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- 1. If $\tan \theta = -\frac{5}{12}$, then what can be the value of $\sin \theta$?
 - (a) $\frac{5}{13}$ but cannot be $-\frac{5}{13}$
 - (b) $-\frac{5}{13}$ but cannot be $\frac{5}{13}$
 - $(9) \frac{5}{13}$ or $-\frac{5}{13}$
 - (d) None of the above
- 2. What is the value of $\cos^4 \frac{7\pi}{8} + \cos^4 \frac{5\pi}{8}$?
 - (a) $\frac{3}{2}$
 - (b) $\frac{3}{4}$
 - (c) $\frac{3}{8}$
 - (d) $\frac{3}{16}$
- 3. What is $\sin^2\left(\frac{\pi}{4} + \theta\right) \sin^2\left(\frac{\pi}{4} \theta\right)$ equal to?
- (3) $\sin 2\theta$
 - (b) $\cos 2\theta$
 - (c) $2\sin\theta$
 - (d) $2\cos\theta$

- 4. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height h. At a point on the plane the angles of elevation of the bottom and top of the flagstaff are θ and 2θ respectively. What is the height of the tower?
 - (a) $h\cos\theta$
 - (b) $h\sin\theta$
- (c) hcos2θ
 - (d) $h\sin 2\theta$
- 5. The shadow of a tower becomes x metre longer, when the angle of elevation of sun changes from 60° to θ . If the height of the tower is $\sqrt{3}x$ metre, then which one of the following is correct?
 - (a) $0 < \theta < 30^{\circ}$
- (b) $30^{\circ} < \theta < 45^{\circ}$
 - (c) $45^{\circ} < \theta < 60^{\circ}$
 - (d) 60° < θ < 90°
- 6. If $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{x}{3}\right) = \frac{\pi}{4}$, where 0 < x < 6, then what is x equal to?
- (9) 1
 - (b) 2
 - (c) 3
 - (d) 5

- 7. If $3\sin^{-1}x + \cos^{-1}x = \pi$, then what is x equal to?
 - (a) 0
 - (b) $\frac{1}{2}$
 - $\sqrt{1} \frac{1}{\sqrt{2}}$
 - (d) $\frac{1}{\sqrt{3}}$
- 8. If $\tan \alpha + \tan \beta = 1 \tan \alpha \cdot \tan \beta$, where $\tan \alpha \cdot \tan \beta \neq 1$, then which of the following is one of the values of $(\alpha + \beta)$?
 - (a) $\frac{\pi}{6}$
 - (b) $\frac{\pi}{4}$
 - (c) $\frac{\pi}{3}$
 - (d) $\frac{\pi}{2}$
- 9. If $(1 + \tan \theta)(1 + \tan \theta) = 2$, then what is the value of $\tan(10\theta)$?
 - (a) 0



- (c) 2
- (d) Infinite

- 10. What is the value of sin0° + sin10° + sin20° + sin30° + ... + sin360°?
 - (a) -1



- (c) 1
- (d) 2
- 11. Consider all the subsets of the set $A = \{1, 2, 3, 4\}$. How many of them are supersets of the set $\{4\}$?
 - (a) 6



- (c) 8
- (d) 9
- 12. Consider the following statements in respect of two non-empty sets A and B:

1.
$$x \notin (A \cup B) \Rightarrow x \notin A \text{ or } x \notin B$$

2.
$$x \notin (A \cap B) \Rightarrow x \notin A \text{ and } x \notin B$$

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2



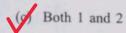
13. Consider the following statements in respect of two non-empty sets A and B:

1.
$$A \cup B = A \cap B$$
 iff $A = B$

2.
$$A\Delta B = \varphi \text{ iff } A = B$$

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only



- (d) Neither 1 nor 2
- 14. Consider the following statements in respect of the relation R in the set IN of natural numbers defined by xRy if $x^2 5xy + 4y^2 = 0$:
 - 1. R is reflexive
 - 2. R is symmetric
 - 3. R is transitive

Which of the above statements is/are correct?



- (b) 2 only
- (c) 1 and 2 only
- (d) 1, 2 and 3
- **15.** Consider the following statements in respect of any relation *R* on a set *A*:
 - 1. If R is reflexive, then R^{-1} is also reflexive
 - 2. If R is symmetric, then R^{-1} is also symmetric
 - 3. If R is transitive, then R^{-1} is also transitive

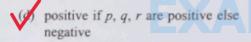
Which of the above statements are correct?

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

16. If
$$\Delta_1 = \begin{vmatrix} 1 & p & q \\ 1 & q & r \\ 1 & r & p \end{vmatrix}$$
 and $\Delta_2 = \begin{vmatrix} 1 & 1 & 1 \\ q & r & p \\ r & p & q \end{vmatrix}$

where $p \neq q \neq r$, then $\Delta_1 + \Delta_2$ is

- (a) 0
- (b) always positive
- (c) always negative



17. If (a-b)(b-c)(c-a) = 2 and abc = 6, then what is the value of

$$\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} ?$$

(a) 3



- (c) 14
- (d) 15

Under which of the following conditions does the determinant

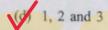
1.
$$a + b + c = 0$$

2.
$$a^3 + b^3 + c^3 = 3abc$$

3.
$$a^2 + b^2 + c^2 - ab - bc - ca = 0$$

Select the correct answer using the code given below:

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



19. Consider the following in respect of the matrices:

$$A = [m \ n], B = [-n - m] \text{ and } C = \begin{bmatrix} m \\ -m \end{bmatrix}$$

1.
$$CA = CB$$

$$2. AC = BC$$

3.
$$C(A+B) = CA + CB$$

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only



(d) 1 and 2

20. If
$$A = \begin{bmatrix} 2\sin\theta & \cos\theta & 0 \\ -2\cos\theta & \sin\theta & 0 \\ -1 & 1 & 1 \end{bmatrix}$$
, then

what is A(adjA) equal to?

- (a) Null matrix
- (b) -I
- (c) I



where I is the identity matrix.

21. For what value of k is the matrix

$$\begin{bmatrix} 2\cos 2\theta & 2\cos 2\theta & 6\\ 1-2\sin^2\theta & 2\cos^2\theta - 1 & 3\\ k & 2k & 1 \end{bmatrix}$$

singular?

- (a) 0 only
- (b) 1 only
- (c) 2 only
- (d) Any real value
- **22.** Let A be a non-singular matrix and B = adjA. Which of the following statements is/are correct?

$$1. AB = BA$$

- 2. AB is a scalar matrix
- 3. AB can be a null matrix

Select the correct answer using the code given below:

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

- 23. Consider the following statements in respect of square matrices A and B of same order:
 - 1. If AB is a null matrix, then at least one of A and B is a null matrix.
 - 2. If AB is an identity matrix, then BA = AB.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
 - (c) Both 1 and 2
- (d) Neither 1 nor 2
- 24. If A is the identity matrix of order 3 and B is its transpose, then what is the value of the determinant of the matrix C = A + B?
 - (a) 1
 - (b) 2
 - (c) 4
 - (d) 8
- **25.** Let A and B be non-singular matrices of the same order such that AB = A and BA = B. Which of the following statements is/are correct?
 - 1. $A^2 = A$
 - 2. $AB^2 = A^2B$

Select the correct answer using the code given below:

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

- 26. How many terms are there in the expansion of $\left(1+\frac{2}{x}\right)^9 \left(1-\frac{2}{x}\right)^9$?
 - (a) 9
 - (1) 10
 - (c) 19
 - (d) 20
- 27. Consider the following statements in respect of the expansion of $(x + y)^{10}$:
 - Among all the coefficients of the terms, the coefficient of the 6th term has the highest value
 - 2. The coefficient of the 3rd term is equal to coefficient of the 9th term

- (a) 1 only
- (b) 2 only
- (9) Both 1 and 2
- (d) Neither 1 nor 2
- **28.** If C(3n, 2n) = C(3n, 2n-7), then what is the value of C(n, n-5)?
 - (a) 42
 - (b) 35
 - (c) 28
 - (4) 21

29. What is the value of C(51, 21) - C(51, 22) + C(51.

$$C(51, 21) - C(51, 22) + C(51, 23) - C(51, 24) + C(51, 25) - C(51, 26) + C(51, 27) - C(51, 28) + C(51, 29) - C(51, 30)$$
?

- (a) C(51, 25)
- (b) C(51, 27)

(f)
$$C(51,51)-C(51,0)$$

- (d) C(51, 25) C(51, 27)
- **30.** How many odd numbers between 300 and 400 are there in which none of the digits is repeated?



- (b) 36
- (c) 40
- (d) 45
- 31. What is the principal argument of $\frac{1}{1+i}$ where $i = \sqrt{-1}$?

(a)
$$-\frac{3\pi}{4}$$



- (c) $\frac{\pi}{4}$
- (d) $\frac{3\pi}{4}$

32. What is the modulus of

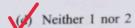
$$\left(\frac{\sqrt{-3}}{2} - \frac{1}{2}\right)^{200}$$
?

- (a) $\frac{1}{4}$
- (b) $\frac{1}{2}$



- (d) 2²⁰⁰
- 33. Consider the following statements:
 - 1. $\frac{n!}{3!}$ is divisible by 6, where n > 3
 - 2. $\frac{n!}{3!} + 3$ is divisible by 7, where n > 3

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2



- **34.** In how many ways can a team of 5 players be selected out of 9 players so as to exclude two particular players?
 - (a) 14



- (c) 35
- (d) 42

- 35. In the expansion of $\left(x + \frac{1}{x}\right)^{2n}$, what is the (n+1)th term from the end (when arranged in descending powers of x)?
 - (a) C(2n, n)x
 - (b) C(2n, n-1)x
 - (c) C(2n, n)
 - (d) C(2n, n-1)
- 36. If the sum of the first 9 terms of an AP is equal to sum of the first 11 terms, then what is the sum of the first 20 terms?
 - (a) 20
 - (b) 10
 - (c) 2
 - (4) 0
- 37. If the 5th term of an AP is $\frac{1}{10}$ and its 10^{th} term is $\frac{1}{5}$, then what is the sum of first 50 terms?
 - (a) 25
 - (b) 25-5
 - (c) 26
 - (d) 26.5
- **38.** What is $(1110011)_2 \div (10111)_2$ equal to?
 - (3) (101)2
 - (b) $(1001)_2$
 - (c) (111)₂
 - (d) (1011)₂

- 39. If $x^3 + y^3 = (100010111)_2$ and $x + y = (11111)_2$, then what is $(x y)^2 + xy$ equal to?
 - (a) (1101)₂
 - (1) (1001)2
 - (c) (1011)₂
 - (d) (1111)₂
- **40.** Consider the inequations 5x-4y+12 < 0, x+y < 2, x < 0 and y > 0. Which one of the following points lies in the common region?
 - (a) (0, 0)
 - (b) (-2, 4)
 - (c) (-1, 4)
 - (2) (-1, 2)
- **41.** Consider the following statements in respect of the function y = [x], $x \in (-1, 1)$ where [.] is the greatest integer function:
 - 1. Its derivative is 0 at x = 0.5
 - 2. It is continuous at x = 0

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only

15

- (c) Both 1 and 2
- (d) Neither 1 nor 2

42. What is the degree of the differential

equation
$$1 + \left(\frac{dy}{dx}\right)^2 = \left(\frac{d^2y}{dx^2}\right)^{\frac{4}{3}}$$
?

- (a) $\frac{4}{3}$
- (b) 2
- (c) 3
- (4) 4
- 43. A radioactive substance decays at a rate proportional to the amount of substance present. If half of the substance decays in 100 years, then what is the decay constant (proportionality constant)?



- (b) $\frac{ln 5}{100}$
- (c) $\frac{ln10}{100}$
- (d) $\frac{2 \ln 2}{100}$
- 44. What is the domain of the function

$$f(x) = \sqrt{1 - (x - 1)^2}$$
?

- (a) (0, 1)
- (b) [-1, 1]
- (c) (0, 2)
- (1) [0, 2]

- 45. The area of the region bounded by the parabola $y^2 = 4kx$, where k > 0 and its latus rectum is 24 square units. What is the value of k?
 - (a) 1
 - (b) 2

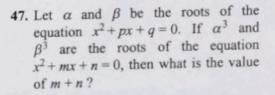


- (d) 4
- 46. How many permutations are there of the letters of the word 'TIGER' in which the vowels should not occupy the even positions?





- (c) 18
- (d) 12



(a)
$$p^3 + q^3 + pq$$

(b)
$$p^3 + q^3 - pq$$

(c)
$$p^3 + q^3 + 3pq$$

(2)
$$p^3 + q^3 - 3pq$$

48. Let α and β be the roots of the equation $x^2 - ax - bx + ab - c = 0$. What is the quadratic equation whose roots are a and b?

(3)
$$x^2 - \alpha x - \beta x + \alpha \beta + c = 0$$

(b)
$$x^2 - \alpha x - \beta x + \alpha \beta - c = 0$$

(c)
$$x^2 + \alpha x + \beta x + \alpha \beta + c = 0$$

(d)
$$x^2 + \alpha x + \beta x + \alpha \beta - c = 0$$

49. If the roots of the equation $x^2 - ax - bx - cx + bc + ca = 0$ are equal, then which one of the following is correct?

(a)
$$a + b + c = 0$$

(b)
$$a - b + c = 0$$

(c)
$$a + b - c = 0$$

(d) $-a + b + c = 0$

(d)
$$-a + b + c = 0$$

50. Let α and β $(\alpha > \beta)$ be the roots of the equation $x^2 - 8x + q = 0$. If $\alpha^2 - \beta^2 = 16$, then what is the value of q?

(b)
$$-10$$

51. What is the maximum value of n such that 5^n divides (30! + 35!), where n is a natural number?

52. What is the value of $2(2\times1)+3(3\times2\times1)+4(4\times3\times2\times1)+$ 5(5×4×3×2×1) + + $9(9\times8\times7\times6\times5\times4\times3\times2\times1)+2$?

- (c) 10+10!
- (d) 11+10!
- 53. If $A = \{\{1, 2, 3\}\}$, then how many elements are there in the power set of A?



(c) 4

54. If a, b, c are in GP where a > 0, b > 0, c > 0, then which of the following are correct?

1.
$$a^2$$
, b^2 , c^2 are in GP

2.
$$\frac{1}{a}$$
, $\frac{1}{b}$, $\frac{1}{c}$ are in GP

3.
$$\sqrt{a}$$
, \sqrt{b} , \sqrt{c} are in GP

Select the correct answer using the code given below:

- 55. If $\frac{a+b}{2}$, b, $\frac{b+c}{2}$ are in HP, then which one of the following is correct?
 - (a) a, b, c are in AP
 - (b) a, b, c are in GP
 - (c) a+b, b+c, c+a are in GP
 - (d) a+b, b+c, c+a are in AP
- **56.** What is value of $\cot^2 15^\circ + \tan^2 15^\circ$?
 - (a) 12
 - (9) 14
 - (c) 8√3
 - (d) 4
- **57.** In a triangle ABC, $\sin A \cos B \cos C = 0$. What is angle B equal to?
 - (a) $\frac{\pi}{6}$
 - (b) $\frac{\pi}{4}$
 - (c) $\frac{\pi}{3}$
 - $(d) \frac{\pi}{2}$
- **58.** If $\alpha + \beta = \frac{\pi}{4}$ and $2\tan \alpha = 1$, then what is $\tan 2\beta$ equal to ?

- (a) $\frac{1}{3}$
- (b) $\frac{2}{3}$
- $(9) \frac{3}{4}$
- (d) $\frac{3}{5}$
- **59.** If $\tan(45^\circ + \theta) = 1 + \sin 2\theta$, where $-\frac{\pi}{4} < \theta < \frac{\pi}{4}$, then what is the value of $\cos 2\theta$?
 - (a) 0
 - (b) $\frac{1}{2}$
 - (9) 1
 - (d) 2
- **60.** Let $\sin 2\theta = \cos 3\theta$, where θ is acute angle. What is the value of $1 + 4\sin\theta$? (given that $\sin 18^\circ = \frac{\sqrt{5} 1}{4}$)
 - (a) $\sqrt{3}$
 - (b) 2
 - (g) √5
 - (d) 3

Consider the following for the next three (03) items that follow:

The plane 6x + ky + 3z - 12 = 0 where $k \neq 0$ meets the coordinate axes at A, B and C respectively. The equation of the sphere passing through the origin and A, B, C is $x^2 + y^2 + z^2 - 2x - 3y - 4z = 0$.

- **61.** What is the value of k?
 - (a) 3
 - (b) 4
 - (c) 6
 - (d) 12
- **62.** If p is the perpendicular distance from the centre of the sphere to the plane, then which one of the following is correct?

(a)
$$0$$

(b)
$$0.5$$

(c)
$$1$$

(d)
$$p > 1.5$$

63. What is the equation of the line through the origin and the centre of the sphere?

(a)
$$x = y = z$$

(b)
$$2x = 3y = 4z$$

(c)
$$6x = 3y = 4z$$

Consider the following for the next two (02) items that follow:

Let the plane $\frac{2x}{k} + \frac{2y}{3} + \frac{z}{3} = 2$ pass through the point (2, 3, -6).

64. What are the direction ratios of a normal to the plane?

65. If p, q and r are the intercepts made by the plane on the coordinate axes respectively, then what is (p+q+r)equal to?



(c) 12

66. If $4\hat{i} + \hat{j} - 3\hat{k}$ and $p\hat{i} + q\hat{j} - 2\hat{k}$ are collinear vectors, then what are the possible values of p and q respectively?

$$(9) \frac{8}{3}, \frac{2}{3}$$

(d)
$$\frac{2}{3}$$
, $\frac{8}{3}$

(d)
$$6x = 4y = 3z$$

67. If \overrightarrow{a} , \overrightarrow{b} , \overrightarrow{c} are the position vectors of the vertices A, B, C respectively of a triangle ABC and G is the centroid of the triangle, then what is \overrightarrow{AG} equal to?

(a)
$$\frac{\vec{a} + \vec{b} + \vec{c}}{3}$$

(b)
$$\frac{2\vec{a}-\vec{b}-\vec{c}}{3}$$

$$(c) \stackrel{\overrightarrow{b}+\overrightarrow{c}-2\overrightarrow{a}}{3}$$

(d)
$$\frac{\overrightarrow{a}-2\overrightarrow{b}-2\overrightarrow{c}}{3}$$

- 68. Consider the following statements:
 - 1. Dot product over vector addition is distributive
 - Cross product over vector addition is distributive
 - Cross product of vectors is associative

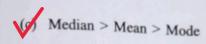
Which of the above statements is/are correct?:

- (a) 1 only
- (b) 2 only
- (g) 1 and 2 only
 - (d) 1, 2 and 3
- **69.** Let \vec{a} , \vec{b} , \vec{c} be three non-zero vectors such that $\vec{a} \times \vec{b} = \vec{c}$. Consider the following statements:

- 1. \vec{a} is unique if \vec{b} and \vec{c} are given
- 2. \vec{c} is unique if \vec{a} and \vec{b} are given

- (a) 1 only
- (b) 2 only
- (g) Both 1 and 2
- (d) Neither 1 nor 2
- 70. Let \vec{a} and \vec{b} be two unit vectors such that $|\vec{a} \vec{b}| < 2$. If 2θ is the angle between \vec{a} and \vec{b} , then which one of the following is correct?
 - (a) $0 < \sin\theta < 1$ only
 - (b) $-\frac{1}{2} < \sin\theta < \frac{1}{2}$ only
 - (c) $-1 < \sin\theta < 0$ only
 - (d) $-1 < \sin\theta < 1$
- 71. Two digits out of 1, 2, 3, 4, 5 are chosen at random and multiplied together. What is the probability that the last digit in the product appears as 0?
 - (a) $\frac{1}{10}$
 - (b) $\frac{1}{5}$
 - (c) $\frac{2}{5}$
 - (d) $\frac{4}{5}$

- 72. The frequency curve (assuming unimodal) corresponding to the data obtained in an experiment is skewed to the left. What conclusion can be drawn from the curve?
 - (a) Mean > Median > Mode
 - (b) Mean > Mode > Median



- (d) Mode > Median > Mean
- 73. The variance of five positive observations is 3.6. If four of the observations are 2, 2, 4, 5 then what is the remaining observation?



- (b) 5
- (c) 7
- (d) 9
- 74. What is the arithmetic mean of 50 terms of an AP with first term 4 and common difference 4?
 - (a) 50
 - (b) 51
 - (c) 100
 - (d) 102

- 75. What is the coefficient of mean deviation of 21, 34, 23, 39, 26, 37, 40, 20, 33, 27 (taken from mean)?
 - (a) 0·11
 - (b) 0.22
 - (c) 0.33
 - (d) 0.44

76. What is
$$\int_0^{\frac{\pi}{4}} \frac{dx}{(\sin x + \cos x)^2}$$
 equal to?

- (a) $-\frac{1}{2}$
- (b) $\frac{1}{2}$
- (c) 1
- (d) $\frac{3}{2}$
- 77. What is $\int (\sin x)^{-1/2} (\cos x)^{-3/2} dx$ equal to ?
 - (a) $\sqrt{\tan x} + c$
 - (b) $2\sqrt{\tan x} + c$
 - (c) $\sqrt{\cot x} + c$
 - (d) $\sqrt{2}\tan x + c$

- 78. If $I_1 = \int \frac{e^x dx}{e^x + e^{-x}}$ and $I_2 = \int \frac{dx}{e^{2x} + 1}$, then what is $I_1 + I_2$ equal to?
 - (a) $\frac{x}{2} + c$
 - (b) x+c
 - (c) $ln(e^x + e^{-x}) + c$
 - (d) $ln(e^x e^{-x}) + c$
- 79. What is $\int_{-2}^{-1} \frac{x}{|x|} dx$ equal to?
 - (a) -2



- (c) 1
- (d) 2
- **80.** How many extreme values does $\sin 4x + 2x$, where $0 < x < \frac{\pi}{2}$ have?
 - (a) 1
 - (b) 2
 - (c) 4
 - (d) 8
- 81. What is the maximum value of the function $f(x) = \frac{1}{\tan x + \cot x}$, where $0 < x < \frac{\pi}{2}$?

- (a) $\frac{1}{4}$
- (b) $\frac{1}{2}$
- (c) 1
- (d) 2
- 82. If

$$4f(x) - f\left(\frac{1}{x}\right) = \left(2x + \frac{1}{x}\right)\left(2x - \frac{1}{x}\right),$$
then what is $f(2)$ equal to ?

- (a) 0
- (b) 1
- (c) 2
- (d) 4
- 83. If f(x) = 4x + 3, then what is $f \circ f \circ f (-1)$ equal to?
 - (a) -1
 - (b) 0
 - (c) 1
 - (d) 2
- 84. If $x^y y^x = 1$, then what is $\frac{dy}{dx}$ at (1, 1) equal to?
 - (a) -1
 - (b) 0
 - (c) 1
 - (d) 4

- **85.** If $y = (x^x)^x$, then what is the value of $\frac{dy}{dx}$ at x = 1?
 - (a) $\frac{1}{2}$
 - (b) 1
 - (c) 2
 - (d) 4
- 86. Let y = [x+1], -4 < x < -3 where [.] is the greatest integer function. What is the derivative of y with respect to x at x = -3.5?



- (b) -3.5
- (c) -3
- (d) 0
- 87. If $\frac{dy}{dx} = (ln5)y$ with y(0) = ln5, then what is y(1) equal to?
 - (a) 0
 - (b) 5
 - (c) 2ln5
 - (d) 5ln5
- **88.** Consider the following in respect of the function $f(x) = 10^x$:
 - 1. Its domain is $(-\infty, \infty)$
 - 2. It is a continuous function
 - 3. It is differentiable at x = 0

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3
- 89. What is $\lim_{x\to 0} x^3 (\csc x)^2$ equal to?
 - (a) 0
 - (b) $\frac{1}{2}$
 - (c) 1
 - (d) Limit does not exist
- 90. What is $\lim_{x\to 1} \frac{x^3-1}{\sqrt{x-1}}$ equal to ?
 - (a) 0
 - (b) 3
 - (c) 6
 - (d) Limit does not exist

Consider the following for the next three (03) items that follow:

The algebraic sum of the deviations of a set of values x_1 , x_2 , x_3 , ... x_n measured from 100 is -20 and the algebraic sum of the deviations of the same set of values measured from 92 is 140.

- 91. What is the mean of the values?
 - (a) 91
 - (b) 96
 - (c) 98
 - (d) 99

- 92. What is the algebraic sum of the deviations of the same set of values measured from 99?
 - (a) 0
 - (b) 10
 - (c) 20
 - (d) 40
- 93. If the algebraic sum of the deviations of the same set of values measured from y is 180, then what is the value of y?
 - (a) 80
 - (b) 85
 - (c) 90
 - (d) 95

Consider the following data for the next three (03) items that follow:

The marks obtained by 51 students in a class are in AP with its first term 4 and common difference 3.

- 94. What is the mean of the marks?
 - (a) 67
 - (b) 71
 - (c) 75
 - (d) 79
- 95. What is the median of the marks?
 - (a) 79.5
 - (b) 79
 - (c) 78·5
 - (d) 77

- 96. What is the sum of the deviations measured from the median?
 - (a) -1
 - (b) 0
 - (c) 1
 - (d) 2

Consider the following data for the next three (03) items that follow:

There are 90 applicants for a job. Some of them are graduates. Some of them have less than three years experience.

	Number of graduates	Number of non-graduates		
At least 3 years experience	18	9		
Less than 3 years experience	36	27		

Let G be the event that the first applicant interviewed is a graduate and T be the event that first applicant interviewed has at least 3 years experience.

- 97. What is $P(G \cap \overline{T})$ equal to?
 - (a) $\frac{1}{5}$
 - (b) $\frac{2}{5}$
 - (c) $\frac{3}{5}$
 - (d) $\frac{4}{5}$

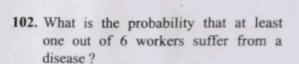
- **98.** What is $P(G | \overline{T})$ equal to?
 - (a) $\frac{2}{7}$
 - (b) $\frac{3}{7}$
 - (c) $\frac{4}{7}$
 - (d) $\frac{5}{7}$
- **99.** What is $P(\overline{T}|\overline{G})$ equal to?
 - (a) $\frac{1}{4}$
 - (b) $\frac{1}{3}$
 - (c) $\frac{3}{5}$
 - (d) $\frac{3}{4}$

Consider the following data for the next three (03) items that follow:

The incidence of suffering from a disease among workers in an industry has a chance of $33\frac{1}{3}\%$.

- 100. What is the probability that exactly 3 out of 6 workers suffer from a disease?
 - (a) $\frac{80}{729}$
 - (b) $\frac{10}{81}$

- (c) $\frac{10}{243}$
- (d) $\frac{160}{729}$
- 101. What is the probability that no one out of 6 workers suffers from a disease?
 - (a) $\frac{665}{729}$
 - (b) $\frac{64}{729}$
 - (c) $\frac{4}{243}$
 - (d) $\frac{1}{729}$



- (a) $\frac{728}{729}$
- (b) $\frac{665}{729}$
- (c) $\frac{653}{729}$
- (d) $\frac{596}{729}$

Consider the following frequency distribution for the next three (03) items that

Class	0-20	20.40	40	60-80 80-100		
Cimo	0 20	20-40	40-60	60-80	80-100	
Frequency	17	p+q	32	n 2-	00-100	
		-		p-3q	19	

The total frequency is 120. The mean is 50.

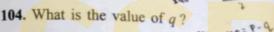
103. What is the value of p?

- (a) 25
- (b) 26

201P10 + 201P-30)

- (c) 27
- (d) 28

40+1P-29 : milntz



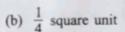


- (b) 2
- (c) 3
- (d) 4
- 105. If the frequency of each class is doubled, then what would be the mean?
 - (a) 25
 - (b) 50
 - (c) 75
 - (d) 100
- 106. In which one of the following intervals is the function $f(x) = \frac{x^3}{3} - \frac{7x^2}{2} + 6x + 5$ decreasing?

- (a) $(-\infty, 1)$ only
 - (b) (1, 6)
 - (c) $(6, \infty)$ only
 - (d) $(-\infty, 1) \cup (6, \infty)$
- 107. If the derivative of the function $f(x) = \frac{m}{x} + 2nx + 1$ vanishes at x = 2, then what is the value of m + 8n?

(a)
$$-2$$

- (b) 0
- (c) 2
- (d) Cannot be determined due to insufficient data
- 108. What is the area included in the first quadrant between the curves y = x and $y = x^{3}$?
 - (a) $\frac{1}{8}$ square unit



- (c) $\frac{1}{2}$ square unit
- (d) 1 square unit
- 109. If xy = 4225 where x, y are natural numbers, then what is the minimum value of x + y?
 - (a) 130
 - (b) 260
 - (c) 2113
 - (d) 4226

- 110. What does the equation $x \frac{dy}{dx} 2y = 0$
 - (a) A family of straight lines
 - (b) A family of circles
 - (c) A family of parabolas
 - (d) A family of ellipses
- 111. If the points with coordinates (-5, 0), $(5p^2, 10p)$ and $(5q^2, 10q)$ are collinear, then what is the value of pq where $p \neq q$?



- (a) -2
- (b) -1



- (c) 1
- (d) 2
- 112. What is the equation of the straight line which passes through the point (1, -2) and cuts off equal intercepts from the axes?
 - (a) x+y-1=0
 - (b) x-y-1=0
 - (c) x+y+1=0
 - (d) x-y-2=0
- 113. What is the equation of the circle which touches both the axes in the first quadrant and the line y 2 = 0?

(a)
$$x^2 + y^2 - 2x - 2y - 1 = 0$$

(b)
$$x^2 + y^2 + 2x + 2y + 1 = 0$$

(c)
$$x^2 + y^2 - 2x - 2y + 1 = 0$$

(d)
$$x^2 + y^2 - 4x - 4y + 4 = 0$$

114. What is the equation of the parabola with focus (-3, 0) and directrix x-3=0?

(a)
$$y^2 = 3x$$

(b)
$$x^2 = 12y$$

(c)
$$y^2 = 12x$$

(d)
$$v^2 = -12x$$

- 115. What is the distance between the foci of the ellipse $x^2 + 2y^2 = 1$?
 - (a) 1
 - (b) $\sqrt{2}$
 - (c) 2
 - (d) $2\sqrt{2}$
- 116. Let a, b, c be the lengths of sides BC, CA, AB respectively of a triangle ABC. If p is the perimeter and q is the area of the triangle, then what is

$$p(p-2a) \tan\left(\frac{A}{2}\right)$$
 equal to?

- (a) q
- (b) 2q
- (c) 3q
- (d) 4q

- 117. A straight line passes through the point of intersection of x + 2y + 2 = 0 and 2x 3y 3 = 0. It cuts equal intercepts in the fourth quadrant. What is the sum of the absolute values of the intercepts?
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 6
- 118. Under which one of the following conditions are the lines ax + by + c = 0 and bx + ay + c = 0 parallel $(a \ne 0, b \ne 0)$?
 - (a) a-b=0 only
 - (b) a + b = 0 only
 - (c) $a^2 b^2 = 0$
 - (d) ab + 1 = 0

- 119. What is the equation of the locus of the mid-point of the line segment obtained by cutting the line x + y = p, (where p is a real number) by the coordinate axes?
 - (a) x y = 0
 - (b) x + y = 0
 - (c) x-y=p
 - (d) x + y = p
- 120. If the point (x, y) is equidistant from the points (2a, 0) and (0, 3a) where a > 0, then which one of the following is correct?
 - (a) 2x 3y = 0
 - (b) 3x 2y = 0
 - (c) 4x 6y + 5a = 0
 - (d) 4x 6y 5a = 0



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