Math

Algebra

Advanced

Geometry and Trigonometry

Problem Solving and Data Analysis

Digital SAT

Prep Book Bundle

Math

Digital SAT

Algebra

SAT Math Algebra

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 $(\frac{5}{2}, b)$. What is the value of b?

x	y
0	16
8	72

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

B. 34

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

D. 35

2. 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. $y = 12x + 5$

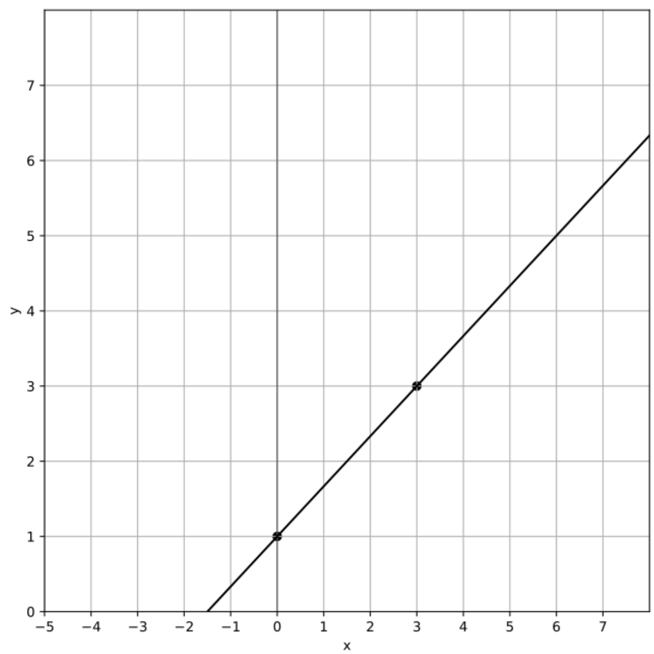
B. $y = 12x - 5$

C. $y =- 12x + 5$

D. $y = 5x + 12$

3. 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?

4. The graph of line g is shown in the xy-plane. Line k is defined by the equation $3x + py = w$, where p and w are constants. If line k is graphed in this xy-plane, resulting in the graph of a system of two linear equations, the system of two linear equations will have infinitely many solutions. What is the value of $p + w$?



A. $-\frac{9}{2}$

B. -3

C. -9

D. 9

5. 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

6. The function f is defined by $f(x) = \frac{2}{n}x - 10$, where n is an integer constant and $8 \leq n \leq 11$. For the graph of $y = f(x) + 6$ in the xy-plane, what is the x-coordinate of a possible x-intercept?

A. 10

B. 12

C. 14

D. 16

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

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

9. 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. $1500 \times m = 10000$

10. 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. $(2, 2)$

SAT Math Algebra 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 $(\frac{5}{2}, b)$. 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 $\frac{67}{2}$.

2. 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 $y = 12x + 5$.

3. 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

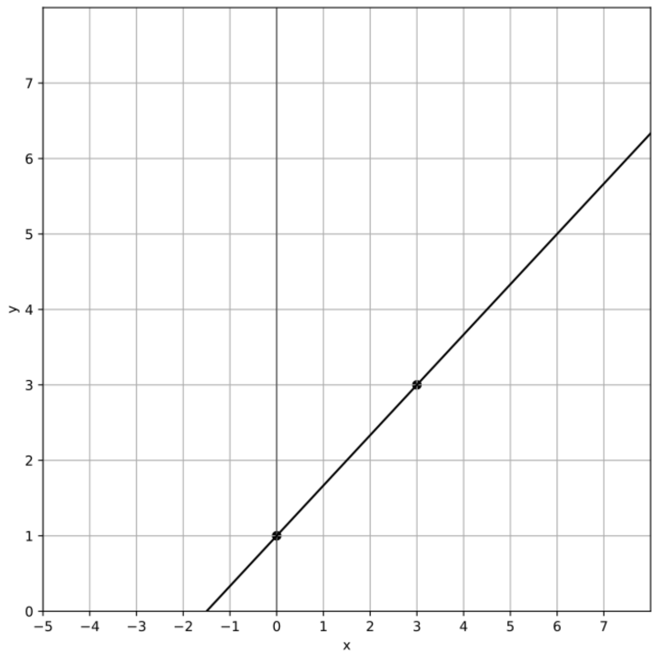
4

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: $x = 4$.

4. The graph of line g is shown in the xy-plane. Line k is defined by the equation $3x + py = w$, where p and w are constants. If line k is graphed in this xy-plane, resulting in the graph of a system of two linear equations, the system of two linear equations will have infinitely many solutions. What is the value of $p + w$?



A. $-\frac{9}{2}$

B. -3

C. -9

D. 9

Answer

C

Solution

This problem tests the student's understanding of the conditions under which a system of linear equations has infinitely many solutions. Specifically, it assesses their ability to identify when two lines are identical by comparing their slopes and y-intercepts.

To solve this problem, the student needs to recognize that for the system of equations to have infinitely many solutions, the two lines must be the same. This means that the equation of line k must be a multiple of the equation of line g.

The student should first find the equation of line g from the graph, determine its slope and y-intercept, and then set the coefficients of line k proportional to those of line g. Remember that two lines are identical if they have the same slope and y-intercept.

When given a line equation in the form $Ax + By = C$, converting it to the slope-intercept form $y = mx + b$ can make it easier to compare slopes and y-intercepts. Be careful when aligning the coefficients of the two equations. It's crucial to ensure that the ratios of the coefficients of x, y, and the constant terms are the same for the two equations.

Also, ensure to simplify the equation of line g correctly from the graph. This type of problem is common in algebra sections of standardized tests, where understanding the graphical representation and algebraic manipulation are key.

It requires not only knowledge of linear equations but also the ability to translate between different forms of these equations. Mastering such problems will enhance a student's ability to quickly and accurately solve linear equation systems on the SAT.

Equating the slopes: $\frac{-3}{p} = \frac{2}{3}$.
Solving for p: $-3 = \frac{2}{3}p$
hence $p = -\frac{9}{2}$.
Equating the y-intercepts: $\frac{w}{p} = 1$.
Substitute $p = -\frac{9}{2}$ into $\frac{w}{p} = 1$: $\frac{w}{-\frac{9}{2}} = 1$
therefore, $w = -\frac{9}{2}$.
Calculate $p + w$: $p + w = (-\frac{9}{2}) + (-\frac{9}{2}) = -9$.

5. 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.

6. The function f is defined by $f(x) = \frac{2}{n}x - 10$, where n is an integer constant and $8 \leq n \leq 11$. For the graph of $y = f(x) + 6$ in the xy-plane, what is the x-coordinate of a possible x-intercept?

A. 10

B. 12

C. 14

D. 16

Answer

D

Solution

This problem tests the student's understanding of linear functions, specifically how to find the x-intercept of a transformed function. It also assesses the ability to handle composite functions and apply algebraic manipulation to solve for specific values.

To find the x-intercept of the function $y = f(x) + 6$, set y to 0 and solve for x. First, rewrite the function $f(x) = \frac{2}{n}x - 10$ and then substitute into the given equation. Set $0 = \frac{2}{n}x - 10 + 6$ and solve for x.

Consider each possible value of n within the given range to find the x-intercept. Remember that the x-intercept occurs where $y = 0$. By setting y to 0 in the given equation, you simplify your task to solving a straightforward linear equation.

Check each value of n to ensure you cover all possible cases. Be careful with signs when solving the equation. Also, ensure that you properly substitute and simplify for each value of n.

It is easy to make arithmetic errors, so double-check your work. This problem is a good exercise in understanding linear functions and their transformations. It requires the student to apply algebraic techniques and consider multiple scenarios due to the range of values for n.

This type of problem is common in SAT math sections and helps assess a student's ability to manipulate and solve equations under different conditions.

Substitute $f(x)$ into $y = f(x) + 6$ to get $y = \frac{2}{n}x - 10 + 6$.

Simplify to $y = \frac{2}{n}x - 4$.

Set y = 0 for the x-intercept: $0 = \frac{2}{n}x - 4$.

Add 4 to both sides: $\frac{2}{n}x = 4$.

Solve for x by multiplying both sides by $\frac{n}{2}$: $x = 2n$.

Substitute possible integer values of n (8, 9, 10, 11) to find possible x-coordinates:
If $n = 8, x = 2(8) = 16$.
If $n = 9, x = 2(9) = 18$.
If $n = 10, x = 2(10) = 20$.
If $n = 11, x = 2(11) = 22$.

7. 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.

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

9. 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 $\$2,000\times5 = \$10,000$.
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:
$2000\times5 + 1500\times(m - 5) = 12000$.

10. 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 $(x, y) = (3, 2)$.

Math

Digital SAT

Advanced

SAT Math Advanced

1. 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. $x = az + 25z$

2. 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

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. 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

5. 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

6. 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

7. 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

8. 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

9. Which expression is equivalent to $3x^3 + 12x^2y + 6xy^2 + 24y^3$?

A. $(3x + 6y)(x^2 + 4y)$

B. $(3x^2 + 6y^2)(x + 4y)$

C. $(3x^3 + 2y^2)(x^2 + 4y)$

D. $(3x^2 + 2y^2)(x + 4y)$

10. In the given system of equations, d is a constant. The system has two distinct real solutions. Which of the following could be the value of d?

$y = 2x + d, y =- 3(x - 4)^2$

A. -8

B. -6

C. -4

D. 0

SAT Math Advanced Solutions

1. 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: $x = az + 25z$.

2. 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 $5\times16 = 80$., Then, calculate $3\times4 = 12$., Now, sum these results: $80 + 12 + 2 = 94$., So, the energy output when the side length is 4 meters is 94 kilowatts.

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. 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.

5. 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: $x = \frac{-7\pm\sqrt{7^2-4\times1\times10}}{2\times1}$., Calculate the discriminant: $b^2 - 4ac = 7^2 - 4\times1\times10 = 49 - 40 = 9$., Complete the formula: x = $\frac{-7\pm\sqrt{9}}{2}$. Thus, k = 9.

6. 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: $g(1) = 6$.

7. 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.

8. 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., $k\% = 0.05 \times 100 = 5\%$.

9. Which expression is equivalent to $3x^{3} + 12x^{2}y + 6xy^{2} + 24y^{3}$?

A. $(3x + 6y)(x^{2} + 4y)$

B. $(3x^{2} + 6y^{2})(x + 4y)$

C. $(3x^{3} + 2y^{2})(x^{2} + 4y)$

D. $(3x^{2} + 2y^{2})(x + 4y)$

Answer

B

Solution

This problem tests the student's ability to factor polynomial expressions, specifically recognizing and applying the greatest common factor and factoring by grouping.
The student should first identify the greatest common factor (GCF) of all the terms in the polynomial. In this case, the GCF is 3. Then, factor out the GCF from each term. Next, the student should look for patterns or group terms to factor further if possible. Grouping terms and factoring each group can lead to a fully factored expression.
Look for the greatest common factor first, as this simplifies the expression and makes further factoring easier. After factoring out the GCF, group terms in pairs and factor each pair separately. Always double-check by expanding to ensure the factored expression matches the original polynomial.
Be careful with signs when factoring. Make sure not to overlook common factors, especially if they involve variables. Additionally, ensure all terms are accounted for and correctly grouped when factoring by grouping.
Factoring polynomial expressions is a crucial skill in algebra, often used as a step in solving equations or simplifying expressions. This problem type assesses the student's ability to recognize patterns and apply factoring techniques. Mastery of these skills is essential for success in more advanced math topics, particularly in calculus and higher-level algebra.

Step 1: Identify the GCF of all terms: $3x^3$, $12x^2y$, $6xy^2$, $24y^3$., The GCF is 3., Factor out the GCF: $3(x^3 + 4x^2y + 2xy^2 + 8y^3)$., Step 2: Factor the expression $x^3 + 4x^2y + 2xy^2 + 8y^3$., Recognize it can be grouped: $(x^3 + 4x^2y) + (2xy^2 + 8y^3)$., Factor each group separately: $x^2(x + 4y) + 2y^2(x + 4y)$., Factor out the common term (x + 4y): $(x + 4y)(x^2 + 2y^2)$., Combine with the GCF: $3(x + 4y)(x^2 + 2y^2)$., Step 3: Match this expression with the given options., Option 2 is $(3x^2 + 6y^2)(x + 4y)$, which upon expansion gives $3x^3 + 12x^2y + 6xy^2 + 24y^3$, matches the original expression.

10. In the given system of equations, d is a constant. The system has two distinct real solutions. Which of the following could be the value of d?

$y = 2x + d, y = -3(x - 4)^2$

A. -8

B. -6

C. -4

D. 0

Answer

A

Solution

The problem aims to test the student's understanding of solving systems involving a linear and a quadratic equation. Specifically, it evaluates the student's ability to determine the conditions under which the system has two distinct real solutions. First, equate the two given equations to find the intersection points, which would involve solving the equation $2x + d = -3(x - 4)^2$. Rearrange and solve this quadratic equation in terms of x. For the system to have two distinct real solutions, the quadratic equation should have two distinct roots, which means its discriminant must be greater than zero. Calculate the discriminant and find the range of values for d that satisfy this condition. Remember that the discriminant of a quadratic equation $ax^2 + bx + c = 0$ is given by $b^2 - 4ac$. For two distinct real solutions, this discriminant should be positive. Additionally, carefully expand and simplify the quadratic equation to ensure all terms are correctly combined. Be cautious when expanding the quadratic term $-3(x-4)^2$. Mistakes in expansion and simplification can lead to incorrect discriminant calculations. Also, ensure that the quadratic equation is correctly converted to the standard form before applying the discriminant condition. This problem assesses the student's ability to handle systems involving both linear and quadratic equations, a crucial skill in advanced mathematics. It specifically tests their understanding of the discriminant's role in determining the nature of the roots of a quadratic equation. Mastery of these concepts is essential for success in the SAT Math section, particularly in advanced algebra topics.

Set the equations equal: $2x + d = -3(x-4)^2$, Rearrange and simplify: $2x + d = -3(x^2 - 8x + 16)$, $2x + d = -3x^2 + 24x - 48$, Rearrange terms: $3x^2 - 22x + (48 + d) = 0$, Calculate the discriminant: $\Delta = b^2 - 4ac$, where $a = 3$, $b = -22$, $c = 48 + d$, Discriminant: $\Delta = (-22)^2 - 4(3)(48 + d)$, $\Delta = 484 - 12(48 + d)$, $\Delta = 484 - 576 - 12d$, $\Delta = -92 - 12d$, For the system to have two distinct real solutions, $\Delta > 0$, $-92 - 12d > 0$, $-12d > 92$, $d < -\frac{46}{6}$, $d < -7.6667$

Math

Digital SAT

Geometry and Trigonometry

SAT Math Geometry and Trigonometry

1. The table gives the perimeters of similar triangles ABC and DEF, where AB corresponds to DE. The length of AB is 5. What is the length of DE?

Triangle	Perimeter
Triangle ABC	30
Triangle DEF	90

A. 12

B. 15

C. 18

D. 20

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. 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

4. 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

5. 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

6. Circle C has a radius of 2x and circle D has a radius of 50x. The area of circle D is how many times the area of circle C?

7. 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?

8. 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

9. A solid sphere has a radius of 15 feet. If a certain VR simulation requires the volume of an object to be equal to the volume of the sphere, what is the volume of the sphere in cubic feet?

A. 3000π

B. 4500π

C. 5000π

D. 6000π

10. 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

SAT Math Geometry and Trigonometry Solutions

1. The table gives the perimeters of similar triangles ABC and DEF, where AB corresponds to DE. The length of AB is 5. What is the length of DE?

Triangle	Perimeter
Triangle ABC	30
Triangle DEF	90

A. 12

B. 15

C. 18

D. 20

Answer

B

Solution

This problem tests the student's understanding of similar triangles and the concept of proportionality. The student should be able to use the known perimeters to find the length of a corresponding side in similar triangles. To solve this problem, the student should start by recognizing that if two triangles are similar, the ratios of their corresponding side lengths are equal to the ratio of their perimeters. First, calculate the ratio of the given perimeters from the table. Then, use this ratio to find the length of DE by setting up a proportion with the known length of AB, which corresponds to DE. Always remember that the key to solving problems with similar triangles is setting up correct proportions. Make sure to match the corresponding sides correctly and use the information given in the problem, such as the length of AB and the perimeters provided, to find the unknown length. Be careful not to mix up the corresponding sides. Double-check which sides correspond to each other based on the problem's description. Also, ensure you correctly calculate the ratio of the perimeters before applying it to the corresponding sides. This type of problem is a classic example of applying the properties of similar triangles and proportional relationships, which is a fundamental skill in geometry. Being able to correctly identify and apply these properties is crucial on the SAT, as it shows a student's ability to understand and manipulate geometric concepts effectively.

Let the length of DE be x., The ratio of the perimeters is 30: 90, which simplifies to 1: 3., Since AB corresponds to DE, the ratio of AB to DE is also 1: 3., Thus, we have $5: x = 1: 3$., Cross-multiplying gives $5\times3 = x\times1$., Therefore, $x = 15$.

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. 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.

4. 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?

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 ∠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: $AB = cos(A)\times AC = \frac{4}{5}\times 300 = 240\, millimeters$.

5. 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

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(θ) = cos(90° - θ). 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: $x = 10$

6. Circle C has a radius of 2x and circle D has a radius of 50x. The area of circle D is how many times the area of circle C?

Answer

625

Solution

This problem tests the student's understanding of the formula for the area of a circle and their ability to use ratios to compare the areas of two circles based on their radii.
To solve this problem, students should first recall the formula for the area of a circle, $A = \pi r^2$, where r is the radius. Next, they calculate the area of both circles using their given radii: Circle C with a radius of 2x and Circle D with a radius of 50x. After finding the areas, students should set up a ratio of the area of Circle D to the area of Circle C and simplify the ratio.
Remember that when comparing areas of circles, the ratio of the areas is the square of the ratio of their radii. This can simplify the calculations significantly.
Be careful with squaring the radii correctly. A common mistake is not squaring the entire expression, which can lead to an incorrect ratio. Also, ensure that you simplify the ratio completely.
This type of problem is common in SAT geometry sections, as it assesses both the understanding of geometric formulas and the ability to manipulate algebraic expressions. Mastery of such problems requires familiarity with basic geometric formulas and an ability to apply algebraic principles, such as simplifying ratios. Practicing these skills will help improve accuracy and speed on test day.

Calculate the area of circle C:, $Area\ of\ circle\ C = \pi(2x)^2 = 4\pi x^2$, Calculate the area of circle D:, $Area\ of\ circle\ D = \pi(50x)^2 = 2500\pi x^2$, Determine how many times the area of circle D is compared to circle C:,
$Number\ of\ times = \frac{2500\pi x^2}{4\pi x^2} = \frac{2500}{4} = 625$

7. 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.

8. 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:, $x = 10$

9. A solid sphere has a radius of 15 feet. If a certain VR simulation requires the volume of an object to be equal to the volume of the sphere, what is the volume of the sphere in cubic feet?

A. 3000π

B. 4500π

C. 5000π

D. 6000π

Answer

B

Solution

This question aims to assess the student's ability to calculate the volume of a sphere using the correct formula. It also tests their understanding of geometric properties and their ability to apply these in a real-world context. To solve this problem, students need to recall the formula for the volume of a sphere, which is $V = \frac{4}{3}\pi r^3$. They should then substitute the given radius (15 feet) into the formula and compute the volume. Make sure to remember the formula for the volume of a sphere: $V = \frac{4}{3}\pi r^3$. Write it down first to help guide your calculations. Also, it might be helpful to use a calculator to ensure accuracy, especially when dealing with π. Be careful with the units and ensure that all measurements are in feet. Additionally, make sure to correctly cube the radius (15 feet) and multiply by π. Misplacing a decimal point or making a minor error in calculation can lead to an incorrect answer. This type of problem is common in the SAT to test geometric understanding and the ability to apply formulas in practical situations. It is essential to be comfortable with key geometric formulas and practice substituting values accurately. Remember to double-check your work to avoid small mistakes that could lead to incorrect answers. Mastery of these skills will be beneficial not only in the SAT but also in future mathematical applications.

Using the formula for the volume of a sphere: $V = \frac{4}{3}\pi r^3$., Substitute $r = 15$ into the formula., Calculate $r^3 = (15)^3 = 3375$., Substitute $r^3 = 3375$ into the volume formula: $V = \frac{4}{3}\pi \times 3375$., Simplify the expression: $V = \frac{4\times 3375}{3}\pi$., Calculate the multiplication: $4\times 3375 = 13500$., Divide by 3: $\frac{13500}{3} = 4500$., Substitute back: $V = 4500\pi$ cubic feet.

10. 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, $GH = 16 \times 3 = 48$.

Math

Digital SAT

Problem Solving and Data Analysis

SAT Math Problem Solving and Data Analysis

1. 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

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

3. 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

4. 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

5. The population of Town B is currently 20,000. If the population increases by 15% each year, how many years will it take for the population to reach 30,000? Let t be the number of years.

A. 2

B. 3

C. 4

D. 5

6. A shipment of goods was classified into three categories: electronics, textiles, and automobiles, with the frequencies shown in the table. If one item from this shipment is selected at random, what is the probability of selecting an automobile?

Product	Frequency
Electronics	25
Textiles	15
Automobiles	30

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

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

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

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

7. 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

8. 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

9. 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

10. The ratio of a to b is equal to the ratio 5 to 8. If a = 15t, what is the value of b in terms of t?

A. 24t

B. 18t

C. 20t

D. 30t

SAT Math Problem Solving and Data Analysis Solutions

1. The table gives the perimeters of similar triangles ABC and DEF, where AB corresponds to DE. The length of AB is 5. What is the length of DE?

Triangle	Perimeter
Triangle ABC	30
Triangle DEF	90

A. 12

B. 15

C. 18

D. 20

Answer

B

Solution

This problem tests the student's understanding of similar triangles and the concept of proportionality. The student should be able to use the known perimeters to find the length of a corresponding side in similar triangles. To solve this problem, the student should start by recognizing that if two triangles are similar, the ratios of their corresponding side lengths are equal to the ratio of their perimeters. First, calculate the ratio of the given perimeters from the table. Then, use this ratio to find the length of DE by setting up a proportion with the known length of AB, which corresponds to DE. Always remember that the key to solving problems with similar triangles is setting up correct proportions. Make sure to match the corresponding sides correctly and use the information given in the problem, such as the length of AB and the perimeters provided, to find the unknown length. Be careful not to mix up the corresponding sides. Double-check which sides correspond to each other based on the problem's description. Also, ensure you correctly calculate the ratio of the perimeters before applying it to the corresponding sides. This type of problem is a classic example of applying the properties of similar triangles and proportional relationships, which is a fundamental skill in geometry. Being able to correctly identify and apply these properties is crucial on the SAT, as it shows a student's ability to understand and manipulate geometric concepts effectively.

Let the length of DE be x., The ratio of the perimeters is 30: 90, which simplifies to 1: 3., Since AB corresponds to DE, the ratio of AB to DE is also 1: 3., Thus, we have $5: x = 1: 3$., Cross-multiplying gives $5\times3 = x\times1$., Therefore, $x = 15$.

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. 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.

4. 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?

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 ∠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: $AB = cos(A)\times AC = \frac{4}{5}\times 300 = 240\ millimeters$.

5. 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

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(θ) = cos(90° - θ). 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

6. Circle C has a radius of 2x and circle D has a radius of 50x. The area of circle D is how many times the area of circle C?

Answer

625

Solution

This problem tests the student's understanding of the formula for the area of a circle and their ability to use ratios to compare the areas of two circles based on their radii.
To solve this problem, students should first recall the formula for the area of a circle, $A = \pi r^2$, where r is the radius. Next, they calculate the area of both circles using their given radii: Circle C with a radius of 2x and Circle D with a radius of 50x. After finding the areas, students should set up a ratio of the area of Circle D to the area of Circle C and simplify the ratio.
Remember that when comparing areas of circles, the ratio of the areas is the square of the ratio of their radii. This can simplify the calculations significantly.
Be careful with squaring the radii correctly. A common mistake is not squaring the entire expression, which can lead to an incorrect ratio. Also, ensure that you simplify the ratio completely.
This type of problem is common in SAT geometry sections, as it assesses both the understanding of geometric formulas and the ability to manipulate algebraic expressions. Mastery of such problems requires familiarity with basic geometric formulas and an ability to apply algebraic principles, such as simplifying ratios. Practicing these skills will help improve accuracy and speed on test day.

Calculate the area of circle C:, $Area\ of\ circle\ C = \pi(2x)^2 = 4\pi x^2$, Calculate the area of circle D:, $Area\ of\ circle\ D = \pi(50x)^2 = 2500\pi x^2$, Determine how many times the area of circle D is compared to circle C:,
$Number\ of\ times = \frac{2500\pi x^2}{4\pi x^2} = \frac{2500}{4} = 625$

7. 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.

8. 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:, $x = 10$

9. A solid sphere has a radius of 15 feet. If a certain VR simulation requires the volume of an object to be equal to the volume of the sphere, what is the volume of the sphere in cubic feet?

A. 3000π

B. 4500π

C. 5000π

D. 6000π

Answer

B

Solution

This question aims to assess the student's ability to calculate the volume of a sphere using the correct formula. It also tests their understanding of geometric properties and their ability to apply these in a real-world context. To solve this problem, students need to recall the formula for the volume of a sphere, which is $V = \frac{4}{3}\pi r^3$. They should then substitute the given radius (15 feet) into the formula and compute the volume. Make sure to remember the formula for the volume of a sphere: $V = \frac{4}{3}\pi r^3$. Write it down first to help guide your calculations. Also, it might be helpful to use a calculator to ensure accuracy, especially when dealing with π. Be careful with the units and ensure that all measurements are in feet. Additionally, make sure to correctly cube the radius (15 feet) and multiply by π. Misplacing a decimal point or making a minor error in calculation can lead to an incorrect answer. This type of problem is common in the SAT to test geometric understanding and the ability to apply formulas in practical situations. It is essential to be comfortable with key geometric formulas and practice substituting values accurately. Remember to double-check your work to avoid small mistakes that could lead to incorrect answers. Mastery of these skills will be beneficial not only in the SAT but also in future mathematical applications.

Using the formula for the volume of a sphere: $V = \frac{4}{3}\pi r^3$., Substitute $r = 15$ into the formula., Calculate $r^3 = (15)^3 = 3375$., Substitute $r^3 = 3375$ into the volume formula: $V = \frac{4}{3}\pi \times 3375$., Simplify the expression: $V = \frac{4\times 3375}{3}\pi$., Calculate the multiplication: $4\times 3375 = 13500$., Divide by 3: $\frac{13500}{3} = 4500$., Substitute back: $V = 4500\pi$ cubic feet.

10. 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, $GH = 16\times3 = 48$.

