

Q1. Let X be the set of all citizens of India. Elements x, y in X are said to be related if the difference of their age is 5 years. Which one of the following is correct?

- (a) The relation is an equivalence relation on X.
- (b) The relation is symmetric but neither reflexive nor transitive.
- (c) The relation is reflexive but neither, symmetric nor transitive.
- (d) None of the above

Q2. Consider the following relations from A to B where $A = \{u, v, w, x, y, z\}$ and $B = \{p, q, r, s\}$.

1. $\{(u, p), (v, p), (w, p), (x, q), (y, q), (z, q)\}$
2. $\{(u, p), (v, q), (w, r), (z, s)\}$
3. $\{(u, s), (v, r), (w, q), (u, p), (v, q), (z, q), \}$
4. $\{(u, q), (v, p), (w, s), (x, r), (y, q), (z, s), \}$

Which of the above relations are not functions?

- (a) 1 and 2
- (b) 1 and 4
- (c) 2 and 3
- (d) 3 and 4

Q3. If α and β are the roots of the equation $ax^2 + bx + c = 0$, where $a \neq 0$, then $(a\alpha + b)(a\beta + b)$ is equal to :

- (a) ab
- (b) bc
- (c) ca
- (d) abc

Q4. Let S denote set of all integers. Define a relation R on S as 'aRb if $ab \geq 0$ where $a, b \in S$ '. Then R is :

- (a) Reflexive but neither symmetric nor transitive relation
- (b) Reflexive, symmetric but not transitive relation
- (c) An equivalence relation
- (d) Symmetric but neither reflexive nor transitive relation

Q5. The roots of the equation $2a^2x^2 - 2abx + b^2 = 0$ when $a < 0$ and $b > 0$ are :

- (a) Sometimes complex
- (b) Always irrational
- (c) Always complex
- (d) Always real

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Q6. What is the sum of the two numbers $(11110)_2$ and $(1010)_2$?

- (a) $(101000)_2$
- (b) $(110000)_2$
- (c) $(100100)_2$
- (d) $(101100)_2$

Q7. Let N denote the set of all non-negative integers and Z denote the set of all integers. The function $f : Z \rightarrow N$ given by $f(x) = |x|$ is:

- (a) One-one but not into
- (b) Onto but not one-one
- (c) Both one-one and onto
- (d) Neither one-one nor onto

Q8. If P and Q are two complex numbers, then the modulus of the quotient of P and Q is :

- (a) Greater than the quotient of their moduli
- (b) Less than the quotient of their moduli
- (c) Less than or equal to the quotient of their moduli
- (d) Equal to the quotient of their moduli

Q9. Let $z = x + iy$ Where x, y are real variables $i = \sqrt{-1}$. If $|2z - 1| = |z - 2|$, then the point z describes:

- (a) A circle
- (b) An ellipse
- (c) A hyperbola
- (d) A parabola

Q10. The sum of an infinite GP is x and the common ratio r is such that $|r| < 1$. If the first term of the GP is 2 , then which one of the following is correct?

- (a) $-1 < x < 1$
- (b) $-\infty < x < 1$
- (c) $1 < x < \infty$
- (d) None of these

Q11. A box contains 3 white and 2 black balls. Two balls are drawn at random one after the other. If the balls are not replaced, what is the probability that both the balls are black?

- (a) $2/5$
- (b) $1/5$
- (c) $1/10$
- (d) None of these

Q12. For two variables x and y , the two regression coefficients are $b_{yx} = -3/2$ and $b_{xy} = -1/6$. The correlation coefficient between x and y is :

- (a) $-1/4$
- (b) $1/4$
- (c) $-1/2$
- (d) $1/2$

Q13. The variance of numbers $x_1, x_2, x_3, \dots, x_n$ is V . Consider the following statements:

1. If every x_i is increased by 2, the variance of the new set of the new set of numbers is V .
2. If the numbers x_i is squared, the variance of the new set is V^2 .

Which of the following statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Q14. What is the mean of the squares of the first 20 natural numbers?

- (a) 151.5
- (b) 143.5
- (c) 65
- (d) 72

Q15. p, q, r, s, t , are five numbers such that the average of p, q and r is 5 and that of s and t is 10. What is the average of all the five numbers?

- (a) 7.75
- (b) 7.5
- (c) 7
- (d) 5

Q16. The cumulative frequency of the largest observed value must always be :

- (a) Less than the total number of observations
- (b) Greater than the total number of observations
- (c) Equal to total number of observations
- (d) Equal to mid point of the last class interval

Q17. It has been found that if A and B play a game 12 times, A wins 6 times, B wins 4 times and they draw twice. A and B take part in a series of 3 games. The probability that they win alternately, is :

- (a) $5/12$
- (b) $5/36$
- (c) $19/27$
- (d) $5/27$

Q18. Out of 7 consonants and 4 vowels, words are to be formed by involving 3 consonants and 2 vowels. The number of such words formed is:

- (a) 25200
- (b) 22500
- (c) 10080
- (d) 5040

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Q19. Let X denote the number of scores which exceed 4 in 18, tosses of a symmetrical die. Consider the following statements :

1. The arithmetic mean of X is 6.
2. The standard deviation of X is 2.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Q20. How many different words can be formed by taking four letters out of the letters of the word 'AGAIN' if each word has to start with A?

- (a) 6
- (b) 12
- (c) 24
- (d) None of the above

Q21. The sum of the series formed by the sequence $3, \sqrt{3}, 1, \dots$ upto infinity is :

- (a) $\frac{3\sqrt{3}(\sqrt{3}+1)}{2}$
- (b) $\frac{3\sqrt{3}(\sqrt{3}-1)}{2}$
- (c) $\frac{3(\sqrt{3}+1)}{2}$
- (d) $\frac{3(\sqrt{3}-1)}{2}$

Q22. If $|z + \bar{z}| = |z - \bar{z}|$, then the locus of z is :

- (a) A pair of straight lines
- (b) A line
- (c) A set of four straight lines
- (d) A circle

Q23. The number 251 in decimal system is expressed in binary system by:

- (a) 11110111
- (b) 11111011
- (c) 11111101
- (d) 11111101

Q24. What is the argument of the complex number $\frac{(1+i)(2+i)}{3-i}$ where $i = \sqrt{-1}$?

- (a) 0
- (b) $\frac{\pi}{4}$
- (c) $-\frac{\pi}{4}$
- (d) $\frac{\pi}{2}$

Q25. Consider the following statements in respect of the matrix

$$A = \begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & -3 \\ -2 & 3 & 0 \end{bmatrix}$$

1. The matrix A is skew-symmetric.
2. The matrix A is symmetric.
3. The matrix A is invertible.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 3 only
- (c) 1 and 3
- (d) 2 and 3



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