Mathnasium Job Assessment Practice Exam (Sample)

Study Guide

Questions

1. **How do you find the volume of a square pyramid?**
    A. V = (1/2)(area of base) x height
    B. V = (1/3)(area of base) x height
    C. V = (1/4)(area of base) x height
    D. V = (1/3)(base x height)

2. **What is the area of a circle with a radius of 7?**
    A. 112
    B. 154
    C. 144
    D. 158

3. **Calculating the expression 2 + 3 * 4 - 5 results in what value?**
    A. 9
    B. 5
    C. 10
    D. 3

4. **How do you convert 25% to a decimal?**
    A. 0.15
    B. 0.25
    C. 0.35
    D. 0.45

5. **How do you calculate the area of a trapezoid?**
    A. A = (1/2)h(b1 + b2)
    B. A = bh
    C. A = (1/2)(b1 + b2)h
    D. A = (1/3)(b1 + b2)h

6. **What is the output of the function f(x) = x² + 1 when x = 3?**
    A. 9
    B. 8
    C. 10
    D. 6

7. **When do vertical asymptotes occur in a function's graph?**

    A. When a factor in the numerator equals zero

    B. When a factor in the denominator equals zero

    C. When the function is undefined

    D. When both numerator and denominator equal zero

8. **What is 12 multiplied by 8?**

    A. 96

    B. 84

    C. 72

    D. 64

9. **Which operation would you perform first in the expression $6 + 2 \times 3$?**

    A. Addition

    B. Multiplication

    C. Both at the same time

    D. None

10. **How many seconds are in a minute?**

    A. 30 seconds

    B. 60 seconds

    C. 120 seconds

    D. 90 seconds

Answers

1. **B**
2. **B**
3. **A**
4. **B**
5. **A**
6. **C**
7. **B**
8. **A**
9. **B**
10. **B**

Explanations

1. How do you find the volume of a square pyramid?

    A. V = (1/2)(area of base) x height

    B. V = (1/3)(area of base) x height

    C. V = (1/4)(area of base) x height

    D. V = (1/3)(base x height)

To find the volume of a square pyramid, the correct approach is to use the formula that incorporates the area of the base and the height of the pyramid. The formula for the volume of a pyramid is generally expressed as the fraction of the area of the base times the height, with a coefficient of $\frac{1}{3}$. In the case of a square pyramid, the area of the base can be calculated by squaring the length of one of its sides. Thus, when you compute the volume, you want to take that area and multiply it by the height of the pyramid, and then multiply the result by $\frac{1}{3}$ to account for the three-dimensional nature of the pyramid, which tapers from the base to the apex. This is why the formula V = $\frac{1}{3}(\text{area of base}) \times \text{height}$ accurately represents the volume of a square pyramid. The use of $\frac{1}{3}$ indicates that the volume fills one-third of the prism formed by extending the base of the pyramid to a height equal to that of the pyramid itself, providing a clear geometric reasoning for this formula.
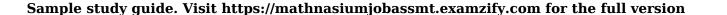
2. What is the area of a circle with a radius of 7?

    A. 112

    B. 154

    C. 144

    D. 158

To find the area of a circle, you can use the formula: $$\text{Area} = \pi r^2$$ In this case, the radius (r) is 7. Plugging that value into the formula gives: $$\text{Area} = \pi (7)^2 = \pi (49)$$ Using the approximation of $\pi \approx 3.14$, you can calculate the area as follows: $$\text{Area} \approx 3.14 \times 49$$ Calculating this results in: $$3.14 \times 49 = 153.86$$ This value can be rounded to 154. Therefore, the area of a circle with a radius of 7 is approximately 154. This matches the given choice, verifying it as the correct answer. In summary, understanding the formula for the area of a circle and performing the multiplication accurately leads to determining that the area of a circle with a radius of 7 is approximately 154.

3. Calculating the expression 2 + 3 * 4 - 5 results in what value?

A. 9

B. 5

C. 10

D. 3

To solve the expression 2 + 3 * 4 - 5, it's crucial to apply the order of operations, often remembered by the acronym PEMDAS (Parentheses, Exponents, Multiplication and Division (from left to right), Addition and Subtraction (from left to right)). 1. First, perform the multiplication in the expression. Here, you multiply 3 by 4, which gives you 12. 2. Replace the multiplication in the original expression: 2 + 12 - 5. 3. Next, move on to addition and subtraction from left to right. Start by adding 2 and 12, which results in 14. 4. Now, subtract 5 from this result: 14 - 5 equals 9. Thus, the final answer to the expression is 9. This demonstrates the correct application of the order of operations, resulting in the accurate value of the expression being calculated.

4. How do you convert 25% to a decimal?

A. 0.15

B. 0.25

C. 0.35

D. 0.45

To convert a percentage to a decimal, you divide the percentage by 100. In this case, to convert 25% to a decimal, you take 25 and divide it by 100. Calculating 25 ÷ 100 gives you 0.25. This decimal representation signifies that 25% of a whole is equivalent to a quarter of that whole. Therefore, the answer is accurately represented as 0.25, which corresponds to the original percentage of 25%. This understanding is fundamental in mathematics, particularly when dealing with fractions, percentages, and decimals, and illustrates a straightforward process of conversion.

5. How do you calculate the area of a trapezoid?

A. A = (1/2)h(b1 + b2)

B. A = bh

C. A = (1/2)(b1 + b2)h

D. A = (1/3)(b1 + b2)h

The formula for calculating the area of a trapezoid is derived from the average length of the two parallel sides, known as the bases, multiplied by the height. In this case, the correct formula is A = (1/2)(b1 + b2)h. This reflects the idea that the area can be visualized as taking the average of the two base lengths (b1 and b2), which amounts to adding them together and dividing by two. This average is then multiplied by the height (h), which is the perpendicular distance between the two bases. With this formula, you can correctly compute the area of any trapezoid by simply substituting the lengths of the bases and the height. This method emphasizes the trapezoid's shape and incorporates both bases into the area calculation, ensuring an accurate result for the geometric figure. The other formulas provided do not correctly represent the area of a trapezoid. While one might relate to the area of a rectangle or a different polygon, they fail to capture the unique characteristics of a trapezoid and therefore aren't applicable in this context.

6. What is the output of the function f(x) = x² + 1 when x = 3?

    A. 9

    B. 8

    C. 10

    D. 6

To determine the output of the function f(x) = x² + 1 when x = 3, you substitute 3 into the function.   First, calculate x²: When x = 3, x² becomes 3², which is 9.   Next, add 1 to this result: 9 + 1 equals 10. Therefore, when you plug in 3 into the function f(x), the output is 10. This matches the answer choice with that value.

7. When do vertical asymptotes occur in a function's graph?

    A. When a factor in the numerator equals zero

    B. When a factor in the denominator equals zero

    C. When the function is undefined

    D. When both numerator and denominator equal zero

Vertical asymptotes occur when a function approaches infinity or negative infinity as the input (x-value) approaches a certain value. This behavior is typically observed in rational functions where the denominator of the function becomes zero, while the numerator does not simultaneously equal zero at those points. Thus, when a factor in the denominator equals zero, it indicates that the function cannot be defined at that x-value, leading to a vertical asymptote on the graph. At this point, the function's value tends to infinitely large or small values, resulting in a vertical line in the graph indicating that the function cannot take any value at this input. In contrast, if a factor in the numerator equals zero or both the numerator and denominator equal zero, this situation would not typically create a vertical asymptote. Instead, other behaviors, such as holes in the graph or a need for further analysis (like removable discontinuities), might occur. Understanding these conditions is essential when analyzing rational functions for vertical asymptotes.

8. What is 12 multiplied by 8?

    A. 96

    B. 84

    C. 72

    D. 64

To find the product of 12 and 8, you can conduct the multiplication: 12 x 8 can be visualized as adding 12 together eight times, or 8 together twelve times, which leads to the same result.   Calculating it step by step, we can break it down: First, you can calculate 12 x 4, which is 48. Since 8 is twice 4, multiplying 48 by 2 gives you 96. Alternatively, you can think of multiplying in parts: - You might first multiply 10 x 8 = 80 and then 2 x 8 = 16. Adding these together: 80 + 16 = 96. The method confirms that 12 multiplied by 8 results in 96, making this the correct answer.   Understanding the multiplication process can aid in grasping how numbers combine, which is foundational in mathematics.

9. Which operation would you perform first in the expression 6 + 2 × 3?

A. Addition

B. Multiplication

C. Both at the same time

D. None

In the expression 6 + 2 × 3, the correct first operation to perform is multiplication. This is because of the order of operations, commonly abbreviated as PEMDAS: Parentheses, Exponents, Multiplication and Division (from left to right), Addition and Subtraction (from left to right). According to this rule, multiplication takes precedence over addition. In this specific example, you would multiply 2 by 3 first, which equals 6, and then you would add that result to 6. Thus, the final calculation would be 6 + 6 = 12. Understanding this principle of order of operations is crucial to solving expressions correctly, ensuring that one evaluates mathematical statements consistently and accurately.

10. How many seconds are in a minute?

A. 30 seconds

B. 60 seconds

C. 120 seconds

D. 90 seconds

A minute is universally defined as having 60 seconds. This is based on the standard time measurement system that we use globally. The division of time into minutes and seconds dates back to ancient civilizations, which established the 60-based system due to its mathematical properties, such as being easily divisible by many numbers. Thus, when considering how many seconds are in a minute, it is well-established that there are exactly 60 seconds. This fundamental concept is used in various applications, including mathematics, science, and everyday life.