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)

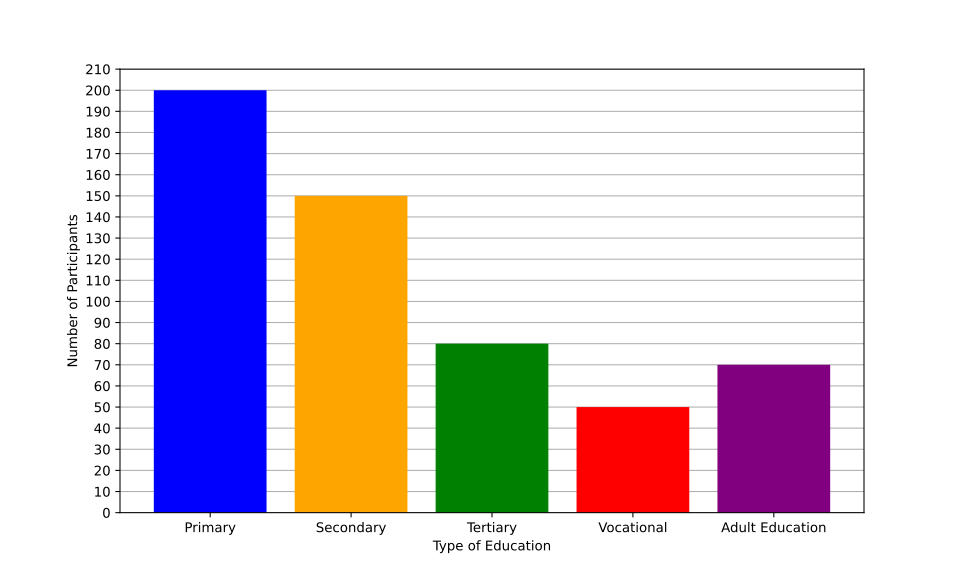
3.  The given equation relates the positive numbers , , and . Which equation correctly expresses in terms of a and ?

A.

B.

C.

D.

4.  Refer to the bar graph above. Which two categories of education combined represent exactly 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 ?

A.   5

B.   6

C.   7

D.   8

6.  Carlos runs a small bakery and sold 250 pastries this week. He plans to save 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 °. What is the value of m?

A.   162

B.   168

C.   174

D.   180

8.  After a space survey of Mars, 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 , where 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 ).  
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.  
.  
Next, we convert the speed from per second to per hour by multiplying by the number of seconds in an hour.  
.  
Rounding 20.16 to the nearest tenth gives us 20.2 kilometers/hour.

3.  The given equation relates the positive numbers , , and . Which equation correctly expresses in terms of a and ?

A.

B.

C.

D.

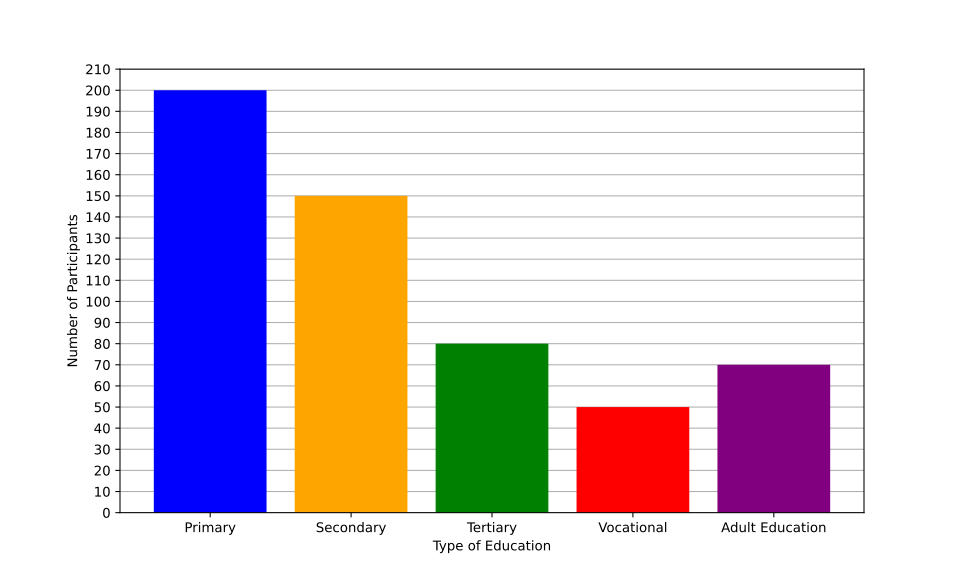
## Answer

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 , we need to perform algebraic operations to get on one side of the equation by itself. Starting with the given equation, we should first eliminate the fraction by multiplying both sides by .  
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: .  
Multiply both sides of the equation by b to eliminate the fraction: .  
Distribute b on the left-hand side: .  
Thus, the expression for in terms of and is .

4.  Refer to the bar graph above. Which two categories of education combined represent exactly 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 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 .  
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 of the total: .  
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 ?

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 , 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 from both sides, resulting in . Then, add 5 to both sides to isolate the term with x, resulting in . Finally, divide both sides by 5 to solve for x, giving .  
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 .  
Step 2: Subtract 10x from both sides to get .  
Step 3: Simplify the equation to .  
Step 4: Add 5 to both sides to get .  
Step 5: Divide both sides by 5 to isolate x, giving .

6.  Carlos runs a small bakery and sold 250 pastries this week. He plans to save 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 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 to a decimal (0.15), (2) Multiply 0.15 by 250.  
A quick way to calculate percentages is to use the formula: . In this case, you can also break it down into simpler steps: first, find of 250, which is 25, and then find of 250, which is half of , hence 12.5. Adding these two results () 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: .  
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 °. 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 degrees, set up an equation: . 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° + ° = 180°  
Combine the known angles: 122° + ° = 180°  
Subtract 122° from both sides: ° = 58°  
Solve for m by multiplying both sides by 3: m = 58° Calculate m: m = 174°

8.  After a space survey of Mars, 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 of the total estimated resources. To find the total estimated resources, the student can set up the equation 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 to find the total estimated resources.  
Be careful not to confuse 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: .  
Divide both sides by 0.30 to solve for x.  
.  
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 , where 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 . Substitute into the function 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: . Then calculate . 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 into the function: .  
Simplify the exponent: .  
Calculate .  
First, calculate .  
Multiply by 500: .  
Thus, the approximate growth of the local economy after 6 years is 578.8125 million dollars.

SAT Math Problems

1.  What value of x is the solution to the equation ?

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.

B.

C.

D.

3.  What is the y-intercept of the function in the xy-plane?

A.   1

B.   3

C.   5

D.   7

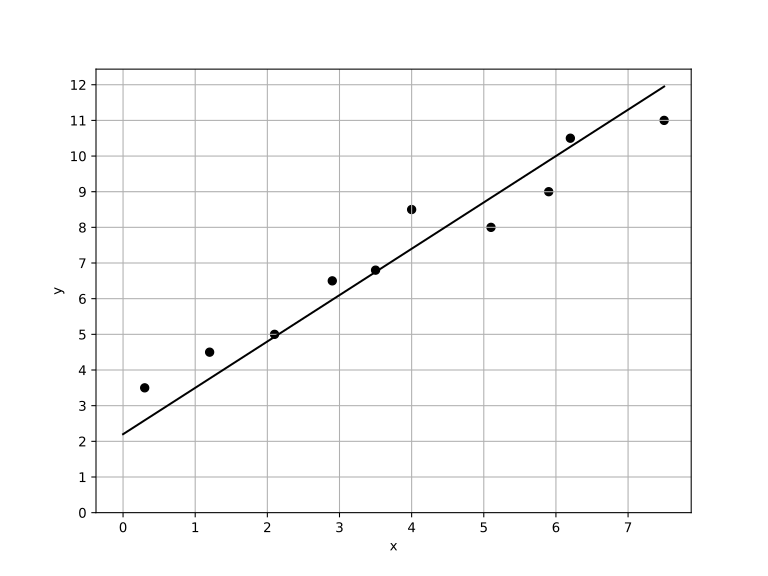
4.  For the linear function g, the graph of in the -plane has a slope of 12 and passes through the point (0, 5). Which equation defines g?

A.

B.

C.

D.

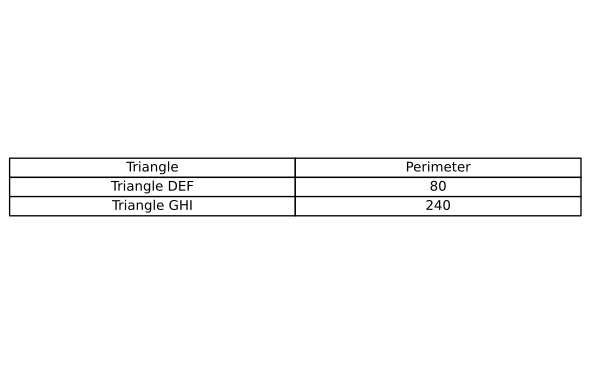
5.  Which of the following equations best represents the line of best fit shown in the scatter plot? 

A.

B.

C.

D.

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? 

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.

B.

C.

D.

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: . 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 hours, the total electricity generated, represented by the function , can be given by the equation . 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 . What is the total area, in , of circles A and B?

SAT Math Solutions

1.  What value of x is the solution to the equation ?

## Answer

## 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 . Then, add 9 to both sides to obtain   
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: .  
Subtract 6x from both sides to gather x terms on one side: .  
This simplifies to: .  
Add 9 to both sides to isolate the x term: .  
This gives: .  
Divide both sides by 9 to solve for x: .  
Simplify the fraction: .  
The solution is , 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.

B.

C.

D.

## 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 , plug in the values for length, width and height:   
First, multiply y by (y - 2):, , Then multiply the result by the height 15:   
Distribute the 15:   
Thus, the function P that gives the volume of the park is .

3.  What is the y-intercept of the function 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 . 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 , the y-intercept can be found by calculating . For exponential functions of the form , substitute to find the y-intercept as .  
Be careful not to confuse the x-intercept with the y-intercept. The x-intercept occurs when , 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 in the function: .  
Simplify the expression: , so .  
Thus, the y-intercept is .

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

A.

B.

C.

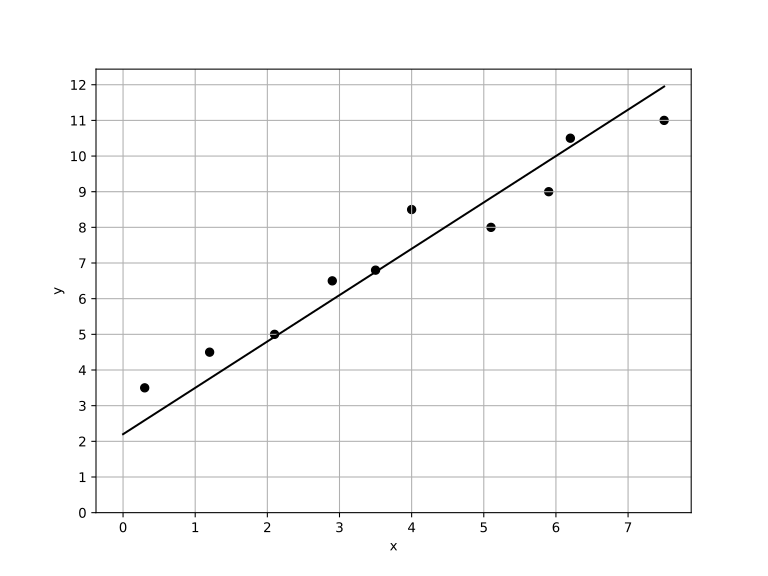
D.

## 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 .  
Remember that in the slope-intercept form , 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 .  
Given the slope and the line passes through the point (0, 5), the y-intercept (b) is 5.  
Therefore, the equation of the line is .

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

A.

B.

C.

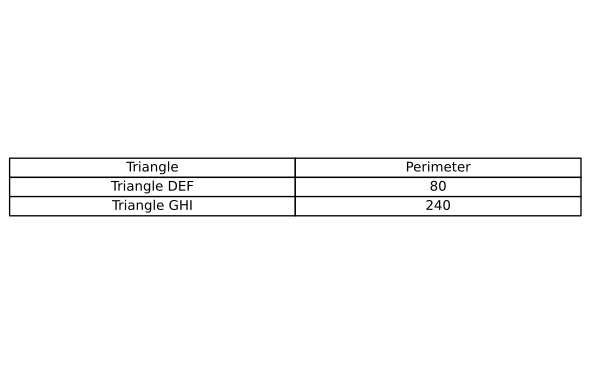
D.

## 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 and .  
The graph shows that both the slope and the intercept are positive, indicating the option with positive values for both.  
Thus, option 1) 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? 

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, .

7.  The equation relates the quantities a, x, and z. Which equation correctly expresses x in terms of a and z?

A.

B.

C.

D.

## 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: .  
Step 1: Multiply both sides by z to eliminate the fraction: .  
Step 2: Express x in terms of a and z: .

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: . 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 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 and then convert this growth factor to a percentage.  
First, calculate 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   
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 = ., Calculate :  
  
The annual growth factor is 1.21550625.  
Subtract 1 from the annual growth factor to determine the percentage increase.  
  
Convert this decimal to a percentage:   
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 hours, the total electricity generated, represented by the function , can be given by the equation . 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 , where represents the total electricity generated in kilowatts and represents the number of hours. To find the electricity generated after 5 hours, substitute 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 into the function :, ,   
Therefore, the turbine generates 75 kilowatts of electricity after 5 hours.  
The constant rate of electricity generation per hour is 15 kilowatts.

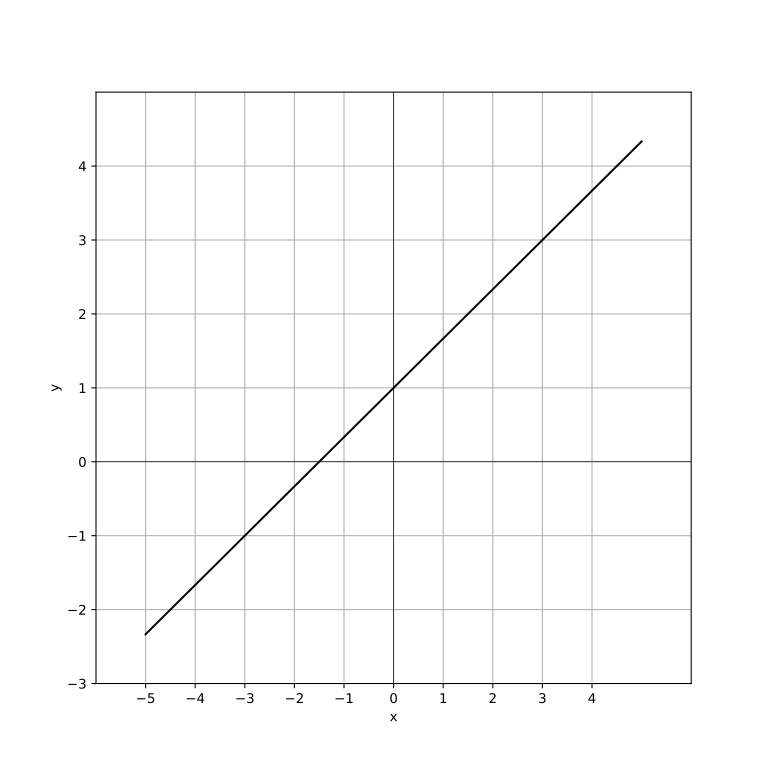
10.  Circle A has a radius of 5 centimeters (cm). Circle B has an area of . What is the total area, in , of circles A and B?

## Answer

## 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 . Since Circle A has a radius of 5 cm, its area is . The area of Circle B is already given as . Add the areas of both circles to find the total area: .  
Remember that the area of a circle is . Make sure to perform the arithmetic operations carefully. Since both areas are already expressed in terms of , you can just add the coefficients of directly.  
Be careful not to confuse the radius with the diameter. Also, ensure that you do not attempt to multiply by itself or perform any unnecessary calculations with . The problem requires recognizing that the areas can be directly summed because they both include .  
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 . 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 .  
Area of Circle .  
Step 2: Add the area of Circle A to the area of Circle B to find the total area.  
.  
Step 3: Combine the areas by adding the coefficients of .  
.

SAT Math Problems

1.  What equation defines the linear function shown in the graph? 

2.  The function f is defined by , where n is an integer constant and . For the graph of in the -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 and decided to donate of the funds to support a local environmental group, how much money will he donate?

A.

B.

C.

D.

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 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 ?

A.

B.

C.

D.

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 ?

A.

B.

C.

D.

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 in the -plane?

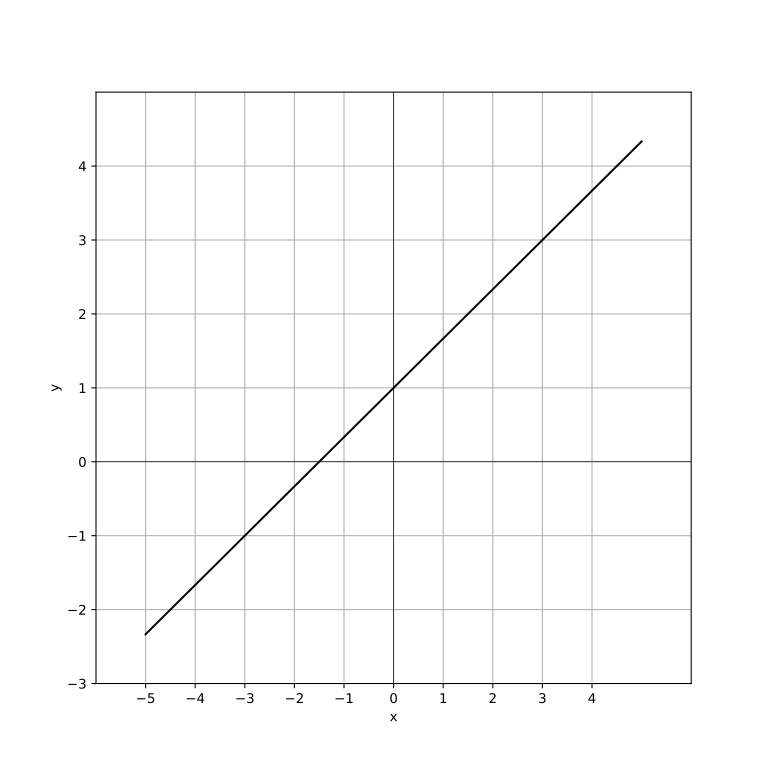
A.    -11

B.    -8

C.    -5

D.    -3

SAT Math Solutions

1.  What equation defines the linear function shown in the graph? 

## Answer

## 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 , where m is the slope and b is the y-intercept. Here, the slope m is given as , 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 and y-intercept is (0,1)  
Substitute slope and y-intercept: , Where the slope is and the y-intercept is 1  
So, .

2.  The function f is defined by , where n is an integer constant and . For the graph of in the -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 . Set y to zero and solve for x: . 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 . 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 into the equation:   
Simplify:   
To find the x-intercept, set y = 0:   
Subtract 5 from both sides:   
Multiply both sides by :   
Considering the integer values of n:  
For n = 5:   
For n = 6:   
For n = 7:   
For   
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 and decided to donate of the funds to support a local environmental group, how much money will he donate?

A.

B.

C.

D.

## 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 of . This involves multiplying by 0.15 (since is the same as 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 to 0.15 and then multiplying by 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 of , we convert to a decimal: = 0.15.  
Multiply the total amount by the decimal: .  
Calculation: .  
Thus, Rob will donate 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: feet per meter.  
Result: feet per second squared.  
Now convert seconds squared to minutes squared: (14.7637795276 feet / ) () seconds squared per minute squared.  
Calculation: feet per minute squared.  
Round the result to the nearest tenth: 53149.2

6.  For a polynomial function, the graph of 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 ?

A.

B.

C.

D.

## 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: can be factored as . This matches two of the roots, indicating it is a factor.  
Option B: can be factored as . This does not match with the needed roots.  
Option C: can be factored as . This does not match with the needed roots  
Option D: can be factored as . 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 ( where ’a’ is the edge length).  
2. Use the given mass and the volume to calculate the density using the formula ().  
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 =   
For this cube, the volume is cubic centimeters.  
Density is given by , Substituting the known values: grams per cubic centimeter.  
Performing the division:   
Rounding to the fourth digit, we get grams per cubic centimeter.

8.  Which expression is equivalent to ?

A.

B.

C.

D.

## 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 , over each term in the polynomial inside the parenthesis. This involves multiplying by each term in the polynomial () and combining the results.  
When distributing the monomial, remember to add the exponents of the x terms. For instance, when multiplying by , you add the exponents to get . 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 to each term in the parentheses: , ,   
Combine the results: .

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.  
 = 75 of 540

10.  What is the y-coordinate of the y-intercept of the graph of in the -plane?

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 occurs when . Start by finding for the given function. Then, adjust this y-intercept by subtracting 3, as indicated by the modified function .  
Always remember that the y-intercept is found by setting x to 0. For composite functions involving transformations like , 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 . Ensure that you correctly substitute 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 when .  
Substitute into :,   
Now substitute into :,   
Therefore, the y-coordinate of the y-intercept is -11.