Mathnasium Job Assessment Practice Exam (Sample)

Study Guide

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Questions

1. Which of the following formulas converts Celsius to Fahrenheit?

A. F = (5/9)C + 32

B. F = (9/5)C + 32

C. F = C - 32

D. F = (9/5)C - 32

2. Considering the outcome of runners, which calculation gives the total permutations of 3 from 7 runners?

A. 7! / 4!

B. 7! + 3!

C. 3!/7!

D. 7! * 3!

3. How many days are there in one year?

A. 360 days

B. 365 days

C. 370 days

D. 400 days

4. What is the term for a number that can be expressed as a fraction of two integers?

A. Real Number

B. Rational Number

C. Whole Number

D. Complex Number

5. If an item costing $50 has a 20% increase, what is the new price?

A. $50

B. $60

C. $70

D. $80

6. What is the solution for y in the equation 3y - 5 = 1?

A. y = 0
B. y = 1
C. y = 2
D. y = 3

7. What is the least common multiple (LCM) of two numbers?

A. The largest number that divides both
B. The smallest number (not zero) that is a multiple of both
C. The sum of the two numbers
D. The average of the two numbers

8. 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

9. What is the value of 45 degrees in radians?

A. π/2
B. π/4
C. 3π/4
D. 2π

10. What do you call the likelihood of an event occurring?

A. Possibility
B. Chance
C. Probability
D. Risk

Answers

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

Explanations

1. Which of the following formulas converts Celsius to Fahrenheit?

A. F = (5/9)C + 32

B. F = (9/5)C + 32

C. F = C - 32

D. F = (9/5)C - 32

The formula that converts Celsius to Fahrenheit is derived from the relationship between the two temperature scales. In this case, the correct formula is represented as \(F = (9/5)C + 32 \). This conversion works as follows: to convert a temperature given in degrees Celsius (C) to degrees Fahrenheit (F), you first multiply the Celsius value by \(\frac{9}{5} \) (which is the ratio of the differences between the freezing and boiling points of water in Fahrenheit and Celsius). After this multiplication, you then add 32, which accounts for the difference in the starting points of the two scales — where 0 degrees Celsius is equivalent to 32 degrees Fahrenheit. In contrast, the other formulas provided either incorporate incorrect multiplication factors, misplace the addition or subtraction of 32, or entirely misrepresent the relationships between Celsius and Fahrenheit. Hence, using \(F = (9/5)C + 32 \) allows for accurate conversion from Celsius to Fahrenheit.

2. Considering the outcome of runners, which calculation gives the total permutations of 3 from 7 runners?

A. 7! / 4!

B. 7! + 3!

C. 3!/7!

D. 7! * 3!

To determine the total permutations of selecting 3 runners from a group of 7, we need to consider the order in which these runners are arranged. The correct calculation involves the concept of permutations, which takes into account all possible arrangements of the selected items. When calculating permutations, the formula used is: \[P(n, r) = \frac{n!}{(n - r)!} \] In this case, \(n \) is the total number of items (runners) we have, which is 7, and \(r \) is the number of items we want to arrange, which is 3. Substituting these values into the formula gives us: \[P(7, 3) = \frac{7!}{(7 - 3)!} = \frac{7!}{4!} \] This result indicates that we first calculate the factorial of 7, which represents all possible arrangements of the 7 runners, and then we divide by the factorial of 4, which accounts for the arrangements of the runners not selected. The choice that reflects this calculation—dividing the factorial of the total number of runners by the factorial of the number of runners not selected—is the first option,

3. How many days are there in one year?

A. 360 days

B. 365 days

C. 370 days

D. 400 days

A year typically has 365 days, which represents the time it takes for the Earth to complete one full orbit around the Sun. This is known as a solar year. It's important to note that in a leap year, which occurs every four years, an extra day is added to February, giving that year a total of 366 days. However, for the majority of years that do not fall into the leap year category, the count remains at 365 days. The other options do not align with the generally accepted standard for the number of days in a year. For instance, 360 days might be thought of in some contexts, like in ancient calendars or for certain mathematical convenience, but it is not accurate for a solar year. Other values, such as 370 or 400 days, are not applicable for a standard calendar year. Thus, 365 days is the correct and widely accepted figure for the number of days in one year.

4. What is the term for a number that can be expressed as a fraction of two integers?

A. Real Number

B. Rational Number

C. Whole Number

D. Complex Number

The term for a number that can be expressed as a fraction of two integers is a rational number. By definition, a rational number is any number that can be written in the form $\frac{a}{b}$, where a and b are integers, and b is not zero. This encompasses integers and fractions, as integers can be represented as fractions by placing them over 1 (for example, 3 can be expressed as $\frac{3}{1}$). In contrast, real numbers include both rational and irrational numbers, but the question specifically asks for a subset of real numbers that meet the fraction criteria, which is why "real number" does not fit this requirement. Whole numbers are a subset of integers and do not cover all forms of fractional representation. Complex numbers include a real part and an imaginary part, which is not merely a fraction of integers, thus that option does not apply either. Therefore, rational numbers are the precise answer in this context, more accurately describing the relationship between integers in fraction form.

5. If an item costing $50 has a 20% increase, what is the new price?

A. $50

B. $60

C. $70

D. $80

To determine the new price of an item after a 20% increase, first, you need to calculate 20% of the original price, which is $50 in this case. Calculating 20% of $50 involves multiplying 50 by 0.20 (the decimal equivalent of 20%). This calculation is: \[50 \times 0.20 = 10 \] This means that the increase in price is $10. Next, to find the new price, you add this increase to the original price: \[50 + 10 = 60 \] Therefore, the new price of the item after a 20% increase is $60. This clearly identifies the correct answer as the new price, which is accurately represented by the choice labeled B.

6. What is the solution for y in the equation 3y - 5 = 1?

A. y = 0

B. y = 1

C. y = 2

D. y = 3

To solve the equation 3y - 5 = 1 for y, start by isolating the term with y. First, add 5 to both sides of the equation: 3y - 5 + 5 = 1 + 5, which simplifies to: 3y = 6. Next, to find y, divide both sides of the equation by 3: 3y/3 = 6/3, resulting in: y = 2. This indicates that the solution for y in the equation 3y - 5 = 1 is 2. Therefore, option C is the correct solution.

7. What is the least common multiple (LCM) of two numbers?

A. The largest number that divides both

B. The smallest number (not zero) that is a multiple of both

C. The sum of the two numbers

D. The average of the two numbers

The least common multiple (LCM) of two numbers is defined as the smallest number that is a multiple of both numbers. This means that the LCM is the first number that can be evenly divided by each of the two given numbers without a remainder. For example, if we consider the numbers 4 and 6, their multiples are 4, 8, 12, 16, and so on for 4; and 6, 12, 18, 24, and so on for 6. The smallest common multiple present in both lists is 12, making it the LCM of 4 and 6. This concept helps in various applications, particularly in finding common denominators in fractions or solving problems involving periodic events. The other provided options do not correctly define the LCM: - The largest number that divides both describes the greatest common divisor (GCD), not the LCM. - The sum of the two numbers does not relate to their multiples. - The average of the two numbers is simply a measure of central tendency and does not concern multiples at all. Thus, the correct choice effectively captures the essence of what the least common multiple represents mathematically.

8. 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.

9. What is the value of 45 degrees in radians?

A. π/2

B. π/4

C. 3π/4

D. 2π

To convert degrees to radians, the formula used is: $$\text{Radians} = \text{Degrees} \times \left(\frac{\pi}{180} \right)$$ For 45 degrees, the calculation is as follows: $$45 \times \left(\frac{\pi}{180} \right) = \frac{45\pi}{180}$$ This simplifies down to: $$\frac{\pi}{4}$$ Thus, the value of 45 degrees in radians is $\frac{\pi}{4}$. This conversion accurately reflects the relationship between degrees and radians, where one full rotation (360 degrees) is equivalent to 2π radians, making it essential to simplify fractions correctly. The other choices do not match this conversion; $\frac{\pi}{2}$ would represent 90 degrees, $\frac{3\pi}{4}$ corresponds to 135 degrees, and 2π signifies a full rotation of 360 degrees, none of which are accurate for 45 degrees.

10. What do you call the likelihood of an event occurring?

A. Possibility

B. Chance

C. Probability

D. Risk

The likelihood of an event occurring is referred to as probability. This concept quantifies the chance that a specific event will happen, typically represented as a number between 0 and 1 or as a percentage. A probability of 0 indicates that the event will not happen, while a probability of 1 means that it is certain to occur. In mathematical terms, probability is defined as the ratio of the number of favorable outcomes to the total number of possible outcomes. This quantification allows for a precise understanding of how likely an event is, making it a fundamental concept in statistics and various fields, including finance, science, and everyday decision-making. Possibility, while it suggests a potential for something to occur, does not carry the same mathematical rigor as probability. Similarly, chance can convey a general idea of likelihood but lacks the precise definition offered by probability. Risk, on the other hand, often involves the potential for loss or negative outcomes and is not synonymous with the mere likelihood of an event occurring. Thus, probability is the most accurate term in this context.