



THE VOLUME DEFENCE AND EDUCATION ACADEMY

“Your Success, Our Commitment”

TEST BOOKLET MATHEMATICS: NDA-I 2025

Time Allowed: Two Hours and Thirty Minutes

Maximum Marks: 600

- (1) The sum of the first k terms of a series S is $3k^2 + 5k$. Which one of the following is correct?
- The terms of S form an arithmetic progression with common difference 14.
 - The terms of S form an arithmetic progression with common difference 6.
 - The terms of S form a geometric progression with common ratio $10/7$.
 - The terms of S form a geometric progression with common ratio $11/4$.
- (2) The sum of the first 8 terms of a GP is five times the sum of its first 4 terms. If $r \neq 1$ is the common ratio, then what is the number of possible real values of r ?
- One
 - Two
 - Three
 - More than three
- (3) If one root of the equation $x^2 - kx + k = 0$ exceeds the other by $2\sqrt{3}$ then which one of the following is a value of k ?
- 3
 - 6
 - 9
 - 12
- (4) If $x + \frac{5}{y} = 4$, and then $y + \frac{5}{z} = -4$ what is $(x+y)$ equal to?
- 0
 - 1
 - 4
 - 5
- (5) If 5th, 7th and 13th terms of an AP are in GP, then what is the ratio of its first term to its common difference?
- 3
 - 2
 - 2
 - 3
- (6) If $p, 1, q$ are in AP and $p, 2, q$ are in GP, then which of the following statements is/are correct?



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- i. $P, 4, q$ are in HP.
- ii. $(1/p), (1/4), (1/q)$ are in AP

Select the answer using the code given

below.

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

(7) If $x = (1111)_2$, $y = (1001)_2$ and $z = (110)_2$, then what is $x^3 - y^3 - z^3 - 3xyz$ equal to?

- a) $(111001)_2$
- b) $(100111)_2$
- c) $(1)_2$
- d) $(0)_2$

(8) If $\Delta = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$ and A, B, C, D, E, F, G are the cofactors of the elements a, b, c, d, e, f, g respectively, then what is $bB + cC - dD - gG$ equal to?

- a) 0
- b) 1
- c) Δ
- d) $-\Delta$

(9) Consider the following statements in respect of the determinant

$$\Delta = \begin{vmatrix} k(k+2) & 2k+1 & 1 \\ 2k+1 & k+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$$

- I. Δ is positive if $k > 0$
- II. Δ is negative if $k < 0$
- III. Δ is zero if $k = 0$

How many statements given above are correct?

- a) None
- b) One
- c) Two
- d) All three



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(10) If $\begin{vmatrix} 2 & 3+i & -1 \\ 3-i & 0 & i-1 \\ -1 & -1-i & 1 \end{vmatrix} = A + iB$ where $i = \sqrt{-1}$, then what is $A + B$ equal to?

- a) -10
- b) -6
- c) 0
- d) 6

(11) If $A^2 + B^2 + C^2 = 0$, then what is the value of the following?

$$\begin{vmatrix} 1 & \cos C & \cos B \\ \cos C & 1 & \cos A \\ \cos B & \cos A & 1 \end{vmatrix}$$

- a) -1
- b) 0
- c) 1
- d) 2

(12) If ω is a non-real cube root of unity, then what is a root of the following equation?

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$$

- a) $X = 0$
- b) $X = 1$
- c) $X = \omega$
- d) $X = \omega^2$

(13) What is $\left(\frac{\sqrt{3}+i}{\sqrt{3}-i}\right)^3$ equal to?

- a) -1
- b) 0
- c) 1
- d) 3

(14) if $x^2 - x + 1 = 0$, then what is $\left(x - \frac{1}{x}\right)^2 + \left(x - \frac{1}{x}\right)^4 + \left(x - \frac{1}{x}\right)^8$

- a) 81
- b) 85
- c) 87
- d) 90



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(15) How many 7-letter words (with or without meaning) can be constructed using all the letters of the word CAPITAL so that all the consonants come together in each word?

- a) 360
- b) 300
- c) 288
- d) 240

(16) If $z \neq 0$ is a complex number, then what is $\arg(z) + \arg(\bar{z})$ equal to?

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

(17) How many sides are there in a polygon that has 20 diagonals?

- a) 6
- b) 7
- c) 8
- d) 10

(18) In how many ways can the letters of the word DELHI be arranged, keeping the positions of vowels and consonants unchanged?

- a) 6
- b) 9
- c) 12
- d) 14

(19) What is the number of positive integer solutions of $x+y+z=5$?

- a) 3
- b) 5
- c) 6
- d) 9

(20) What is the number of rational terms in the expansion of $(\sqrt{3} + 5^{\frac{1}{4}})^{12}$

- a) 2
- b) 3
- c) 4
- d) 6



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(21) If the sum of binomial coefficients in the expansion of $(x+y)^n$ is 256, then the greatest binomial coefficient occurs in which one of the following terms?

- a) Third
- b) Fourth
- c) Fifth
- d) Ninth

(22) If $k < (\sqrt{2} + 1)^3 < k + 2$, where k is a natural number, the value of k ?

- a) 11
- b) 13
- c) 15
- d) 17

(23) If $[x \ 1 \ 1] \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = [45]$

Then which one of the following is a value of x ?

- a) -2
- b) -1
- c) 0
- d) 1

(24) If $A = \begin{bmatrix} x & z & x \\ z & x & y \\ x & y & z \end{bmatrix}$ where x, y, z are

integers, is an orthogonal matrix,

then what is the value of

$$x^2 + y^2 + z^2?$$

- a) 0
- b) 1
- c) 4
- d) 14



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(25) Consider the following in respect of a non-singular matrix M:

- I. $|M^2| = |M|^2$
- II. $|M| = |M^{-1}|$
- III. $|M| = |M^T|$

How many of the above are correct?

- a) None
- b) One
- c) Two
- d) All three

(26) If $f(\theta) = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then what is $(f(\pi))^2$ equal to?

- a) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
- b) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- c) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$
- d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(27) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then what is $A^2 - 4A$ equal to?

- a) $-5I_3$
- b) $-I_3$
- c) I_3
- d) $5I_3$

(28) If the number of selections of r as well as $(n-r)$ things from $5n$ different things are equal, then what is the value of r ?

- a) n
- b) $2n$
- c) $3n$
- d) $4n$

(29) What is the number of selections of at most 3 things from 6 different things?

- a) 20
- b) 22
- c) 41



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d) 42

(30) If $A = \begin{bmatrix} x & y & z \\ y & z & x \\ z & x & y \end{bmatrix}$

Where x, y, z are integers, in an orthogonal matrix, then what is A^2 equal to?

- a) Null matrix
- b) Identity matrix
- c) A
- d) -A

Comprehension: (Que No. 31 - 33)

Consider the following for the three (03) items that follow: Let $p = \sin 35^\circ$, $q = \sin 25^\circ$ and $r = \sin(-95^\circ)$.

(31) What is $(p+q+r)$ equal to?

- a) -1
- b) 0
- c) $2\sin 5^\circ$
- d) $2\cos 5^\circ$

(32) What is $(pq+qr+rp)$ equal to?

- a) $-3/4$
- b) 0
- c) $1/4$
- d) $3/4$

(33) What is $(p^2 + q^2 + r^2)$ equal to?

- a) $1/2$
- b) 1
- c) $3/2$
- d) 2

Comprehension: (Que No. 34 – 35)

Consider the following for the two (02) items that follow: Let $p = |\sin \alpha - \sin(\alpha - 90^\circ)|$.

(34) What is the minimum value of p ?

- a) 0
- b) $1/2$
- c) $1/\sqrt{2}$



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d) 1

(35) What is the maximum value of p ?

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

Comprehension: (Que No. 36 - 38)

Consider the following for the three (03) items that follow: The sides of a triangle ABC are $AB=3\text{cm}$, $BC=5\text{cm}$ and $CA=7\text{cm}$.

(36) Consider the following statements:

- I. The triangle is obtuse-angled triangle.
- II. The sum of acute angles of the triangle is also acute.

Which of the statement given above is/are correct?

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

(37) What is $\angle B$ equal to?

- a) 60°
- b) 105°
- c) 120°
- d) 150°

(38) What is the area of the triangle?

- a) $15\sqrt{3}/4$ sq. cm
- b) $15\sqrt{3}/2$ sq. cm
- c) $15\sqrt{3}$ sq. cm
- d) $30\sqrt{3}$ sq. cm

Comprehension: (Que No. 39-40)

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

The top (M) of a tower is observed from three points P, Q and R lying in a horizontal straight line which passes directly along the foot (N) of the tower. The angles of elevations of M from P, Q and R are 30° , 45° and 60° respectively. Let $PQ = a$ and $QR = b$

(39) What is PN equal to?



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- a) $\left(\frac{3-\sqrt{3}}{2}\right)a$
- b) $\left(\frac{3+\sqrt{3}}{2}\right)a$
- c) $\left(\frac{3-\sqrt{3}}{4}\right)a$
- d) $\left(\frac{3+\sqrt{3}}{4}\right)a$

(40) What is MN equal to?

- a) $\left(\frac{3+\sqrt{3}}{2}\right)b$
- b) $\left(\frac{3-\sqrt{3}}{2}\right)b$
- c) $\left(\frac{3-\sqrt{3}}{4}\right)b$
- d) $\left(\frac{3+\sqrt{3}}{4}\right)b$

Comprehension: (Que No. 41 - 43)

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

Let $p = \tan 2\alpha - \tan \alpha$ and $q = \cot 2\alpha$

(41) What is (p/q) equal to?

- a) $-\tan \alpha \cdot \tan 2\alpha$
- b) $-\cot \alpha \cdot \cot 2\alpha$
- c) $\tan \alpha \cdot \tan 2\alpha$
- d) $\cot \alpha \cdot \cot 2\alpha$

(42) What is (p+q) equal to?

- a) $\sec 4\alpha$
- b) $\operatorname{cosec} 4\alpha$
- c) $2\sec 4\alpha$
- d) $2\operatorname{cosec} 4\alpha$

(43) What is $\tan^2 \alpha$ equal to?

- a) $(pq)/(p+q)$
- b) $(p+2q)/p$
- c) $p/(p+2q)$
- d) $p/(2q+p)$

Comprehension: (Que No. 44 - 45)



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

Let $2\sin\alpha + \cos\alpha = 2$ where $0 < \alpha < 90^\circ$

(44) What is $\tan\alpha$ equal to?

- a) $1/2$
- b) 1
- c) $3/4$
- d) 2

(45) What is $2\sin 2\alpha + \cos 2\alpha$ equal to?

- a) $11/10$
- b) $11/5$
- c) $12/5$
- d) $13/5$

Comprehension: (Que No. 46 - 47)

Consider the following for the two (02) items that follow in a triangle ABC, two sides BC and CA are in the ratio 2:1 and their opposite corresponding angles are in the ratio 3: 1.

(46) One of the angles of the triangle is

- a) 15°
- b) 30°
- c) 45°
- d) 75°

(47) Consider the following statements:

- I. The triangle is right-angled.
- II. One of the sides of the triangle is 3 times the other.
- III. The angles A, C and B of the triangle are in AP.

Which of the statement given above is/are correct?

- a) I only
- b) II and III only
- c) I and III only
- d) I, II and III

(48) A man at M, standing 100m away from the base (P) of a chimney of height 50 m, observes the angle of elevation of the highest point (Q) of the smoke to be 45° . The highest point of the chimney is at R. Further P, R and Q are in a straight line and the straight line is perpendicular to PM. What is the angle RMQ equal to?



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- a) $\tan^{-1}\left(\frac{1}{2}\right)$
- b) $\tan^{-1}\left(\frac{1}{3}\right)$
- c) $\tan^{-1}\left(\frac{2}{3}\right)$
- d) $\tan^{-1}\left(\frac{3}{4}\right)$

(49) If K is a root of $x^2-4x+1=0$, then what is $\tan^{-1}1/k$ equal to?

- a) $-\pi/2$
- b) 0
- c) $\pi/4$
- d) $\pi/2$

(50) If $\tan^{-1}k + \tan^{-1}\frac{1}{2} = \frac{\pi}{4}$, then what is the value of k?

- a) 1
- b) $1/2$
- c) $1/3$
- d) $1/4$

(51) Under what condition will the lines $m^2x+ny-1=0$ and $n^2x-my+2=0$ be perpendicular?

- a) $Mn-1=0$
- b) $Mn+1=0$
- c) $M + n = 0$
- d) $M - n = 0$

(52) If p and q are real number between 0 and 1 such that the points (p, 1), (1, q) and (0, 0) form an equilateral triangle, then what is (p + q) equal to?

- a) $\sqrt{2}$
- b) $\sqrt{2}-1$
- c) $2-\sqrt{3}$
- d) $4-2\sqrt{3}$

(53) The vertices of a triangle are A(1, 1), B(0, 0) and C(2, 0). The angular bisectors of the triangle meet at P. What are the coordinates of P?

- a) $(1, \sqrt{2} - 1)$
- b) $(1, \sqrt{3} - 1)$
- c) $(1, 1/2)$
- d) $(1/2, \sqrt{2} - 1)$



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(54) Let $A(3, -1)$ and $B(1, 1)$ be the end points of line segment AB. Let P be the middle point of the line segment AB. Let Q be the point situated at a distance $\sqrt{2}$ units from P on the perpendicular bisector line of AB. What are the possible coordinates of Q?

- a) $(2, 1)$
- b) $(3, 1)$
- c) $(2, 2)$
- d) $(1, 3)$

(55) ABC is an equilateral triangle and AD is the altitude on BC. If the Coordinates of A are $(1, 2)$ and that of D are $(-2, 6)$, then what is the equation of BC?

- a) $3x + 4y - 18 = 0$
- b) $4x + 3y - 1 = 0$
- c) $4x - 3y + 26 = 0$
- d) $3x - 4y + 30 = 0$

(56) What is the equation of the circle whose diameter is 10 cm and the equations of two of its diameters are $x + y = 0$ and $x - y = 0$?

- a) $x^2 + y^2 = 1$
- b) $x^2 + y^2 = 25$
- c) $x^2 + y^2 = 100$
- d) $x^2 + y^2 - 2x - 2y - 23 = 0$

(57) A square is inscribed in a circle $x^2 + y^2 + 2x + 2y + 1 = 0$ and its sides are parallel to coordinate axes. Which one of the following is vertex of the square?

- a) $(-2, 2)$
- b) $(-2, -2)$
- c) $\left(-1 + \frac{1}{\sqrt{2}}, -1 - \frac{1}{\sqrt{2}}\right)$
- d) None of the above

(58) A tangent to the parabola $y^2 = 4x$ is inclined at an angle 45° with the positive direction of x-axis. What is the point of contact of the tangent and the parabola?

- a) $(1, 1)$
- b) $(2, 2\sqrt{2})$
- c) $\left(\frac{1}{2}, \frac{1}{\sqrt{2}}\right)$
- d) $(1, 2)$

(59) What is the distance between the two foci of the hyperbola $25x^2 - 75y^2 = 225$?

- a) $2\sqrt{3}$ units
- b) $4\sqrt{3}$ units
- c) $\sqrt{6}$ units
- d) $2\sqrt{6}$ units

(60) If any point on an ellipse is $(3\sin\alpha, 5\cos\alpha)$, then what is the eccentricity of the ellipse?



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- a) $4/3$
- b) $4/5$
- c) $3/4$
- d) $1/2$

(61) If a line in 3 dimensions makes angle α , β and γ with the positive direction of the coordinate axes, then what is $\cos(\alpha + \beta)\cos(\alpha - \beta)$ equal to?

- a) $\cos^2\gamma$
- b) $-\cos^2\gamma$
- c) $\sin^2\gamma$
- d) $-\sin^2\gamma$

(62) A (1, 2, -1), B (2, 5, -2) and C (4, 4, -3) are three vertices of a rectangle. What is the area of the triangle?

- a) 8 square units
- b) 9 square units
- c) $\sqrt{66}$ square units
- d) $\sqrt{68}$ square units

(63) ABC is a triangle right angled at B, If A(K, 1, -1), B(2k, 0, 2) and C(2+2k, k, 1) are the vertices of the triangle, then what is the value of k?

- a) -3
- b) -1
- c) 1
- d) 3

(64) If a line $\frac{x+1}{p} = \frac{y-1}{q} = \frac{z-2}{r}$ where $p=2q=3r$, makes an angle θ with the positive direction of y-axis then what is $\cos 2\theta$ equal to?

- a) $-31/49$
- b) $-37/49$
- c) $31/49$
- d) $37/49$

(65) What is the equation of the plane passing through the point (1, 1, 1) and perpendicular to the line whose direction ratios are (3, 2, 1)?

- a) $X+2Y+3Z=6$
- b) $3X+2Y+Z=6$
- c) $X+Y+Z=3$
- d) $3X+2Y+Z=0$

(66) A line makes angles α , β , and γ with the positive directions of the coordinate axes. If $\vec{a} = (\sin^2\alpha)\hat{i} + (\sin^2\beta)\hat{j} + (\sin^2\gamma)\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$, then what is $\vec{a}, \vec{b}$ equal to?



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- a) -2
- b) -1
- c) 1
- d) 2

(67) Consider the following statements with respect to a vector $d = (a \times b) \times c$:

- I. d is coplanar with a and b .
- II. d is perpendicular to c .

which of the following statements given above is/are correct?

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

(68) The position vector of three points A, B and C are a , b and c respectively such that $3\vec{a} - 4\vec{b} + \vec{c} = \vec{0}$, then what is AB: BC equal to?

- a) 3:1
- b) 1:3
- c) 3:4
- d) 1:4

(69) The position vector of three points A, B and C respectively, where $\vec{a}$, $\vec{b}$ and $\vec{c}$ respectively, where $\vec{c} = (\cos^2 \theta)\vec{a} + (\sin^2 \theta)\vec{b}$. What is $(\vec{a} \times \vec{b}) + ((\vec{b} \times \vec{c}) + (\vec{c} \times \vec{a}))$ equal to?

- a) $\vec{0}$
- b) $2\vec{c}$
- c) $3\vec{c}$
- d) Unit vector

(70) Let $\vec{a}$, $\vec{b}$, $(\vec{a} \times \vec{b})$ be unit vectors. What is $\vec{a} \cdot \vec{b}$ equal to?

- a) 0
- b) $1/2$
- c) 1
- d) 3

Comprehension: (Que No. 71 - 72)

Let $x = \sec \theta - \cos \theta$ and $y = \sec^4 \theta - \cos^4 \theta$

(71) What is $\left(\frac{dy}{dx}\right)^2$ equal to?



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- a) $\frac{4(y^2+4)}{x^2+4}$
- b) $\frac{4(y^2-4)}{x^2-4}$
- c) $\frac{16(y^2+4)}{x^2+4}$
- d) $\frac{16(y^2-4)}{x^2-4}$

- a) (72) What $\left[\frac{x^2+4}{y^2+4} \frac{dy}{dx} \left(x^2 + 4 \frac{d^2y}{dx^2} - 16y \right) \right]$ equal to?
- b) $16x$
 - c) $16y$
 - d) $-16x$
 - e) $-16y$

Comprehension: (Que No. 73 – 74)

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

Let ABC be a triangle right-angled at B and $AB+AC = 3$ units.

(73) What is $\angle A$ equal to if the area of the triangle is maximum?

- a) $\pi/6$
- b) $\pi/4$
- c) $\pi/3$
- d) $5\pi/12$

(74) What is the maximum area of the triangle?

- a) $\sqrt{3}/2$
- b) $\sqrt{3}$
- c) $\sqrt{6}/2$
- d) $\sqrt{6}$

Comprehension: (Que No. 75 - 76)

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

Let $(x + y)^{p+q} = x^p y^q$, where p, q are positive integers.

(75) The Derivative of y with respect to x

- a) Depends on p only
- b) Depends on q only
- c) Depends on both p and q
- d) Is independent of both p and q



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(76) If $p + q = 10$, then what is $\frac{dy}{dx}$ equal to?

- a) $\frac{y}{x}$
- b) xy
- c) $x^{10}y^{10}$
- d) $\left(\frac{y}{x}\right)^{10}$

Comprehension: (Que No. 77 - 78)

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

The slope of the tangent to the curve $y = f(x)$ at $(x, f(x))$ is 4 for every real number x and the curve passes through the origin.

(77) What is the nature of the curve?

- a) A straight line passing through (1, 4)
- b) A straight line passing through (-1, 4)
- c) A parabola with vertex at origin and focus at (2, 0)
- d) A parabola with vertex at origin and focus at (1, 0)

(78) What is the value of area bounded by the curve, the x-axis and the line $x = 4$?

- a) 8 sq units
- b) 16 sq units
- c) 32 sq units
- d) 64 sq units

Comprehension: (Que No. 79 - 80)

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

$$\text{Let } f(x) = \begin{cases} x^3, & x^2 < 1 \\ x^2, & x^2 \geq 1 \end{cases}$$

(79) What is $\lim$ equal to?

- a) 2
- b) 1
- c) 0
- d) Limit does not exist

Consider the following statements:



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- I. The function is continuous at $x = -1$.
- II. The function is differentiable at $x = 1$.

(80) Which of the statement given above is/are correct?

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

Comprehension: (Que No. 81 - 82)

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

Let the function $y = (1 - \cos x)^{-1}$ where $x \neq 2n\pi$ and n is an integer

(81) What is the range of the function?

- a) $[0, \infty)$
- b) $[0.5, \infty)$
- c) $[1, \infty)$
- d) $(-\infty, 0.5]$

(82) What is $\int y dx$ equal to?

- a) $-\tan\left(\frac{x}{2}\right) + c$
- b) $-\cot\left(\frac{x}{2}\right) + c$
- c) $\tan\left(\frac{x}{2}\right) + c$
- d) $\cot\left(\frac{x}{2}\right) + c$

Comprehension: (Que No. 83 - 84)

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

Let the function $f(x) = \sin[x]$, where $[.]$ is the greatest integer function and $g(x) = |x|$.

(83) What is the $\lim_{x \rightarrow 0} \{f(x)g(x)\}$ equal to?

- a) -1
- b) 0
- c) 1
- d) Limit does not exist

(84) What is $\lim_{x \rightarrow 0} \frac{f(x)}{g(x)}$ equal to?



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- a) $-\sin 1$
- b) $\sin 1$
- c) 0
- d) Limit does not exist

Comprehension: (Que No. 85 - 86)

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

Let the curve $f(x) = |x - 3|$.

(85) What is the domain of the function $f(x)$?

- a) $(0, \infty)$
- b) $(3, \infty)$
- c) $(-\infty, \infty)$
- d) $(-\infty, \infty)/3$

(86) What is the area bounded by the curve $f(x)$ and $y = 3$?

- a) 3 square units
- b) 4.5 square units
- c) 7.5 square units
- d) 9 square units

Comprehension: (Que No. 87 - 88)

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

Let $f = \{(1, 1), (2, 4), (3, 7), (4, 10)\}$

(87) If $f(x) = px + q$, then what is the value of $(p + q)$?

- a) -1
- b) 0
- c) 1
- d) 5

Consider the following statements:

- I. f is one-one function.
- II. f is onto function if the codomain is the set of natural numbers.

(88) Which of the statements given above is/are correct?

- a) I only
- b) II only
- c) Both I and II



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d) Neither I nor II

Comprehension: (Que No. 89 - 90)

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

Let the function $f(x) = x^2 - 1$.

(89) What is $\lim_{x \rightarrow 1} \{f \circ f(x)\}$ equal to?

- a) -1
- b) 0
- c) 1
- d) 2

(90) What is the area bounded by the function $f(x)$ and the x - axis?

- a) $1/3$ sq units
- b) $2/3$ sq units
- c) $4/3$ sq units
- d) 2 sq units

Comprehension: (Que No. 91 - 92)

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

Let $y = \sin^{-1} \left(x - \frac{4x^3}{27} \right)$.

(91) What is y equal to?

- a) $\sin^{-1} x$
- b) $\sin^{-1} \left(\frac{x}{3} \right)$
- c) $3\sin^{-1} x$
- d) $3\sin^{-1} \left(\frac{x}{3} \right)$

(92) What is $\frac{dy}{dx}$ equal to?

- a) $\frac{1}{\sqrt{9-x^2}}$
- b) $\frac{1}{\sqrt{3-x^2}}$
- c) $\frac{3}{\sqrt{9-x^2}}$
- d) $\frac{9}{\sqrt{9-x^2}}$



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Comprehension: (Que No. 93 - 94)

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

Let the function $f(x) = x^2 + 9$.

(93) What is $\lim_{x \rightarrow 0} \frac{\sqrt{f(x)} - 3}{\sqrt{f(x)} + 7 - 4}$ equal to?

- a) $\frac{2}{3}$
- b) 1
- c) $\frac{4}{3}$
- d) 2

Consider the following statements:

- I. $f(x)$ is an increasing function.
- II. $f(x)$ has local maximum at $x = 0$.

(94) Which of the statements given above is/are correct?

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

Comprehension: (Que No. 95 - 96)

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

The function $f(x)$ satisfies $c f\left(\frac{x}{y}\right) = \frac{f(x)}{f(y)}$ for all positive real values of x and y , and $f(2) = 3$.

(95) What is $f(16)$ equal to?

- a) 18
- b) 27
- c) 54
- d) 81

(96) What is $f(1) f(4)$ equal to?

- a) 4
- b) 8
- c) 9
- d) 18

Comprehension: (Que No. 97 - 98)

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

A function f is such that $f(xy) = f(x + y)$ for all real values of x and y , and $f(5) = 10$.



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(97) What is $f(0)$ equal to?

- a) 0
- b) 1
- c) 5
- d) 10

(98) What is $f(20) + f(-20)$ equal to?

- a) 0
- b) 10
- c) 20
- d) 40

Comprehension: (Que No. 99 - 100)

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

Let $f(x) = [x^2]$, where $[.]$ is the greatest integer function.

(99) What is $\int_{\sqrt{2}}^{\sqrt{3}} f(x) dx$ equal to?

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

(100) What is $\int_{\sqrt{2}}^2 f(x) dx$ equal to?

- a) $6 - \sqrt{3} - 2\sqrt{2}$
- b) $6 - \sqrt{3} - \sqrt{2}$
- c) $6 - \sqrt{3} + 2\sqrt{2}$
- d) $6 + \sqrt{3} - 2\sqrt{2}$

Comprehension: (Que No. 101 - 104)

Consider the following for the four (04) items that follow:

The frequency distribution of height of students of a class is given below:

Height (in cm)	Number of Students
160 – 162	12



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162 – 164	15
164 – 166	24
166 - 168	13

(101) What is the total number of students whose height is less than or equal to 165cm?

- a) 15
- b) 39
- c) 51
- d) None of the above

(102) What is the median height of the class?

162.41 cm

163.41 cm

164.41 cm

165.41 m

(103) The height which occurs most frequently in the class is

- a) 163.5 cm
- b) 163.9 cm
- c) 164.5 cm
- d) 164.5 cm

(104) The most appropriate graphical representation of the given frequency distribution is

- a) Bar chart
- b) Percentage bar chart
- c) Histogram
- d) Pie chart

Comprehension: (Que No. 105 - 106)

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

The sum and the sum of the squares of the observations corresponding to length X (in cm) and weight Y (in gm) of 50 tropical tubers are given as $\sum X = 200$, $\sum Y = 250$, $\sum X^2 = 900$ and $\sum Y^2 = 1400$.

(105) Which one of the following is correct?

- a) Variance (X) > Variance (Y)
- b) Variance (X) < Variance (Y)
- c) Variance (X) = Variance (Y)
- d) Cannot be determined from the given data.



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(106) Which one of the following statements is correct?

- a) Coefficient of variation of X is strictly more than coefficient of variation of Y
- b) Coefficient of variation of X is strictly less than coefficient of variation of Y
- c) Coefficient of variation of X is same as coefficient of variation of Y
- d) Coefficient of variation cannot be determined from the given data

Comprehension: (Que No. 107 - 108)

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

Let X be a random variable following binomial distribution with parameters $n = 6$ and $p = k$. further, $9P(X = 4) = P(X = 2)$.

(107) What is the value of k?

- a) $1/2$
- b) $1/3$
- c) $1/4$
- d) $1/5$

(108) What is the value of $P(X = 3)$?

- a) $135/1024$
- b) $5/128$
- c) $45/1024$
- d) $70/1024$

Comprehension: (Que No. 109 - 110)

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

A committee of 6 members is formed from a group of 7 gentlemen and 4 ladies.

(109) What is the probability that the committee includes exactly 3 gentlemen?

- a) $10/33$
- b) $30/77$
- c) $100/231$
- d) $5/11$

(110) What is the probability that the committee includes at least 2 ladies?

- a) $41/66$
- b) $47/66$
- c) $49/66$
- d) $53/66$

Comprehension: (Que No. 111 - 112)



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

The probabilities that A, B and C become managers are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively. The probabilities that bonus scheme will be introduced if A, B and C become managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively

(111) What is the probability that the bonus scheme will be introduced?

- a) $\frac{17}{45}$
- b) $\frac{19}{45}$
- c) $\frac{23}{45}$
- d) $\frac{26}{45}$

(112) If the bonus scheme has been introduced, then what is the probability that the manager appointed was B?

- a) $\frac{5}{23}$
- b) $\frac{6}{23}$
- c) $\frac{7}{23}$
- d) $\frac{8}{23}$

(113) The arithmetic mean of 100 observations is 50. If 5 is subtracted from each observation and then divided by 20, then what is the new arithmetic mean?

- a) 2.25
- b) 3.5
- c) 4.25
- d) 5.5

(114) The standard deviation of 100 observations is 10. If 5 is added to each observation and then divided by 20, then what will be the new standard deviation?

- a) 0.25
- b) 0.5
- c) 0.75
- d) 1.00

(115) If $P(A)=\frac{1}{3}$, $P(B)=\frac{1}{2}$ and $P(A \cap B)=\frac{1}{4}$, then what is the value of $P(B/A^c)$?

- a) $\frac{1}{8}$
- b) $\frac{3}{8}$
- c) $\frac{5}{8}$
- d) $\frac{7}{8}$

(116) If $P(A)=\frac{1}{3}$, $P(B)=\frac{1}{2}$ and $P(A \cap B)=\frac{1}{4}$, then what is the value of $P(A^c \cap B^c)$?

- a) $\frac{1}{4}$
- b) $\frac{5}{12}$



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- c) $7/12$
- d) $11/12$

(117) If two fair dice are tossed, then what is the probability that the sum of the numbers on the faces of the dice is strictly greater than 7?

- a) $1/3$
- b) $5/12$
- c) $7/12$
- d) $3/4$

(118) The probability of a man hitting a target is $1/5$. If the man fires 7 times, then what is the probability that he hits the target at least twice?

- a) $1 - \left(\frac{3}{5}\right)\left(\frac{4}{5}\right)^6$
- b) $1 - \left(\frac{3}{5}\right)\left(\frac{4}{5}\right)^7$
- c) $1 - \left(\frac{11}{5}\right)\left(\frac{4}{5}\right)^6$
- d) $1 - \left(\frac{11}{5}\right)\left(\frac{4}{5}\right)^7$

(119) Let X be a random variable following binomial distribution whose mean and variance are 200 and 160 respectively. What is the value of the number of trials (n)?

- a) 500
- b) 1000
- c) 1500
- d) 2000

(120) What is the arithmetic mean of $8^2, 9^2, 10^2, \dots, 15^2$?

- a) 133.5
- b) 135.5
- c) 137.5
- d) 139.5