NDA MATHS MOCK TEST - 172 (SOLUTION)

1. (A) Given that, A = $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$, B = $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ and

C = $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

Now, AB = $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

$= \begin{bmatrix} 0+0 & -i+0 \\ 0-i & 0+0 \end{bmatrix} = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$

$= \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix} = -C$

$\Rightarrow AB = -C$

2. (B) Splitting 1.01 and using binomial theorem to write the first few ferms we have

$A = (1.01)^{1000000} = (1 + 0.01)^{1000000}$

$\Rightarrow A = {}^{1000000}C_0 + {}^{1000000}C_1(0.01)$ + other positive terms

$\Rightarrow A = 1 + 1000000 \times 0.01$ + other positive terms

$\Rightarrow A = 1 + 10000$ + other positive terms > 10000

$\Rightarrow A > 10000$

$\Rightarrow A > B$

3. (C) We have,

$$\sum_{r=1}^{100} a_r = \sum_{r=1}^{100} r(r!) = \sum_{r=1}^{100} \{(r+1)-1\} r!$$

$$\Rightarrow \sum_{r=1}^{100} a_r = \sum_{r=1}^{100} \{(r+1) - r!\}$$

$$\Rightarrow \sum_{r=1}^{100} a_r = (2! - 1!) + (3! - 2!) + (4! - 3!) + \ldots$$

$\ldots\ldots + (101! - 100!)$

$$\Rightarrow \sum_{r=1}^{100} a_r = 101! - 1$$

4. (D) Let d be the common difference of the given A.P., then,

$$\frac{1}{a_1a_2} + \frac{1}{a_2a_3} + \ldots\ldots\ldots + \frac{1}{a_na_{n+1}}$$

$$= \frac{1}{d}\left\{\frac{a_1 - a_1}{a_1a_2} + \frac{a_3 - a_2}{a_2 - a_3} + \ldots\ldots \frac{a_{n+1} - a_n}{a_na_{n+1}}\right\}$$

$$= \frac{1}{d}\left\{\frac{1}{a_1} - \frac{1}{a_2} + \frac{1}{a_2} - \frac{1}{a_3} + \ldots\ldots \frac{1}{a_n} - \frac{1}{a_{n+1}}\right\}$$

$$= \frac{1}{d}\left\{\frac{1}{a_1} - \frac{1}{a_{n+1}}\right\} = \frac{a_{n+1} - a_1}{d\ a_1a_{n+1}} = \frac{nd}{d\ a_1a_{n+1}}$$

$$= \frac{n}{a_1a_{n+1}}$$

5. (C) We have

$$\int \sin^3 x \cos^2 x\, dx = \int \sin^2 x \cos^2 x (\sin x)\, dx$$

$$= \int (1 - \cos^2 x)\cos^2 x(\sin x)\, dx$$

Let $t = \cos x$

$\Rightarrow dt = -\sin x\ dx$

$$\Rightarrow \int \sin^3 x \cos^2 x\ dx = -\int (1 - t^2)t^2\ dt$$

$$= -\int t^2 - t^4\ dt$$

$$= -\left(\frac{t^3}{3} - \frac{t^5}{5}\right) + c$$

$$= -\frac{1}{3}\cos^3 x + \frac{1}{5}\cos^5 x + c$$

6. (A) Range of cosecA is $(-\infty, -1] \cup [1, \infty)$

7. (D) We have $x^2 - 6x + 13 = x^2 - 6x + 3^2 - 3^2 + 13$

$= (x - 3)^2 + 4$

So, $\displaystyle\int \frac{dx}{x^2 - 6x + 13} = \int \frac{1}{(x-3)^2 + (2)^2}\, dx$

Let $x - 3 = t$

$dx = dt$

$$\Rightarrow \int \frac{dx}{x^2 - 6x + 13} = \int \frac{dt}{t^2 + 2^2}$$

$$= \frac{1}{2}\tan^{-1}\frac{t}{2} + c$$

$$= \frac{1}{2}\tan^{-1}\frac{(x-3)}{2} + c$$

8. (A) We have $y^x - x^y = 1$

$\Rightarrow e^{x\log y} - e^{y\log x} = 1$

diff. with respect to x, we get

$$y^x\left\{\frac{x}{y}\frac{dy}{dx} + \log y\right\} - x^y\left\{\frac{dy}{dx}\log x + \frac{y}{x}\right\} = 0$$

Putting $x = 1$, $y = 2$

We get

$$2\left(\frac{1}{2}\frac{dy}{dx} + \log 2\right) - (0 + 2) = 0$$

$$\frac{dy}{dx} = 2 - 2\log 2 = 2(1 - \log 2)$$

9. (C) $e > 1 \rightarrow$ hyperbola
$e = 0 \rightarrow$ circle
$e < 1 \rightarrow$ ellipse
$e = 1 \rightarrow$ parabola

10. (C) Here $A^2 = \begin{bmatrix} \alpha & 0 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} \alpha & 0 \\ 1 & 2 \end{bmatrix}$

$A^2 = \begin{bmatrix} \alpha^2 & 0 \\ \alpha+2 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 4 \end{bmatrix} = B$

$\alpha^2 = 1, \alpha + 2 = 1$
$\alpha = -1$, Matrix satisfied

11. (C) $\dfrac{\log_{\sqrt{\alpha\beta}}(H)}{\log_{\sqrt{\alpha\beta\gamma}}(H)} = \dfrac{\log_H \sqrt{\alpha\beta\gamma}}{\log_H \sqrt{\alpha\beta}}$

$= \log_{\sqrt{\alpha\beta}} \sqrt{\alpha\beta\gamma}$

$= \log_{\alpha\beta} (\alpha\beta\gamma)$

12. (B) $\cos\left(\dfrac{\pi}{4} + x\right) + \cos\left(\dfrac{\pi}{4} - x\right)$

$2\cos\left[\dfrac{\frac{\pi}{4} + x + \frac{\pi}{4} - x}{2}\right].\cos\left[\dfrac{\frac{\pi}{4} + x - \frac{\pi}{4} + x}{2}\right]$

$2\cos\dfrac{\pi}{4}.\cos x$

$\sqrt{2}\cos x$

13. (B) We know that
$\because AM \geq GM$

Consider two terms $\sec^2\theta$, $\dfrac{1}{\sec^2\theta}$

$\left(0 < \theta < \dfrac{\pi}{2}\right)$

$\therefore \left(\sec^2\theta + \dfrac{1}{\sec^2\theta}\right) \geq 2\left(\sec^2\theta.\dfrac{1}{\sec^2\theta}\right)^{1/2}$

$\Rightarrow (\sec^2\theta + \cos^2\theta) \geq 2$
$\Rightarrow y \geq 2$

14. (D) Word "ELEPHANT"

No of permulation = $\dfrac{8!}{2!} = 20160$

15. (D) We know that $\omega^3 = 1$
$1 + \omega + \omega^2 = 0$
$\omega^{100} + \omega^{200} + \omega^{300}$
$(\omega^3)^{33}.\omega + (\omega^3)^{66}.\omega^2 + (\omega^3)^{100}$
$\omega + \omega^2 + 1 = 0$

16. (D) Here

$\Rightarrow \dfrac{z-1}{z+1} = \dfrac{x+iy-1}{x+iy+1} = \left[\dfrac{(x-1)+iy}{(x+1)+iy}\right] \times \left[\dfrac{(x+1)-iy}{(x+1)-iy}\right]$

$\Rightarrow \text{Re}\left(\dfrac{(x+1)(x-1)+y^2}{(x+1)^2+y^2}\right) = 0$

$x^2 + y^2 - 1 = 0$
$x^2 + y^2 = 1$
$z = x + iy$

$|z| = \sqrt{x^2+y^2}$

$|z| = \sqrt{1}$

$|z| = 1$

17. (B) We know that $\sin^{-1}(\sin x) = x$
Therefore

$\sin^{-1}\left(\sin\dfrac{3\pi}{5}\right) = \dfrac{3\pi}{5}$

But $\dfrac{3\pi}{5} \notin \left[\dfrac{-\pi}{2}, \dfrac{\pi}{2}\right]$, which does not belong to the range of $\sin^{-1}x$

However $\sin\dfrac{3\pi}{5} = \sin\left(\pi - \dfrac{3\pi}{5}\right) = \sin\dfrac{2\pi}{5}$

and $\dfrac{2\pi}{5} \in \left[\dfrac{-\pi}{2}, \dfrac{\pi}{2}\right]$

Therefore,

$\sin^{-1}\sin\left(\dfrac{3\pi}{5}\right) = \sin^{-1}\left(\sin\dfrac{2\pi}{5}\right) = \dfrac{2\pi}{5}$

18. (C) Let the eq^n of the circle be
$(x - h)^2 + (y - k)^2 = r^2$
since the circle passes through (2, –2) and (3, 4), we have
$(2 - h)^2 + (-2 - k)^2 = r^2$ ...(i)
and $(3 - h)^2 + (4 - k)^2 = r^2$ ...(ii)
Also since the centre lies on the line $x + y = 2$, We have $h + k = 2$ ...(iii)
Sloving the equation (i), (ii) & (iii), we get $h = 0.7$, $k = 1.3$ and $r^2 = 12.58$
Hence, the eq^n of the required circle is
$(x - 0.7)^2 + (y - 1.3)^2 = 12.58$

19. (C) $\sin480° - \sin60° + \sin780° + \cos120°$
$\Rightarrow \sin(360° + 120°) - \sin60° + \sin(2\times 360° + 60°) + \cos(90° + 30°)$
$\Rightarrow \sin120° - \sin60° + \sin60° - \sin 30°$
$\Rightarrow \cos30° - \sin30°$

$\Rightarrow \dfrac{\sqrt{3}-1}{2}$

20. (B) For equal root
$D = 0$ (where D = Discriminants)
A.T.Q,
$kx(x-2) + 6 = 0$
$kx^2 - 2kx + 6 = 0$
$D = b^2 - 4ac = 0$
$4k^2 - 4 \times 6 = 0$
$4\ k \neq 0\ k = 6$
$k - 6\ 0\ k = 0$
$k = 0$ doesn't satisfy equation
Hence $k = 6$

21. (C) Here, $x^2 - 2x\sec\theta + 1 = 0$ has roots α_1 and β_1

$$\therefore \alpha_1, \beta_1 = \frac{2\sec\theta \pm \sqrt{4\sec^2\theta - 4}}{2 \times 1}$$

$$= \frac{2\sec\theta \pm 2\tan\theta}{2}$$

Since $\theta \in \left(\frac{-\theta}{6}, \frac{-\theta}{12}\right)$

i.e. $\theta \in$ IV Quadrant $= \frac{2\sec\theta \mp 2\tan\theta}{2}$

$\therefore \alpha_1 = \sec\theta - \tan\theta$ and $\beta_1 = \sec\theta + \tan\theta$ [as $\theta_1 > \beta_1$]
and $x^2 + 2x\tan\theta - 1 = 0$ has roots α_2 and β_2

i.e. $\alpha_2, \beta_2 = \frac{-2\tan \pm \sqrt{4\tan^2 + 4}}{2}$

$\therefore \alpha_2 = -\tan\theta + \sec\theta$ and $\beta_2 = -\tan\theta - \sec\theta$ [as $\alpha_2 > \beta_2$]
$\Rightarrow \alpha_1 + \beta_2 = -2\tan\theta$

22. (A) The number of ways $= \frac{{}^{12}C_3 \times 2^9}{3^{12}}$

$$= \frac{55}{3}\left(\frac{2}{3}\right)^{11}$$

23. (C) $P(A \cup B) = P(A) + P(B) - P(A).P(B)$, as A and B are independent events.
$\Rightarrow 0.9 = 0.4 + P(B) - (0.4).P(B)$
$\Rightarrow P(B) = \frac{5}{6}$

24. (B) To determine the quotient and remainder of binary digits, first we will convert these to decimals.
$(101110)_2 = (46)_{10}$
$(110)_2 = (6)_{10}$
Dividing 46 by 6,
Quotient $= (7)_{10} = (111)_2$
Remainder $= (4)_{10} = (100)_2$

25. (C) E is the universal set and $A = B \cup C$
$E - (E - (E - (E - (E - A))))$
$= E - (E - E - (E - A')))$
$= E - (E - (E - A))$
$= E - (E - A')$
$= E - A$
$= A' = (B \cup C)' = B' \cap C'$

26. (D) Each property is true.

27. (A) $A = \begin{bmatrix} 4i - 6 & 10i \\ 14i & 6 + 4i \end{bmatrix}$

$$kA = \begin{bmatrix} \frac{2i-3}{i} & 5 \\ 7 & \frac{3+2i}{i} \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-2-3i}{-1} & 5 \\ 7 & \frac{3i-2}{-1} \end{bmatrix}$$

$$= \begin{bmatrix} 2 + 3i & 5 \\ 7 & 2 - 3i \end{bmatrix}$$

28. (D) This is quadratic equation in the form of $|x - 3|$.
Let $|x - 3| = t$
Therefore equation becomes '$t^2 + t - 2 = 0$'
Solving the equation, we get $t = 1$ (– ve value is neglected as t is + ve)
$\therefore x = 4, 2$
Sum of roots = 6

29. (C) $x^2 - 4x - \log_3 P = 0$
It is given that roots are real.

$$\therefore \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \geq 0$$

Or $16 + 4\log_3 P \geq 0$
Or $\log_3 P \geq -4$
Or $P \geq 3^{-4}$ or $P \geq 1/81$

30. (C) adj $A^T = (\text{adj } A)^T$
Therefore, adj $A^T - (\text{adj } A)^T = 0$

31. (B) $C_0 + C_1 + C_2 + C_3 + C_4 + C_5 + ...C_n = 2^n$

Therefore $C_1 + C_3 + C_5 + ...C_n = \frac{1}{2} \times 2^n$

$$= \frac{1}{2} \times 2^{50} = 2^{49}$$

32. (C) (a, b) R (c, d) $a + d = b + c$

Or $b + c = a + d$

(b, c) R (a, d)

$\therefore$ R is symmetric ...(i)

(a, b) R (c, d) $\Leftrightarrow a + b = b + c$

$a + a = a + a$

$\Rightarrow (a, a)$ R (a, a)

R is reflexive (ii)

(a, b) R (c, d) and (c, d) R (e, f)

$\Rightarrow a + d = b + c$ and $c + f = d + e$

$\Rightarrow a + d + c + f = b + c + d + e$

$\Rightarrow a + f = b + e$

$\Rightarrow (a, b)$ R (e, f)

$\therefore$ R is transitive ...(iii)

From (i), (ii), and (iii) : R is an equivalence relation.

33. (B) $kx + y + z = 1$, $x + k y + z = k$ and $x + y + k z = k^2$ will have no solution if

$$\begin{vmatrix} k & 1 & 1 \\ 1 & k & 1 \\ 1 & 1 & k \end{vmatrix} = 0$$

Solving this determinant, $k = 1, -2$

If $k = 1$ then first two equations will become same.

Therefore $k = -2$.

34. (C) $R = \frac{\pi}{2}$

$\therefore P + Q = \frac{\pi}{2}$

[sum of angles of a triangle = π]

$$\frac{P}{2} + \frac{Q}{2} = \frac{\pi}{4}$$

$$\tan\left(\frac{P}{2} + \frac{Q}{2}\right) = \frac{\pi}{4}$$

$$\frac{\tan\frac{P}{2} + \tan\frac{Q}{2}}{1 - \tan\frac{P}{2} + \tan\frac{Q}{2}} = \tan\frac{\pi}{4} \quad ...(1)$$

Now $\tan\frac{P}{2}$ and $\frac{Q}{2}$ are roots of equation

$ax + b x + c = 0$

$\therefore$ Sum of roots $= -b/a$

And product of roots $= c/a$

putting in (i) :

$$\frac{-b/a}{1 - c/a} = 1$$

Or $a + b = c$

35. (B) The length of the normal from origin to the plane $= \frac{9}{\sqrt{1^2 + 2^2 + (-2)^2}} = 3$

36. (B) Let $\delta = x\hat{i} + y\hat{j} + z\hat{k}$

Since δ is perpendicular on α and β.

$\therefore x + 2y - z = 0$ ...(i)

and $2x + y - 3z = 0$ ...(ii)

also, $\delta . y = 0$

$\therefore 2x + y - 6z = 0$ ...(iii)

Solving (i), (ii), (iii)

$x = -2$, $y = 2$, and $z = 2$

$\therefore \delta = \sqrt{4 + 4 + 4} = 2\sqrt{3}$

37. (C) The line joining the points $\vec{A}\,(i + 2j - 3k)$ and $\vec{B}\,(3i - j + 5k)$ is i.e., $AB = 2i - 3j + 8k$

Work done $= \vec{F}.AB = 1\times 2 + 3\times(-3) + 2\times 8 = 9$

38. (B) Let $\vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$

$|\vec{a} \times i|^2 + |\vec{a} \times j|^2 + |\vec{a} \times \hat{k}|^2$

$= z^2 + y^2 + x^2 + z^2 + x^2 + y^2 = 2(x^2 + y^2 + z^2)$

$= 2|\vec{a}|^2$

39. (B) $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 0$

Applying operations on the given matrix:

$C_2 \to C_2 - C_1$, $C_3 \to C_3 - C_1$

$$\begin{vmatrix} a & 1-a & 1-a \\ 1 & b-1 & 0 \\ 1 & 0 & c-1 \end{vmatrix} = 0$$

Expanding by first row and dividing by $(1 - a)(1 - b)(1 - c)$:

$$\frac{a}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 0$$

Or $\frac{a}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = \frac{a}{1-a} + \frac{1}{1-a}$

Or $\frac{a}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 1$

40. (B) $\cos\frac{\pi}{4} = \frac{2x-3+10}{\sqrt{4+1+4}\sqrt{x^2+9+25}}$

$\frac{1}{\sqrt{2}} = \frac{2x+7}{3\sqrt{x^2+34}}$

Squaring...

$\left[\frac{1}{2} = \frac{4x^2+28x+49}{9x^2+306}\right]$

Or $x^2 - 56x + 208 = 0$

$\Rightarrow x = 4$

41. (A) $2x^2 + 7y^2 - 20 = 0$

Put $x = 1$, $y = 2$

$2 + 28 - 20 = 10 > 0$

$\therefore$ (1, 2) lies outside the ellipse

42. (A) Required equation of line is:

$y + 5 = \tan 120° x$

or $y + 5 = -\sqrt{3}\, x$

or $y + \sqrt{3}\, x + 5 = 0$

43. (B) Equation of line passing through intersection of $2x - 3y + 7 = 0$ and $7x + 4y + 2 = 0$ is :

$(2x - 3y + 7) + \lambda(7x + 4y + 2) = 0$ ...(i)

This line passes through (2, 3)

$\therefore (4 - 9 + 7) + \lambda(14 + 12 + 2) = 0$

$\lambda = -1/14$

Putting in eq(i) :

$21x - 46y + 96 = 0$

44. (B) Latus rectum = 4 and $e = 3/4$

$\therefore b^2 = 2a$ and $c = e\, a$

Also $a^2 = b^2 + c^2$

or $a^2 + 2a + \frac{9}{16}a^2$

or $a = 32/7$

$b^2 = 64/7$

Equation of ellipse is

$\frac{49x^2}{1024} + \frac{7y^2}{64} = 1$

45. (A) Only 1 and 2 are correct.

46. (B) $f'(x) = -2x$, $0 < x \le 1$

47. (A) $f'(x) = 3x^2 - 1$

Put $f'(x) = 0$ implies that $x = \pm\frac{1}{\sqrt{3}}$

Putting in $f''(x)$: Maxima will be at $\frac{-1}{\sqrt{3}}$

and minima will be at $\frac{1}{\sqrt{3}}$

$\therefore$ Max $f(x) = f\left(\frac{1}{\sqrt{3}}\right) = \frac{2}{3\sqrt{3}}$

Min $f(x) = f\left(\frac{1}{\sqrt{3}}\right) = \frac{-2}{3\sqrt{3}}$

48. (D) 1, 2 and 3 are correct.

49. (C) $f(x) = \frac{x}{2} - 1$, $[0, \pi]$

$\tan[f(x)] = \tan\left[\left(\frac{x}{2} - 1\right)\right]$

$\frac{1}{f(x)} = \frac{1}{\frac{x}{2} - 1}$

Both functions are discontinous for $x = 2$ in $[0, \pi]$

50. (B) $f'(x) = \frac{-xe^{-x^2}}{\sqrt{1-e^{-x^2}}}$

Which is defined for all $x \in R$

51. (B) (A – 2), (B – 3), C – 4), (D – 1).

$f(x)$ Maximum value

A. $\sin x + \cos x = \sqrt{1^2+1^2} = \sqrt{2}$

B. $3\sin x + 4\cos x = \sqrt{3^2+4^2} = 5$

C. $2\sin x + 3\cos x = \sqrt{2^2+1^2} = \sqrt{3}$

D. $\sin x + 3\cos x = \sqrt{1^2+3^2}\ \sqrt{10}$

52. (D) $f(x)$ is continuous and differentiable also [As L.H.L = R.H.L = $f(0)$ = 0 and L.H. D = R.H.D]

53. (C) $f(x) = \frac{x}{x}$, $x \ne 0$ implies that $y = 1$

54. (A) $f(n) = \left[\frac{1}{4} + \frac{n}{1000}\right]$

$\sum_{n=1}^{1000} f(n) = \left[1000 \times \frac{1}{4} + \frac{1}{1000} + \frac{2}{1000} + \ldots + \frac{1000}{1000}\right]$

= [250 + 0 + 0 + ... + 1]

= 251

55. (B) For any open cylinder fo surface area, when it has maximum volume, the height and radius of the base area equal.

Therefore diameter of cylinder = Twice of its height

So k will be equal to 2.

56. (D) $y = A[\sin(x+c) + \cos(x+c)]$

$y' = A[\cos(x+c) - \sin(x+c)]$

$y'' = -A[\sin(x+c) + \cos(x+c) = -y$

or $y'' + y = 0$

57. (A) Both statements are correct but 2 is not the correct explanation of 1.

58. (D) $\frac{dy}{dx} = \frac{y\phi'(x) - y^2}{\phi(x)} = y\frac{\phi'(x)}{\phi(x)} - \frac{y^2}{\phi(x)}$

Dividing by y^2 on both sides

$$\frac{1}{y^2}\frac{dy}{dx} = \frac{1\phi'}{y}\frac{(x)}{\phi(x)} - \frac{1}{\phi(x)}$$

or $\frac{1}{y^2}\frac{dy}{dx} - \frac{1\phi'}{y}\frac{(x)}{\phi(x)} = -\frac{1}{\phi(x)}$

Let $\frac{-1}{y} = z$

$$\frac{1}{y^2}\frac{dy}{dx} = \frac{dz}{dx}$$

Above equation becomes :

$$\frac{dz}{dx} - \frac{\phi'(x)}{\phi(x)}z = -\frac{1}{\phi(x)}$$

I.F = $e^{\int\frac{\phi'(x)}{\phi(x)}dx} = e^{\log\phi(x)} = \phi(x)$

Solution of above equation is:

$$z.\ \phi'(x) = \int\frac{-1}{\phi(x)} \times \phi(x)\ dx$$

$$\frac{-1}{y}\phi'(x) = -x$$

or $y = \frac{\phi(x)}{x} + c$

59. (B) $\text{fog}\left(\frac{e-1}{e+1}\right) = f\left[\ln\frac{\left(1+\frac{e-1}{e+1}\right)}{\left(1-\frac{e-1}{e+1}\right)}\right]$

$= f\left[\ln\left(\frac{e+1+e-1}{e+1-e+1}\right)\right] = f\left[\ln\left(\frac{2e}{2}\right)\right] = f(1) =$

$\frac{4+1}{1+4} = 1$

60. (B) $\begin{vmatrix} 1-\alpha & \alpha-\alpha^2 & \alpha^2 \\ 1-\beta & \beta-\beta^2 & \beta^2 \\ 1-\gamma & \gamma-\gamma^2 & \gamma^2 \end{vmatrix}$

Operating $C_1 \to C_1 + C_2 + C_3$

$$\begin{vmatrix} 1 & \alpha-\alpha^2 & \alpha^2 \\ 1 & \beta-\beta^2 & \beta^2 \\ 1 & \gamma-\gamma^2 & \gamma^2 \end{vmatrix}$$

Operating $C_2 \to C_2 + C_3$ $\begin{vmatrix} 1 & \alpha & \alpha^2 \\ 1 & \beta & \beta^2 \\ 1 & \gamma & \gamma^2 \end{vmatrix}$

$= (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$

61. (B) $A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 0 & 3 & 1 \end{pmatrix}$

First we will find all the cofactors of this matrix:

$A_{11} = 1, A_{12} = -2, A_{13} = 6$

$A_{21} = 6, A_{22} = 1, A_{23} = -3$

$A_{31} = -2, A_{32} = 4, A_{33} = 1$

$$\text{Adj } A = \begin{bmatrix} 1 & -2 & 6 \\ 6 & 1 & -3 \\ -2 & 4 & 1 \end{bmatrix}^T = \begin{bmatrix} 1 & 6 & -2 \\ -2 & 1 & 4 \\ 6 & -3 & 1 \end{bmatrix}$$

62. (B) $A = \begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}$

$$A^2 = \begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}\begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix} = \begin{pmatrix} 8 & -8 \\ -8 & 8 \end{pmatrix}$$

$= -4A$

63. (C) Re $(z^2 - i) = 2$

Let $z = x + iy$

$z^2 - i = 2$

or $x^2 - y^2 + 2xy - i = 2$

$x^2 - y^2 + (2xy - 1)i = 2$

Now Re $(z^2 - i) = x^2 - y^2$

Therefore $x^2 - y^2 = 2$, Which is equation of rectangular hyperbola.

64. (D) X = 3, 6, 9 ....48} = 16

Y = 1, 3, 5 ....49} = 25

Total integers = 51 (0 is also included)

$\therefore P(X) = \frac{16}{51}, P(Y) = \frac{25}{51}$

65. (B) 1 and 2 are correct statements. 3rd is incorrect because mean deviation is least when measured about mean not median.

66. (D) A.M = 24, S.D = 0

As S.D = 0, therefore average of any 5 observations will be equal to A.M.

67. (A) Regression coefficient of y on x is equal to the regression coefficient of x on y, which implies that (x, y) lies on the line $x = y$.

68. (C) $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{12}$

$$P(B/\overline{A}) = \frac{P(B \cap \overline{A})}{P(\overline{A})}$$

Now, $P(\overline{A}) = 1 - \frac{1}{3} = \frac{2}{3}$

$= P(B \cap \overline{A}) = P(B) - P(A \cap B) = \frac{1}{6} - \frac{1}{12} = \frac{1}{12}$

Therefore $P(B/\overline{A}) = \frac{1}{8}$

69. (C) Mean(np) $= \frac{2}{3}$

Variance(npq) $= \frac{5}{9}$

Therefore q = npq/np $= \frac{5}{6}$

$p = 1 - q = \frac{1}{6}$, $n = 4$

$p(x = 2) = {}^4C_2\left(\frac{1}{6}\right)^2 \times \left(\frac{5}{6}\right)^2 = \frac{25}{216}$

70. (C) P(safely reaches) $= \frac{1}{3}$

P(not reaches safely) $= 1 - \frac{1}{3} = \frac{2}{3}$

P(at least 4 arrive safely) = P(4) + P(5)

$= {}^5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right) + {}^5C_5\left(\frac{1}{3}\right)^5$

$= \frac{11}{3^5} = \frac{11}{243}$

71. (C) Regression equation of X on Y is $X - \overline{X} =$

$r - \frac{\sigma x}{\sigma y}(Y - \overline{Y})$

After Substituting the values and solving it, we get
$X = -8 + 0.2Y$

72. (B) P(he/she know correct answer) = p
P(he/she guesses correct answer)

$= (1 - p) \times \frac{1}{m}$

P(correct answer) $= p + \frac{1-p}{m}$

P(he/she really know correct answer)

$$= \frac{p}{p + \frac{1-p}{m}}$$

$$= \frac{mp}{1 + p(m-1)}$$

73. (C) Let $y = \tan^{-1}\frac{x}{\sqrt{1-x^2}}$ and $z = \cos^{-1}x$

$x = \cos z$

$$\Rightarrow y = \tan^{-1}\left(\frac{\cos z}{\sqrt{1-\cos^2 z}}\right)$$

$$\Rightarrow y = \tan^{-1}\left(\frac{\cos z}{\sin z}\right)$$

$$\Rightarrow y = \tan^{-1}\left[\tan\left(\frac{\pi}{2} - z\right)\right]$$

$$\Rightarrow y = \frac{\pi}{2} - z$$

On diffrentiating both side w.r.t. 'z'

$$\Rightarrow \frac{dy}{dz} = -1$$

74. (B) 1 0 0 1 0

$0 \times 2^0 = 0$
$1 \times 2^1 = 2$
$0 \times 2^2 = 0$
$0 \times 2^3 = 0$
$1 \times 2^4 = 16$
18

0.11

$\frac{1}{2} = 1 \times 2^{-1}$

$\frac{1}{4} = 1 \times 2^{-2}$

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4} = 0.75$

$(10010)_2 = (18)_{10}$, $(0.11)_2 = (0.75)_{10}$

Hence $(10010.11)_2 = (18.75)_{10}$

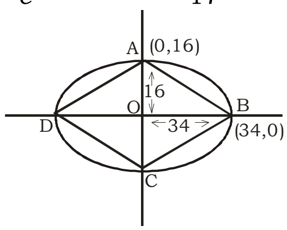
75. (D) $10! \times C(19,11) = k.P(19,8)$

$$10! \times \frac{19!}{11!\,8!} = k.\frac{19!}{11!}$$

$$\frac{10!}{8!} = k \Rightarrow k = 90$$

76. (B) Given that $e = \dfrac{17}{30}$

and $\dfrac{2a}{e} = 120 \Rightarrow \dfrac{2a \times 30}{17} = 120 \Rightarrow a = 34$



Now, $e^2 = 1 - \dfrac{b^2}{(34)^2}$

$\Rightarrow \dfrac{64}{289} = \dfrac{b^2}{(34)^2} \Rightarrow \dfrac{8}{17} = \dfrac{b}{34} \Rightarrow b = 16$

Area of $\Delta\,\text{AOB} = \dfrac{1}{2} \times \text{OA} \times \text{OB}$

$= \dfrac{1}{2} \times 16 \times 34 = 272$

Area of ABCD= 4×Area of $\Delta\,\text{AOB}$

= 4×272 =1088 sq. units

77. (C) $\begin{vmatrix} 8! & 9! & 10! \\ 9! & 10! & 11! \\ 10! & 11! & 12! \end{vmatrix}$

$R_2 \to R_2 - R_1$ and $R_3 \to R_3 - R_1$

$\Rightarrow \begin{vmatrix} 8! & 9! & 10! \\ 8 \times 8! & 9 \times 9! & 10 \times 10! \\ 89 \times 8! & 109 \times 9! & 131 \times 10! \end{vmatrix}$

$\Rightarrow 8! \times 9! \times 10! \begin{vmatrix} 1 & 0 & 0 \\ 8 & 1 & 2 \\ 89 & 20 & 42 \end{vmatrix}$

$\Rightarrow 8! \times 9! \times 70! \left[1(42-40) - 0 - 0\right]$

$\Rightarrow 2 \times 8! \times 9! \times 10!$

78. (A) $\vec{a} = 3\hat{i} + 2\hat{j} - 5\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - 4\hat{k}$

$\vec{b} - 2\vec{a} = \left(-\hat{i} + \hat{j} - 4\hat{k}\right) - 2\left(3\hat{i} + 2\hat{j} - 5\hat{k}\right)$

$\vec{b} - 2\vec{a} = (-7\hat{i} - 3\hat{j} + 6\hat{k})$

$3\vec{a} - \vec{b} = 3\left(3\hat{i} + 2\hat{j} - 5\hat{k}\right) - \left(-\hat{i} + \hat{j} - 4\hat{k}\right)$

$= (10\hat{i} + 5\hat{j} - 11\hat{k})$

Now $(\vec{b} - 2\vec{a}).(3\vec{a} - \vec{b})$

$\Rightarrow (-7\hat{i} - 3\hat{j} + 6\hat{k}).(10\hat{i} + 5\hat{j} - 11\hat{k})$

$\Rightarrow -70 - 15 - 66 \Rightarrow -151$

79. (D) A.T.Q –

$a + 33d = 235$ ......(i)

$a + 234d = 34$ ......(ii)

from eq. (i) and eq (ii)

$d = -1$ and $a = 268$

Let $T_n = 0$

$\Rightarrow a + (n-1)d = 0$

$\Rightarrow 268 + (n-1)(-1) = 0 \Rightarrow n = 269$

80. (C) $\operatorname{cosec}^{-1}\left(-\sqrt{2}\right) = \operatorname{cosec}^{-1}\left(-\operatorname{cosec}\dfrac{\pi}{4}\right)$

$\operatorname{cosec}^{-1}\left(-\sqrt{2}\right) = \operatorname{cosec}^{-1}\left[\operatorname{cosec}\left(-\dfrac{\pi}{4}\right)\right] = -\dfrac{\pi}{4}$

81. (A) Let $y = \log_{10}(3x^2 - 5)$ and $z = x^2$

$y = \log_{10}(3z - 5)$

$y = \log_{10} e \times \log_e (3z - 5)$

On differentialting both side w.r.t. 'z'

$\dfrac{dy}{dz} = \log_{10} e \times \dfrac{1}{3z - 5} \times 3$

$\dfrac{dy}{dz} = \dfrac{3\log_{10} e}{3z - 5} \Rightarrow \dfrac{dy}{dz} = \dfrac{3\log_{10} e}{3x^2 - 5}$

82. (C) Probability of selecting Rohan $P(R) = \dfrac{2}{5}$

and $P\left(\overline{R}\right) = 1 - \dfrac{2}{5} = \dfrac{3}{5}$

probability of selecting Sumit $P(S) = \dfrac{1}{4}$

$P\left(\overline{S}\right) = 1 - \dfrac{1}{4} = \dfrac{3}{4}$

Probability of one of them is selected

$= \dfrac{2}{5} \times \dfrac{3}{4} + \dfrac{3}{5} \times \dfrac{1}{4} \Rightarrow \dfrac{6}{20} + \dfrac{3}{20} = \dfrac{9}{20}$

83. (A)

84. (B) equation $x^2 - 5x + 3 = 0$

$\alpha + \beta = 5$ and $\alpha.\beta = 3$

Now, $\dfrac{\alpha^4 - \beta^4}{\alpha^{-4} - \beta^{-4}} = \dfrac{\alpha^4 - \beta^4}{\dfrac{1}{\alpha^4} - \dfrac{1}{\beta^4}} = \dfrac{\alpha^4 - \beta^4}{\dfrac{\beta^4 - \alpha^4}{(\alpha\beta)^4}}$

$= -(\alpha\beta)^4 = -3^4 = -81$

85. (D) given that the equation of circle
$x^2 + y^2 - 4x - 3y - 16 = 0$
Let equation of circle which is concentric with given equation
$x^2 + y^2 - 4x - 3y + c = 0$ ....(i)
it passes through the point (3, – 2)
$9 + 4 - 4 \times 3 (-2) + c = 0 \Rightarrow c = -7$
from eq. (ii)
$x^2 + y^2 - 4x - 3y - 7 = 0$

86. (C) points $(a, 0)$, $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$ are collinear, then

$$\begin{vmatrix} a & 0 & 1 \\ at_1^2 & 2at_1 & 1 \\ at_2^2 & 2at_2 & 1 \end{vmatrix} = 0$$

$$\Rightarrow a \times 2a \begin{vmatrix} 1 & 0 & 1 \\ t_1^2 & t_1 & 1 \\ t_2^2 & t_2 & 1 \end{vmatrix} = 0$$

$\Rightarrow 1\ (t_1 - t_2) + 1\ (t_1^2.t_2 - t_1.t_2^2) = 0$
$\Rightarrow 1\ (t_1 - t_2) + t_1.t_2\ (t_1 - t_2) = 0$
$\Rightarrow (t_1 - t_2)\ (1 + t_1.\ t_2) = 0$
$\Rightarrow t_1.\ t_2 + 1 = 0 \Rightarrow t_1.\ t_2 = -1$

87. (B) In the expansion of $\left(9x - \frac{6}{x^3}\right)^8$

$$T_{r+1} = {}^8C_r\ (9x)^{8-r} \left(\frac{-6}{x^3}\right)^r$$

$$= {}^8C_r\ (9)^{8-r}\ (-6)^r\ x^{8-4r}$$

Now, $8 - 4r = 0 \Rightarrow r = 2$
The required term = 2 + 1 = 3rd

88. (B) $\frac{4x}{12x^2 + 24x - 11} > \frac{1}{3x + 4}$
$\Rightarrow 12x^2 + 16x > 12x^2 + 24x - 11$
$\Rightarrow 0 > 8x - 11$

$\Rightarrow 8x < 11 \Rightarrow x < \frac{11}{8}$

Hence $x \in \left(-\infty, \frac{11}{8}\right)$

89. (A) Zero

90. (C) given that $b_{yx} = \frac{-10}{9}$ and $b_{xy} = \frac{-2}{5}$

$$r = \sqrt{b_{yx} \times b_{xy}}$$

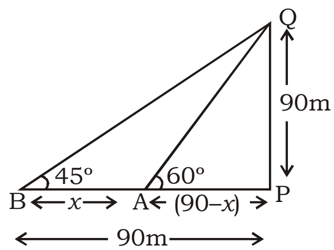
$$r = \sqrt{\frac{-10^2}{9} \times \frac{-2}{5}} \Rightarrow r = \frac{-2}{3}$$

91. (B) One year = 365 days
= 52 weeks and 1 day

The required Probability = $\frac{1}{7}$

92. (C)
$$\begin{array}{r} 1\ 0\ x\ 0\ 1\ 1 \\ -1\ 1\ y\ 0\ 1 \\ \hline 1\ 1\ z\ 0 \\ \hline \end{array}$$
$z = 1,\ y = 1,\ x = 1$

93. (B) Let AB = x m



In ΔAPQ

$$\tan 60^\circ = \frac{PQ}{AP}$$

$$\Rightarrow \sqrt{3} = \frac{90}{90 - x}$$

$$\Rightarrow 90\sqrt{3} - \sqrt{3}x = 90$$

$$\Rightarrow x = \frac{90\left(3 - \sqrt{3}\right)}{3}$$

$$\Rightarrow x = 30(3 - 1.732) = 38.04\text{m}$$

94. (C) given that $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} + \hat{j} - 2\hat{k}$

and $\vec{c} = 2\hat{i} + \hat{j} - 3\hat{k}$

Now, $\vec{a} \times (\vec{b} - \vec{c}) - \vec{b} \times (\vec{c} - \vec{a}) + \vec{c} \times (\vec{a} - \vec{b})$

$\Rightarrow \vec{a} \times \vec{b} - \vec{a} \times \vec{c} - \vec{b} \times \vec{c} + \vec{b} \times \vec{a} + \vec{c} \times \vec{a} - \vec{c} \times \vec{b}$
$\Rightarrow \vec{a} \times \vec{b} + \vec{c} \times \vec{a} - \vec{b} \times \vec{c} - \vec{a} \times \vec{b} + \vec{c} \times \vec{a} + \vec{b} \times \vec{c}$
$\Rightarrow 2\ \vec{c} \times \vec{a}$

$$\Rightarrow 2 \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -3 \\ 2 & 3 & 4 \end{vmatrix}$$

$$\Rightarrow 2\left[\hat{i}(4 + 9) - \hat{j}(8 + 6) + \hat{k}(6 - 2)\right]$$

$$\Rightarrow 2\left[13\hat{i} - 14\hat{j} + 4\hat{k}\right] \Rightarrow 26\hat{i} - 28\hat{j} + 8\hat{k}$$

95. (B)

96. (B) $10^{-x\sec x}\left[\dfrac{d}{dx}10^{x\sec x}\right]$

$\Rightarrow 10^{-x\sec x}[10^{x\sec x}\log 10\{x.\sec x.\tan x+\sec x\}]$

$\Rightarrow 10^{-x\sec x}10^{x\sec x}.\ \sec x\,(x\tan x + 1)\ \ln 10$

$\Rightarrow \sec x\,(x\tan x + 1)\ \ln 10$

97. (A) $\Rightarrow (35x-38)^5 = {}^5C_0\,(35x)^5 + {}^5C_1\,(35x)^4.\ 38 + {}^5C_2\,(35x)^3.38^2 + \ldots\ldots\ldots\ldots.. + {}^5C_5\,38^5$

$\Rightarrow (35x-38)^5 = {}^5C_0\,35^5 + {}^5C_2\,35^4.\ 38^1 + {}^5C_3\,35^4.38^1\ldots\ldots\ldots{}^5C_5\,38^5$

$\Rightarrow (-3)^5$ = sum of the coeffi. of all terms

$\Rightarrow$ sum of the coefficients of all terms $= -243$

98. (B) given that A.M. $= \dfrac{a+b}{2} = 14 \Rightarrow a + b = 28$

G.M. $= \sqrt{ab} = 7 \Rightarrow ab = 49$

Now, H.M. $= \dfrac{2ab}{a+b}$

H.M. $= \dfrac{2\times 49}{28} = \dfrac{7}{2}$

99. (A) A.M $\geq$ G.M $\geq$ H.M.

100. (B) $\lim\limits_{x\to\pi/4} \dfrac{(1-\tan x)(1+\sin 2x)}{(1+\tan x)(\pi-4x)}\left[\dfrac{0}{0}\right]$ form

by L-Hospital's Rule

$\Rightarrow \lim\limits_{x\to\pi/4} \dfrac{(1-\tan x)(2\cos 2x)+(1+\sin 2x)(-\sec^2 x)}{(1+\tan x)(-4)+(\pi-4x)(\sec^2 x)}$

$\Rightarrow \dfrac{\left(1-\tan\frac{\pi}{4}\right)\left(2\cos\frac{\pi}{2}\right)+\left(1+\sin\frac{\pi}{2}\right)\left(-\sec^2\frac{\pi}{4}\right)}{\left(1+\tan\frac{\pi}{4}\right)(-4)+(\pi-\pi)\sec^2\frac{\pi}{4}}$

$\Rightarrow \dfrac{0+2(-2)}{2(-4)+0} = \dfrac{-4}{-8} = \dfrac{1}{2}$

101. (B) $i^{n+3} + i^{n+4} + i^{n+5} + i^{n+6} + i^{n+7}$

$\Rightarrow i^{n+3}\,(1 + i + i^2 + i^3 + i^4)$

$\Rightarrow i^{n+3}\,(1 + i - 1 - i + 1) = i^{n+3}$

102. (B) $I = \int_0^5 |x-3|\,dx$

$I = \int_0^3 -(x-3)\,dx + \int_3^5 (x-3)\,dx$

$I = -\left[\dfrac{x^2}{2}-3x\right]_0^3 + \left[\dfrac{x^2}{2}-3x\right]_3^5$

$I = -\dfrac{3}{2} + \left[\dfrac{25}{2}-15-\dfrac{9}{2}+9\right]$

$I = \dfrac{-9}{2} + 9 + \dfrac{25}{2} - 15 - \dfrac{9}{2} + 9$

$I = 3 + \dfrac{7}{2} = \dfrac{13}{2}$

103. (B) $I = \int_0^{2\pi} \dfrac{\tan\frac{x}{4}}{\tan\frac{x}{4}+\cot\frac{x}{4}}\,dx$ ....(i)

$I = \int_0^{2\pi} \dfrac{\tan\frac{2\pi-x}{4}}{\tan\frac{2\pi-x}{4}+\cot\frac{2\pi-x}{4}}\,dx$

$I = \int_0^{2\pi} \dfrac{\cot\frac{x}{4}}{\cot\frac{x}{4}+\tan\frac{x}{4}}\,dx$ ....(ii)

from eq. (i) and eq (ii)

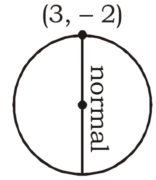
$2I = \int_0^{2\pi} \dfrac{\tan\frac{x}{4}+\cot\frac{x}{4}}{\tan\frac{x}{4}+\cot\frac{x}{4}}\,dx$

$2I = \int_0^{2\pi} 1.dx \Rightarrow 2I = [x]_0^{2\pi}$

$\Rightarrow 2I = 2\pi \Rightarrow I = \pi$

104. (C)

(3, – 2)



(–1, 4)

Equation of circle

$(x-3)(x+1) + (y+2)(y-4) = 0$

$x^2 - 2x - 3 + y^2 - 2y - 8 = 0$

$x^2 + y^2 - 2x - 2y - 11 = 0$

105. (A) $y = c.\,e^{\tan^{-1}x}$ ...(i)

On differentiating both side w.r.t. 'x'

$\dfrac{dy}{dx} = c.\,e^{\tan^{-1}x}.\dfrac{1}{1+x^2}$

$\dfrac{dy}{dx} = \dfrac{y}{1+x^2}$ [from eq (i)]

$(1+x^2)\dfrac{dy}{dx} = y$

106. (D)

107. (C) $f(x) = \begin{cases} 4x^2 + 9x - 1, & 0 \le x \le 1 \\ 30 - x, & 1 < x \le 2 \end{cases}$

(a) $f(x) = 13 - x$ on [1, 2]

$1 < 2$

but $f(1) > f(2)$

***f(x)* is decreaseing on [1, 2].**

(b) L.H.L. = $\lim_{x \to 1} f(x)$

$= \lim_{x \to 1} (4x^2 + 9x - 1) = 12$

R.H.L. = $\lim_{x \to 1} f(x)$

$= \lim_{x \to 1} 13 - x = 12$

L.H.L. = R.H.L.

***f(x)* is continuous on [0, 2].**

(c) $f(x)$ is increasing on [0, 1]

and $f(x)$ is decreasing on [1, 2]

Hence ***f(x)* is maximum at *x* = 1.**

(d) L.H.D. = $\lim_{h \to 0} \frac{f(1-h) - f(1)}{-h}$

$= \lim_{h \to 0} \frac{4(1-h)^2 + 9(1-h) - 1 - 12}{-h}$

$= \lim_{h \to 0} \frac{4h^2 - 8h - 9h}{-h}$

$= \lim_{h \to 0} -4h + 8 + 9 = 17$

108. (B) $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2\frac{4\pi}{3}}}}}$

$\Rightarrow \sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2\frac{4\pi}{3}}}}}$

$\Rightarrow \sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+2\cos\frac{4\pi}{3}}}}}$

$\Rightarrow \sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2\frac{2\pi}{3}}}}$

$\Rightarrow \sqrt{2+\sqrt{2\times 2\cos^2\frac{\pi}{3}}}$

$\Rightarrow \sqrt{2+\sqrt{2\times 2\cos^2\frac{\pi}{3}}}$

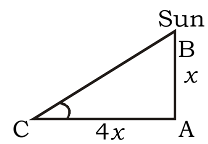
$\Rightarrow \sqrt{2+2\cos\frac{\pi}{3}}$

$\Rightarrow \sqrt{2+2\cos^2\frac{\pi}{6}}$

$\Rightarrow 2\cos\frac{\pi}{6} = 2 \times \frac{\sqrt{3}}{2} = \sqrt{3}$

109. (B) Let AB = x m

AC = $4x$ m



Δ **ABC**

$\tan\theta = \frac{AB}{AC}$

$\tan\theta = \frac{x}{4x} \Rightarrow \theta = \tan^{-1}\left(\frac{1}{4}\right)$

110. (B) Conic $4x^2 - 6y^2 = 48$

$\frac{x^2}{12} - \frac{y^2}{8} = 1$

Now, eccentricity $e = \sqrt{1+\frac{b^2}{a^2}}$

$e = \sqrt{1+\frac{8}{12}}$

$e = \sqrt{\frac{20}{12}} = \sqrt{\frac{5}{3}}$

111. (A) maximum value of $(24\sin\theta + 7\cos\theta)$

$= \sqrt{(24)^2 + (7)^2}$

$= \sqrt{576+49} = 25$

112. (D) $\frac{1+\sin\theta}{1-\sin\theta} = 3$

$1 + \sin\theta = 3 - 3\sin\theta$

$4\sin\theta = 2$

$\sin\theta = \frac{1}{2}$

$\sin\theta = \sin\frac{\pi}{6}$

$\theta = n\pi + (-1)^n\frac{\pi}{6}$

113. (A)

114. (A) Differential equation

$3(1+e^{2x})\ y\ dy = e^x\ dx$

$\Rightarrow 3y\ dy = \dfrac{e^x}{1+e^{2x}}\ dx$

Let $e^x = t \Rightarrow e^x\ dx = dt$

$\Rightarrow 3y\ dy = \dfrac{dt}{1+t^2}$

On integrating

$\Rightarrow \dfrac{3y^2}{2} = \tan^{-1}t + c$

$\Rightarrow 3y^2 = 2\tan^{-1}(e^x) + c$

115. (C) $I = \int_{0.1}^{2.5}[x]\,dx$

$I = \int_{0.1}^{1}[x]\,dx + \int_{1}^{2}[x]\,dx + \int_{2}^{2.5}[x]\,dx$

$I = \int_{0.1}^{1}0.\,dx + \int_{1}^{2}1.\,dx + \int_{2}^{2.5}2.\,dx$

$I = 0 + [x]_1^2 + 2\ [x]_2^{2.5}$

$I = 2 - 1 + 2\ (2.5 - 2)$

$I = 1 + 2 \times \dfrac{1}{2} = 2$

116. (D) given that $A = B \cap C$

Now, $(U-(U-(U-(U-(U-A)))))$

$\Rightarrow (U-(U-(U-(U-A'))))$

$\Rightarrow (U-(U-(U-A)))$

$\Rightarrow (U-(U-A'))$

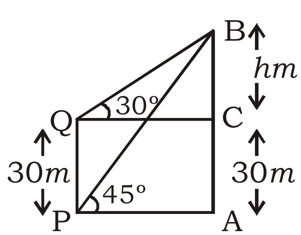
$\Rightarrow (U-A) = A' = (B\cap C)' = (B' \cup C')$

117. (C)

$$\begin{array}{r} 1\ x\ 0\ 0\ 1 \\ +\ 1\ 0\ 1\ y\ 1 \\ \hline 1\ 0\ 1\ z\ 0\ 0 \\ \hline \end{array}$$

$y = 1,\ z = 0,\ x = 0$

118. (C) Let BC = h m



In ΔABP

$\tan 45 = \dfrac{AB}{AP}$

$1 = \dfrac{30+h}{AP} \Rightarrow AP = 30 + h = QC$

In ΔQCB

$\tan 30° = \dfrac{BC}{QC}$

$\dfrac{1}{\sqrt{3}} = \dfrac{h}{30+h} \Rightarrow h = 15\left(\sqrt{3}+1\right)$

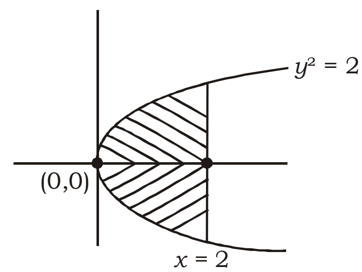
Height of the tower $= 30 + h$

$= 30 + 15\sqrt{3} + 15$

$= 15\left(3+\sqrt{3}\right) m$

119. (A) Curve $y = \sqrt{2}\ \sqrt{x}$

and line $x = 2$



Area $= 2\int_0^2 y.dx$

Area $= 2\int_0^2 \sqrt{2}.\sqrt{x}\ dx$

Area $= 2\sqrt{2}\left[\dfrac{x^{3/2}}{\frac{3}{2}}\right]_0^2$

Area $= 2 \times \dfrac{2\sqrt{2}}{3}\left[2^{3/2}\right] = \dfrac{16}{3}$ sq. unit

120. (B) $\sum_{r=1}^{3} C(20+r,3) + C(21,4)$

$\Rightarrow {}^{21}C_3 + {}^{22}C_3 + {}^{23}C_3 + {}^{21}C_4$

$\Rightarrow {}^{21}C_3 + {}^{21}C_4 + {}^{22}C_3 + {}^{23}C_3$

$\Rightarrow {}^{22}C_4 + {}^{22}C_3 + {}^{23}C_3$

$\Rightarrow {}^{23}C_4 + {}^{23}C_3 \Rightarrow {}^{24}C_4$

NDA (MATHS) MOCK TEST - 172 (Answer Key)

1.	(B)	21.	(C)	41.	(A)	61.	(B)	81.	(A)	101.	(B)
2.	(B)	22.	(A)	42.	(A)	62.	(B)	82.	(C)	102.	(B)
3.	(C)	23.	(C)	43.	(B)	63.	(C)	83.	(A)	103.	(B)
4.	(D)	24.	(B)	44.	(B)	64.	(D)	84.	(B)	104.	(C)
5.	(C)	25.	(C)	45.	(A)	65.	(B)	85.	(D)	105.	(A)
6.	(A)	26.	(D)	46.	(B)	66.	(D)	86.	(C)	106.	(D)
7.	(D)	27.	(A)	47.	(A)	67.	(A)	87.	(D)	107.	(C)
8.	(A)	28.	(D)	48.	(D)	68.	(C)	88.	(B)	108.	(B)
9.	(C)	29.	(C)	49.	(C)	69.	(C)	89.	(A)	109.	(B)
10.	(C)	30.	(C)	50.	(B)	70.	(C)	90.	(C)	110.	(B)
11.	(C)	31.	(B)	51.	(B)	71.	(C)	91.	(B)	111.	(A)
12.	(B)	32.	(C)	52.	(D)	72.	(B)	92.	(C)	112.	(D)
13.	(B)	33.	(B)	53.	(C)	73.	(C)	93.	(B)	113.	(A)
14.	(D)	34.	(C)	54.	(A)	74.	(B)	94.	(C)	114.	(A)
15.	(D)	35.	(B)	55.	(B)	75.	(D)	95.	(B)	115.	(C)
16.	(D)	36.	(B)	56.	(D)	76.	(B)	96.	(B)	116.	(D)
17.	(B)	37.	(C)	57.	(A)	77.	(C)	97.	(A)	117.	(C)
18.	(C)	38.	(B)	58.	(D)	78.	(A)	98.	(B)	118.	(C)
19.	(C)	39.	(B)	59.	(B)	79.	(D)	99.	(A)	119.	(A)
20.	(B)	40.	(B)	60.	(B)	80.	(C)	100.	(B)	120.	(B)

Note:- If your opinion differs regarding any answer, please message the mock test and question number to 8860330003

Note:- Whatsapp with Mock Test No. and Question No. at 7053606571 for any of the doubts, also share your suggestions and experience of Sunday Mock

Note:- If you face any problem regarding result or marks scored, please contact 9313111777