NDA MATHS MOCK TEST - 94 (SOLUTION)

1. (B) Word "ALLAHABAD"

No. of Permutations = $\frac{9!}{4!2!}$ = 7560

2. (C) Let $y = x.\ln\cos x$

On differentiating w.r.t. 'x'

$$\frac{dy}{dx} = x \times \frac{(-\sin x)}{\cos x} + \ln\cos x \times 1$$

$$\frac{dy}{dx} = -x.\tan x + \ln\cos x$$

3. (D) $5x^2 + 7x + 2 = 0$

$(5x + 2)(x + 1) = 0$

roots α and $\beta = -1, -\frac{2}{5}$

then $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{1\times 5}{-2} + \frac{4}{25(-1)}$

$$= -\frac{5}{2} - \frac{4}{25} = -\frac{133}{50}$$

4. (A) $\tan^{-1}\frac{1}{6} + \cos^{-1}\frac{5}{13}$

$\Rightarrow \tan^{-1}\frac{1}{6} + \tan^{-1}\frac{12}{5}$

$$\Rightarrow \tan^{-1}\left[\frac{\frac{1}{6}+\frac{12}{5}}{1-\frac{1}{6}\times\frac{12}{5}}\right] = \tan^{-1}\left[\frac{77}{18}\right]$$

5. (B) $e = \sqrt{2}$

and $2ae = 2\sqrt{3}$

$2a \times \sqrt{2} = 2\sqrt{3}$

$$a = \frac{\sqrt{3}}{\sqrt{2}} \Rightarrow a^2 = \frac{3}{2}$$

then $e^2 = 1 + \frac{b^2}{a^2}$

$$2 = 1 + \frac{2b^2}{3}$$

$$1 = \frac{2b^2}{3} \Rightarrow b^2 = \frac{3}{2}$$

Equation of hyperbola

$$\frac{2x^2}{3} - \frac{2y^2}{3} = 1$$

$$2x^2 - 2y^2 = 3$$

6. (B) $z = 1 + \cos\frac{\pi}{6} + i\sin\frac{\pi}{6}$

$$z = 2\cos^2\frac{\pi}{12} + i \times 2\sin\frac{\pi}{12}.\cos\frac{\pi}{12}$$

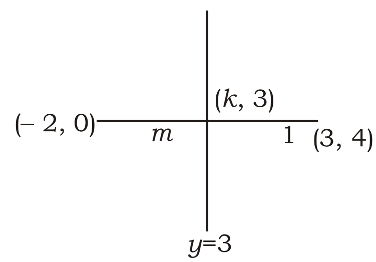
$$z = 2\cos\frac{\pi}{12}\left(\cos\frac{\pi}{12} + i\sin\frac{\pi}{12}\right)$$

$$\arg(z) = \tan^{-1}\left(\frac{b}{a}\right)$$

$$\arg(z) = \tan^{-1}\left(\frac{\sin\frac{\pi}{12}}{\cos\frac{\pi}{12}}\right)$$

$$\arg(z) = \tan^{-1}\left(\tan\frac{\pi}{12}\right) = \frac{\pi}{12}$$

7. (A)



Let the line $y = 3$ divides the joining the points (– 2, 0) and (3, 4) in the ratio 3 : 1. then

$$\frac{m\times 4 + 1\times 0}{m+1} = 3$$

$$4m = 3m + 3 \Rightarrow m = 3$$

The required ratio = 3 : 1

8. (C) Slope of line $m = \tan\theta$

$= \tan 15^\circ = 2 - \sqrt{3}$

and y-intercept $c = 30$

Equation of line

$$y = mx + c$$

$$y = (2 - \sqrt{3})x + 30$$

$$(2 - \sqrt{3})x - y + 30 = 0$$

9. (D) $\left(\frac{1-\sqrt{2}i}{1+\sqrt{2}i}\right)^2 = \left[\frac{(1-\sqrt{2}i)(1-\sqrt{2}i)}{(1+\sqrt{2}i)(1-\sqrt{2}i)}\right]^2$

$$= \left[\frac{-1-2\sqrt{2}i}{3}\right]^2 = \frac{-7+4\sqrt{2}i}{9}$$

10. (C) In the expansion of $\left(2\sqrt{x} - \frac{1}{4x}\right)^9$

$$T_{r+1} = {}^9C_r\,(2\sqrt{x})^{9-r}\left(-\frac{1}{4x}\right)^r$$

$$T_{r+1} = {}^9C_r\,2^{9-3r}\,(-1)^r\,x^{\frac{9-3r}{2}}$$

Then $\frac{9-3r}{2} = 3 \Rightarrow r = 1$

Coefficient of $x^3 = {}^9C_1\,2^{9-3}\,(-1)^1$
$= -9 \times 64 = -576$

11. (B) Straight line
$(2x - 3y - 6) + k(3x + y - 10) = 0$
$(2 + 3k)x + (-3 + k)\,y - 6 - 10k = 0$

Slope of line $m = \frac{-(2+3k)}{-3+k}$

Slope of perpendicular line m' $= \frac{-1}{m}$

$= \frac{-3+k}{2+3k}$

According to question

$\frac{-3+k}{2+3k} = 0 \Rightarrow k = 3$

12. (C) Let $a - ib = \sqrt{4 - 8\sqrt{6}i}$
On squaring both side w.r.t. 'x'
$(a^2 - b^2) - 2abi = 4 - 8\sqrt{6}$ …(i)
$(a^2 + b^2)^2 = (a^2 - b^2)^2 + 4a^2b^2$
$(a^2 + b^2) = 16 + 384$
$a^2 + b^2 = 20$ …(ii)
$2a^2 = 24$ $2b^2 = 16$
$a^2 = 12$ $b^2 = 8$
$a = \pm 2\sqrt{3}$ $b = \pm 2\sqrt{2}$

Square root of $(4 - 8\sqrt{6}\,i) = \pm(2\sqrt{3} - 2\sqrt{2}\,i)$

13. (A) $n(S) = 6 \times 6 = 36$

$$E = \begin{Bmatrix} (6,3),(3,6),(5,4),(4,5)\text{ for sum} = 9 \\ (6,4),(4,6),(5,5)\text{ for sum} = 10 \\ (6,5),(5,6),\text{ for sum} = 11 \\ (6,6)\text{ for sum} = 12 \end{Bmatrix}$$

$n(E) = 10$

The required Probability $= \frac{n(E)}{n(S)} = \frac{10}{36}$

$= \frac{5}{18}$

14. (C) Number of diagonals $= \frac{n(n-3)}{2}$
On putting $n = 10$
The number of diagonals $= \frac{10 \times 7}{2} = 35$

15. (D) S = 0.6 + 0.06 + 0.006 + … ∞
= 0.6 [1 + 0.1 + 0.01+…∞]

$= 0.6 \times \frac{1}{1 - 0.1}$

$= \frac{0.6}{0.9} = \frac{2}{3}$

16. (B) $S_n = 2n^2 - 5n$
$S_{n-1} = 2(n-1)^2 - 5(n-1)$
$S_{n-1} = 2n^2 - 9n + 7$
$T_n = S_n - S_{n-1}$
$T_n = 2n^2 - 5n - 2n^2 + 9n - 7$
$T_n = 4n - 7$
$T_{13} = 4 \times 13 - 7 = 45$

17. (B) $I = \int \frac{1}{\sqrt{1+\cos x}}\,dx$

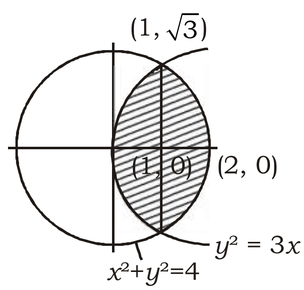
$$I = \int \frac{1}{\sqrt{2\cos^2\frac{x}{2}}}\,dx$$

$$I = \frac{1}{\sqrt{2}}\int \sec\frac{x}{2}\,dx$$

$$I = \frac{1}{\sqrt{2}}\,\frac{\log\left|\sec\frac{x}{2} + \tan\frac{x}{2}\right|}{\frac{1}{2}} + c$$

$$I = \sqrt{2}\log\left|\sec\frac{x}{2} + \tan\frac{x}{2}\right| + c$$

18. (A)



Curve
$y_1 \Rightarrow y = \sqrt{3}\,\sqrt{x}$ …(i)
and $y_2 \Rightarrow y = \sqrt{4 - x^2}$ …(ii)
On solving eq. (i) and eq. (ii)
$x = 1,\ y = \sqrt{3}$

Area $= 2\left[\int_0^1 y_1 dx + \int_1^2 y_2 dx\right]$

$= 2\left[\int_0^1 \sqrt{3}\sqrt{x}.dx + \int_1^2 \sqrt{4-x^2}dx\right]$

$= 2\left[\frac{2\sqrt{3}}{3}x^{\frac{3}{2}}\right]_0^1 + \left[\frac{1}{2}x\sqrt{4-x^2} + \frac{1}{2}\times 4\sin^{-1}\frac{x}{2}\right]_1^2$

$= 2\left[\frac{2\sqrt{3}}{3} + 2\times\frac{\pi}{2} - \frac{\sqrt{3}}{2} - 2\sin^{-1}\frac{1}{2}\right]$

$= 2\left[\frac{2}{\sqrt{3}} + 2\times\frac{\pi}{2} - \frac{\sqrt{3}}{2} - 2\times\frac{\pi}{6}\right]$

$= \frac{\sqrt{3}+4\pi}{3}$

19. (B) Equation whose roots are – 15 and 12.
$(x + 15)(x - 12) = 0$
$x^2 + 3x - 180 = 0$
Original equation
$x^2 + 24x - 180 = 0$
$(x + 30)(x - 6) = 0$
roots = – 30, 6

20. (C) Vectors
$-\hat{i} + \hat{j} + m\hat{k}$ and $2\hat{i} + \hat{j} + 2\hat{k}$
angle between vectors

$\cos\theta = \frac{-1\times 2 + 1\times 1 + m\times 2}{\sqrt{(-1)^2+(1)^2+m^2}\sqrt{(2)^2+(1)^2+(2)^2}}$

$\cos\frac{\pi}{4} = \frac{2m-1}{\sqrt{m^2+2}\times 3}$

$\frac{1}{\sqrt{2}} = \frac{2m-1}{3\sqrt{m^2+2}}$

$\frac{1}{2} = \frac{4m^2+1-4m}{9(m^2+2)}$

$m^2 + 8m + 16 = 0$
$(m + 4)^2 = 0 \Rightarrow m = -4$

21. (B) $\frac{\cos^2 6A}{\cos^2 2A} - \frac{\sin^2 6A}{\sin^2 2A} = \left(\frac{\cos 6A}{\cos 2A}\right)^2 - \left(\frac{\sin 6A}{\sin 2A}\right)^2$

$\Rightarrow \left(\frac{4\cos^3 2A - 3\cos 2A}{\cos 2A}\right)^2 - \left(\frac{3\sin 2A - 4\sin^3 2A}{\sin 2A}\right)^2$

$\Rightarrow (4\cos^2 2A - 3)^2 - (3 - 4\sin^2 2A)^2$

$\Rightarrow 16\cos^4 2A + 9 - 24\cos^2 2A - 9 - 16\sin^4 2A + 24\sin^2 2A$

$\Rightarrow 16(\cos^4 2A - \sin^4 2A) - 24(\cos^2 2A - \sin^2 2A)$

$\Rightarrow 16(\cos^2 2A - \sin^2 2A) - 24(\cos^2 2A - \sin^2 2A)$

$\Rightarrow (\cos^2 2A - \sin^2 2A)(16 - 24) = -8\cos 4A$

22. (C) $y = x^3 + e^{2x}$
On differentiating w.r.t. 'x'

$\frac{dy}{dx} = 3x^2 + 2e^{2x}$

again, differentiating w.r.t. 'x'

$\frac{d^2y}{dx^2} = 3\times 2x + 2.e^{2x}\times 2$

$\frac{d^2y}{dx^2} = 6x + 4.e^{2x}$

23. (D) $y = a^{x^2\log_a\cos x}$

$y = a^{\log_a(\cos x)^{x^2}}$

$y = (\cos x)^{x^2}$

taking log both side
$\log y = x^2.\log\cos x$
On differentiating both side w.r.t. 'x'

$\frac{1}{y}\frac{dy}{dx} = x^2\times\frac{(-\sin x)}{\cos x} + \log\cos x\times 2x$

$\frac{dy}{dx} = y(-x^2\tan x + 2x.\log\cos x)$

24. (D) $I = \int_0^{\frac{1}{2}}\frac{\cos^{-1}x}{\sqrt{1-x^2}}dx$

Let $\cos^{-1}x = t$ when $x\to 0,\ t\to\frac{\pi}{2}$

$\frac{-1}{\sqrt{1-x^2}}dx = dt$ $x\to\frac{1}{2},\ t\to\frac{\pi}{3}$

$\frac{1}{\sqrt{1-x^2}}dx = -dt$

$I = \int_{\frac{\pi}{2}}^{\frac{\pi}{3}}(-t)\,dt$

$I = -\left[\frac{t^2}{2}\right]_{\frac{\pi}{2}}^{\frac{\pi}{3}}$

$I = -\frac{1}{2}\left[\left(\frac{\pi}{3}\right)^2 - \left(\frac{\pi}{2}\right)^2\right]$

$I = -\frac{1}{2}\left[\frac{\pi^2}{9} - \frac{\pi^2}{4}\right] = \frac{5\pi^2}{72}$

25. (B) $I = \int \frac{1}{x(1-\log x)^2}\,dx$

Let $1 - \log x = t$

$-\frac{1}{x}dx = dt \Rightarrow \frac{1}{x}dx = -dt$

$I = \int \frac{-dt}{t^2}$

$I = \frac{1}{t} + c \Rightarrow I = \frac{1}{1-\log x} + c$

27. (A) Lines $15x - 8y + 7 = 0$ ...(i)
and $30x - 16y + 11 = 0$

$15x - 8y + \frac{11}{2} = 0$ ...(ii)

Distance (D) = $\frac{7 - \frac{11}{2}}{\sqrt{(15)^2 + (-8)^2}}$

$= \frac{3}{2\times 17} = \frac{3}{34}$

28. (B) Equation of line

$y - 7 = \frac{-4}{7}(x+2)$

$4x + 7y = 41$

29. (D) $(1+x^2)\frac{dy}{dx} + 2xy = 2$

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

On comparing with general equation

$P = \frac{2x}{1+x^2}$ and $Q = \frac{2}{1+x^2}$

I.F. = $e^{\int P\,dx}$

I.F. = $e^{\int \frac{2x}{1+x^2}dx}$

I.F. = $e^{\log(1+x^2)} = 1 + x^2$

Solution of the differential equation

$y \times I.F. = \int Q \times \text{I.F.}\,dx$

$y \times (1+x^2) = \int \frac{2}{1+x^2} \times (1+x^2)dx$

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

30. (C)

$$\begin{array}{r} 1110101 \\ +1110 \\ \hline 10000011 \end{array} \qquad \begin{array}{r} 10000011 \\ -110010 \\ \hline 1010001 \end{array}$$

31. (B) Table is round, one seat is fixed.
The number of ways = (8 – 1)! = 7! = 5040

32. (A) We know that

$C_0 + C_1x + C_2x^2 + \ldots C_{n-1}x^{n-1} + C_nx^n = (1+x)^n$ ...(i)

$x \to \frac{1}{x}$

$C_0 + \frac{C_1}{x} + \frac{C_2}{x^2} + \ldots + \frac{C_n}{x^n} = \left(1 + \frac{1}{x}\right)^n$

multiply by x

$C_0x + C_1 + \frac{C_2}{x} + \frac{C_3}{x^2} + \ldots + \frac{C_n}{x^{n-1}} = \frac{x(x+1)^n}{x^n}$ ...(ii)

From equation (i) and (ii)

Coefficient of x^0 in $(x+1)^n \cdot \frac{x(x+1)^n}{x^n}$

$= C_0C_1 + C_1C_2 + \ldots + C_{n-1}C_n$

Coefficient of x^{n-1} in $(1+x)^{2n}$

$= C_0C_1 + C_1C_2 + \ldots + C_{n-1}C_n$

${}^{2n}C_{n-1} = C_0C_1 + C_1C_2 + \ldots + C_{n-1}C_n$

$C_0C_1 + C_1C_2 + \ldots + C_{n-1}C_n = \frac{(2n)!}{(n-1)!(n+1)!}$

33. (B) $z = \frac{1}{\sin 2\theta - i(1-\cos 2\theta)}$

$z = \frac{1}{2\sin\theta.\cos\theta - i \times 2\sin^2\theta}$

$z = \frac{1}{2\sin\theta(\cos\theta - i\sin\theta)}$

$z = \frac{(\cos\theta + i\sin\theta)}{2\sin\theta(\cos\theta - i\sin\theta)(\cos\theta + i\sin\theta)}$

$z = \frac{(\cos\theta + i\sin\theta)}{2\sin\theta(\cos^2\theta - i^2\sin^2\theta)}$

$z = \frac{1}{2}(\cot\theta + i)$

Real part of $z = \frac{1}{2}\cot\theta$

34. (C) $y = 3^{142}$

Taking log both side

$\log_{10}y = 142\log_{10}3$

$\log_{10}y = 142 \times 0.4771$

$\log_{10}y = 67.7482$

No. of digits = 67 + 1 = 68

35. (B) $\lim_{x\to 3} \frac{x^3-27}{81-x^4}$

by L- Hospital's Rule

$\Rightarrow \lim_{x\to 3} \frac{3x^2-0}{0-4x^3}$

$\Rightarrow \lim_{x\to 3} \frac{-3}{4x} = \frac{-3}{4\times 3} = \frac{-1}{4}$

36. (C) Straight line $\frac{x-4}{3} = \frac{y-14}{-4} = \frac{z+1}{-2}$

and $\frac{x+2}{-2} = \frac{y+4}{-4} = \frac{z-5}{5}$

angle between lines

$\cos\theta = \frac{3\times(-2)+(-4)(-4)+(-2)\times 5}{\sqrt{(3)^2+(-4)^2+(-2)^2}\sqrt{(-2)^2+(-4)^2+(5)^2}}$

$\cos\theta = \frac{-6+16-10}{\sqrt{29}+\sqrt{45}}$

$\cos\theta = 0 \Rightarrow \theta = \frac{\pi}{2}$

37. (B) $\sec\theta$

38. (D) $5^{\frac{1}{3}} \times 5^{\frac{1}{9}} \times 5^{\frac{1}{27}} \times \ldots\infty$

$\Rightarrow 5^{\left(\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\ldots\infty\right)}$

$\Rightarrow 5^{\frac{\frac{1}{3}}{1-\frac{1}{3}}}$

$\Rightarrow 5^{\frac{\frac{1}{3}}{\frac{2}{3}}} \Rightarrow 5^{\frac{1}{2}} = \sqrt{5}$

39. (A) $[0, \pi]$

40. (B) $I = \int 1 . \log x\, dx$

$I = \log x \int 1 .dx - \int \left\{\frac{d}{dx}(\log x).\int 1.dx\right\} dx$

$I = x.\log x - \int \frac{1}{x} \times x\, dx$

$I = x.\log x - x + c$

$I = x(\log x - 1) + c$

41. (C) $f(x) = \begin{cases} \frac{2x+\tan x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous

at $x = 0$, then

$\lim_{x\to 0^-} f(x) = f(0)$

$\lim_{x\to 0} \frac{2x+\tan x}{x} = k$

by L-Hospital's Rule

$\lim_{x\to 0} \frac{2+\sec^2 x}{1} = k$

$\frac{2+1}{1} = k \Rightarrow k = 3$

42. (A) Ellipse $\frac{x^2}{\lambda^2} + \frac{y^2}{25}$ where $\lambda > 5$

$e^2 = 1 + \frac{25}{\lambda^2} \Rightarrow e = \frac{\sqrt{\lambda^2+25}}{\lambda}$

foci = $\pm (ae, 0) = \pm (\sqrt{\lambda^2+25}, 0)$

hyperbola $\frac{x^2}{25} - \frac{y^2}{36} = 1$

$e^2 = 1 + \frac{36}{25} \Rightarrow e = \frac{\sqrt{61}}{5}$

foci = $\pm (ae, 0) = \pm (\sqrt{61}, 0)$

then

$\sqrt{\lambda^2+25} = \sqrt{61} \Rightarrow \lambda^2 = 36$

43. (C) $\frac{2b^2}{a} = \frac{1}{3} \times 2a$

$b^2 = \frac{a^2}{3}$

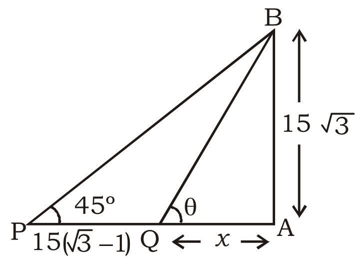
then $e^2 = 1 + \frac{b^2}{a^2}$

$e^2 = 1 + \frac{a^2}{3a^2}$

$e^2 = 1 + \frac{1}{3}$

$e = \frac{1}{\sqrt{3}}$

44. (B)



Let AQ = x m

In ΔABP

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

$$1 = \frac{15\sqrt{3}}{15\left(\sqrt{3}-1\right)+x} \Rightarrow x = 15$$

In ΔABQ

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

$$\tan\theta = \frac{15\sqrt{3}}{15}$$

$$\tan\theta = \sqrt{3} \Rightarrow \theta = 60^\circ$$

45. (A) Equation

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

one root is $(-1+\sqrt{7}\,i)$

other root is $(-1-\sqrt{7}\,i)$.

46. (C) In ΔABC,

∠B = 60°, ∠A = 15°, then ∠C = 105°

Sine Rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin 15} = \frac{b}{\sin 60} = \frac{c}{\sin 105}$$

then $\frac{a}{\sin 15} = \frac{b}{\sin 60}$ and $\frac{c}{\sin 105} = \frac{b}{\sin 60}$

$$\frac{a\times 2\sqrt{2}}{\sqrt{3}-1} = \frac{2\times b}{\sqrt{3}}, \quad \frac{c\times 2\sqrt{2}}{\sqrt{3}+1} = \frac{b\times 2}{\sqrt{3}}$$

$$a = b\frac{\sqrt{3}-1}{\sqrt{3}}, \; c = b\left(\frac{\sqrt{3}+1}{\sqrt{6}}\right)$$

then $a + c = \frac{b}{\sqrt{6}}\left(\sqrt{3} - 1 + \sqrt{3} + 1\right)$

$$= \frac{b}{\sqrt{6}}\left(2\sqrt{3}\right) = \sqrt{2}\,b$$

47. (A) Determinant $\begin{vmatrix} -1 & 2 & 0 \\ 2 & -5 & 1 \\ 3 & 4 & -3 \end{vmatrix}$

Co-factor of element 4 = $(-1)^{3+2}\begin{vmatrix} -1 & 0 \\ 2 & 1 \end{vmatrix}$

$= -(-1-0) = 1$

48. (C) $\lim_{x\to\infty}\left(\frac{x+5}{x+3}\right)^{x+6}$

$$\Rightarrow \lim_{x\to\infty}\left[\left(1+\frac{2}{x+3}\right)^{\frac{x+3}{2}}\right]^{\frac{2(x+6)}{x+3}}$$

$$\Rightarrow e^{2\lim_{x\to\infty}\frac{2(x+6)}{x+6}} \qquad \left[\because \lim_{x\to\infty}(1+\lambda/x)^x = e^{\lambda}\right]$$

$$\Rightarrow e^{2\lim_{x\to\infty}\frac{2\left(1+\frac{6}{x}\right)}{\left(1+\frac{3}{x}\right)}} = e^{2\times 2} = e^4$$

49. (A) $n(S) = 6 \times 6 \times 6 = 216$

$n(E) = 6$

$$P(E) = \frac{n(E)}{n(S)} = \frac{6}{216} = \frac{1}{36}$$

50. (D) Let $y = x^2 + \sin x$ and $z = x.\tan x$

$$\frac{dy}{dx} = 2x + \cos x, \quad \frac{dz}{dx} = x\sec^2 x + \tan x$$

then $\frac{dy}{dz} = \frac{dy}{dx} \times \frac{dx}{dz}$

$$\frac{dy}{dz} = \frac{(2x+\cos x)}{x\sec^2 x + \tan x}$$

$$\frac{dy}{dz} = \frac{(2x+\cos x)\cos^2 x}{x + \sin x.\cos x}$$

51. (C) $\overrightarrow{\begin{bmatrix} 3 & 1 \\ -1 & 4 \end{bmatrix}} \begin{bmatrix} -1 & 2 \\ \lambda & 0 \end{bmatrix}\Big\downarrow = \begin{bmatrix} -5 & 6 \\ -7 & -2 \end{bmatrix}$

$$\begin{bmatrix} -3+\lambda & 6+0 \\ 1+4\lambda & -2+0 \end{bmatrix} = \begin{bmatrix} -5 & 6 \\ -7 & -2 \end{bmatrix}$$

$$\begin{bmatrix} -3+\lambda & 6 \\ 1+4\lambda & -2 \end{bmatrix} = \begin{bmatrix} -5 & 6 \\ -7 & -2 \end{bmatrix}$$

On comparing

$-3 + \lambda = -5 \Rightarrow \lambda = -2$

52. (A) $I = \int \tan^{-1}(\cot x + \text{cosec}x)dx$

$$I = \int \tan^{-1}\left(\frac{\cos x}{\sin x} + \frac{1}{\sin x}\right)dx$$

$$I = \int \tan^{-1}\left(\frac{2\cos^2\frac{x}{2}}{2\sin\frac{x}{2}.\cos\frac{x}{2}}\right)dx$$

$$I = \int \tan^{-1}\left(\cot\frac{x}{2}\right)dx$$

$$I = \int \tan^{-1}\left[\tan\left(\frac{\pi}{2} - \frac{x}{2}\right)\right]dx$$

$$I = \int\left(\frac{\pi}{2} - \frac{x}{2}\right)dx$$

$$I = \frac{\pi}{2}x - \frac{x^2}{4} + c$$

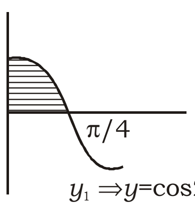
53. (B) $\log_2(\log_2(\log_3 81))$

$\Rightarrow \log_2(\log_2(\log_3 3^4))$

$\Rightarrow \log_2(\log_2 4)$

$\Rightarrow \log_2(\log_2 2^2) = \log_2 2 = 1$

54. (C)



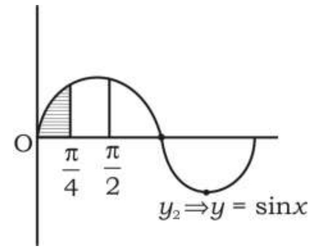
$$A_1 = \int_0^{\frac{\pi}{4}} y_1\, dx$$

$$A_1 = \int_0^{\frac{\pi}{4}} \cos 2x\, dx$$

$$A_1 = \left[\frac{\sin 2x}{2}\right]_0^{\frac{\pi}{4}}$$

$$A_1 = \frac{1}{2}\left[\sin\frac{\pi}{2} - \sin 0\right]$$

$$A_1 = \frac{1}{2}[1 - 0] = \frac{1}{2}$$



$$A_2 = \int_0^{\frac{\pi}{4}} y_2\, .dx$$

$$A_2 = \int_0^{\frac{\pi}{4}} \sin x\, dx$$

$$A_2 = -\left[\cos x\right]_0^{\frac{\pi}{4}}$$

$$A_2 = -\left[\cos\frac{\pi}{4} - \cos 0\right]$$

$$A_2 = -\left[\frac{1}{\sqrt{2}} - 1\right] = \frac{\sqrt{2}-1}{\sqrt{2}}$$

$$A_1 : A_2 = \frac{1}{2} : \frac{\sqrt{2}-1}{\sqrt{2}}$$

$$= 1 : 2 - \sqrt{2}$$

55. (B) AB = c = 8 cm, BC = a = 15 cm and CA = b = 17 cm

$$s = \frac{a+b+c}{2} = \frac{15+17+8}{2} = 20$$

$$\cot\frac{A}{2} = \sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$$

$$\cot\frac{A}{2} = \sqrt{\frac{20\times5}{3\times12}}$$

$$\cot\frac{A}{2} = \frac{10}{6} \Rightarrow \frac{5}{3}$$

56. (A) sin1725 = sin(360 × 4 + 285)

= sin(285)

= sin(270 + 15)

$$= -\cos 15 = -\frac{\sqrt{3}+1}{2\sqrt{2}}$$

57. (B) Let $y = \sin^2\left[\tan^{-1}\sqrt{\frac{1+x}{1-x}}\right]$

On putting $x = \cos 2\theta$

$$y = \sin^2\left[\tan^{-1}\sqrt{\frac{1+\cos 2\theta}{1-\cos 2\theta}}\right]$$

$$y = \sin^2\left[\tan^{-1}\sqrt{\frac{2\cos^2\theta}{2\sin^2\theta}}\right]$$

$$y = \sin^2\left[\tan^{-1}(\cot\theta)\right]$$

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

$$y = \sin^2\left[\frac{\pi}{2}-\theta\right]$$

$$y = \cos^2\theta$$

$$y = \frac{1+\cos 2\theta}{2}$$

$$y = \frac{1+x}{2} \Rightarrow \frac{dy}{dx} = \frac{1}{2}$$

58. (B) $\vec{a} = 2\hat{i}+\hat{j}-3\hat{k},\ \vec{b} = \hat{i}-\hat{j}+3\hat{k}$

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

$$= 7\hat{i}+2\hat{j}-6\hat{k}$$

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

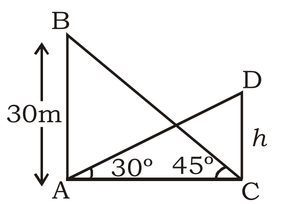
$$= 2\hat{i}-5\hat{j}+15\hat{k}$$

Then

$(3\vec{a}+\vec{b}).(4\vec{b}-\vec{a}) = 14 - 10 - 90 = -86$

59. (C)

60. (A)



Let height of smaller tower (CD) = h m

then $AC = kh$

In ΔABC

$$\tan 45° = \frac{AB}{AC}$$

$$1 = \frac{30}{kh} \Rightarrow kh = 30 \quad \ldots(i)$$

In ΔACD

$$\tan 30° = \frac{CD}{AC}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{kh} \Rightarrow k = \sqrt{3}$$

from eq. (i)

$\sqrt{3} \times h = 30 \Rightarrow h = 10\sqrt{3}\ m$

61. (B) $y = \frac{x}{\sqrt{1-x^2}}$

On differentiating w.r.t. 'x'

$$\frac{dy}{dx} = \frac{\sqrt{1-x^2}.1 - x.\frac{1}{2}(1-x^2)^{-\frac{1}{2}}(-2x)}{\left(\sqrt{1-x^2}\right)^2}$$

$$\frac{dy}{dx} = \frac{\sqrt{1-x^2}+\frac{x^2}{\sqrt{1-x^2}}}{1-x^2}$$

$$\frac{dy}{dx} = \frac{1}{(1-x^2)^{\frac{3}{2}}} \Rightarrow \frac{dx}{dy} = (1-x^2)^{3/2}$$

62. (C) $I = \frac{\sin x}{\sin x+\cos x}dx \quad \ldots(i)$

$$I = \int_0^{\frac{\pi}{2}} \frac{\sin\left(\frac{\pi}{2}-x\right)}{\sin\left(\frac{\pi}{2}-x\right)+\cos\left(\frac{\pi}{2}-x\right)}dx$$

$$I = \frac{\cos x}{\cos x+\sin x}\ dx \quad \ldots(ii)$$

from equation (i) and equation (ii)

$$I + I = \int_2^{\frac{\pi}{2}} 1\,.dx$$

$$2I = [x]_0^{\frac{\pi}{2}}$$

$$2I = \frac{\pi}{2} \Rightarrow I = \frac{\pi}{4}$$

63. (B) $I = \int \sin x.\log\tan x\, dx$

$$I = \log(\tan x)\int \sin x\, dx - \int\left\{\frac{d}{dx}(\log\tan x).\int\sin x\,dx\right\}dx$$

$$I = \log(\tan x).(-\cos x) - \int\frac{1\times\sec^2 x}{\tan x}(-\cos x)dx$$

$$I = -\cos x.\log\tan x + \int \operatorname{cosec} x\, dx$$

$$I = -\cos x.\log\tan x + \log\tan\frac{x}{2} + c$$

64. (A) $I = \int_1^2 e^x \left(\frac{x-2}{x^3}\right) dx$

$I = \int_1^2 e^x \left(\frac{1}{x^2} - \frac{2}{x^3}\right) dx$

$I = \left[e^x \times \frac{1}{x^2}\right]_1^2$

$I = \left[\frac{e^2}{4} - \frac{e^1}{1}\right] = \left(\frac{e^2}{4} - e\right)$

65. (C) $\frac{\sin 15 - \sin 45}{\sin^3 15 - \sin^2 45}$

$= \frac{(\sin 15 - \sin 45)}{(\sin 15 - \sin 45)(\sin^2 15 + \sin^2 45 + \sin 15 . \sin 45)}$

$= \frac{1}{\sin^2 15 + \sin^2 45 + \sin 15 . \sin 45}$

$= \frac{1}{\frac{2-\sqrt{3}}{4} + \frac{1}{2} + \frac{\sqrt{3}-1}{2\sqrt{2}} \times \frac{1}{\sqrt{2}}} = \frac{4}{3}$

66. (B) $\sin 18^o = \frac{\sqrt{5}-1}{4}$

67. (C) line $3x + 7y + 5 = 0$

Equation of line which is perpendicular to the given line

$7x - 3y = c$

It passes through the point (– 3, 1)

$7(-3) - 3 \times 1 = c$

$c = -24$

The equation of line

$7x - 3y = -24$

$7x - 3y + 24 = 0$

68.(A) 1 1 0 1 1   0. 0 1 1

$1 \times 2^0 = 1$

$1 \times 2^1 = 2$

$0 \times 2^2 = 0$

$1 \times 2^3 = 8$

$1 \times 2^4 = 16$

27

$0 = 0 \times 2^{-1}$

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

$\frac{1}{8} = 1 \times 2^{-3}$

$\frac{1}{4} + \frac{1}{8} = \frac{3}{8} = 0.375$

$(11011.011)_2 = (27.375)_{10}$

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

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

order = 3, degree = 1

70. (A) $I = \int_0^{\frac{\pi}{2}} \ln(\cot x)\,\text{cosec}^2 2x\,dx$ ...(i)

$I = \int_0^{\frac{\pi}{2}} \ln\left[\cot\left(\frac{\pi}{2} - x\right)\right] \text{cosec}^2 2\left(\frac{\pi}{2} - x\right) dx$

$I = \int_0^{\frac{\pi}{2}} \ln(\tan x)\,\text{cosec}^2 2x\,dx$ ...(ii)

from eq. (i) and eq. (ii)

$2I = \int_0^{\frac{\pi}{2}} \text{cosec}^2 2x[\ln\cot x + \ln\tan x]\,dx$

$2I = \int \text{cosec}^2 2x\,(\ln 1)dx$

$2I = 0 \Rightarrow I = 0$

71. (D) $f(x) = \begin{cases} 4x - 5, & 2 \le x \le 3 \\ 3\lambda + x, & 3 < x \le 5 \end{cases}$ is continuous

at $x = 3$, then

$\lim_{x \to 3^-} f(x) = \lim_{x \to 3^+} f(x)$

$\lim_{x \to 3} (4x - 5) = \lim_{x \to 3} (3\lambda + x)$

$4 \times 3 - 5 = 3\lambda + 3$

$7 = 3\lambda + 3 \Rightarrow \lambda = \frac{4}{3}$

72. (B) In the expansion of $\left(x - \frac{1}{2\sqrt{x}}\right)^7$

$T_{r+1} = {}^7C_r\,(x)^{7-r}\left(\frac{-1}{2\sqrt{x}}\right)^r$

$= {}^7C_r\left(\frac{-1}{2}\right)^r x^{7-\frac{3r}{2}}$

Then

$7 - \frac{3r}{2} = 1$

$\frac{3r}{2} = 6 \Rightarrow r = 4$

Coefficient of $x = {}^7C_4\left(\frac{-1}{2}\right)^4$

$= \frac{7!}{4!3!} \times \frac{1}{16} = \frac{35}{16}$

73. (B) 5

74. (B) $\begin{vmatrix} p-q & a-b & x-y \\ q-r & b-c & y-z \\ r-p & c-a & z-x \end{vmatrix}$

$R_1 \to R_1 + R_2 + R_3$

$\Rightarrow \begin{vmatrix} 0 & 0 & 0 \\ q-r & b-c & y-z \\ r-p & c-a & z-x \end{vmatrix} = 0$

75. (A) $2a = 6 \Rightarrow a = 3$

and $e = \frac{2}{3}$

$\sqrt{1-\frac{b^2}{a^2}} = \frac{2}{3}$

$1 - \frac{b^2}{9} = \frac{4}{9}$

$\frac{5}{9} = \frac{b^2}{9} \Rightarrow b^2 = 5$

Equation of an ellipse

$\frac{x^2}{9} + \frac{y^2}{5} = 1$

$5x^2 + 9y^2 = 45$

76. (B) $\log_3 27 - 4\log_9 3$

$\Rightarrow \log_3 3^3 - \log_9 3^4$

$\Rightarrow 3\log_3 3 - 2\log_9 9$

$\Rightarrow 3 - 2 = 1$

77. (D) $-4x + 3y + 3z = 36$

$\frac{x}{-9} + \frac{y}{12} + \frac{z}{12} = 1$

intercept (– 9, 12, 12)

78. (B) The sum of of focal radii of any point on an ellipse = $a + x + a - x$

$= 2a$ (length of major axis)

79. (D) Circle $(x-1)^2 + (y+2)^2 = 15$

centre (1, –2)

and circle $x^2 + y^2 + 3x + 4y + 5 = 0$

centre $\left(-\frac{3}{2}, -2\right)$

Distance = $\sqrt{\left(1+\frac{3}{2}\right)^2 + (-2+2)^2}$

80. (B) $\begin{vmatrix} 1 & -1 & 0 \\ 2 & x & 1 \\ 3 & 4 & 2 \end{vmatrix} = 3$

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

$\Rightarrow 2x - 4 + 1 = 3$

$\Rightarrow 2x - 3 = 3$

$\Rightarrow 2x = 6$

$\Rightarrow x = 3$

81. (C) Let $a + ib = \sqrt{45+28i}$

$(a^2 - b^2) + 2abi = 45 + 28i$

$a^2 - b^2 = 45$ and $2ab = 28$ ...(i)

$(a^2 + b^2)^2 = (a^2 - b^2) + (2ab)^2$

$(a^2 + b^2)^2 = (45)^2 + (28)^2$

$(a^2 + b^2)^2 = 2809$

$a^2 + b^2 = 53$ ...(ii)

from eq. (i) and eq. (ii)

$a = \pm 7$ and $b = \pm 2$

then square root of $(45 + 28i) = \pm (7 + 2i)$

82. (B) Standard deviation

83. (C) $n(S) = 8$

E = (HHT), (HTH), (THH)

$n(E) = 3$

$P(E) = \frac{n(E)}{n(S)} = \frac{3}{8}$

84. (B) sin25 < sin45 and cos 25 > cos 45

sin 25 < cos45

then

sin25 < cos45 < cos25

sin25 < cos25

sin25 – cos25 < 0

Negative but greater than – 1

85. (A) Word 'EDUCATION'

(EUAIO) DCTN

as one letter

total arrangement = 5! × 5!

= 120 × 120 = 14400

86. (B) $A = \begin{bmatrix} 1 & -2 \\ -4 & 5 \end{bmatrix}$

Co-factor of A –

$C_{11} = (-1)^{1+1}(5) = 5$, $C_{12} = (-1)^{1+2}(-4) = 4$

$C_{21} = (-1)^{2+1}(-2) = 2$, $C_{22} = (-1)^{2+2}(1) = 1$

$C = \begin{bmatrix} 5 & 4 \\ 2 & 1 \end{bmatrix}$

$Adj\,A = \begin{bmatrix} 5 & 2 \\ 4 & 1 \end{bmatrix}$

$A(Adj\,A) = \begin{bmatrix} 1 & -2 \\ -4 & 5 \end{bmatrix} \begin{bmatrix} 5 & 2 \\ 4 & 1 \end{bmatrix}$

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

87. (D) $I = \int \frac{dx}{8x - x^2 - 7}$

$I = \int \frac{dx}{9 - (x^2 - 8x + 16)}$

$I = \int \frac{dx}{(3)^2 - (x-4)^2}$

$I = \frac{1}{2 \times 3} \log\left(\frac{x-4-3}{x-4+3}\right) + c$

$I = \frac{1}{6} \log\left(\frac{x-7}{x-1}\right) + c$

88. (A) Two diameters of circle
$2x - y + 6 = 0$ and $3x - y + 7 = 0$
intersection point i.e. centre$(-g,-f) = (-1,4)$
$g = 1, f = -4$
Equation of circle =
$x^2 + y^2 + 2x - 8y + c = 0$ ...(i)
it passes through the point $(-2, 1)$
$4 + 1 - 4 - 8 + c = 0$
$-7 + c = 0 \Rightarrow c = 7$
from eq. (i)
Equation of circle
$x^2 + y^2 + 2x - 8y + 7 = 0$

89. (C) $\lim_{x\to 0} \frac{x^5}{\sqrt{2+x^5}-\sqrt{2-x^5}}$ $\left[\frac{0}{0}\right]$ Form

$$\Rightarrow \lim_{x\to 0} \frac{x^5}{\sqrt{2+x^5}-\sqrt{2-x^5}} \times \frac{\sqrt{2+x^5}+\sqrt{2-x^5}}{\sqrt{2+x^5}+\sqrt{2-x^5}}$$

$$\Rightarrow \lim_{x\to 0} \frac{x^5\left[\sqrt{2+x^5}+\sqrt{2-x^5}\right]}{2+x^5-2+x^5}$$

$$\Rightarrow \lim_{x\to 0} \frac{x^5\left[\sqrt{2+x^5}+\sqrt{2-x^5}\right]}{2.x^5}$$

$$\Rightarrow \frac{\sqrt{2}+\sqrt{2}}{2} = \sqrt{2}$$

90. (B) Vectors $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + 2\hat{j} - \hat{k}$
angle between the vectors

$$\cos\theta = \frac{1\times 3 + 2\times 2 + (-3)\times(-1)}{\sqrt{(1)^2+(2)^2+(-3)^2}\sqrt{(3)^2+(2)^2+(-1)^2}}$$

$$\cos\theta = \frac{10}{\sqrt{14}\sqrt{14}}$$

$$\cos\theta = \frac{10}{14} = \frac{5}{7}$$

91. (A) Differential equation
$(2x - 1)dy = (y + 1)^2 dx$

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

On Integrating

$$\frac{(y+1)^{-1}}{-1} = \frac{\log(2x-1)}{2} + \frac{\log c}{2}$$

$$\frac{-2}{y+1} = \log c(2x - 1)$$

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

$$c(2x - 1)\, e^{\frac{2}{y+1}} = \frac{1}{c}$$

$$(2x - 1)\, e^{\frac{2}{y+1}} = C$$

92. (C) Differential equation

$$\frac{dy}{dx} - \frac{y}{x^2} = 2.e^{\frac{-1}{x}}$$

On comparing with general equation

$$P = -\frac{1}{x^2} \quad \text{and} \quad Q = 2.e^{\frac{-1}{x}}$$

$$\text{I.F.} = e^{\int P.dx}$$

$$= e^{\int -\frac{1}{x^2}dx} = e^{\frac{1}{x}}$$

Solution of differential equation

$$y \times \text{I.F.} = \int Q \times \text{I.F.}\, dx$$

$$y \times e^{\frac{1}{x}} = \int 2.e^{\frac{-1}{x}}.e^{\frac{1}{x}}\, dx$$

$$y \times e^{\frac{1}{x}} = 2x + c$$

93. (B) Let angles of a triangle = $3x, 4x, 3x$
$3x + 4x + 3x = 180$
$10x = 180 \Rightarrow x = 18$
angles of a triangle = 54°, 72°, 54°
Sine Rule

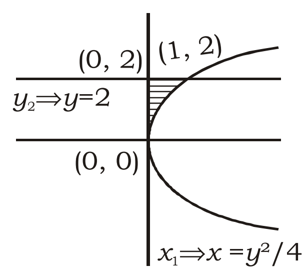
$$\frac{a}{\sin 54} = \frac{b}{\sin 72} = \frac{c}{\sin 54}$$

$$\frac{a}{\frac{\sqrt{5}+1}{4}} = \frac{b}{\frac{\sqrt{10+2\sqrt{5}}}{4}} = \frac{c}{\frac{\sqrt{5}+1}{4}}$$

$$\frac{a}{\sqrt{5}+1} = \frac{b}{\sqrt{10+2\sqrt{5}}} = \frac{c}{\sqrt{5}+1}$$

$$a : b : c = (\sqrt{5} + 1) : \left(\sqrt{10+2\sqrt{5}}\right) : (\sqrt{5} + 1)$$

94. (A)



curve $x_1 \Rightarrow x = \frac{y^2}{4}$ and line $y = 2$

$$\text{Area} = \int_0^2 x_1\, dy$$

$$= \int_0^2 \frac{y^2}{4}\, dy$$

$$= \left[\frac{y^3}{4\times 3}\right]_0^2 = \frac{1}{12}[2^3 - 0] = \frac{2}{3} \text{ sq. unit}$$

95. (C) 23, 24, 26, 29, 28, 30, 35, 36
On arranging in ascending order
23, 24, 26, 28, 29, 30, 35, 36
middle term = 28 and 29

median = $\frac{28+29}{2}$ = 28.5

96. (B) $y = \sin^2 t$ and $x = \cos t$

$\frac{dy}{dt} = 2\sin t.\cos t \qquad \frac{dx}{dt} = -\sin t$

$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$

$\frac{dy}{dx} = 2\sin t.\cos t\left(\frac{1}{-\sin t}\right)$

$\frac{dy}{dx} = -2\cos t$

$\frac{d^2y}{dx^2} = -2(-\sin t)\frac{dt}{dx}$

$\frac{d^2y}{dx^2} = 2\sin t\left(\frac{-1}{\sin t}\right) \Rightarrow \frac{d^2y}{dx^2} = -2$

97. (C) Perimeter of a rectangle $2(l + b) = 24$
$l + b = 12$
Area of a rectangle (A) = lb
$A = l(12 - l)$
$A = 12l - l^2$ ...(i)

$\frac{dA}{dl} = 12 - 2l$

$\frac{d^2A}{dl^2} = -2$ (maxima) ...(ii)

for maxima and minima

$\frac{dA}{dl} = 0$

$12 - 2l = 0 \Rightarrow l = 6$
Maximum area = 6 × 6 = 36 sq. unit

98. (B) $(1.04)^6 = (1+0.04)^6$
$= {}^6C_0 + {}^6C_1(0.04) + {}^6C_2(0.04)^2 + \ldots$
$= 1 + 6 \times 0.04 + 15 \times 0.0016 + \ldots$
$= 1 + 0.24 + 0.024 + \ldots$
≈ 1.26

99. (B) Probability = $\frac{{}^4C_1 \times {}^4C_1}{{}^{52}C_2}$

$= \frac{16 \times 2}{52 \times 51}$

$= \frac{8}{13 \times 51} = \frac{8}{663}$

100. (D) curve $x^2 + y^2 + 3x - 4y + 2 = 0$
Equation of tangent at point (–2, 4) on the given curve

$x(-2) + y \times 4 + \frac{3}{2}(x - 2) - 2(y + 4) + 2 = 0$

$-2x + 4y + \frac{3x}{2} - 3 - 2y - 8 + 2 = 0$

$x - 4y + 18 = 0$

101. (D) Four digit number

9	9	8	7

= 9×9×8×7=4536

'0'can't put here

102. (B) at a line

103. (D) a leap year = 366 days
= 52 weeks and 2 days

The required Probability = $\frac{2}{7}$

104. (A) S = 5 + 55 + 555 + ...
S = 5(1+ 11 +111 +... upto 10 term)

$= \frac{5}{9}$(9 + 99 + 999 +... upto 10 term)

$= \frac{5}{9}$[(10–1) + (100 –1) +...upto10 term)]

$= \frac{5}{9}$[(10+100+1000+...upto 10 term)– (1 +1+ ...upto 10 term)]

$= \frac{5}{9}\left[\frac{10\left(10^{10}-1\right)}{10-1} - 10\right]$

$= \frac{50}{81}\left[\left(10^{10}-1\right) - 9\right]$

$= \frac{500}{81}[10^9 - 1]$

105. (D)

Class	x_i	f_i	$f_i \times x_i$	$\lvert x_i - A\rvert$	$f_i \times \lvert x_i - A\rvert$
0-10	5	9	45	26.3	236.7
10-20	15	3	45	16.3	48.9
20-30	25	11	275	6.3	69.3
30-40	35	11	385	3.7	40.7
40-50	45	9	405	13.7	123.3
50-60	55	8	440	23.7	189.6
	$\Sigma f_i=51, \Sigma f_i \times x_i=1595, \Sigma f_i(x_i - A)=708.5$				

$A = \frac{\Sigma f_i \times x_i}{\Sigma f_i}$

$= \frac{1595}{51} = 31.3$

Mean deviation = $\frac{\Sigma f_i \times \lvert x_i - A\rvert}{\Sigma f_i}$

$= \frac{708.5}{51} \cong 13.9$

106. (B)

107. (B) $\begin{bmatrix} 2x+y+z & y & z \\ x & x+2y+z & z \\ x & y & x+y+2z \end{bmatrix}$

$\Rightarrow C_1 \to C_1 + C_2 + C_3$

$\Rightarrow \begin{bmatrix} 2(x+y+z) & y & z \\ 2(x+y+z) & x+2y+z & z \\ 2(x+y+z) & y & x+y+2z \end{bmatrix}$

$\Rightarrow 2(x+y+z)\begin{bmatrix} 1 & y & z \\ 1 & x+2y+z & z \\ 1 & y & x+y+2z \end{bmatrix}$

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

$\Rightarrow 2(x+y+z)\begin{bmatrix} 1 & y & z \\ 0 & x+y+z & 0 \\ 0 & 0 & x+y+z \end{bmatrix}$

$\Rightarrow 2(x+y+z)\,[1(x+y+z)^2 - 0 - 0]$

$\Rightarrow 2(x+y+z)^3$

108. (C) $a = 6$ cm, $b = 10$ cm, $c = 14$ cm

$\cos C = \frac{a^2+b^2-c^2}{2ab}$

$\cos C = \frac{36+100-196}{2\times 6\times 10}$

$\cos C = \frac{-60}{120}$

$\cos C = -\frac{1}{2} \Rightarrow C = 120°$

109. (C) $\log_{ab} a = y$

$\frac{1}{\log_a ab} = y$

$\frac{1}{y} = \log_a a + \log_a b$

$\frac{1}{y} = 1 + \log_a b$

$\log_a b = \frac{1-y}{y}$

then $\log_b ab = \log_b a + \log_b b$

$\log_b ab = \frac{1}{\log_a b} + 1$

$\log_b ab = \frac{y}{1-y} + 1$

$\log_b ab = \frac{1}{1-y}$

110. (B) No. of ways = ${}^6C_4 = 15$

111. (B) **Statement I**

L.H.S. = $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \frac{1}{r}$

$= \frac{s-a}{\Delta} + \frac{s-b}{\Delta} + \frac{s-c}{\Delta} + \frac{s}{\Delta}$

$= \frac{4s-a-b-c}{\Delta}$

$= \frac{4s-2s}{\Delta} = \frac{2s}{\Delta} = \frac{2}{r} \neq$ R.H.S

Statement I is incorrect.

Statement II

$r_3 = r_1 + r_2 + r$

$\frac{\Delta}{s-c} = \frac{\Delta}{s-a} + \frac{\Delta}{s-b} + \frac{\Delta}{s}$

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

$\frac{s-s+c}{s(s-c)} = \frac{s-b+s-a}{(s-a)(s-b)}$

$\frac{c}{s(s-c)} = \frac{c}{(s-a)(s-b)}$

$s^2 - s(a+b) + ab = s^2 - sc$

$ab = s(a+b-c)$

$ab = \frac{(a+b+c)}{2}(a+b-c)$

$2ab = (a+b)^2 - c^2$

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

ΔABC is a right-angled triangle.

Statement II is correct.

112. (A) $I = \int_0^{1.5} [x^2]\,dx$

$= \int_0^1 [x^2]\,dx + \int_1^{\sqrt{2}} [x^2]\,dx + \int_{\sqrt{2}}^{1.5} [x^2]\,dx$

$= \int_0^1 0\,.dx + \int_1^{\sqrt{2}} 1.dx + \int_{\sqrt{2}}^{1.5} 2.dx$

$= 0 + [x]_1^{\sqrt{2}} + 2[x]_{\sqrt{2}}^{1.5}$

$= [\sqrt{2} - 1] + 2[1.5 - \sqrt{2}] = 2 - \sqrt{2}$

113. (B) $\Delta \neq 0$, $h^2 = ab$

114. (B) two parameters

115. (C)

2	68	
2	34	0
2	17	0
2	8	1
2	4	0
2	2	0
2	1	0
	0	1

$(68)_{10} = (1000100)_2$

116. (A) $f(x) = \sin(\sqrt{x^5}) = \sin(x^{\frac{5}{2}})$

On differentiating w.r.t. 'x'

$$f'(x) = \cos\sqrt{x^5} \times \frac{5}{2}x^{\frac{3}{2}}$$

$$f'(x) = \frac{5}{2}\sqrt{x^3}\cos\sqrt{x^5}$$

117. (D)

118. (C) $I = \int \frac{1+x^2}{(x^4 - x^2 + 1)\tan^{-1}\left(x - \frac{1}{x}\right)}dx$

$$I = \int \frac{\frac{1}{x^2}+1}{\left(x^2 - 1 + \frac{1}{x^2}\right)\tan^{-1}\left(x - \frac{1}{x}\right)}dx$$

$$I = \int \frac{\frac{1}{x^2}+1}{\left[\left(x - \frac{1}{x}\right)^2 + 1\right]\tan^{2}\left(x - \frac{1}{x}\right)}dx$$

$$x - \frac{1}{x} = t$$

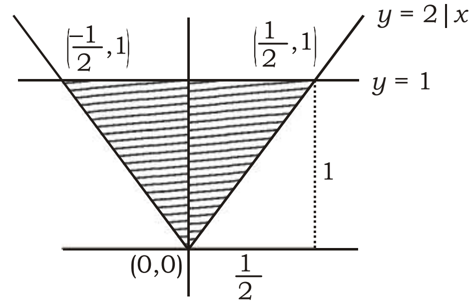
$$\left(1 + \frac{1}{x^2}\right)dx = dt$$

$$I = \int \frac{dt}{(t^2+1)\tan^{-1}t}$$

$$I = \log(\tan^{-1}t) + c$$

$$I = \log\left[\tan^{-1}\left(x - \frac{1}{x}\right)\right] + c$$

119. (B)



$y = 2|x|$ and $y = 1$

Area $= 2 \times \frac{1}{2} \times 1 \times \frac{1}{2} = \frac{1}{2}$ sq. unit

120. (B) $f(x) = x^2 + 5x + 6$

$f'(x) = 2x - 5$

$f(x)$ to be increasing

$f'(x) > 0$

$2x - 5 > 0 \Rightarrow x > \frac{5}{2}$

NDA (MATHS) MOCK TEST - 94 (Answer Key)

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

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 8860330003*

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

Note : *Whatsapp with Mock Test No. and Question No. at 705360571 for any of the doubts. Join the group and you may also share your sugesstions and experience of Sunday Mock Test.*