NDA (MATHS) MOCK TEST - 64 (SOLUTION)

1. (D) Let x = $\sqrt{8+2\sqrt{8+2\sqrt{8+...+\infty}}}$

Squaring both the sides of the equation, we have,

$$x^2 = \left[\sqrt{8+2\sqrt{8+2\sqrt{8+...+\infty}}}\right]^2$$

$\Rightarrow$ $x^2 = 8+2\sqrt{8+2\sqrt{8+2\sqrt{8+...+\infty}}}$

$\Rightarrow x^2 = 8 + 2x$

$\Rightarrow x^2 - 2x - 8 = 0$

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

$\Rightarrow$ x+2 =0 or x-4 = 0

$\Rightarrow$ x+2 = 0 or x-4=0

Neglecting the negative sign, we have, x=4

2. (C) Given that A = {a,b,c}

There are 3 elements in the set,

If the number of elements in the set is 'n', then the

number if subsets is 2^n.

But the set A is also a subset of A.

Since we required the number of proper subsets.

The total number of proper subset is

$2^n - 1$

Therefore, there are $2^3 - 1 = 8-1 = 7$ proper subsets of A.

3. (A) Total number of arrangements= $\frac{10!}{2}$

Consider a single unit which comprises of two 'I's.

Thus, there are 9! ways in which two 'I's are together.

So, the number of arrangements in

which two 'I's are not together= $\frac{10!}{2}$ -9!

Thus, required probability SP =

$$\frac{Number\ of\ favourable\ events}{Total\ number\ of\ events}$$

$$= \frac{\frac{10!}{2} - 9!}{\frac{10!}{2}}$$

$$= \frac{4}{5}$$

4. (C) $\Rightarrow$ A = $\tan^{-1}\frac{1}{2}$ and B=$\tan^{-1}\frac{1}{3}$

$\Rightarrow$ 4A= 4 $\tan^{-1}\frac{1}{2}$ and 4B=4$\tan^{-1}\frac{1}{3}$

$\Rightarrow$ 4A + 4B=4 $\tan^{-1}\frac{1}{2}$ +4$\tan^{-1}\frac{1}{3}$

$$= 4\left(\tan^{-1}\left(\frac{\frac{5}{6}}{1-\frac{1}{6}}\right)\right)$$

$$= 4\left(\tan^{-1}\left(\frac{\frac{5}{6}}{\frac{5}{6}}\right)\right)$$

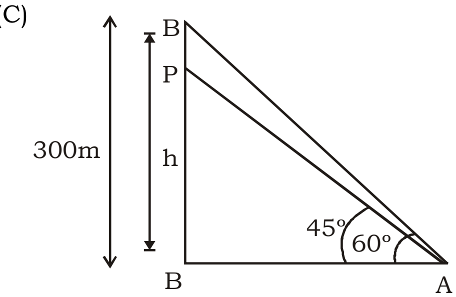
$$= 4\left(\tan^{-1}\left(\frac{\frac{5}{6}}{\frac{5}{6}}\right)\right)$$

$= 4(\tan^{-1} 1)$

$= 4\left(\frac{\pi}{4}\right)$

$= \pi$

5. (C)



In ΔAPB,

$\tan 45° = \frac{BP}{AB}$

$\Rightarrow 1 = \frac{h}{AB}$

$\Rightarrow$ h = AB...(1)

In triangle AQB.

$\tan 60° = \frac{BQ}{AB}$

$\Rightarrow h = \frac{300}{\sqrt{3}}$ [Form equation(1)]

$h = 100\sqrt{3}m$

6. (C) If the position vectors in the plane are collinear,

AB = λ BC

$\Rightarrow \overrightarrow{OB} - \overrightarrow{OA} = \lambda\ \overrightarrow{OC} - \overrightarrow{OB}$

$\Rightarrow 2\hat{i} - 8\hat{j} = \lambda\ \left(m\ \hat{i} - 12\hat{i} + 16\hat{j}\right)$

$\Rightarrow 2\hat{i} - 8\hat{j} = \lambda\,(m - 12)\hat{i} + 16\hat{j}$

Compaing the coefficients of i and j, we have,

$\lambda(m-12) = 2 and 16\lambda = -8$

$\Rightarrow \lambda(m-12) = 2 and \lambda = -\frac{1}{2}$

Substituting the value of λ in λ(m-12)=2, we have,

$-\frac{1}{2}(m-12) = 2$

$\Rightarrow -(m-12) = 4$

$\Rightarrow m = 8$

7. (C) Let $X_1, X_2, X_3, X_4, X_5, X_6, X_7$, be the set of 7 observations.

Since mean of 7 observations is 10, we have,

$10 = \frac{X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7}{7}$

$\Rightarrow 70 = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 \ldots(1)$

Let Y_1, Y_2, Y_3 be the set of 3 observations.

Since mean of 3 Observations is 5, we have,

$\Rightarrow 5 = \frac{Y_1 + Y_2 + Y_3}{3}$

$\Rightarrow 15 = Y_1 + Y_2 + Y_3 \ldots(2)$

Now adding equations (1) and (2), We have,

$X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + Y_1 + Y_2 + Y_3$

= 70 + 15

$\Rightarrow \frac{X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + Y_1 + Y_2 + Y_3}{10}$

$= \frac{70 + 15}{10}$

= 8.5

8. (B) Thus, the n^{th} term of binomial expansion $\left(X^2 + \frac{2}{X}\right)^{15}$ is given as

$T_{r+1} = {}^{15}C_r X^{2(15-r)} \left(\frac{2}{X}\right)^r$

$= {}^{15}C_r X^{30-3r} 2^r \ldots(1)$

To get the /Coeffuecient of x^{15}, 30-3r = 15

$\Rightarrow 3r = 30 - 15$

$\Rightarrow r = 5$

Thus, from equation(1), the coefficient of x^{15} $= {}^{15}C_5 \times 2^5 \ldots(2)$

To get the independent of the term x, we have, 30 – 3r = 0

$\Rightarrow r = 10$

Thus, from equation(1), the independent term x $= {}^{15}C_{10} \times 2^{10} \ldots(3)$

From equations (2) and (3), required ratio

$= \frac{{}^{15}C_5 \times 2^5}{{}^{15}C_{10} \times 2^{10}} = \frac{1}{2^5} = \frac{1}{32}$

9. (B) $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = (1+a)[(1+b)(1+c) - 1] - 1[1(1+c)-1] + 1[(1-1)+b]$

$\Rightarrow \lambda = (1+a)(c+b) + bc - c - b$

$\Rightarrow \lambda = bc + ac + ab + abc \ldots(1)$

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

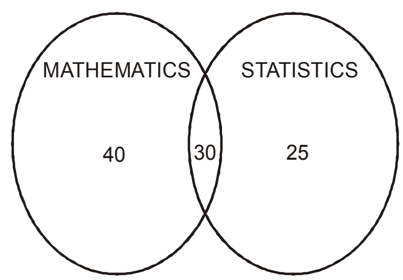
$\Rightarrow \frac{bc + ac + ab}{abc} = 0$

$\Rightarrow bc + ac + ab = 0$

Therefore, equation (1) becomes,

$\lambda = abc$

10. (A)



$\therefore$ Required probability

$= \frac{\text{Favourable number of events}}{\text{Total number of events}}$

$= \frac{65}{125}$

$= \frac{13}{25}$

11. (C) Given that, $\log_{10}2$, $\log_{10}(2^x - 1)$ and $\log_{10}(2^x + 3)$ are in AP.

$\therefore 2\log_{10}(2^x - 1) = \log_{10}2 + \log_{10}(2^x + 3)$

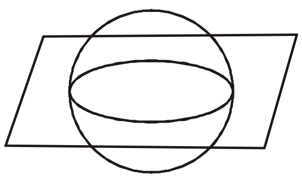
$\Rightarrow \log_{10}(2^x - 1)^2 = \log_{10}[2 \times (2^x + 3)]$

$\Rightarrow (2^x - 1)^2 = [2 \times (2^x + 3)]$

$\Rightarrow 2^{2x} + 1 - 2 \times 2^x = 2 \times 2^x + 6$

$\Rightarrow 2^{2x} - 2 \times 2^x - 2 \times 2^x - 5 = 0$
$\Rightarrow (2^x)^2 - 4(2^x) - 5 = 0$
Let $2^x = y$, then above equation becomes
$y^2 - 4y - 5 = 0$
$\Rightarrow y(y - 5) + 1(y - 5) = 0$
$\Rightarrow (y + 1) = 0$ or $(y - 5) = 0$
$\Rightarrow y = -1$ or $y = 5$
$\Rightarrow 2^x = -1$ or $2^x = 5$
$\Rightarrow x = \log_2(-1)$ or $x = \log_2 5$
Logarithm of negative numbers does not exist.
$\therefore x = \log_2 5$

12. (A) The locus of points of intersection of a sphere and a plane is the circle.



13. (D) Imaginary roots always occur in conjugate pairs.
Thus, conjugate pair of $2 + 5i$ is $2 - 5i$.
Therefore, the other root of the equation is $2 - 5i$.

14. (A) Let $x + iy = \sqrt{-2i}$
Squaring both the sides, we have,
$(x + iy)^2 = (\sqrt{-2i})^2$
$\Rightarrow (x + iy)^2 = -2i$
$\Rightarrow x^2 + i^2y^2 + 2xyi = -2i$
$\Rightarrow x^2 - y^2 + 2xyi = -2i$
Comparing the real and imaginary parts, we have,
$x^2 - y^2 = 0$ and $2xy = -2$
Consider
$(x^2 + y^2)^2 = (x^2 - y^2) + 4x^2y^2$
$= 0 + (-2)^2$
$= 4$
$\Rightarrow (x^2 + y^2)^2 = 2^2$
$\Rightarrow x^2 + y^2 = 2$
We have,
$x^2 - y^2 = 0$
$x^2 + y^2 = 2$
Adding the above equations we have,
$2x^2 = 2 \Rightarrow x^2 = 1 \Rightarrow x = \pm 1$
Substituting the value, $x^2 = 1$ in the equation $x^2 + y^2 = 2$, we have,
$y^2 = 1 \Rightarrow y = \pm 1$
$\therefore (\pm 1) + i(\pm 1) = \sqrt{-2i}$
$\Rightarrow \sqrt{-2i} = \pm(1 + i)$

15. (C) Consider the equation of the curve
$y = \cos 3x, \ 0 \le x \le \frac{\theta}{6}$

$$\text{Area} = \int_0^{\frac{\theta}{6}} \cos 3x\,dx$$

$$= \left[\frac{\sin 3x}{3}\right]_0^{\frac{\theta}{6}}$$

$$= \frac{\sin 3 \propto \frac{\theta}{6}}{3} = \frac{\sin \frac{\theta}{2}}{3} = \frac{1}{3} \text{ square unit}$$

16. (A) At extreme point of a function, $f(x)$, the slope of the curve $\frac{dy}{dx} = 0$
Since $\frac{dy}{dx} = 0$, the tangent is parallel to x-axis.

17. (B) Consider the given function,
$$y = \left(1 , x^{\frac{1}{4}}\right)\left(1 , x^{\frac{1}{2}}\right)\left(1 - x^{\frac{1}{4}}\right)$$
Rewriting the above function, we have,
$$y = \left(1 , x^{\frac{1}{4}}\right)\left(1 - x^{\frac{1}{4}}\right)\left(1 , x^{\frac{1}{2}}\right)$$
Using the identity, $(a + b)(a - b) = a^2 - b^2$, we have,
$$y = \left(1^2 - \left(x^{\frac{1}{4}}\right)^2\right)\left(1 , x^{\frac{1}{2}}\right)$$
$$\Rightarrow y = \left(1 - x^{\frac{1}{2}}\right)\left(1 , x^{\frac{1}{2}}\right)$$
Againg using the identity, $(a + b)(a - b) = a^2 - b^2$, we have, $y = \left(1^2 - \left(x^{\frac{1}{2}}\right)^2\right)$
$\Rightarrow y = (1 - x)$
$\Rightarrow \frac{dy}{dx} = -1$

18. (A) Consider the decimal number 0.3
$0.3 \times 2 = 0.6$ $\boxed{0}$
$0.6 \times 2 = 1.2$ $\boxed{1}$
$0.2 \times 2 = 0.4$ $\boxed{0}$
$0.4 \times 2 = 0.8$ $\boxed{0}$

$0.8 \times 2 = 1.6$ $\boxed{1}$

Thus, binary equivalent of 0.3 is :
$(0.3)_{10} = (0.01001...)_2$

19. (A)It is a four letter word out of which two, O and E, are vowels.
Number of ways of selecting 2 letters from 4 = $^4C_2$
Thus, the total number of events = $^4C_2$
Number of ways of selecting 2 vowels from 2 letters = $^2C_2$
Thus, the favourable number of events = $^2C_2$
The probability of selecting two vowels

$= \frac{\text{Favourable number of events}}{\text{Total number of events}}$

$= \frac{^2C_2}{^4C_2}$

$= \frac{1}{6}$

20. (B) Given that $z = 1 + i\tan\alpha$

$\pi < \alpha < \frac{3\theta}{2}$

$z = 1 + i\tan\alpha$

$|z| = \sqrt{1,\ \tan^2\beta}$

$= \sqrt{\sec^2\beta}$

Given that α lies in the third quadrant, and in third quadrant, tangent and cotagent are positive, and all other ratios are negative.
Hence, $|z| - \sec\alpha$

21. (D) We know that if the vectors are coplanar, then thier scalar triple product is zero.
Hence,

$$\begin{vmatrix} 2 & -3 & 4 \\ 1 & 2 & -1 \\ m & -1 & 2 \end{vmatrix} = 0$$

2 [4–1]– (–3)[2– (–m)]+4 -1 -2m = 0
$\Rightarrow 8 - 5m = 0$
$\Rightarrow 5m = 8$
$\Rightarrow m = \frac{8}{5}$

22. (B) $\text{Cos}C = \frac{a^2 + b^2 - c^2}{2ab}$

$= \frac{8^2 + 10^2 - 12^2}{2 \times 8 \times 10}$

$= \frac{64 + 100 - 144}{160}$

$= \frac{1}{8} ...(1)$

Now, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$= \frac{10^2 + 12^2 - 8^2}{2 \times 10 \times 12}$

$= \frac{3}{4} ...(2)$

$\cos 2A = 2\cos^2 A - 1$

$= 2 \times \left(\frac{3}{4}\right)^2 - 1$

$= \frac{1}{8} ...(3)$

Consider $\cos^2\left(\frac{A}{2}\right) = \frac{1 + \cos A}{2}$

$\Rightarrow \text{Cos}^2\left(\frac{A}{2}\right) = \frac{1 + \frac{3}{4}}{2} = \frac{7}{8}$ from equation (2)

$\Rightarrow \text{Cos}\frac{A}{2} = \frac{\sqrt{7}}{2\sqrt{2}}$

$\therefore C \neq \frac{A}{2} ...(4)$

We know that,
$\cos 3A = 4\cos^3 A - 3\cos A$

$= \frac{27 - 36}{16}$

$= \frac{-9}{16} ...(5)$

$\cos^2\left(\frac{3A}{2}\right) = \frac{1 + \text{Cos}3A}{2}$

$\Rightarrow \cos^2\left(\frac{3A}{2}\right) = \frac{1 + \left(\frac{-9}{16}\right)}{2}$ [from equation(5)]

$\therefore C \neq \frac{3A}{2} ...(6)$

From equations (1), (2), (3), (4), (5), (6), we have,
C=2A

23. (C) $\text{Sin}\,\theta = x + \frac{a}{x}, x \in R - 0$

We know that, $-1 \leq \sin\theta \leq 1$

$\Rightarrow -1 \leq x + \frac{a}{x} \leq 1$

$\Rightarrow -1 \leq \frac{x^2 + a}{x} \leq 1$

$\Rightarrow -x \leq x^2 + a \leq x$

Thus, equations are:

$\Rightarrow x^2 + a + x \geq 0$ or $x^2 + a - x \leq 0$

$\Rightarrow x^2 + x + a \geq 0$ or $x^2 - x + a \leq 0$

The above equations will have real roots, if the discriminant is greater than or equal to zero.

That is $(1)^2 - 4\times a\times 1 \geq 0$ or $1^2 - 4\times a\times 1 \geq 0$

$\Rightarrow 1 - 4a \geq 0$

$\Rightarrow a \leq \frac{1}{4}$

24. (C) $\tan^4 X - 2\sec^2 X + a^2 = 0$

$\tan^4 X - 2(1 + \tan^2 X) + a^2 = 0$

$\Rightarrow \tan^4 X - 2 - 2\tan^2 X + a^2 = 0$

$\Rightarrow \tan^4 X - 2\tan^2 X + a^2 - 2 = 0$

25. (C) ATQ,

$2b = a + c$

$\Rightarrow a = 2b - c$

$$\text{Cos A} = \frac{b^2 + c^2 - 2b - c^2}{2bc}$$

$$= \frac{-3b^2 + 4bc}{2bc}$$

$$= \frac{4c - 3b}{2c}$$

26. (A) Let $I = \int_1^2 [k^2 + (4 - 4k)x + 4x^3]dx$

$$\Rightarrow 12 \geq \left[k^2 X + (4-4)k\frac{X^2}{2} + \frac{4}{4}X^4\right]$$

$$\Rightarrow 12 \geq \left[k^2(2-1) + \frac{4-4k}{2}(2^2 - 1^2) + 2^4 - 1^4\right]$$

$$\Rightarrow 12 \geq \left[k^2 + \frac{3(4-4k)}{2} + 15\right]$$

$\Rightarrow k - 3^2 \leq 0$

$\Rightarrow k = 3$

27. (D) Given that p, q and r are positive integers and is the cube root of unity.

Also $f(x) = x^{3p} + X^{3q+1} + X^{3r+2}$

So, $f(\omega) = \omega^{3p} + \omega^{3q+1} + \omega^{3r+2}$

$\Rightarrow f(\omega) = \omega^{3^p} + \omega^{3q}\,\omega + \omega^{3^r}\,\omega^2$

$\Rightarrow f(\omega) = 1 + \omega + \omega^2$

$\Rightarrow f(\omega) = 0 \quad [\therefore 1 + \omega + \omega^2 = 0]$

28. (C) We know that the equation

$a\cos\theta + b\sin\theta = C$ is solvable for $|c| \leq \sqrt{a^2 + b^2}$

Comparing the general equation with the given equation, we have,

a = 3 and b=4

$-\sqrt{3^2 + 4^2}$ / $3\cos\theta + 4\sin\theta$ / $\sqrt{3^2 + 4^2}$

$\Rightarrow -5 \leq 3\cos\theta + 4\sin\theta \leq 5$

$\Rightarrow -5 + 5$ / $3\cos\theta + 4\sin\theta + 5$ / $5 + 5$

Thus, the maximum value of the fuction is 10.

29. (A) $\cos^2\theta(1 + \cos^2\theta) = \sin\theta(1 + \sin\theta)$

$= \sin\theta + \sin^2\theta$

$= \sin\theta + 1 - \cos^2\theta$

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

$= 1$

30. (D) Let (he equation of the required plane be $a(x-x_1) + b(y-y_1) + c(z-z_1) = 0$, where (x_1, y_1, z_1) is a point on the plane.

Givene point (1, –1, –1) lies on the plane.

Thus, the equation of the required plane is $a(x - 1) + b(y + 1) + c(z + 1) = 0$...(1)

Also, given that the given plane is perpen dicular to

x - 2y - 8z = 0

and

2x + 5y - z = 0

Thus, we have,

a - 2b - 8c = 0

and

2a + 5b - c = 0

Cross multiplying, we have,

$$\frac{a}{(2+40)} = \frac{b}{(-16+1)} = \frac{c}{(5+4)}$$

$$\Rightarrow \frac{a}{14} = \frac{b}{-5} = \frac{c}{3} = R$$

$\Rightarrow$ a = 14R, b = -5R and c=3R

Substituting the values of a,b and c in equa tion (1), we have,

14R(X-1)-5R(Y+1)-3R(Z+1)=0

$\Rightarrow$ 14x - 14 - 5y - 5 + 3z+3 = 0

$\Rightarrow$ 14x - 5y + 3z - 16

31. (C) One man can vote in $^4C_1$ ways = 4 ways.

$\therefore$ 5 men can vote in $= 4 \times 4 \times 4 \times 4 \times 4$ ways

= 1024 ways

32. (A) $\sum_{r>1}^{n} \frac{P)n,r*}{r!} = \frac{P)n,1*}{1!} + \frac{P)n,2*}{2!} + \frac{P)n,3*}{3!} + \ldots + \frac{P)n,n*}{n!}$

$= \frac{n!}{)n-1*!1!} + \frac{n!}{)n-2*!2!} + \frac{n!}{)n-3*!3!} + \ldots +$

$\frac{n!}{)n - n*!n!}$

$= 1 + {}^nC_1 + {}^nC_2 + {}^nC_3 + ... + {}^nC_{n-1} + {}^nC_n - 1$

$= ({}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + ... + {}^nC_{n-1} + {}^nC_n) - 1$

$= (1 + 1)^n - 1$

$= 2^n - 1$

33. (B) Let M(a, b) be the coordinates of the foot of perpendicular on the given line.
Equation joining two points is

$$\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}$$

∴ The equation of the line joining the point P(2, 3) and M(a, b) is

$$\frac{y - 3}{3 - b} = \frac{x - 2}{2 - a}$$

$\Rightarrow (y - 3)(2 - a) = (x - 2)(3 - b)$

$\Rightarrow (y - 3) = \frac{)x - 2*}{)2 - a*}(3 - b)$

$\Rightarrow y = \frac{x)3 - b*}{)2 - a*} - \frac{2)3 - b*}{)2 - a*} + 3$

Thus, the slope of the line is $\frac{)3 - b*}{)2 - a*}$

Slope of the given line is –1 Since the product of slopes of
two perpendicular lines is –1, we have,

$\frac{)3 - b*}{)2 - a*} = 1$

$\Rightarrow 3 - b = 2 - a$

$\Rightarrow a - b = -1$

Since M(a, b) lies on the line $x + y - 11 = 0$, we have, $a + b - 11 = 0$

$\Rightarrow a + b = 11$ ...(i)

and

$\Rightarrow a - b = -1$ ...(ii)

From equations (i) and (ii) $a = 5$, $b = 6$

Thus, the foot of perpendicular is M(5, 6).

34. (B) Degree of the differential equation is the power of the highest order derivative, when differential coefficients are made free from radicals and fractions, in the given equation.
Consider the given differential equation

$$\left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} + 4 - 3\left(\frac{d^2y}{dx^2}\right) + 5\left(\frac{dy}{dx}\right) = 0$$

$$\Rightarrow \left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} = 3\left(\frac{d^2y}{dx^2}\right) - 5\left(\frac{dy}{dx}\right) = 0$$

Cubing both the sides of the equation, we have,

$$\left(\frac{d^3y}{dx^3}\right)^2 = \left\{3\left(\frac{d^2y}{dx^2}\right) - 5\left(\frac{dy}{dx}\right) - 4\right\}$$

∴ Degree of the above differential equation = Power of the highest order = 2

35. (B) We need to find area enclosed by the equation
$x^2 + y^2 = 2$

$\Rightarrow x^2 + y^2 = (\sqrt{2})^2$

$\Rightarrow y^2 = 2 - x^2$

$\Rightarrow y = \pm \sqrt{2 - x^2}$

Thus, Area $= 4\int_0^{\sqrt{2}} \sqrt{2 - x^2 dx}$

$= 4\left[\frac{x}{2}\sqrt{2 - x^2} , \frac{2}{2}\sin^{-1}\frac{x}{\sqrt{2}}\right]_0^{\sqrt{2}}$

$= 4\left[\frac{x}{2}\sqrt{2 - x^2} , \frac{2}{2}\sin^{-1}\frac{x}{\sqrt{2}}\right]_0^{\sqrt{2}}$

$= 4\left[\frac{\theta}{2} - 0\right]$

$= 2\pi$ sq. unit

36. (A) $I = \int \frac{dx}{\sin^2 x \cos^2 x}$

$= \int \frac{)\sin^2 x , \cos^2 x*dx}{\sin^2 x \cos^2 x}$

$= \int \frac{dx}{\cos^2 x} + \int \frac{dx}{\sin^2 x}$

$= \int \frac{dx}{\cos^2 x} + \int \frac{dx}{\sin^2 x}$

$= \int \sec^2 x dx + \int \text{cosec}^2 \text{xdx}$

$= \tan x + \cot x + C$

37. (A) $\begin{vmatrix} x & \beta & 1 \\ \chi & x & 1 \\ \chi & \eta & 1 \end{vmatrix} = 0$

Expanding the determinant, we have,

$x(x - \gamma) - \alpha(\beta - \beta) + 1\ (\beta\gamma - \beta x) = 0$

$\Rightarrow x^2 - x\gamma - 0 + \beta\gamma - \beta x = 0$

$\Rightarrow x^2 - x(\beta - \gamma) + \beta\gamma = 0$

Thus the roots of the above equation are α and γ.

38. (C) $\overline{x} = \frac{\int_{i>1}^{n} x_1 f_1}{\int_{i>1}^{n} f_1} = \frac{760}{40} = 19$

39. (C) If $\vec{a} \cdot \vec{b} = 0$, then $\vec{a}$ and $\vec{b}$ are perpendicular vectors.
If $\vec{a} \times \vec{b} = 0$, then $\vec{a}$ and $\vec{b}$ are parallel vectors.
Since both of the above conditions cannot be satisfied simultaneously, either one of the vectors $\vec{a}$ or $\vec{b}$ should be a null vector.

40. (D) $y = \log \sqrt{\tan x}$

$\Rightarrow y = \frac{1}{2} \log(\tan x)$

Differentiating the above function with respect to x, we have,

$$\frac{dy}{dx} = \frac{1}{2} \times \frac{1}{\tan x} \times \sec^2 x$$

$$\left.\frac{dy}{dx}\right|_{x>\frac{\theta}{4}} = \frac{1}{2} \times \frac{1}{\tan\left(\frac{\theta}{4}\right)} \times \sec^2\left(\frac{\theta}{4}\right)$$

$$= \frac{1}{2} \times \frac{1}{1} \times \left(\sqrt{2}\right)^2$$

$= 1$

41. (A) tan15° tan195° = tan15° tan180°+15°

= tan15°tan15° $[\because \tan 180° + \theta = \tan\theta]$

= $\tan^2 15°$

$$\tan^2 15° = \frac{1 - \cos 2 \times 15°}{1 + \cos 2 \times 15°}$$

$$= \frac{1 - \cos 30°}{1 + \cos 30°}$$

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

$= 7 - 4\sqrt{3}$

42. (C) Volume of the sphere is given as

$$V = \frac{4}{3}\pi r^3$$

Here, V = $f(r, t)$ and $\frac{dV}{dt} = K$

Differentiating with respect to 't', we have,

$$\frac{dV}{dt} = \frac{dV}{dr} \times \frac{dr}{dt}$$

$$= 3 \times \frac{4}{3}\pi r^2 \times \frac{dr}{dt}$$

$$K = 4\pi r^2 \times \frac{dr}{dt}$$

$$\frac{dr}{dt} = \frac{K}{4\pi r^2} \cdots (1)$$

Similarly, we have, $S = 4\pi r^2$

$$\frac{ds}{dt} = \frac{ds}{dr} \times \frac{dr}{dt}$$

$$= \frac{2K}{r}$$

$$\Rightarrow \frac{ds}{dt} \alpha \frac{1}{r}$$

Thus the rate of change of surface area is inversely proportional to radius.

43. (B) $$\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = \frac{\sin^2 x + 1 + \cos x^2}{(1 + \cos x)\sin x}$$

$$= \frac{\sin^2 x + 1 + \cos^2 x + 2\cos x}{(1 + \cos x)\sin x}$$

$$= \frac{2 + 2\cos x}{(1 + \cos x)\sin x}$$

$$= \frac{2(1 + \cos x)}{(1 + \cos x)\sin x}$$

= 2 cosec$x$

44. (D) Let a and b be two observations.

1.Arithmetic mean, AM=$\frac{a+b}{2}$

Multiplying by c to each and every observation, we have,

$$AM = \frac{ac + bc}{2} = c\left(\frac{a+b}{2}\right)$$

2. Geomatric mean GM= $\sqrt{ab}$

Multiplying by c to each and every observa tion, we have,

$$GM = \sqrt{acbc} = c\sqrt{ab}$$

3. Harmonic mean, HM=$\frac{2ab}{a+b}$

Multiplying by c to each and every observa tion, we have,

$$HM = \frac{2acbc}{ac + bc} = \frac{2ac^2b}{c\ a+b} = c\left(\frac{2ab}{a+b}\right)$$

4. Median

(i)

Let A, B, C, D and E be five observations. Number of observations is n=5, odd, and hence

Median= $\frac{n+1}{2}$ =3

Thus, median is 3rd term, c.
Now consider Ac, Bc, Cc, Dc and Ec.

Median= $\frac{n+1}{2}$ =3

Thus, median is 3rd term, Cc.
(ii)
Let A, B, C ans D be four observations.
Number of Observations is n=4, even, and hence

$$\text{Median}=\frac{\left(\frac{n}{2}\right)^{th} term+\left(\frac{n}{2}+1\right)^{th} term}{2}$$

$$=\frac{2^{nd}\ term+3^{rd}\ term}{2}$$

Thus, median is = $\left(\frac{B+C}{2}\right)$

Now consider Ac, Bc, Cc and Dc,
Number of observations is n = 4, even, and hence

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}}\text{ term},\left(\frac{n}{2},\ 1\right)^{\text{th}}\text{ term}}{2}$$

$$=\frac{2^{\text{nd}}\text{term}+3^{\text{rd}}\text{ term}}{2}$$

Thus, median is = $c\left(\frac{B,\ C}{2}\right)$

45. (C) For maximum of minimum, we have, $f'x=0$

$$\therefore x\times\frac{1}{x}+logx=0$$

$$\Rightarrow log\ x=-1$$

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

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

46. (A) The values of the variate are
2,3,4,2,5,4,3,2,1
In the above data values, the value '2' has been repeated thrice and hence the mode of the data is 2.

47. (D) z = $\frac{1+2i}{2-i}-\frac{2-i}{1+2i}$

$$=\frac{1-4+4i-4+1+4i}{2+4i-i+2}$$

$$=\frac{8i-6}{4+3i}$$

$$=\frac{8i-6}{4+3i}\times\frac{4-3i}{4-3i}$$

=2i

$z\bar{z}$ = 2i - 2i = 4

$z^2=|z|^2=z\bar{z}=4$

Thus, $z^2+z\bar{z}=4+4=8$

48. (D) Argument of 1–sinθ + icosθ

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

$$=\tan^{-1}\left(\frac{cos^2\frac{\theta}{2}-sin^2\frac{\theta}{2}}{cos^2\frac{\theta}{2}-sin^2\frac{\theta}{2}-2sin\frac{\theta}{2}sin\frac{\theta}{2}}\right)$$

$$=\tan^{-1}\frac{\left(cos^2\frac{\theta}{2}+sin\frac{\theta}{2}\right)}{\left(cos^2\frac{\theta}{2}-sin\frac{\theta}{2}\right)}$$

$$=\tan^{-1}\frac{\left(1+tan\frac{\theta}{2}\right)}{\left(1-tan\frac{\theta}{2}\right)}$$

$$=\tan^{-1}\tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right)$$

$$=\frac{\pi}{4}+\frac{\theta}{2}$$

49. (D) When the curve meets X axis, we have,
y = 0

$\Rightarrow\sqrt{X}=\sqrt{a}$

$\Rightarrow$ X = a

When the curve meets y axis, we have,
x = 0

$\Rightarrow\sqrt{Y}=\sqrt{a}$

$\Rightarrow$ Y = a

Rewriting the equation (1), we have,

$\sqrt{Y}=\sqrt{a}-\sqrt{X}$

$\Rightarrow\sqrt{Y}^2=\sqrt{a}-\sqrt{X}^2$

$\Rightarrow$ y = a + X -2 $\sqrt{a}\ \sqrt{X}$

Thus,

Area= $\int_0^a$ ydx

$= \int_0^a [a + X - 2\sqrt{a}\sqrt{X}]dx$

$= \left[aX + \frac{X^2}{2} - \frac{4}{3}\sqrt{a}X^{\frac{3}{2}}\right]_0^a$

$= \left[a^2 + \frac{a^2}{2} - \frac{4}{3}\sqrt{a}a\frac{3}{2}\right]$

$= \left[\frac{9a^2 - 8a^2}{6}\right]$

$= \left[\frac{a^2}{6}\right]$

50. (A) Let A and B be two square matrices of same order. Given statement AB=0
$\Rightarrow |A| = 0$ or $|B| = 0$
We Know that:
If the product of two non-null square matrices is a null matrix, then both of them must be singular matrices.
$\therefore |A| = 0$ or $|B| = 0$
Hence statement I is true.
We know that the product of two matrices can be null matrix, while neither of them is the null matrix.
Hence statement II is false.
Thus option (a) is correct.

51. (B) $y = e^x \sin x$
Differentiating the above function with respect to x, we have,

$\frac{dy}{dx} = e^x \cos x + \sin x e^x$

$= e^x (\cos x + \sin x)$

The slope of the function
$y = e^x \sin x \sin e^x (\cos x + \sin x)$
Slope, $m = e^x (\cos x + \sin x)$

$\frac{dm}{dx} = e^x (-\sin x + \cos x) + (\cos x + \sin x)e^x$

$\Rightarrow \frac{dm}{dx} = 2e^x \cos x$

For the slope, the attain its maximum, we have,

$\frac{dm}{dx}$ should be zero.

$\Rightarrow 2e^x \cos x = 0$

$\Rightarrow e^x \cos x = 0$

$\Rightarrow e^x = e^{-\infty} = 0$ or $\cos x = \cos\frac{\theta}{2}$

$\Rightarrow x = -\infty$ or $x = \frac{\theta}{2}$ and $\frac{3\theta}{2}$ in $(0, 2\pi)$

Differentiating once again, we have,

$\frac{d^2m}{dx^2} = 2e^x \cos^x - 2e^x \sin x$

At $x = \frac{\theta}{2}$,

$\frac{d^2m}{dx^2} = 2e^{\frac{3\theta}{2}} \cos\frac{3\theta}{2} - 2e^{\frac{3\theta}{2}} \sin\frac{3\theta}{2}$

$= 2e^{\frac{3\theta}{2}} > 0$

So, the function $y = e^x \sin x$ has maximum slope at $x = \frac{3\theta}{2}$.

52. (D) $\tan\theta = \sqrt{m}$
$\Rightarrow \tan^2\theta = m$
Now consider sec2θ

$\sec 2\theta = \frac{1}{\cos 2\rho}$

$= \frac{1}{\frac{1 - \tan^2\rho}{1 ,\ \tan^2\rho}}$

$= \frac{1 ,\ \tan^2\rho}{1 - \tan^2\rho}$

$= \frac{1 ,\ m}{1 - m}$

= a rational number

53. (C) $\cos C = \frac{a^2 ,\ b^2 - c^2}{2ab}$

$\Rightarrow \cos C = \frac{6^2 ,\ 10^2 - 14^2}{2 \propto 6 \propto 10}$

$\Rightarrow \cos C = \frac{36 ,\ 100 - 196}{120}$

$\Rightarrow \cos C = \frac{136 - 196}{120}$

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

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

$\Rightarrow \cos C = \frac{-1}{2} = \cos\frac{2\theta}{3}$

$\Rightarrow C = \frac{2\theta}{3}$

$\Rightarrow$ C = 120°

54. (B) $\tan^{-1} 2 + \tan^{-1} 3 = \tan^{-1}\left(\frac{2\ ,\ 3}{1-2\propto 3}\right)$

$= \tan^{-1}\left(\frac{5}{1-6}\right)$

$= \tan^{-1}\left(\frac{5}{-5}\right)$

= tan–1 – 1
= 135°

$\Rightarrow$ A + B = 135°
We have, A + B + C = 180°
$\Rightarrow$ C = 180° – A + B
$\Rightarrow$ C = 180° – 135°

$\Rightarrow$ C = 45° = $\frac{\theta}{4}$

55. (C) $(x - a)(x - b) = c$, where $c \neq 0$
$\Rightarrow x^2 - a + bx + ab - c = 0$
Given that α and β are the root of the equation.
$\alpha + \beta = a + b$
$\alpha\beta = ab - c$
Now consider the equation,
$(x - \alpha)(x - \beta) + c = 0$
$\Rightarrow x^2 - \alpha + \beta x + \alpha\beta + c = 0$
$\Rightarrow x^2 - a + bx + ab - c + c = 0$
Thus the root of the above equation are a and b.

56. (D) Let α and β are the roots of the equation $x^2 - px + q = 0$
$\Rightarrow \alpha + \beta = p$ and $\alpha\beta = q$ ...(1)
And let α be the common root of $x^2 - px + q = 0$
$\Rightarrow 2\alpha = a$ and $\alpha^2 = b$

$\Rightarrow \left(\frac{a}{2}\right)^2 = b$

$\Rightarrow a^2 = 4b$ ...(2)
Consider equation (1).

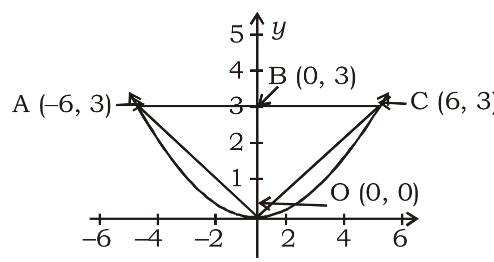
$\Rightarrow \frac{a}{2} + \frac{q}{\frac{a}{2}} = p \left|\because \frac{a}{2} > \beta \sin\chi > \frac{q}{\beta}\right|$

$\Rightarrow a^2 + 4q = 2ap$
$\Rightarrow 4b + 4q = 2ap$
$\Rightarrow 2(b + q) = \text{ap}$

57. (C) Given that $n!$, $3 \times (n!)$ and $(n + 1)!$ are in GP.
If a, b and c are in GP, then, $b^2 = ac$
$\therefore [3 \times n!]^2 = n! \times n \times 1!$
$\Rightarrow 9 \times n! \times n! \times n! \times n + 1$
$\Rightarrow n + 9 - 1$
$\Rightarrow n = 8$

58. (A)

59. (D) $x^2 = 12y$
Comparing the above equation with the standard equation, $x^2 = 4ay$, we have
$4a = 12$
$\Rightarrow a = 3$
Substituting $y = 3$, in the equation, $x^2 = 12y$,
$x^2 = 12 \times 3 = 36$
$\Rightarrow x = \pm 6$
Thus, the latus rectum passes through the points (–6,0), (0, 3) and (6, 0)



We need to find the area of the triangle OAC

We have, Area of the triangle = $\frac{1}{2}$ × base × height

Thus, area of OBC = $\frac{1}{2}$ × AC × OB

$= \frac{1}{2} \times 12 \times 3$

= 18 square units

60. (B) We need to find the angle between the planes $2x - y + z = 4$ and $x + y + 2z = 6$.
Let θ be the angle between the given planes. Thus,

$$\cos\theta = \left|\frac{a_1a_2\ ,\ b_1b_2\ ,\ c_1c_2}{\sqrt{a_1^2\ ,\ b_1^2\ ,\ c_1^2}\sqrt{a_2^2\ ,\ b_2^2\ ,\ c_2^2}}\right|$$

Here $a_1 = 2$, $b_1 = -1$, $c_1 = 1$ and $a_2 = 1$, $b_2 = 1$ and $c_2 = 2$

$$\cos\theta = \left|\frac{2)1*,\ )-1*1\ ,\ )1*2}{\sqrt{2^2\ ,\ )-1*^2\ ,\ 1^2}\sqrt{1^2\ ,\ 1^2\ ,\ 2^2}}\right|$$

$\Rightarrow \cos\theta = \left|\frac{3}{6}\right|$

$\Rightarrow \cos\theta = \cos\frac{\theta}{3}$

$\Rightarrow \theta = \frac{\theta}{3}$

61. (A) x + 2y - 9 = 0...(1)
$\Rightarrow$ 2y = 9 - x

$\Rightarrow y = \frac{1}{2}(-x + 9)$

Slope of the first line, m= $\frac{-1}{2}$

Consider the second line:
kx + 4y + 5 = 0
$\Rightarrow 4y = -Kx - 5$

$\Rightarrow y = \frac{1}{4}(-Kx - 5)$

Slope of the Second line, m= $\frac{-k}{4}$

Given that the above lines are parallel and hence the
Slopes are equal.

$\frac{-1}{2} = \frac{-k}{4}$

$\Rightarrow k = 2$

62. (A) $x^2 + y^2 - 2X - 3 = 0$ ...(1)
$\Rightarrow y^2 = -x^2 + 2x + 3$

$\Rightarrow 2y\frac{dy}{dx} = -2X + 2$

$\Rightarrow \frac{dy}{dx} = \frac{-X+1}{Y}$

Given that tangents to the curve are parallel to x-axis.
Thus slope = 0

$\Rightarrow \frac{dy}{dx} = 0$

$\Rightarrow -x + 1 = 0$
$\Rightarrow x = 1$
Substituting the value x = 1 in equation (1), we have,
$1^2 + y^2 - 2\times1 - 3 = 0$
$\Rightarrow y^2 - 4 = 0$
$\Rightarrow y^2 = 4$
$\Rightarrow y = \pm 2$
Thus, the points on the curve, where the tangents to the curve are parallel to x-axis are (1,2) and (1,-2)

63. (B) Since, 3 sin A - $4\sin^3 A = 1$
$\Rightarrow 4\sin^3 A - 3\sin A + 1 = 0$
The above equation is a cubic polynomial in sinA.
Therefore, there are 3 solutions for the above equation.
Substituting sinA= -1, we have,
$4(1)^3 - (-1) + 1 = 0$
$\Rightarrow$ sinA = -1 is a solution of the equation.
Dividing $4\sin^3 A - 3\sin A + 1$ by sinA + 1, we have,

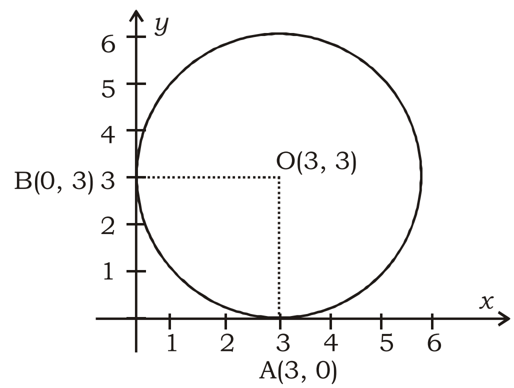
$\frac{4\sin 3A - 3\sin A + 1}{\sin A + 1} = 4\sin^2 A - 4\sin A + 1$

Thus, $4\sin^2 A - 4\sin A + 1$ is a quadratic equation.
And $4\sin^2 A - 4\sin A + 1 = (2\sin A - 1)^2$

Thus sinA= $\frac{1}{2}, \frac{1}{2}$

Therefore, sinA can assume two distinct values, -1 and $\frac{1}{2}$.

64. (A)



We know that the line joining the centre and the tangent is perpendicular to the tangent.
Since x-axis is the tangent to the circle and OA is perpendicular to x-axis.
The length of the segment joining the centre and any point of on the circle is called the radius of the circle.
Thus, OA is the radius of the circle and (OA) = 3 units.
Radius = 3 units.

65. (B) $2^{4n} - 15n - 1$.
We have, $2^4 = 16$.
$\Rightarrow 2^{4n} = 16^n$
$\Rightarrow 2^{4n} = (1 + 15)^n$
$\Rightarrow 2^{4n} = 1 + {}^nC_1 15 + {}^nC_2 15^2 + \ldots {}^nC_r 15^r + \ldots + {}^nC_n 15^n$
$\Rightarrow 2^{4n} - 15n - 1 = 15^2({}^nC_2 + {}^nC_3 15 + \ldots + 15^{n-2})$...1
Let us consider ${}^nC_2 + {}^nC_3 15 + \ldots + 15^{n-2} = k$
Thus equation (1) becomes,
$2^{4n} - 15n - 1 = 15^2 k$
$\Rightarrow 2^{4n} - 15n - 1 = 225k$
$\Rightarrow 2^{4n} - 15n - 1$ is divisible by 225.

66. (D) $x^2 - 4x - \log_3 N = 0$
Given that roots of the above equation are real.
Thus the discriminant, $b^2 - 4ac \geq 0$
$\therefore -4^2 - 4 \times 1 \times -\log_3 N \geq 0$
$\Rightarrow 16 + 4\log_3 N \geq 0$

$\Rightarrow 16 + 4\dfrac{\log_{10}N}{\log_{10}3} \geq -4$

$\Rightarrow \log_{10}N > -4\log_{10}3$

$\Rightarrow \log_{10}N \geq \log_{10}3^{-4}$

$\Rightarrow \log_{10}N > \log_{10}\left(\dfrac{1}{81}\right)$

Thus the minimum value of N is $\dfrac{1}{81}$.

67. (B) $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ ...(1)

Since the sphere passing through the origin, the constant term, $d = 0$

$\therefore$ equation of the sphere is $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz = 0$ ...(2)

The sphere passing through origin and the point (– 1, 0, 0) (0, – 2, 0) and (0, 0, – 3)

$(-1)^2 + 0^2 + 0^2 + 2u(-1)(-1) - 2v \times 0 + 2w \times 0 = 0$

$0^2 + (-2)^2 + 0^2 + 2u \times 0 + 2v \times (-2) - 2w \times 0 = 0$

$0^2 + 0^2 + (-3)^2 + 2u \times 0 + 2v \times 0 + 2w \times (-3) = 0$

$\Rightarrow 1 - 2u = 0$

$\Rightarrow 4 - 4v = 0$

$9 - 6w = 0$

$\Rightarrow u = \dfrac{1}{2}, v = 1, w = \dfrac{3}{2}$

Substituting, the above values in equation (2), the equation of the sphere is

$\Rightarrow x^2 + y^2 + z^2 + x + 2y + 3z = 0$

$\Rightarrow x^2 + y^2 + z^2 + f(x, y, z) = 0$

Therefore, $f(x, y, z) = x + 2y + 3z$

68. (A) We know that area of the triangle

$= \dfrac{1}{2}\left|\overrightarrow{AB} \propto \overrightarrow{AC}\right|$

$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = (2-1)\hat{i} + (5-2)\hat{j} + -(1-3)\hat{k}$

$= \hat{i} + 3\hat{j} - 4\hat{k}$

Similarly,

$\overrightarrow{AC} = \overrightarrow{OB} - \overrightarrow{OA} = (-1-1)\hat{i} + (1-2)\hat{j} + (-1-3)\hat{k}$

$= -2\hat{i} - \hat{j} - \hat{k}$

Thus, Area $= \dfrac{1}{2}\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & -4 \\ -2 & -1 & -1 \end{vmatrix}$

$= \dfrac{1}{2}\left|-7\hat{i},\ 9\hat{j},\ 5\hat{k}\right|$

$= \dfrac{1}{2}\sqrt{-7^2,\ 9^2,\ 5^2}$

$= \dfrac{\sqrt{155}}{2}$ square units.

69. (D) $[1\ 3\ 2]\begin{bmatrix} 1 & 3 & 0 \\ 3 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix}\begin{bmatrix} 0 \\ 3 \\ x \end{bmatrix} = 0$

$\Rightarrow (1 \times 1 + 3 \times 3 + 2)\ (1 \times 3 + 3 \times 0 + 2 \times 0)$

$(1 \times 0 + 3 \times 2 + 2 \times 1)\begin{bmatrix} 0 \\ 3 \\ x \end{bmatrix} = 0$

$\Rightarrow 14 \times 0 + 3 \times 3 + 8 \times x = 0$

$\Rightarrow x = \dfrac{-9}{8}$

70. (C) $(ab - c)x^2 + (bc - a)x + ca - b = 0$

Given that one of the roots of the above equation is 1.

Let α be the other root.

Thus, $1 + \alpha = \dfrac{-(bc - a)}{ab - c}$

$\Rightarrow \alpha = \dfrac{-(bc - a) - (ab - c)}{ab - c}$

$\Rightarrow \alpha = \dfrac{ca - b}{ab - c}$

71. (D) Cos x sin$y$ dy = sin$a$cos$y$ dx

$\sin x \cos y dx + \cos x \sin y dy = 0$

$\Rightarrow \cos x \sin y dx + \cos x \sin y dy = 0$

$\Rightarrow \dfrac{\sin y}{\cos y}dy = -\dfrac{\sin x}{\cos x}dx$

$\Rightarrow \tan y dy = -\tan x dx$

$\Rightarrow \tan y dy + \tan x dx = 0$

$\Rightarrow \int \tan y dy + \int \tan x dx = 0$

$\Rightarrow \log \cos y + \log \cos x = \log C$

$\Rightarrow \cos x \cos y = C$

When $x = 0$, $y = \dfrac{\theta}{3}$

Thus, $\cos 0 \cos\dfrac{\theta}{3} = C$

$\Rightarrow C = 1 \times \dfrac{1}{2} = \dfrac{1}{2}$

Therefore, the equation of the curve is cos$x$

$\cos x \cos y = 1 \times \dfrac{1}{2} = \dfrac{1}{2}$

72. (B) Probability of selecting husband

$P(H) = \dfrac{1}{5}$

$\Rightarrow P(\overline{H}) = 1 - \dfrac{1}{5} = \dfrac{4}{5}$

Probability of selecting wife P(W) = $\frac{1}{3}$

$\Rightarrow$ P(W) = $1 - \frac{1}{3} = \frac{2}{3}$

$\therefore$ Probability of one of them is selected

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

$= \frac{2}{15} + \frac{4}{15}$

$= \frac{2}{5}$

73. (C) Given α and β are the complex cube roots of unity.

$1 + \alpha + \beta = 0$

$\Rightarrow \alpha + \beta = -1$ (1)

$\Rightarrow \alpha\beta = 1$ (2)

Consider the expression

$= (1 + \alpha)(1 + \beta)(1 + \alpha^2)(1 + \beta^2)$

$= (1 + \alpha + \beta + \alpha\beta)(1 + \alpha^2 + \beta^2 + \alpha^2\beta^2)$

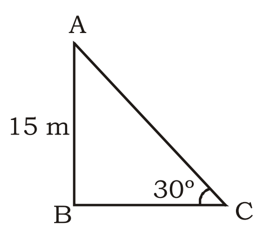
$= (1 + (\alpha + \beta) + \alpha\beta)(1 + (\alpha + \beta)^2 - 2\alpha\beta + (\alpha\beta)^2)$

$= (1-1+1)(1 + (-1)^2 - 2(1) + (1)^2)$

$= (1 + 1 - 2(1) + (1)^2)$

$= 1$

74. (A)



In triangle ABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{15}{BC}$

$\Rightarrow BC = 15\sqrt{3}\ m$

The distance of the point from the foot of the tower is $15\sqrt{3}$ m.

75. (C) We know that

$\cot(A - B) = \frac{\cot A \cot B , 1}{\cot B - \cot A}$ ...(1)

$\tan(A - B) = \frac{\cot A - \tan B}{1 , \tan A \tan B}$ ...(2)

Substituting the value, $x = \tan A - \tan B$, we have

$\tan(A - B) = \frac{x}{1 , \tan A \tan B}$ ...(3)

Also,

$\cot(A - B) = \frac{1}{\tan)A - B*}$

$= \frac{1}{\frac{\tan A - \tan B}{1 , \tan A \tan B}}$

$= \frac{1 , \tan A \tan B}{x}$ ...(4)

From equation (1), we have,

$\cot(A - B) = \frac{\frac{1}{\tan A \tan B} , 1}{\cot B - \cot A}$

$= \frac{1 , \tan A \tan B}{\tan A \tan B \propto y}$ ...(5)

Equating equations (4) and (5), we have

$\frac{1 , \tan A \tan B}{\tan A \tan B \propto y} = \frac{1 , \tan A \tan B}{x}$

$\Rightarrow \frac{1}{\tan A \tan B \propto y} = \frac{1}{x}$

$\Rightarrow \tan A \tan B = \frac{x}{y}$ ...(6)

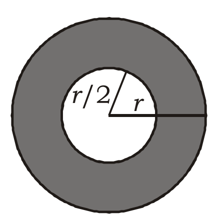
Substituting the value $\tan A \tan B = \frac{x}{y}$ in equation (4), we have,

$\cot(A - B) = \frac{1 , \frac{x}{y}}{x}$

$= \frac{1}{x} + \frac{1}{y}$

76.(A) Let the radius of the given circle be 'r'.

Now consider a inner circle of radius $\frac{r}{2}$



Area of the shaded region = $\pi r^2 - \pi\left(\frac{r}{2}\right)^2$

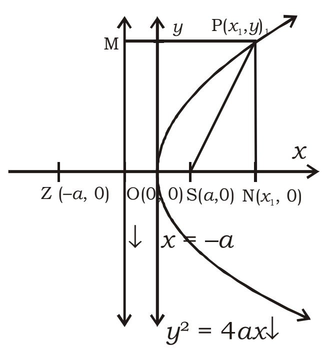
$= \frac{3\theta r^2}{4}$

Required Probability = $\frac{\frac{3\theta r^2}{4}}{\theta r^2} = \frac{3}{4}$

77. (B) Let n be the number of sides of a polygon. In an 'n' sided polygon, there are n starting points.
A diagonal cannot connect to its own starting point and other two neighbouring points.
∴ Neglecting three points, each diagonal can connect to $(n-3)$ end points.
∴ There are total $n(1-3)$ ways to connect diagonally.
Neglecting the repetition of ways, the total number of diagonal in an n-sided pentagon is $\frac{n)1-3*}{2}$.

78. (C) Mean of marks, $\bar{x} = \frac{\sum_{i>1}^{3} f_1 x_1}{\sum_{i>1}^{3} f_1} = \frac{6800}{100} = 68$

79. (D)



By the definition of parabola, we have,

$\frac{SP}{PM} = e$ and for parabola $e = 1$

Thus, the focal distance of the point is $a + x_1$.

80. (D) $-\hat{i} - 2x\hat{j} - 3y\hat{k}$ and $\hat{i} - 3xj - 2y\hat{k}$
Given that they are orthogonal to each other.
Thus, $\vec{a} \cdot \vec{b} = 0$

$(-\hat{i} - 2x\hat{j} - 3y\hat{k}) \times (\hat{i} - 3x\hat{j} - 2y\hat{k}) = 0$

$\Rightarrow -1 + 6x^2 + 6y^2 = 0$
$\Rightarrow 6x^2 + 6y^2 = 1$
$\Rightarrow x^2 + y^2 = \frac{1}{6}$

which is the equation of the circle.

81. (A) $2(y+2)^3 - 5(y+2) = 12$
$2(y+2)^2 - 5(y+2) - 12 = 0$
Let $x = y + 2$
Thus, above equation becomes,
$2x^2 - 5x - 12 = 0$
$\Rightarrow 2x + 3 = 0$ or $x - 4 = 0$
$\Rightarrow x = -\frac{3}{2}$ or $x = 4$
$\therefore y = -\frac{7}{2}$ or $y = 2$

82. (A) Let $x = \log_3 81$
$\Rightarrow x = 4\log_3 3$
$\Rightarrow x = 4$
$\therefore \log_2(\log_2 81) = \log_2 4$
$= 2$

83. (D) $3x^2 - 5x + q = 0$
Given that the roots of the equation are equal.
Let α be the root.
Thus, sum of the roots

$\alpha + \alpha = \frac{--5}{3}$

$\alpha = \frac{5}{6}$

product of the roots, $\alpha^2 = \frac{q}{3}$

$\Rightarrow \left(\frac{5}{6}\right)^2 = \frac{q}{3}$

$\Rightarrow q = \frac{25}{12}$

84. (D) We know that φ is a set which contains nothing and it is called as the null set. Hence (d) is the correct option.

85. (D) Equation of the line parallel to x-axis is $y = c$, where c is the distance of the line above or below the x-axis.
Since the line is 5 units below the x-axis, its equation is $y = -5$.

86. (A) The total population for the year 1997 = 810

87. (B) The female urban population in the year 1995 = 410

88. (C) The urban population in the year 1997 = 310 + 180 = 490

89. (D) The total population in the year 1998 = 680 + 370 = 1050

90. (A) Number of females in the year 1995 = 720
Number of males in the year 1995 = 630
Thus, the difference between number of females and the number of males in the year 1995 = 720 – 630 = 90

91. (C) $\begin{vmatrix} a-b & b, c & a \\ b-c & c, a & b \\ c-a & a, b & c \end{vmatrix}$

Applying $C_3 \rightarrow C_3 + C_2$

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

$$= (a+b+c) \begin{vmatrix} a-b & b,\ c & 1 \\ b-c & c,\ a & 1 \\ c-a & a,\ b & 1 \end{vmatrix}$$

Applying $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$

$$= (a+b+c) \begin{vmatrix} a-b & b,\ c & 1 \\ 2)b-c* & a-b & 0 \\ b-c & a-c & 0 \end{vmatrix}$$

$= a + b + c\ [(a - b)\ 0 - 0 - (b + c)\ 0 - 0 + 1$
$[b - (c - a)\ (a - c) - b + c - 2a\ \ a - b]]$

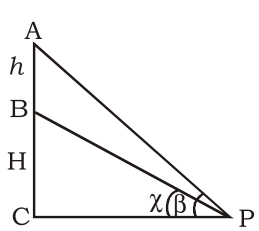
$$= a + b + c \begin{vmatrix} 2ab - 2bc - ac,\ c^2 - a^2,\ ac \\ -ab,\ ac - 2a^2 - b^2 - bc,\ 2ab \end{vmatrix}$$

$= a + b + c\ |a^2 + b^2 + c^2 - ab - bc - ca|$
$= a^3 + b^3 + c^3 - 3abc$

92\. (B) Given that, a, b, c, d, e and f are in arithmetic progression.
Thus, $b - a = c - b = d - c = e - d = f - e = k$ (Let)
$\therefore\ e - d = d - c$
$\Rightarrow e = d + d - c$
$\Rightarrow e = 2d - c$
$\Rightarrow e - c = 2d - c - c$
$\Rightarrow e - c = 2d - 2c$
$\Rightarrow e - c = 2\ (d - c)$

93\. (D) Let α and β are the roots of the equation.
Since $b^2 - 4ac < 0$, the roots of the equation are imaginary.
Thus α and β are the cube roots of unity and hence,
Now consider $\alpha^{19}\ \alpha^{18} \times \alpha = (\alpha^3)\ 6 \times\ \alpha = 1^6 \times \alpha = \alpha$.
And $\beta^7 = \beta^6 \times \beta = (\alpha^3)^2 \times \beta = 1^2 \times \beta = \beta$
Thus the equation whose roots are $\alpha^{19} = \alpha$ and $\beta^7 = \beta$ is $x^2 + x + 1 = 0$

94\. (A)



In ΔBCP

$\tan\beta = \dfrac{BC}{CP}$

$CP = \dfrac{H}{\tan\chi}$

$= \dfrac{AC}{CP} = \dfrac{H+h}{CP} = \dfrac{H+h}{\dfrac{H}{\tan\chi}}$

$= \dfrac{H + h\tan\chi}{H}$

$\Rightarrow$ H tan α = H + h tan β = h tan β
$\Rightarrow$ H(tanα − tanβ) = $h$tanβ

$\Rightarrow H = \dfrac{h\tan\chi}{)\tan\beta - \tan\chi*}$

95\. (C) Consider the given determinant

$$\begin{vmatrix} p & -q & 0 \\ 0 & p & q \\ q & 0 & p \end{vmatrix} = 0$$

Expanding the determinant, we have,
$p[p^2] - (-q)\ [-q^2] = 0$

$\Rightarrow p^3 - q^3 = 0$
$\Rightarrow (p - q)\ (p^2 + pq + q^2) = 0$
$\Rightarrow p - q\ = 0$ or $p^2 + pq + q^2 = 0$

$\Rightarrow p = q$ or $\left(\dfrac{p}{q}\right)^2 + \dfrac{pq}{q^2} + \dfrac{q^2}{q^2} = 0$

$\Rightarrow p = q$ or $\left(\dfrac{p}{q}\right)^2 + \dfrac{p}{q} + 1\ = 0$

$\Rightarrow p = q$ or $\dfrac{p}{q}$ is one of the cube roots of unity.

96\. (A) Consider the given point $P(p, q)$
Given that, P is equidistant from the points A (1, 2) and B (2, 3)
$\Rightarrow$ PA = PB
$\Rightarrow \sqrt{)p-1*^2,\ )q-2*^2} = \sqrt{)p-2*^2,\ )q-3*^2}$
$\Rightarrow p^2 + 1 - 2p + q^2 + 4 - 4q = p^2 + 4 - 4p + q^2 + 9 - 6q$
$\Rightarrow 1 - 2p + 4 - 4q = 4 - 4p + 9 - 6q$
$\Rightarrow 2p + 2q - 8 = 0$
$\Rightarrow p + q\ = 4$
Given that the point P lies on the x-axis.
Thus, $p = 4$ and $q = 0$

97\. (B) Given that the variance of the data 2, 4, 5, 6, 17 is v.
We know that var $\lambda x = \lambda^2$ var $\overline{x}$
Now consider the data, 4, 8, 10, 12, 34.
We got the above data by multiplying the given data by 2.
$\Rightarrow$ var $\overline{2x} = 4v$
$\because$ variance of the first set is given as v.

98. (C) We know that the vector perpendicular $\vec{a}$ and $\vec{b}$ is $\vec{a} \times \vec{b}$.

Thus, the unit vector perpendicular to $\vec{a}$ and $\vec{b}$ is $\frac{\vec{a} \propto \vec{b}}{|\vec{a} \propto \vec{b}|}$

Therefore, the other unit vector perpendicular to and $\vec{a}$ and $\vec{b}$ = $-\frac{\vec{a} \propto \vec{b}}{|\vec{a} \propto \vec{b}|}$

99. (A) Given that p is the length of the perpendicular drawn from the origin to the line $\frac{x}{a} + \frac{y}{b} = 1$.

Distance of any point P, (x_1, y_1) to the line $Ax + By + C = 0$

is D = $\left|\frac{\frac{1}{a} \propto 0 , \frac{1}{b} \propto 0 - 1}{\sqrt{\left(\frac{1}{a}\right)^2 , \left(\frac{1}{b}\right)^2}}\right|$

Here, $x_1 = 0$ and $y_1 = 0$

$\Rightarrow p = \left|\frac{-1}{\sqrt{\frac{1}{a^2} , \frac{1}{b^2}}}\right|$

$\Rightarrow \sqrt{\frac{1}{a^2} , \frac{1}{b^2}} = \frac{1}{p}$

$\Rightarrow \frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

100. (C) The ratio of given sides of the triangle is $a : b : c = 2 : \sqrt{6} : 1 + \sqrt{3}$

By applying sine rule, we have

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

Thus, we have,

$2 : \sqrt{6} : 1 + \sqrt{3}$

$\frac{2}{\sin A} = \frac{\sqrt{6}}{\sin B} = \frac{1 , \sqrt{3}}{\sin C} = k$

$\Rightarrow \sin A = \frac{2}{k}, \sin B = \frac{\sqrt{6}}{k}, \sin C = \frac{1 , \sqrt{3}}{k}$

$\Rightarrow \sin A : \sin B : \sin C = \frac{2}{\sqrt{6}} : 1 : \frac{1 , \sqrt{3}}{\sqrt{6}}$

$\Rightarrow \sin A : \sin B : \sin C = \sqrt{\frac{2}{3}} : 1 : \frac{1 , \sqrt{3}}{\sqrt{6}}$

$\Rightarrow \sin A : \sin B : \sin C = \frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{3} : \frac{\sqrt{3}}{2} : \frac{1 , \sqrt{3}}{\sqrt{6}} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \sin A : \sin B : \sin C = \frac{1}{\sqrt{2}} : \frac{\sqrt{3}}{2} : \frac{1 , \sqrt{3}}{2\sqrt{2}}$

101. (C) Number of males in the ascending order = 440, 630, 670, 680

Thus, the minimum number of males population = 440

Therefore, the minimum number of males population is in the year 1997.

102. (A) Number of female in the ascending order = 370, 370, 450, 720

Thus, the maximum number of females population = 720

Therefore, the maximum number of females population is in the year 1995.

103. (A) Number of male rural population for the year 1998 = 280

The whole population for the year 1998 = 1050

Therefore, percentage of male rural population over the whole population in the year 1998 = $\frac{280}{1050} \times 100 = \frac{80}{3}$ %

104. (C) Distribution of data in pie chart (in terms of angles) : 90°, 45°, 30°, 120° and 75°

Maximum angle is 120°.

Thus, Employment head is allocated maximum funds.

105. (A) Thus amount allocated for education.

$= \frac{30^\circ}{360^\circ} \times 36000$ = ₹3,000 crores.

106. (B) Thus amount allocated for Agriculture

$= \frac{90^\circ}{360^\circ} \times 36000$ = ₹ 9000 crores

Thus amount allocated for Employment

$= \frac{120^\circ}{360^\circ} \times 36000$ = ₹ 12,000 crores

Amount allocated for both Agriculture and Employment = ₹ 9,000 + ₹ 12,000 crores

= ₹ 21,000 crores

107. (C) Thus, amount allocated for Miscellaneous

$= \frac{75^\circ}{360^\circ} \times 36000 =$ ₹ 7,500 crores

Thus amount allocated for education.

$= \frac{30^\circ}{360^\circ} \times 36000 =$ ₹ 3,000 crores

Excess amount allocated to Miscellaneous over Education = ₹ 7,500 – ₹ 3,000 crores

= ₹ 4,500 crores.

108. (B) Geometric mean of data 10, 20, 40

$= \sqrt[3]{10 \times 20 \times 40}$

$= \sqrt[3]{8 \times 1000}$

$= 10\sqrt[3]{8}$

= 20

109. (A) 3, 7, 6, 9, 5, 4, 2

Arranging the above data in ascending order, we have,

2, 3, 4, 5, 6, 7 and 9

Number of terms = 7

Thus median $= \left(\frac{7+1}{2}\right)^{th}$ terms

$= 4^{th}$ term

= 5

110. (C) Let a and b be the two numbers.

Arithmetic mean of a and b is 10 and the geometric mean of a and b is 8

$\Rightarrow \frac{a+b}{2} = 10$ and $\sqrt{ab} = 8$

$\Rightarrow a + b = 20$ ...(1)

and $ab = 64$ ...(2)

Consider $(a - b)^2 = a + b^2 - 4ab$

$= 20^2 - 4 \times 64$

$= 400 - 256$

$= 144$

$\Rightarrow a - b = 12$ ...(3)

Adding equations (1) and (3), we have,

$a = 16$

Substituting the value a = 16 in equation (2), we have

$b = \frac{64}{16} = 4$

Thus, one number exceeds the other by 12.

111. (A) Consider the given expression

$(1 + i)^5 + (1 - i)^5$, where $i = \sqrt{-1}$

Applying binomial theorem, we have,

$(1 + i)^5 + (1 - i)^5$

$= 1 + {}^5C_1 i + {}^5C_2 i^2 + {}^5C_3 i^3 + {}^5C_4 i^4 - i^5$

$+ 1 - {}^5C_1 i + {}^5C_2 i^2 - {}^5C_3 i^3 + {}^5C_4 i^4 - i^5$

$= 1 + {}^5C_2 i^2 + {}^5C_4 i^4 + 1 + {}^5C_2 i^2 + {}^5C_4 i^4$ ...(1)

Since $i = \sqrt{-1}$, we have, $i^2 = -1$, $i^3 = -i$, $i^4 = 1$, $i^5 = i$

Thus equation (1) becomes,

$(1 + i)^5 + (1 - i)^5 = 2 - 2 \times {}^5C_2 \times 2 \times {}^5C_4$

$= 2 - 2 \times \frac{5 \times 4}{1 \times 2} + 2 \times \frac{5 \times 4 \times 3 \times 2}{1 \times 2 \times 3 \times 4}$

$= 2 - 10 + 10$

$= -8$

112. (D) tan 9° – tan 27° – tan 63° + tan 81°

= tan 9° + tan 81° – (tan 27° + tan 63°)

= tan 9° + tan (90° – 9°) – (tan 27° + tan (90° – 27°))

= tan 9° + cot 9° – (tan 27° + tan 27°)

$= \frac{\sin 9^\circ}{\cos 9^\circ} + \frac{\cos 9^\circ}{\sin 9^\circ} - \left(\frac{\sin 27^\circ}{\cos 27^\circ} + \frac{\cos 27^\circ}{\sin 27^\circ}\right)$

$= \frac{\sin^2 9^\circ + \cos^2 9^\circ}{\cos 9^\circ \sin 9^\circ} - \left(\frac{\sin^2 27^\circ + \cos^2 27^\circ}{\cos 27^\circ \sin 27^\circ}\right)$

$= \frac{1}{\cos 9^\circ \sin 9^\circ} - \left(\frac{1}{\cos 27^\circ \sin 27^\circ}\right)$

$= \frac{2}{\sin(2 \times 9^\circ)} - \left(\frac{2}{\sin(2 \times 27^\circ)}\right)$

$= \frac{2}{\sin 18^\circ} - \left(\frac{2}{\sin 54^\circ}\right)$

$= \frac{2}{\sin 18^\circ} - \frac{2}{\sin(90^\circ - 36^\circ)}$

$= \frac{2}{\sin 18^\circ} - \left(\frac{2}{\cos 36^\circ}\right)$ ...(i)

We know that $\sin 18^\circ = \frac{\sqrt{5} - 1}{4}$ and $\cos 36^\circ = \frac{\sqrt{5} + 1}{4}$

Thus, equation (1) becomes,

$= \frac{2}{\frac{\sqrt{5} - 1}{4}} - \frac{2}{\frac{\sqrt{5} + 1}{4}}$

$= \frac{8}{\sqrt{5} - 1} - \frac{8}{\sqrt{5} + 1}$

$= \frac{8(\sqrt{5} + 1 - \sqrt{5} + 1)}{(\sqrt{5} - 1)(\sqrt{5} + 1)}$

$= \frac{8(\sqrt{5} + 1 - \sqrt{5} + 1)}{(\sqrt{5} - 1)}$

$= \frac{8(2)}{4} = 4$

113. (B) $x = y\cos\left(\frac{2\theta}{3}\right) = z\cos\left(\frac{4\theta}{3}\right)$

$\Rightarrow x = y\cos\left(\frac{\theta}{2}, \frac{\theta}{6}\right) = -y\sin\left(\frac{\theta}{6}\right)$

and

$x = z\cos\left(\theta, \frac{\theta}{3}\right) = -z\cos\left(\frac{\theta}{3}\right)$

That is we have,

$x = -y\left(\frac{1}{2}\right)$

and

$x = -z\left(\frac{1}{2}\right)$

Therefore, we have, $x = \frac{-y}{2} = \frac{-z}{2}$

$\Rightarrow 2x = -y = -z$

$\Rightarrow \frac{x}{\left(\frac{1}{2}\right)} = \frac{y}{-1} = \frac{z}{-1} = R$

Thus,

$xy + yz + zx$

$= \left(\frac{R}{2}\right)(-R) + (-R)(-R) + (-R)\left(\frac{R}{2}\right)$

$= \frac{R^2}{2} + R^2 - \frac{R^2}{2}$

$= R^2 - R^2$

$= 0$

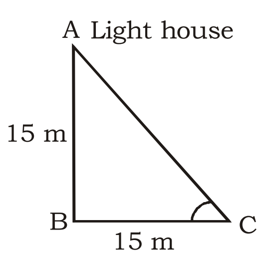
114. (B) The maximum possible value of sine function is 1.

Thus, sinA + sinB + sinC = 3 $\Rightarrow$ sinA = 1, sinB = 1 and sinC = 1

Therefore, A = B = C = $\frac{\theta}{2}$.

$\Rightarrow$ cosA + cosB + cosC = $\cos\frac{\theta}{2} + \cos\frac{\theta}{2} + \cos\frac{\theta}{2} = 0$

115. (C)



We need to find the angle of elevation.

Let the angle of elevation be θ.

In ΔABC,

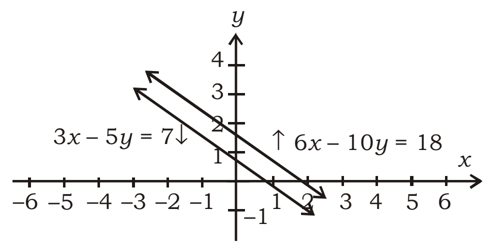
$\Rightarrow \frac{15}{15} = \tan\theta$

$\Rightarrow 1 = \tan\theta$

$\Rightarrow \tan 45^\circ = \tan\theta$

$\Rightarrow \theta = 45^\circ$

116. (A)



$3x + 5y = 7$ ...(1)

$6x + 10y = 18$ ...(2)

We have,

$3x + 5y = 7$

$\Rightarrow 5y = -3x + 7$

$\Rightarrow y = \frac{-3}{5}x + \frac{7}{5}$

Slope of first line is $\frac{-3}{5}$

Similarly,

$6x + 10y = 18$

$\Rightarrow 10y = -6x + 18$

$\Rightarrow y = \frac{-6}{10}x + \frac{18}{10}$

$\Rightarrow y = \frac{-3}{5}x + \frac{9}{5}$

Slope of second line is $\frac{-3}{5}$

Slope first line = Slope of second line.

The y-intercepts of both the lines are not uique.

Thus lines (1) and (2) are parallel to each other, As parallel lines do not intersect, the system of equations do not have a solution.

117. (D) Let $x = \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$

$\Rightarrow \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$ = An angle in $[0, \pi] - \frac{\theta}{2}$

whose secant is $\left(\frac{2}{\sqrt{3}}\right)$

$\Rightarrow \sec^{-1}\left(\frac{2}{\sqrt{3}}\right) = \frac{\theta}{6}$

tan θ

BC

Thus, the principal value of $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$ is $\frac{\theta}{6}$

118. (B) Consider the series $S_1 = 2 + \boxed{6} + 10 + 14 + 18 + 22 + \boxed{26} + 30 + 34 + 38 + 42 + \boxed{46} + \ldots$

Now, consider the second series

$S_2 = 1 + \boxed{6} + 11 + 16 + 21 + \boxed{26} + 31 + 36 + 41 + \boxed{46} \ldots$

In both the series, common terms are marked. The number sequence of common terms in S_1,

$S_1' = 2^{nd\ term}, 7^{nd\ term}, 12^{nd\ term}, 17^{nd\ term}, 22^{nd\ term} \ldots$

The number sequence of common terms in S_1,

$S_2' = 2^{nd\ term}, 6^{nd\ term}, 10^{nd\ term}, 14^{nd\ term}, 18^{nd\ term} \ldots$

Thus, 10th term in $S_1' = 2 + (10 - 1) \times 5 = 47^{nd\ term}$ of S_1

Thus, 10th term in $S_2' = 2 + (10 - 1) \times 4 = 38^{nd\ term}$ of S_2

So, 47th term in S_1 and 38th term in S_2 are:

For S_1, $t_{47} = 2 + (47 - 1) \times 4 = 186$

For S_2, $t_{38} = 1 + (38 - 1) \times 5 = 186$

119. (A) Given that 10^{th} term of a GP is 9.

$\Rightarrow t_{10} = ar^{10-1} = 9$

$\Rightarrow ar^9 = 9$ ...(1)

And 4^{th} term is 4

$\Rightarrow t_4 = ar^{4-1} = 4$

$\Rightarrow ar^3 = 4$ ...(2)

Divide equation (1) by equation (2), we have,

$$\frac{t_{10}}{t_4} = \frac{ar^9}{ar^3} = \frac{9}{4}$$

$$\Rightarrow \frac{r^9}{r^6} = \frac{9}{4}$$

$$\Rightarrow r^6 = \frac{9}{4} \quad \ldots(3)$$

Multiplying equations (1) and (2), we have,

$(ar^9)(ar^3) = 9 \times 4$

$\Rightarrow a^2r^{12} = 36$

$$\Rightarrow a^2(r)^2 = 36 \quad \left(\because r^6 > \frac{9}{4}\right)$$

$$\Rightarrow a^2\left(\frac{9}{4}\right)^2 = 6^2$$

$$\Rightarrow a = \frac{8}{3}$$

Substituting the value of a in equation (4), we have,

$\Rightarrow t_7 = 6$

120. (D) Since the given equation y = mx + c represents the equation of the straight line, there is neither maximum point nor minimum point.

NDA MATHS MOCK TEST- 64 (ANSWER KEY)

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

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*