^2$

C. $P(y) = 15y^2 - 30y$

D. $P(y) = y^2 - 2y + 15$

3. What is the y-intercept of the function $f(x) = 5(2)^x$ in the xy-plane?

A. 1

B. 3

C. 5

D. 7

4. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, 5). Which equation defines g?

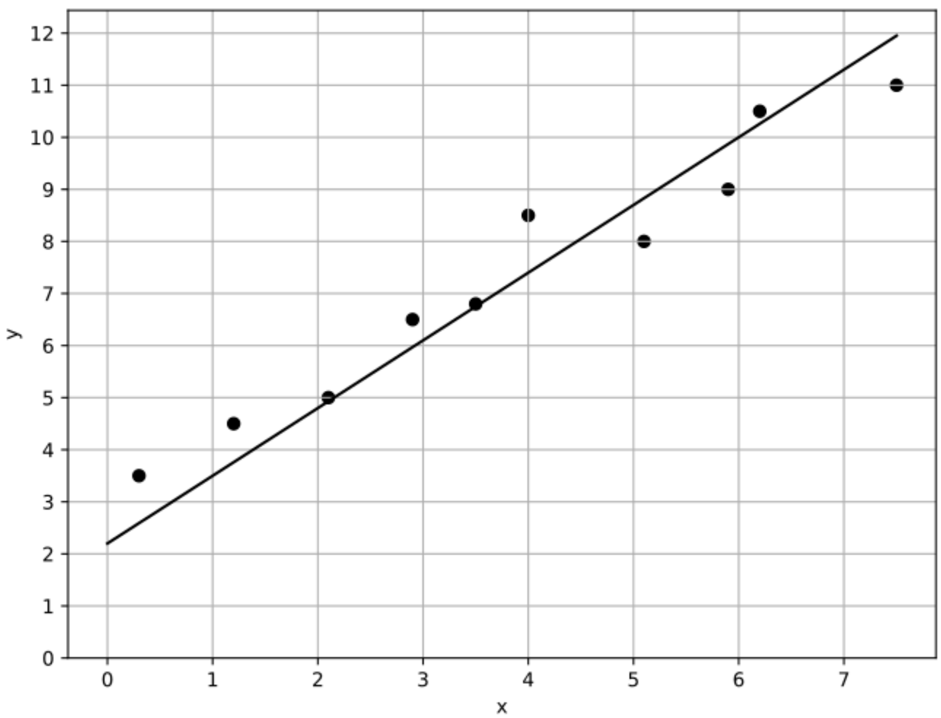
A. $y = 12x + 5$

B. $y = 12x - 5$

C. $y = -12x + 5$

D. $y = 5x + 12$

5. Which of the following equations best represents the line of best fit shown in the scatter plot?



A. $y = 2.2 + 1.3x$

B. $y = 2.2 - 1.3x$

C. $y = -2.2 + 1.3x$

D. $y = -2.2 - 1.3x$

6. The table gives the perimeters of similar triangles DEF and GHI, where DE corresponds to GH. If the length of DE is 16, what is the length of GH?

Triangle	Perimeter
Triangle DEF	80
Triangle GHI	240

A. 24

B. 32

C. 48

D. 64

7. The equation relates the quantities a, x, and z. Which equation correctly expresses x in terms of a and z? $a + 25 = \frac{x}{z}$

A. $x = \frac{a+25}{z}$

B. $x = \frac{z}{a+25}$

C. $x = a + 25z$

D. $x = az + 25z$

8. The function R models the number of devices connected to a 5G network in millions, t years after 2020. The growth of the network follows the model: $R(t) = 50(1.05)^{4t}$. What is the annual percentage growth rate of devices connected to the 5G network based on this model?

9. A wind turbine generates electricity at a constant rate of 15 kilowatts per hour. If this turbine operates for h hours, the total electricity generated, represented by the function $E(h)$, can be given by the equation $E(h) = 15h$. How many kilowatts of electricity does this turbine generate after 5 hours? Additionally, how much electricity is generated per hour?

A. 70, 12

B. 75, 15

C. 80, 18

D. 65, 10

10. Circle A has a radius of 5 centimeters (cm). Circle B has an area of $64\pi cm^2$. What is the total area, in cm^2, of circles A and B?

SAT Math Solutions

1. What value of x is the solution to the equation $15x - 9 = 6x + 12$?

Answer

$\frac{7}{3}$

Solution

This problem tests the student's ability to solve basic linear equations. The student needs to understand the concept of isolating the variable on one side of the equation to find its value.
To solve this equation, the student should first move all terms containing x to one side and constant terms to the other side. This can be done by subtracting 6x from both sides to get $9x - 9 = 12$. Then, add 9 to both sides to obtain $9x = 21$
Always simplify the equation step by step. After moving terms, check to ensure all x terms are on one side and constants on the other. Simplify fractions if possible at the end to get the final answer.
Be careful with the signs when moving terms from one side to the other. It's easy to make a mistake with positive and negative signs, which can lead to the wrong answer. Also, ensure to simplify your final answer.
This type of problem is fundamental in algebra and is crucial for understanding more complex equations. It's important to master these basic steps of moving terms and simplifying, as they form the foundation for solving a variety of algebraic problems on the SAT. Practice will help in reducing errors and increasing speed in solving such equations.

Start with the equation: $15x - 9 = 6x + 12$.
Subtract 6x from both sides to gather x terms on one side: $15x - 6x - 9 = 12$.
This simplifies to: $9x - 9 = 12$.
Add 9 to both sides to isolate the x term: $9x - 9 + 9 = 12 + 9$.
This gives: $9x = 21$.
Divide both sides by 9 to solve for x: $x = \frac{21}{9}$.
Simplify the fraction: $x = \frac{7}{3}$.
The solution is $x = \frac{7}{3}$, which is the improper fraction form.

2. A city is planning to build a series of parks to accommodate the rising urban population. Each park will be in the shape of a rectangular prism, with a height of 15 feet. If the length of the park's base is represented by the variable y feet, and its width is 2 feet less than the length, which function P gives the volume of the park in cubic feet in terms of the length of the park's base?

A. $P(y) = 15y^2 + 30y$

B. $P(y) = 15(y - 2)^2$

C. $P(y) = 15y^2 - 30y$

D. $P(y) = y^2 - 2y + 15$

Answer

C

Solution

The problem aims to assess the student's understanding of polynomial functions and their application in real-world scenarios. Specifically, it tests the ability to set up and manipulate expressions for volume in terms of polynomial functions.
To solve this problem, students need to understand the formula for the volume of a rectangular prism, which is length × width × height. Given the height and the relationship between length and width, students need to express the width in terms of the given variable y and then set up a function P(y) representing the volume.
Start by explicitly writing down the relationships: the width is y - 2 feet, and the height is 15 feet. Then substitute these values into the volume formula. Remember, the expression for the volume will be a polynomial in terms of y.
Be careful not to confuse the dimensions. Ensure you subtract correctly when determining the width. Also, watch out for simple arithmetic errors when expanding the polynomial expression.
This problem is a classic example of applying algebraic concepts to geometric shapes, a skill frequently tested in SAT Math. It evaluates the ability to derive expressions from given conditions and manipulate them into the required format. Mastering these types of problems will boost your confidence in handling complex word problems involving polynomials.

Using the formula $V = length \times width \times height$, plug in the values for length, width and height: $V = y \times (y - 2) \times 15$
First, multiply y by (y - 2):, $y(y - 2) = y^2 - 2y$, Then multiply the result by the height 15: $V = 15(y^2 - 2y)$

Distribute the 15: $V = 15y^2 - 30y$

Thus, the function P that gives the volume of the park is $P(y) = 15y^2 - 30y$.

3. What is the y-intercept of the function $f(x) = 5(2)^x$ in the xy-plane?

A. 1

B. 3

C. 5

D. 7

Answer

C

Solution

This problem is designed to test the student's understanding of exponential functions and specifically their ability to determine the y-intercept of such a function.
To find the y-intercept of the function, the student needs to evaluate the function at $x = 0$. This is because the y-intercept is the point where the graph intersects the y-axis, which occurs when x is 0.
Remember that for any function $y = f(x)$, the y-intercept can be found by calculating $f(0)$. For exponential functions of the form $y = a(b)^x$, substitute $x = 0$ to find the y-intercept as $a \times b^0 = a$.
Be careful not to confuse the x-intercept with the y-intercept. The x-intercept occurs when $y = 0$, which is not relevant in this problem. Also, remember that any number raised to the power of 0 is 1.
This type of problem is straightforward once you understand the concept of the y-intercept in a function. It evaluates the student's ability to apply basic principles of exponential functions and substitution. Mastering this concept is crucial as it is foundational for solving more complex problems involving exponential growth and decay in the SAT math section.

Set $x = 0$ in the function: $f(0) = 5(2)^0$.
Simplify the expression: $2^0 = 1$, so $f(0) = 5 \times 1$.
Thus, the y-intercept is $f(0) = 5$.

4. For the linear function g, the graph of $y = g(x)$ in the xy-plane has a slope of 12 and passes through the point (0, 5). Which equation defines g?

A. $y = 12x + 5$

B. $y = 12x - 5$

C. $y =- 12x + 5$

D. $y = 5x + 12$

Answer

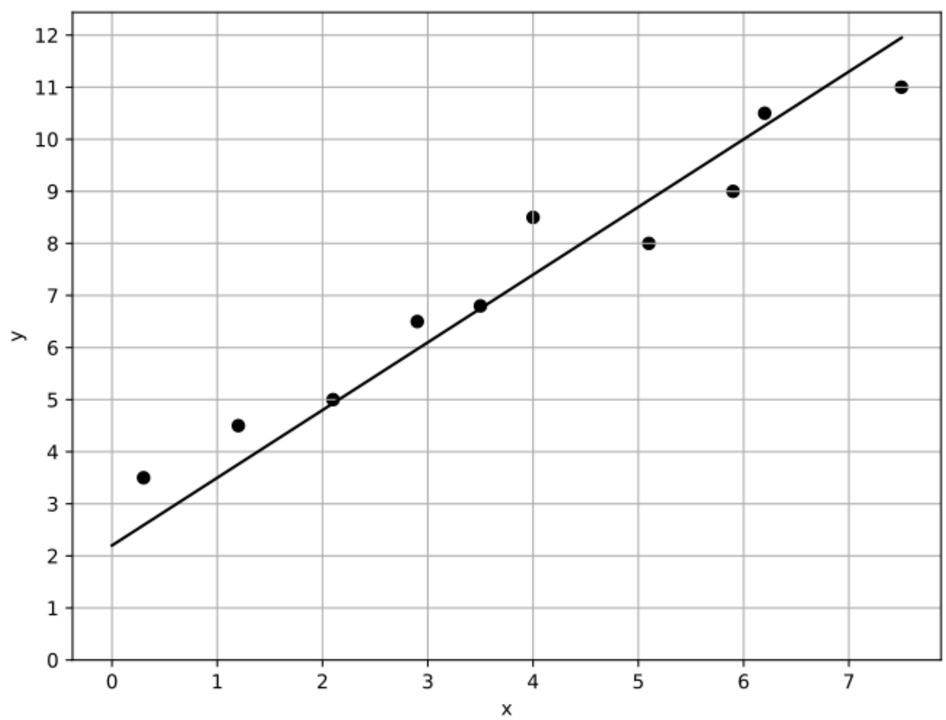
A

Solution

This problem tests the student's understanding of the equation of a linear function, specifically identifying and using the slope-intercept form. It checks if the student knows how to apply the concept of slope and y-intercept to find the equation of a line.
To solve this problem, the student should recognize that the slope-intercept form of a linear equation is y = mx + b, where m represents the slope and b represents the y-intercept. Given the slope (m) is 12 and the y-intercept (b) is 5 (since the line passes through (0, 5)), the equation becomes $y = 12x + 5$.
Remember that in the slope-intercept form $y = mx + b$, m is the slope and b is the y-intercept, which is the point where the line crosses the y-axis. Substitute the given values directly into this form to find the equation quickly.
Be careful not to confuse the x-intercept with the y-intercept. Also, ensure that you correctly substitute the slope and y-intercept into the equation form without mixing them up. Double-check that the point given (0, 5) confirms the y-intercept directly.
This problem is straightforward if you are familiar with the slope-intercept form of linear equations. It assesses your ability to interpret and apply basic algebraic concepts in graphing linear functions. Practicing these types of problems can help reinforce your understanding of linear equations and their graphical representations, which are fundamental in algebra. On the SAT, such questions evaluate your capacity to quickly and accurately apply algebraic principles.

For a linear function with slope m and y-intercept b, the equation can be written as $y = mx + b$.
Given the slope $m = 12$ and the line passes through the point (0, 5), the y-intercept (b) is 5.
Therefore, the equation of the line is $y = 12x + 5$.

5. Which of the following equations best represents the line of best fit shown in the scatter plot?



A. $y = 2.2 + 1.3x$

B. $y = 2.2 - 1.3x$

C. $y = - 2.2 + 1.3x$

D. $y = - 2.2 - 1.3x$

Answer

A

Solution

The problem aims to assess a student's ability to understand and interpret scatter plots, specifically in identifying the line of best fit. It tests the student's knowledge of linear equations and how they relate to data representation in plots.
Students should begin by analyzing the scatter plot to identify the general trend of the data points. They must understand that the line of best fit is a line that best represents the data points by minimizing the distance of each point from the line.

Then, students should compare the slope and y-intercept of the given linear equations to the trend observed in the scatter plot.
Focus on the overall direction of the data points. If they generally increase, the slope will be positive; if they decrease, the slope will be negative. Estimate the y-intercept by observing where the line of best fit crosses the y-axis. This helps in matching the visual trend to the correct equation.
Be wary of outliers that can skew your perception of the line of best fit. Also, ensure you understand the scale of both axes, as misinterpretation can lead to selecting an incorrect equation. Double-check that the slope and y-intercept of your chosen equation logically represent the plotted data.
This type of question is common in the SAT as it evaluates a student's ability to connect algebraic concepts with data interpretation. Mastery of scatter plots and the concept of lines of best fit is crucial not only for the SAT but also for real-world data analysis. Understanding these concepts will aid in solving similar problems efficiently.

Looking at the provided graph through code, we can see a positive slope as the general trend of the data points is upwards as x increases.
The slope and intercept are estimated as $m = 1.3$ and $b = 2.2$.
The graph shows that both the slope and the intercept are positive, indicating the option with positive values for both.
Thus, option 1) $y = 2.2 + 1.3x$ best represents the line of best fit.

6. The table gives the perimeters of similar triangles DEF and GHI, where DE corresponds to GH. If the length of DE is 16, what is the length of GH?

Triangle	Perimeter
Triangle DEF	80
Triangle GHI	240

A. 24

B. 32

C. 48

D. 64

Answer

C

Solution

This problem tests the student's understanding of the concept of similarity in geometry, particularly focusing on how the perimeters and corresponding side lengths of similar triangles are related.
To solve this problem, the student should recognize that the perimeters of similar triangles are proportional to the corresponding side lengths. Given the perimeter of both triangles, the student can set up a proportion to find the missing length of GH.
Remember that the ratio of any pair of corresponding side lengths in similar triangles is equal to the ratio of their perimeters. Use this ratio to set up a proportion between the length of DE and GH.
Be careful to ensure that the sides being compared are indeed corresponding sides.
Also, make sure to solve the proportion correctly to avoid calculation errors.
This type of problem is common in SAT geometry questions as it assesses the ability to apply the properties of similar figures, which is a fundamental concept in geometry. Mastery of setting up and solving proportions is crucial for these problems. Practicing similar problems can improve speed and accuracy in solving them during the test.

For similar triangles, the ratio of the lengths of corresponding sides is equal to the ratio of their perimeters., Given: DE corresponds to GH, Perimeter of DEF = 80, Perimeter of GHI = 240.
The ratio of the perimeters is 80:240, which simplifies to 1:3.
Therefore, the ratio of DE to GH is also 1:3.

If DE = 16, then GH must be 16 multiplied by this ratio, 3.
Hence, $GH = 16 \times 3 = 48$.

7. The equation relates the quantities a, x, and z. Which equation correctly expresses x in terms of a and z? $a + 25 = \frac{x}{z}$

A. $x = \frac{a+25}{z}$

B. $x = \frac{z}{a+25}$

C. $x = a + 25z$

D. $x = az + 25z$

Answer

D

Solution

This problem tests the student's ability to manipulate and isolate a variable in an algebraic equation, specifically involving operations with polynomials and fractions. To solve for x, you need to express x in terms of a and z. Start by isolating the fraction on one side of the equation by subtracting 25 from both sides, then multiply both sides by z to solve for x.
Remember that solving for a variable often involves reversing operations. In this case, you need to handle both addition and division to isolate x. Keep your operations clear and systematic.
A common mistake is forgetting to multiply the entire expression by z. Ensure that you apply operations to both sides of the equation correctly. Also, be cautious with the signs when subtracting and multiplying.
This problem is a classic example of isolating a variable within an algebraic equation. It assesses algebraic manipulation skills, which are crucial for advanced mathematics. Mastering these skills is essential for solving more complex equations efficiently on the SAT.

Given the equation: $a + 25 = \frac{x}{z}$.
Step 1: Multiply both sides by z to eliminate the fraction: $(a + 25)z = x$.
Step 2: Express x in terms of a and z: $x = az + 25z$.

8. The function R models the number of devices connected to a 5G network in millions, t years after 2020. The growth of the network follows the model: $R(t) = 50(1.05)^{4t}$. What is the annual percentage growth rate of devices connected to the 5G network based on this model?

Answer

21.55

Solution

This problem is designed to test the student's understanding of exponential growth, specifically in interpreting and manipulating exponential functions. The student should be able to identify the growth factor and convert it into an annual percentage growth rate.
To solve this problem, the student should recognize that the function $R(t) = 50(1.05)^{4t}$ describes exponential growth. The base of the exponent, 1.05, represents the growth factor for each quarter of a year (since the exponent is 4t, meaning four times per year). To find the annual growth rate, the student needs to calculate $(1.05)^4$ and then convert this growth factor to a percentage.
First, calculate $(1.05)^4$ to find the annual growth factor. Then, subtract 1 from this result and multiply by 100 to convert it into a percentage. This will give you the annual percentage growth rate.
Be careful with the interpretation of the exponent. The model describes quarterly growth, so you need to calculate the annual growth factor by compounding the quarterly growth factor four times. Also, ensure that you perform the arithmetic operations accurately to avoid errors in the final percentage.
This problem is a typical example of how exponential functions are used to model real-world scenarios, such as network growth. It assesses the student's ability to manipulate and interpret exponential expressions and understand how growth factors translate into percentage growth rates. Mastery of these skills is crucial for solving a wide range of problems in advanced mathematics and real-world applications. By practicing these types of problems, students can improve their proficiency in handling exponential models, a common topic on the SAT.

To find the annual growth rate, we need to determine the equivalent growth factor for one year.
Given $R(t) = 50(1.05)^{4t}$
this represents growth every quarter, with a quarterly growth factor of 1.05.
In one year, there are 4 quarters, so we raise the quarterly growth factor to the power of 4 to find the annual growth factor.
The annual growth factor = $(1.05)^4$., Calculate $(1.05)^4$:

$(1.05)^2 = 1.05 \times 1.05 \times 1.05 \times 1.05 = 1.21550625$
The annual growth factor is 1.21550625.
Subtract 1 from the annual growth factor to determine the percentage increase.
$1.21550625 - 1 = 0.21550625$
Convert this decimal to a percentage: $0.21550625 \times 100 = 21.550625\%$
Rounding to the nearest whole number, the annual growth rate is approximately 21.55%.

9. A wind turbine generates electricity at a constant rate of 15 kilowatts per hour. If this turbine operates for h hours, the total electricity generated, represented by the function $E(h)$, can be given by the equation $E(h) = 15h$. How many kilowatts of electricity does this turbine generate after 5 hours? Additionally, how much electricity is generated per hour?

A. 70, 12

B. 75, 15

C. 80, 18

D. 65, 10

Answer

B

Solution

The problem tests the student's ability to understand and apply linear equations in the context of a real-world scenario, specifically focusing on the concept of the mean rate of change and interpreting linear functions.
First, identify the given linear equation $E(h) = 15h$, where $E(h)$ represents the total electricity generated in kilowatts and h represents the number of hours. To find the electricity generated after 5 hours, substitute h with 5 in the equation. Secondly, recognize that the rate of electricity generation per hour is the constant coefficient in the equation, which is 15 kilowatts per hour.
When dealing with linear equations, always identify the variables and constants clearly.
Substituting the given values into the equation step-by-step helps to avoid mistakes.
Remember that the coefficient of the variable (in this case, 15) indicates the rate of change per unit.
Ensure that you substitute the correct value for h and perform the multiplication accurately. It's easy to misinterpret the coefficient; remember that it represents a constant rate in this context. This type of algebra problem is common on the SAT, as it tests a student's ability to interpret and manipulate linear equations in a real-world context. Understanding how to apply linear functions and calculate mean rates of change is crucial. Practice with similar problems will improve accuracy and speed in solving these questions.
To find the total electricity generated after 5 hours, substitute $h = 5$ into the function $E(h)$:, $E(5) = 15 \times 5, E(5) = 75$
Therefore, the turbine generates 75 kilowatts of electricity after 5 hours.
The constant rate of electricity generation per hour is 15 kilowatts.

10. Circle A has a radius of 5 centimeters (cm). Circle B has an area of $64\pi cm^2$. What is the total area, in cm^2, of circles A and B?

Answer

89π

Solution

This problem tests the student's ability to apply the formula for the area of a circle and to perform basic arithmetic operations to find the total area of multiple circles. First, calculate the area of Circle A using the formula for the area of a circle, which is $A = \pi r^2$. Since Circle A has a radius of 5 cm, its area is $25\pi cm^2$. The area of Circle B is already given as $64\pi cm^2$. Add the areas of both circles to find the total area: $25\pi + 64\pi = 89\pi cm^2$.

Remember that the area of a circle is πr^2. Make sure to perform the arithmetic operations carefully. Since both areas are already expressed in terms of π, you can just add the coefficients of π directly.

Be careful not to confuse the radius with the diameter. Also, ensure that you do not attempt to multiply π by itself or perform any unnecessary calculations with π. The problem requires recognizing that the areas can be directly summed because they both include π.

This problem is a straightforward test of basic geometry knowledge, specifically the calculation of circle areas. It assesses a student's ability to apply a simple formula and handle algebraic expressions involving π. Problems like these are common on the SAT, where understanding fundamental concepts and executing simple calculations accurately are key to success.

Step 1: Calculate the area of Circle A using the formula $A = \pi r^2$.

Area of Circle $A = \pi \times (5cm)^2 = \pi \times 25cm^2 = 25\pi cm^2$.

Step 2: Add the area of Circle A to the area of Circle B to find the total area.

$Total\ Area = Area\ of\ Circle\ A + Area\ of\ Circle\ B = 25\pi cm^2 + 64\pi cm^2$.

Step 3: Combine the areas by adding the coefficients of π.

$Total\ Area = (25 + 64)\pi cm^2 = 89\pi cm^2$.

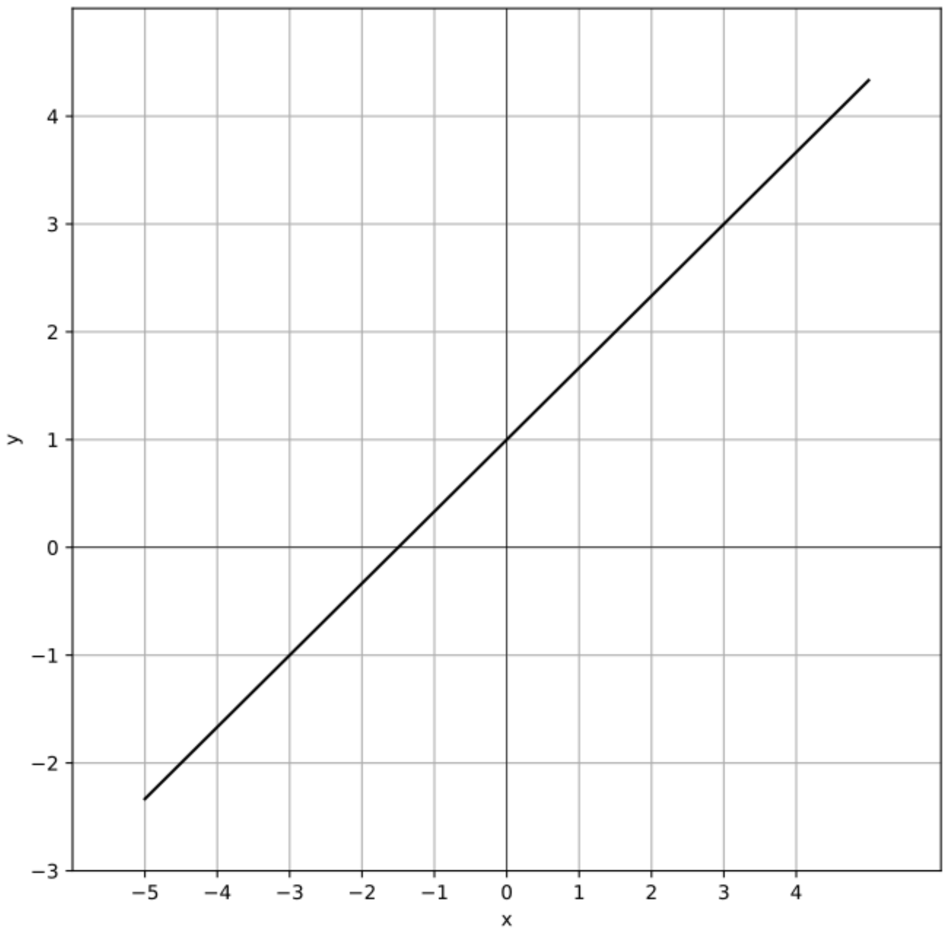
Digital

SAT Math

13

SAT Math Problems

1. What equation defines the linear function shown in the graph?



2. The function f is defined by $f(x) = \frac{2}{n}x - 10$, where n is an integer constant and $5 \leq n \leq 8$. For the graph of $y = f(x) + 15$ in the xy-plane, what is the x-coordinate of a possible x-intercept?

A. -13

B. -15

C. -17

D. -19

3. What is the median of the data set shown? data set = [3, 7, 9, 1, 5, 8, 2]

4. Rob holds a fundraising event for a political movement advocating for climate policy reform. If he raised $800 and decided to donate 15% of the funds to support a local environmental group, how much money will he donate?

A. $100

B. $110

C. $120

D. $130

5. A car travels at a constant acceleration of 4.5 meters per second squared. What is this acceleration, in feet per minute squared, rounded to the nearest tenth? (Use 1 foot = 0.3048 meters)

A. 53149.0

B. 53149.2

C. 53150.0

D. 53150.2

6. For a polynomial function, the graph of $y = f(x)$ in the xy-plane contains the points (2, 0), (3, 0), (-1, 0), and (5, 0). Which of the following must be a factor of $f(x)$?

A. $x^2 - 5x + 6$

B. $x^2 - 4x + 3$

C. $x^2 - 2x - 15$

D. $x^2 - 8x + 12$

7. A wooden cube used in a public health education demonstration has an edge length of 3 centimeters. If the cube weighs 5.61 grams, what is the density of the cube in grams per cubic centimeter?

A. 0.2068

B. 0.2070

C. 0.2082

D. 0.2078

8. Which expression is equivalent to $5x^4(3x^3 + 2x^2 - 7)$?

A. $15x^7 + 10x^6 - 35x^5$

B. $15x^7 + 10x^6 + 35x^4$

C. $15x^{12} + 10x^8 - 35x^4$

D. $15x^7 + 10x^6 - 35x^4$

9. Liam is collecting data on educational access for girls in a community. If the number of girls with access to education is 75% of the total number of girls, and the total number of girls is 540, how many girls have access to education?

10. What is the y-coordinate of the y-intercept of the graph of $y = f(x) - 3$ in the xy-plane? $f(x) = 2(5x - 4)$

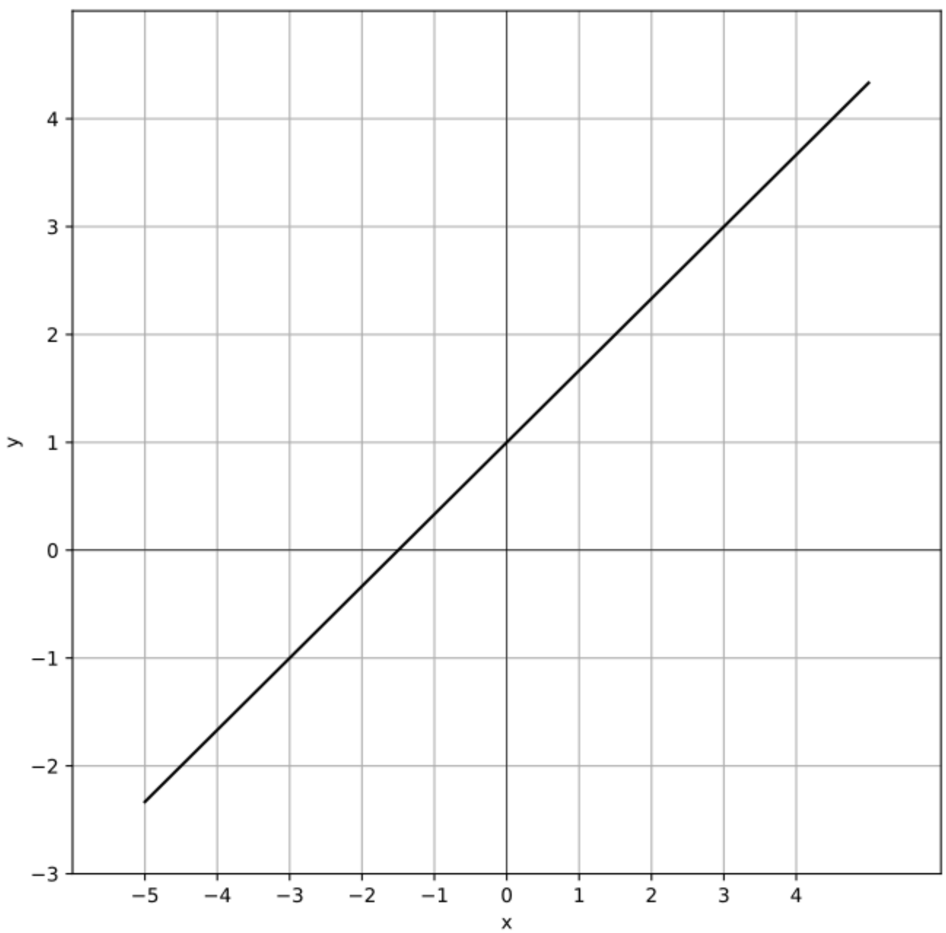
A. -11

B. -8

C. -5

D. -3

1. What equation defines the linear function shown in the graph?



Answer

$f(x) = \frac{2}{3}x + 1$

Solution

This problem tests the student's ability to understand and apply the concept of linear equations, specifically the slope-intercept form. The student must be able to

identify the slope and y-intercept from a graph and use these to formulate the equation of the line.
The student should recall the slope-intercept form of a linear equation, which is $y = mx + b$, where m is the slope and b is the y-intercept. Here, the slope m is given as $\frac{2}{3}$, and the y-intercept b is given as 1. Substituting these values into the equation will give the equation of the line.
Remember that the y-intercept is the point where the line crosses the y-axis, so it is always in the form of (0, b). Also, when given a slope, ensure you understand that it represents the rate of change or 'rise over run', which in this case is 2/3.
Be careful not to confuse the slope with the y-intercept. Also, ensure that you substitute the values correctly into the slope-intercept form. Watch out for common mistakes like reversing the numerator and denominator of the slope.
This type of problem is fundamental in understanding how linear equations represent straight lines in a graph. It reinforces the concept of the slope-intercept form and the importance of accurately identifying and applying the slope and y-intercept. Mastering this concept is crucial for solving more complex algebraic equations and understanding linear relationships in various contexts. In the SAT, such problems test the student's ability to quickly translate graphical information into algebraic expressions, a vital skill for success.

Find slope and y-intercept in graph: slope is $\frac{2}{3}$ and y-intercept is (0,1)

Substitute slope and y-intercept: $f(x) = mx + b$, Where the slope is $\frac{2}{3}$ and the y-intercept is 1
So, $f(x) = \frac{2}{3}x + 1$.

2. The function f is defined by $f(x) = \frac{2}{n}x - 10$, where n is an integer constant and $5 \leq n \leq 8$. For the graph of $y = f(x) + 15$ in the xy-plane, what is the x-coordinate of a possible x-intercept?

A. -13

B. -15

C. -17

D. -19

Answer

B

Solution

This problem tests the student's understanding of linear equations and their graphs, specifically focusing on finding the x-intercept of a transformed function. It also checks the student's ability to manipulate algebraic expressions and understand the effect of constants on the graph of the function.
To solve this problem, recognize that the x-intercept is the value of x when y equals zero. The function provided is transformed to $y = f(x) + 15$. Set y to zero and solve for x: $0 = \frac{2}{n}x - 10 + 15$. Simplify the equation to find x in terms of n, then substitute possible integer values for n between 5 and 8 as given in the problem to find the possible x-intercept.
Remember that the x-intercept occurs when $y = 0$. Carefully handle the algebraic manipulation and ensure you substitute each possible value of n to find potential solutions. Check your work by substituting back to see if the value makes the entire expression zero.
A common mistake is to forget adding or subtracting constants when manipulating the function. Make sure not to overlook the +15 when setting up the equation for finding the x-intercept. Additionally, ensure all integer values of n within the specified range are checked.
This problem is a good test of basic algebraic manipulation and understanding of linear functions. It requires careful attention to detail, especially in handling transformations of functions. SAT problems like this assess whether students can apply algebraic concepts in slightly more complex contexts, which is a critical skill for success in this section.

Substitute $y = f(x) + 15$ into the equation: $y = (\frac{2}{n}x - 10) + 15$

Simplify: $y = \frac{2}{n}x + 5$

To find the x-intercept, set y = 0: $0 = \frac{2}{n}x + 5$

Subtract 5 from both sides: $-\frac{2}{n}x = 5$

Multiply both sides by $-\frac{n}{2}$: $x = -\frac{5n}{2}$

Considering the integer values of n:

For n = 5: $x = -\frac{5(5)}{2} = -\frac{25}{2} = -12.5$

For n = 6: $x = -\frac{5(6)}{2} = -\frac{30}{2} = -15$

For n = 7: $x = -\frac{5(7)}{2} = -\frac{35}{2} = -17.5$

For $n = 8$: $x = -\frac{5(8)}{2} = -\frac{40}{2} = -20$

Possible x-coordinates are -12.5, -15, -17.5, and -20.

3. What is the median of the data set shown? data set = [3, 7, 9, 1, 5, 8, 2]

Answer

5

Solution

The problem aims to assess the student's understanding of finding the median from a data set. It checks if the student can correctly identify the middle value of an ordered data set, which is a fundamental concept in statistics.
To solve this problem, the student should first arrange the data set in ascending order. Once the data is ordered, the student should identify the middle value. Since the data set has an odd number of elements, the median is the middle number of the ordered list.
Remember, the median is the middle value of a data set arranged in order. For an odd number of data points, it's simply the middle one. For an even number, it's the average of the two middle values. Always ensure your data is ordered before searching for the median.
A common mistake is forgetting to order the data before finding the median. Always double-check that the data is sorted correctly. Also, ensure you correctly count to find the middle position, especially if the data set is long.
This problem is a classic example of testing basic statistical skills related to identifying central tendencies. Being able to find the median is crucial as it provides insight into the distribution of data. In the SAT, this type of problem tests accuracy and attention to detail, ensuring students understand and apply statistical concepts accurately.

Step 1: Arrange the data set in ascending order.
The given data set is [3, 7, 9, 1, 5, 8, 2].
Arranging it in ascending order gives [1, 2, 3, 5, 7, 8, 9].
Step 2: Determine the number of values in the data set.
The data set has 7 values, which is an odd number.
Step 3: Find the middle value.
Since there are 7 values, the median is the 4th value in the ordered data set.
The 4th value is 5.
Therefore, the median of the data set is 5.

4. Rob holds a fundraising event for a political movement advocating for climate policy reform. If he raised $800 and decided to donate 15% of the funds to support a local environmental group, how much money will he donate?

A. $100

B. $110

C. $120

D. $130

Answer

C

Solution

This problem is designed to test the student's ability to calculate percentages and apply this understanding to a real-world context. It examines whether students can interpret percentage problems and execute the basic arithmetic needed to find a percentage of a given amount.
To solve this problem, students need to identify that they are required to calculate 15% of $800. This involves multiplying $800 by 0.15 (since 15% is the same as $\frac{15}{100}$ or 0.15). The result of this calculation will give the amount that Rob will donate to the local environmental group.
When calculating percentages, it can be helpful to convert the percentage into a decimal by dividing by 100. This makes it straightforward to multiply by the given amount. In this case, converting 15% to 0.15 and then multiplying by $800 simplifies the calculation process.
One common mistake is to forget to convert the percentage into a decimal form before multiplying. Additionally, ensure that the multiplication is performed correctly and double-check calculations to avoid simple arithmetic errors. Remember, the amount given is initially in dollars, so the final answer should also reflect a monetary value.
This problem is a straightforward percentage calculation that is typical of the 'Percentages' unit in the 'Problem Solving and Data Analysis' category. It assesses a fundamental skill that is applicable in many real-life scenarios. Being adept at such calculations is crucial for effectively handling financial decisions and data analysis tasks. Mastery of this type of problem is important for succeeding in the SAT math section, as it builds a foundation for more complex percentage problems encountered later.

To find 15% of $800, we convert 15% to a decimal: 15% = 0.15.
Multiply the total amount by the decimal: $\$800 \times 0.15$.

Calculation: $800 \times 0.15 = 120$.
Thus, Rob will donate \$120 to the local environmental group.

5. A car travels at a constant acceleration of 4.5 meters per second squared. What is this acceleration, in feet per minute squared, rounded to the nearest tenth? (Use 1 foot = 0.3048 meters)

A. 53149.0

B. 53149.2

C. 53150.0

D. 53150.2

Answer

B

Solution

This problem tests the student's ability to perform unit conversions, specifically converting from meters per second squared to feet per minute squared. It also evaluates the student's understanding of unit relationships and their ability to handle multi-step conversions.
To solve this problem, the student should follow these steps:
1) Convert meters to feet by using the conversion factor 1 foot = 0.3048 meters.
2) Convert seconds squared to minutes squared by recognizing that there are 60 seconds in a minute and squaring that conversion factor.
3) Combine these conversions to find the acceleration in feet per minute squared.
First, remember to deal with one unit conversion at a time. It might help to write down each step to keep track of your conversions. Additionally, always double-check your conversion factors and ensure that units cancel out correctly.
Be careful with squaring the time conversion factor. Remember that you need to square the entire conversion factor (60 seconds per minute) to convert seconds squared to minutes squared. Also, ensure you do not round off too early in your calculations, as this can lead to inaccuracies.
This unit conversion problem is a common type in SAT math, reflecting real-world scenarios where multiple unit conversions are necessary. It tests both basic arithmetic skills and understanding of unit relationships. Mastering these types of problems is crucial for the Problem Solving and Data Analysis section of the SAT.

Given acceleration: 4.5 meters per second squared.
First, convert meters to feet: $\frac{4.5}{0.3048}$ feet per meter.
Result: $\frac{4.5}{0.3048} = 14.7637795276$ feet per second squared.
Now convert seconds squared to minutes squared: (14.7637795276 feet / $(second)^2$) × $((60)^2)$ seconds squared per minute squared.

Calculation: $14.7637795276 \times 3600 = 53149.2062996$ feet per minute squared.
Round the result to the nearest tenth: 53149.2

6. For a polynomial function, the graph of $y = f(x)$ in the xy-plane contains the points (2, 0), (3, 0), (-1, 0), and (5, 0). Which of the following must be a factor of $f(x)$?

A. $x^2 - 5x + 6$

B. $x^2 - 4x + 3$

C. $x^2 - 2x - 15$

D. $x^2 - 8x + 12$

Answer

A

Solution

This problem tests your understanding of polynomial functions and their factors, specifically how the x-intercepts of a polynomial relate to its factors.
To solve this problem, recognize that each x-intercept of the polynomial function corresponds to a factor of the function. The x-intercepts given are (2, 0), (3, 0), (-1, 0), and (5, 0). Therefore, the factors of the polynomial are (x - 2), (x - 3), (x + 1), and (x - 5).
Remember that if a polynomial has a root at x = a, then (x - a) is a factor of the polynomial. Listing out the given x-intercepts can help you quickly determine the factors.
Be cautious not to confuse the x-intercepts with y-intercepts, as they indicate different things. Also, ensure that you do not overlook any negative signs when determining factors from the intercepts.
This type of problem is common on the SAT as it assesses your ability to connect graphical information to algebraic expressions. Mastery of this concept is crucial because it highlights your understanding of the relationship between a polynomial's roots and its factors, a fundamental concept in advanced algebra.

Given roots are x = 2, x = 3, x = -1, and x = 5. Therefore, f(x) must include factors (x - 2), (x - 3), (x + 1), and (x - 5).
The task is to determine which option is necessarily a factor of f(x).

Option A: $x^2 - 5x + 6$ can be factored as $(x - 2)(x - 3)$. This matches two of the roots, indicating it is a factor.

Option B: $x^2 - 4x + 3$ can be factored as $(x - 1)(x - 3)$. This does not match with the needed roots.

Option C: $x^2 - 2x - 15$ can be factored as $(x + 3)(x - 5)$. This does not match with the needed roots

Option D: $x^2 - 8x + 12$ can be factored as $(x - 2)(x - 6)$. This does not match with the needed roots.

7. A wooden cube used in a public health education demonstration has an edge length of 3 centimeters. If the cube weighs 5.61 grams, what is the density of the cube in grams per cubic centimeter?

A. 0.2068

B. 0.2070

C. 0.2082

D. 0.2078

Answer

D

Solution

This problem aims to test the student's understanding of geometric properties of a cube, specifically how to calculate the volume, and then apply the formula for density. The student needs to be familiar with basic volume formulas and the concept of density as mass per unit volume.
1. Calculate the volume of the cube using the formula for the volume of a cube ($V = a^3$ where 'a' is the edge length).
2. Use the given mass and the volume to calculate the density using the formula ($Density = \frac{Mass}{Volume}$).
Remember that the volume of a cube is found by cubing the edge length. Write down all given information and use the density formula directly after calculating the volume. This helps in organizing thoughts and reducing careless errors.
Be careful with units and ensure consistency throughout the calculation.
Miscalculating the volume by forgetting to cube the edge length is a common mistake. Verify that the density units are in grams per cubic centimeter as required by the problem.
This problem tests fundamental skills in geometry and unit analysis, which are crucial for many SAT math problems. Understanding the relationships between edge length, volume, and density is key. Efficiently solving such problems requires a clear grasp of basic formulas and careful unit management, which are essential skills for SAT success.

The formula for calculating the volume of a cube is $Volume = edge\ length^3$
For this cube, the volume is $3^3 = 27$ cubic centimeters.
Density is given by $Density = \frac{Mass}{Volume}$, Substituting the known values:
$Density = \frac{5.61}{27}$ grams per cubic centimeter.

Performing the division: $\frac{5.61}{27} = 0.207777...$

Rounding to the fourth digit, we get $Density \cong 0.2078$ grams per cubic centimeter.

8. Which expression is equivalent to $5x^4(3x^3 + 2x^2 - 7)$?

A. $15x^7 + 10x^6 - 35x^5$

B. $15x^7 + 10x^6 + 35x^4$

C. $15x^{12} + 10x^8 - 35x^4$

D. $15x^7 + 10x^6 - 35x^4$

Answer

D

Solution

This problem assesses a student's understanding of polynomial operations, specifically focusing on the multiplication of polynomials with a degree greater than two. The student must demonstrate their ability to distribute a monomial across a polynomial expression and simplify the result.

To solve this problem, the student needs to distribute the monomial, which is $5x^4$, over each term in the polynomial inside the parenthesis. This involves multiplying $5x^4$ by each term in the polynomial $(3x^3, 2x^2, and\ -7)$ and combining the results. When distributing the monomial, remember to add the exponents of the x terms. For instance, when multiplying x^4 by x^3, you add the exponents to get x^7. Also, keep track of the coefficients and make sure to multiply them correctly.
Be careful with the signs when multiplying. It's easy to make mistakes with negative numbers, so when multiplying the -7 term, ensure you apply the negative sign correctly. Additionally, ensure all terms are combined at the end to form a correct polynomial expression.
This type of problem is common in the Advanced Math section of the SAT and tests a fundamental algebra skill: operations with polynomials. Mastery of these skills is crucial as they form the basis for more complex algebraic manipulations. Efficiently distributing terms and simplifying expressions is an essential skill in algebra that will be used in various contexts throughout the test.

Distribute $5x^4$ to each term in the parentheses: $5x^4 \times 3x^3 = 15x^{(4+3)} = 15x^7$, $5x^4 \times 2x^2 = 10x^{(4+2)} = 10x^6, 5x^4 \times (-7) =- 35x^4$
Combine the results: $15x^7 + 10x^6 - 35x^4$.

9. Liam is collecting data on educational access for girls in a community. If the number of girls with access to education is 75% of the total number of girls, and the total number of girls is 540, how many girls have access to education?

Answer

405

Solution

This question assesses the student's ability to understand and apply percentage concepts in a real-world context. It tests the student's capacity to calculate percentages and apply them to word problems to find a solution.
To solve this problem, the number of girls is given as 540, and 75% of them have access to education. Calculate 75% of 540 to find the number of girls with access.
When dealing with percentages, remember that you can find a percentage of a number by converting the percentage to a decimal and then multiplying. For instance, 75% becomes 0.75, and you multiply by 540 to get the result.
Students often make mistakes by confusing the percentages or applying the percentage to the wrong number. Ensure that the percentage is applied to the correct total number of girls, not some other number mentioned in the problem.
This type of problem is common in the SAT as it evaluates the student's ability to apply mathematical concepts to real-world scenarios. It is essential to read the problem carefully, identify the correct data points, and apply the percentage calculations accurately. Mastery of this type of problem demonstrates a solid understanding of percentages and their applications, which is a valuable skill in the SAT math section.

1. Calculate the number of girls with access to education.
The number of girls with access to education is 75% of the total number of girls.
$Number\ of\ girls\ with\ access$ = 75% of 540
$Number\ of\ girls\ with\ access\ =\ 0.75\ \times\ 540$
$Number\ of\ girls\ with\ access\ =\ 405$

10. What is the y-coordinate of the y-intercept of the graph of $y = f(x) - 3$ in the xy-plane? $f(x) = 2(5x - 4)$

A. -11

B. -8

C. -5

D. -3

Answer

A

Solution

This problem assesses a student's ability to understand and manipulate linear functions, particularly focusing on finding the y-intercept of a modified function. It tests knowledge of how transformations affect the graph of a function and basic algebraic operations.
To solve this problem, first understand that the y-intercept of a function $y = f(x)$ occurs when $x = 0$. Start by finding $f(0)$ for the given function $f(x) = 2(5x - 4)$. Then, adjust this y-intercept by subtracting 3, as indicated by the modified function $y = f(x) - 3$.
Always remember that the y-intercept is found by setting x to 0. For composite functions involving transformations like $y = f(x) - 3$, first find the y-intercept of the original function and then apply the transformation to this intercept.
Be careful with the order of operations when evaluating $f(0)$. Ensure that you correctly substitute $x = 0$ and perform all arithmetic operations accurately. Also, do not forget to apply the transformation (subtracting 3) to the original y-intercept.
This type of problem is common in SAT algebra sections and tests the student's proficiency in handling linear functions and their transformations. Understanding function transformations and correctly applying them to find the y-intercept is a crucial skill. By practicing similar problems, students can improve their ability to quickly and accurately solve these types of questions.

First, solve for $f(x)$ when $x = 0$.
Substitute $x = 0$ into $f(x)$:, $f(x) = 2(5(0) - 4) = 2(-4) = -8$
Now substitute $f(x)$ into $y = f(x) - 3$:, $y = -8 - 3 = -11$
Therefore, the y-coordinate of the y-intercept is -11.

