

MATHEMATICS

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

1. The number of rational terms in the binomial expansion of $(5^{1/2} + 7^{1/8})^{1016}$ is
- (1) 129 (2) 128
(3) 127 (4) 130

Answer (2)

Sol. $T_{r+1} = 1016C_r \cdot \left(\frac{1}{7^8}\right)^r \cdot 5^{\frac{1}{2}(1016-r)}$

$$\Rightarrow \frac{r}{8} \text{ and } \frac{1016-r}{2} \in \text{Integer}$$

$$\Rightarrow 8/r \Rightarrow r = 0, 8, 16, \dots, 1016$$

$$\Rightarrow r = 0 \times 8, 1 \times 8, \dots, 127 \times 8$$

$$\Rightarrow \text{Total 128 } r \text{ such that } T_{r+1} \text{ is rational}$$

2. $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \dots = \frac{\pi^4}{90}$,

$$\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots = \alpha$$

$$\frac{1}{2^4} + \frac{1}{4^4} + \frac{1}{6^4} + \dots = \beta$$

Then find $\frac{\alpha}{\beta}$.

- (1) 15 (2) 14
(3) 23 (4) 18

Answer (1)

Sol. $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \dots = \frac{\pi^4}{90}$

$$\left(\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots\right) + \left(\frac{1}{2^4} + \frac{1}{4^4} + \dots\right) = \frac{\pi^4}{90}$$

$$\alpha + \frac{1}{2^4} \left(\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \dots\right) = \frac{\pi^4}{90}$$

$$\alpha + \frac{1}{2^4} \cdot \frac{\pi^4}{90} = \frac{\pi^4}{90}$$

$$\alpha = \frac{\pi^4}{90} \cdot \frac{15}{16}$$

$$\therefore \alpha + \beta = \frac{\pi^4}{90}$$

$$\therefore \beta = \frac{\pi^4}{90} - \frac{15\pi^4}{90 \times 16} = \frac{\pi^4}{90 \times 16}$$

$$\therefore \frac{\alpha}{\beta} = \frac{\frac{\pi^4}{90} \times \frac{15}{16}}{\frac{\pi^4}{90} \times \frac{1}{16}}$$

$$\therefore \frac{\alpha}{\beta} = 15$$

3. There are 12 points in a plane in which 5 are collinear such that no three of them are in straight line, then the number of triangles that can be formed from any 3 vertices from 12 points.

- (1) 220
(2) 210
(3) 230
(4) 240

Answer (2)

Sol.



$$\begin{aligned} \text{Number of triangles} &= {}^5C_1 \times {}^7C_2 + {}^7C_3 + {}^5C_2 \times {}^7C_1 \\ &= 210 \end{aligned}$$

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4. Probability of event A is 0.7 and event B is 0.4, $P(A \cap B^c) = 0.5$, then the value of $P(B|A \cup B^c)$ is equal to

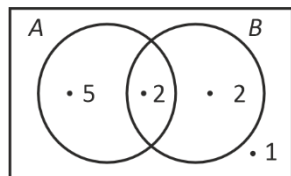
- (1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) $\frac{1}{4}$ (4) $\frac{3}{4}$

Answer (3)

Sol. $P(A \cap B^c) = \frac{1}{2}$

$$P\left(\frac{B}{A \cup B^c}\right) = \frac{P(B \cap (A \cup B^c))}{P(A \cup B^c)}$$

$$= \frac{P((A \cap B) \cup B \cap B^c)}{P(A \cup B^c)}$$



$$= \frac{P(A \cap B)}{P(A \cup B^c)} = \frac{0.2}{0.5 + 0.2 + 0.1}$$

$$\frac{0.2}{0.8} = \frac{1}{4}$$

5. $\int_{-1}^{3/2} |\pi^2 x \sin(\pi x)| dx$.

- (1) $4\pi + 1$ (2) $3\pi + 1$
(3) $5\pi + 1$ (4) $6\pi + 1$

Answer (2)

Sol. $I = \int_{-1}^{3/2} |\pi^2 x \sin(\pi x)| dx$

$$= \int_{-1}^0 |\pi^2 x \sin(\pi x)| dx + \int_0^{3/2} |\pi^2 x \sin(\pi x)| dx$$

$$= 2 \int_0^1 |\pi^2 x \sin(\pi x)| dx - \pi^2 \int_1^{3/2} |x \sin(\pi x)| dx$$

$$= 2\pi^2 \int_0^1 |x \sin(\pi x)| dx - \pi^2 \int_1^{3/2} |x \sin(\pi x)| dx$$

$$\therefore \int x \sin(\pi x) dx = x \left(\frac{-\cos \pi x}{\pi} \right) - \int \frac{-\cos \pi x}{\pi} dx$$

$$= -\frac{x}{\pi} \cos \pi x + \frac{1}{\pi^2} \sin \pi x + C$$

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

$$= 2\pi + 1 + \pi$$

$$= 3\pi + 1$$

6. The product of last 2 digits of $(1919)^{1919}$ is

- (1) 56
(2) 63
(3) 45
(4) 54

Answer (2)

Sol. $(1920 - 1)^{1919} = {}^{1919}C_0(1920)^{1919} - {}^{1919}C_1(1920)^{1918} + \dots$
 $\dots - {}^{1919}C_{1918}(1920)^1 - {}^{1919}C_{1919}1$

Last two digits ${}^{1919}C_{1918}(1920) - 1$

$$= 3684479$$

$$\therefore \text{Last 2 digits} = 79$$

The product is $7 \times 9 = 63$

7. If $A = \begin{bmatrix} 2 & 2+p & 2+p+q \\ 4 & 6+2p & 8+3p+2q \\ 6 & 12+3p & 20+6p+3q \end{bmatrix}$, then the value of

$\det(\text{adj}(\text{adj}(3A))) = 2^m \cdot 3^n$, then $m + n$ is equal to

- (1) 20 (2) 24
(3) 36 (4) 18

Answer (2)

Sol. $\begin{vmatrix} 2 & 2+p & 2+p+q \\ 4 & 6+2p & 8+3p+2q \\ 6 & 12+3p & 20+6p+3q \end{vmatrix}$

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$$= \begin{vmatrix} 2 & 2 & 2+p+q \\ 4 & 6 & 8+3p+2q \\ 6 & 12 & 20+6p+3q \end{vmatrix} + \underbrace{\begin{vmatrix} 2 & p & 2+p+q \\ 4 & 2p & 8+3p+2q \\ 6 & 3p & 20+6p+3q \end{vmatrix}}_{=0}$$

$$= 2 \times 2 \begin{vmatrix} 1 & 1 & 2+p+q \\ 2 & 3 & 8+3p+2q \\ 3 & 6 & 20+6p+3q \end{vmatrix}$$

$$C_3 \rightarrow C_3 \rightarrow pC_2$$

$$= 4 \begin{vmatrix} 1 & 1 & 2+q \\ 2 & 3 & 8+2q \\ 3 & 6 & 20+3q \end{vmatrix} = 4 \begin{vmatrix} 1 & 1 & 2 \\ 2 & 3 & 8 \\ 3 & 6 & 20 \end{vmatrix} + 0$$

$$= 4 \begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 4 \\ 3 & 6 & 10 \end{vmatrix}$$

$$= 8(1(6) - 1(8) + 1(3))$$

$$= 8$$

$$|\text{adj}(\text{adj}(3A))| = (|3A|)^2 = |3A|^4$$

$$= (3^3 |A|)^4 = 3^{12} \cdot |A|^4$$

$$= 3^{12} \cdot (2^3)^4$$

$$= 3^{12} \cdot 2^{12}$$

8. If $f(x) = x - 1$ and $g(x) = e^x$ and

$$\frac{dy}{dx} = \left(e^{-2\sqrt{x}} g(f(f(x))) - \frac{y}{\sqrt{x}} \right), \text{ where } y(0) = 0.$$

Then $y(1)$ equals to

$$(1) \frac{2e-1}{e^4}$$

$$(2) \frac{e-1}{e^4}$$

$$(3) \frac{e^3-1}{e^4}$$

$$(4) \frac{e^2-1}{e^4}$$

Answer (2)

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

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

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

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

$$= e^{2\sqrt{x}}$$

$$y \cdot e^{2\sqrt{x}} = \int e^{2\sqrt{x}} \cdot e^{-2\sqrt{x}} e^{x-2} dx$$

$$y \cdot e^{2\sqrt{x}} = \int e^{x-2} dx$$

$$y e^{2\sqrt{x}} = e^{x-2} + c$$

$$y(0) = 0$$

$$0 = \frac{1}{e^2} + c$$

$$c = -\frac{1}{e^2}$$

$$\therefore y e^{2\sqrt{x}} = e^{x-2} - \frac{1}{e^2}$$

$$\therefore \text{Put } x = 1$$

$$y e^2 = e^{-1} - \frac{1}{e^2}$$

$$y = \frac{1}{e^3} - \frac{1}{e^4}$$

$$y = \frac{e-1}{e^4}$$

9. Consider two statements

Statement 1: $\lim_{x \rightarrow 0} \frac{\tan^{-1} x + \ln \sqrt{\frac{1+x}{1-x}} - 2x}{x^5} = \frac{2}{5}$

Statement 2: The $\lim_{x \rightarrow 1} x^{\left(\frac{2}{1-x}\right)}$ is equal to e^2 and can be

solved by the method $e^{\lim_{x \rightarrow 1} x \cdot f(x)} (g(x) - 1)$

(1) Only Statement 1 is true

(2) Only Statement 2 is true

(3) Both Statement 1 and Statement 2 true

(4) Both Statement 1 and Statement 2 False

Answer (1)

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Sol. $\lim_{x \rightarrow 0} \left(\frac{\tan^{-1} x + \ln \sqrt{\frac{1+x}{1-x}} - 2x}{x^5} \right)$

$$\Rightarrow \lim_{x \rightarrow 0} \frac{\left(x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots \right) + \frac{1}{2} \left(x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} + \dots \right) - \frac{1}{2} \left(-x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \frac{x^5}{5} + \dots \right) - 2x}{x^5}$$

$$\Rightarrow \lim_{x \rightarrow 0} \frac{\left(x + \frac{1}{2}(x+x) - 2x \right) + x^3 \left(\frac{-1}{3} + \frac{1}{2} \times \frac{1}{3} + \frac{1}{2} \times \frac{1}{3} \right) + x^5 \left(\frac{1}{5} + \frac{1}{2} \times \frac{1}{5} + \frac{1}{2} \times \frac{1}{5} \right) + \dots}{x^5}$$

$$\Rightarrow \lim_{x \rightarrow 0} \frac{\left(\frac{1}{5} + \frac{1}{10} + \frac{1}{10} \right) x^5}{x^5} = \frac{2}{5}$$

$$\Rightarrow \lim_{x \rightarrow 1} x^{\left(\frac{2}{1-x} \right)} = \lim_{x \rightarrow 1} \left([1 + (x-1)]^{\frac{1}{x-1}} \right)^{(x-1)2}$$

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

10. Value of $\cot^{-1} \left(\frac{\sqrt{1+\tan^2 2} + 1}{\tan 2} \right)$

$-\cot^{-1} \left(\frac{\sqrt{1+\tan^2 2} - 1}{\tan 2} \right)$ is

(1) $\frac{\pi}{2} + \frac{5}{2}$

(2) $\frac{\pi}{2} - \frac{3}{2}$

(3) $2 - \frac{\pi}{2}$

(4) $3 + \frac{\pi}{2}$

Answer (3)

Sol. $\cot^{-1} \left(\frac{\sqrt{1+\tan^2 2} + 1}{\tan 2} \right) - \cot^{-1} \left(\frac{\sqrt{1+\tan^2 2} - 1}{\tan 2} \right)$

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

$$= \cot^{-1} \left(\frac{1 - \sec 2}{\tan 2} \right) - \cot^{-1} \left(\frac{\sec 2 - 1}{\tan 2} \right)$$

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

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

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

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

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

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

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

$$= \tan^{-1}(-\cot 2)$$

$$= -\tan^{-1}(\cot 2)$$

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

11. Let $\vec{a} = \hat{i} + 4\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{c}$ is a vector perpendicular to $\vec{a}$ and lies in the plane of $\vec{a}$, $\vec{b}$ is equal to

(1) $\hat{i} + \hat{j} + \hat{k}$

(2) $-\hat{i} + \hat{j} - \hat{k}$

(3) $\hat{i} - \hat{j} + \hat{k}$

(4) $-\hat{i} - \hat{j} - \hat{k}$

Answer (2)

Sol. $\vec{c} = \vec{a} + \lambda \vec{b}$

$$\vec{c} \cdot \vec{a} = 0$$

$$\Rightarrow 0 = 26 + \lambda \cdot (2 + 12 + 12)$$

$$\Rightarrow \lambda = -1$$

$$\therefore \vec{c} = \vec{a} - \vec{b}$$

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

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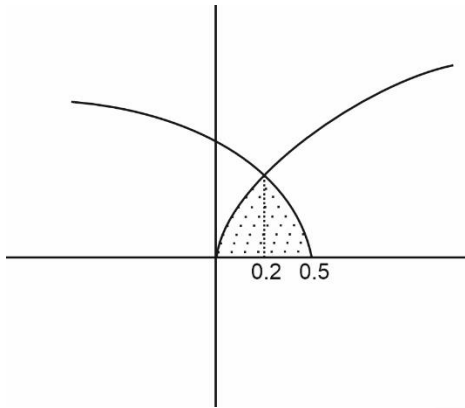
12. Area of the region

$$\{(x, y) : 0 \leq y \leq \sqrt{9x}, y^2 \geq 3 - 6x\} \text{ (in square units)}$$

- (1) $\frac{1}{3} \left(\frac{9}{5}\right)^{1/2}$ (2) $\frac{3}{5} \left(\frac{8}{5}\right)^{1/2}$
 (3) $\frac{1}{3} \left(\frac{7}{5}\right)^{1/2}$ (4) $\frac{1}{9} \left(\frac{7}{5}\right)^{1/2}$

Answer (1)

Sol. $0 \leq y \leq \sqrt{9x}$
 $y^2 \leq 3 - 6x$



$$\text{Area} = \int_0^{\frac{1}{5}} \sqrt{9x} dx + \int_{\frac{1}{5}}^{\frac{1}{2}} \sqrt{3-6x} dx$$

$$\left[\frac{2(9x)^{3/2}}{3 \times 9} \right]_0^{\frac{1}{5}} + \left[\frac{2(3-6x)^{3/2}}{3(-6)} \right]_{\frac{1}{5}}^{\frac{1}{2}}$$

$$\frac{2}{27} \times \left(\frac{9}{5}\right)^{3/2} + \frac{1}{9} \left(3 - \frac{6}{5}\right)^{3/2}$$

$$= \frac{2}{27} \times \left(\frac{9}{5}\right)^{3/2} + \frac{1}{9} \left(\frac{9}{5}\right)^{3/2}$$

$$= \left(\frac{9}{5}\right)^{3/2} \left[\frac{2}{27} + \frac{1}{9} \right] = \frac{5}{27} \times \left(\frac{9}{5}\right)^{3/2}$$

$$= \frac{1}{3} \times \left(\frac{9}{5}\right)^{1/2}$$

13. Let f be defined as $R - \{0\} \rightarrow R$ such that $f(x) = \frac{x}{3} + \frac{3}{x} + 3$.
 If $f(x)$ is strictly increasing in $(-\infty, \alpha_1) \cup (\alpha_2, \infty)$ and strictly decreasing in $(\alpha_3, \alpha_4) \cup (\alpha_4, \alpha_5)$ then $\sum_{i=1}^5 (\alpha_i)^2$ is

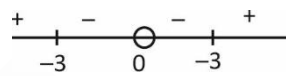
equal to

- (1) 28 (2) 36
 (3) 48 (4) 40

Answer (2)

Sol. $f(x) = \frac{x}{3} + \frac{3}{x} + 3, x \neq 0$

$$f'(x) = \frac{1}{3} - \frac{3}{x^2} = \frac{x^2 - 9}{3x^2}$$

 $(-\infty, -3) \cup (0, \infty)$ $f(x)$ increasing $f(x)$ is decreasing $(-3, 0) \cup (0, 3)$

$$(-\infty, \alpha_1) \cup (\alpha_2, \infty) \Rightarrow \alpha_1 = -3, \alpha_2 = 3$$

$$(-3, 0) \cup (0, 3) \Rightarrow \alpha_3 = -3, \alpha_4 = 0, \alpha_5 = 3$$

$$\sum_{i=1}^5 \alpha_i^2 = (-3)^2 + 3^2 + (-3)^2 + 0^2 + 3^2 = 4 \times 3^2 = 4 \times 9 = 36$$

14. Let $A = \{0, 1, 2, 3, 4, 5, 6\}$. Let R_1 be a relation defined on $A \times A$ such that $R_1 = \{(x, y) : \max(x, y) \in \{3, 4\}\}$.

Consider two statements

Statement 1 : Total number of elements in R_1 is 18Statement 2: R is symmetric but not reflexive and transitive

- (1) Statement 1 is true but Statement 2 is false
 (2) Statement 2 is true but Statement 1 is false
 (3) Statement 1 and Statement 2 are true
 (4) Neither Statement 1 nor Statement 2 are true

Answer (2)

Sol. Let $\max(x, y) = 3$

$$\Rightarrow \{(0, 3), (1, 3), (2, 3), (3, 3), (3, 0), (3, 1), (3, 2)\}$$

similarly
 Let $\max(x, y) = 4$

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$\Rightarrow \{(0, 4), (1, 4), (2, 4), (3, 4), (4, 4), (4, 0), (4, 1), (4, 2), (4, 3)\}$ Total 16 elements

R_1 is not reflexive : $\max(x, y) \in \{3, 4\} \Rightarrow R_1$ is symmetric

$\Rightarrow \max(y, x) \in \{3, 4\}$

$\max(x, y) \in \{3, 4\}$ and $\max(y, z) \in \{3, 4\} \Rightarrow \max = \{x, z\} \Rightarrow$ not transitive $(0, 4) \in R_1$ and $(4, 0) \in R_1 \Rightarrow (0, 0) \notin R_1$

15. Let $I_1 = \int_{-\frac{1}{2}}^1 2xf(2x(1-2x))dx$ and

$I_2 = \int_{-1}^1 f(x(1-x))dx$ then $\frac{I_2}{I_1}$ equals to

- (1) 4 (2) 2
(3) 3 (4) 1

Answer (1)

Sol. $I_1 = \int_{-\frac{1}{2}}^1 2xf(2x(1-2x))dx$

$$I_1 = \int_{-\frac{1}{2}}^1 2\left(\frac{1}{2} - x\right)f\left(2\left(\frac{1}{2} - x\right)\left(1 - 2\left(\frac{1}{2} - x\right)\right)\right)dx$$

$$I_1 = \int_{-\frac{1}{2}}^1 (1-2x)f((1-2x)(2x))dx$$

$$I_1 = \int_{-\frac{1}{2}}^1 f((1-2x)(2x))dx - \int_{-\frac{1}{2}}^1 2xf((1-2x)(2x))dx$$

$$2I_1 = \int_{-\frac{1}{2}}^1 f((1-2x)(2x))dx$$

Put $2x = t$

$$2dx = dt$$

$$dx = \frac{dt}{2}$$

$$2I_1 = \frac{1}{2} \int_{-1}^2 f((1-t)(t))dt$$

$$I_1 = \frac{1}{4} \int_{-1}^2 f((1-x)(x))dx$$

$$I_1 = \frac{1}{4} I_2$$

$$4 \Rightarrow \frac{I_2}{I_1}$$

16. A circle touches the parabola $y^2 = 9x$ at $(4, 6)$ and positive x-axis. Find the radius of the circle.

- (1) $\frac{20}{3}$ (2) $\frac{10}{3}$
(3) $\frac{1}{3}$ (4) $\frac{5}{3}$

Answer (2)

Sol. Equation of tangent at $(4, 6)$ using $T = 0$

$$y \cdot 6 = \frac{9}{2}(x + 4)$$

$$\Rightarrow 3x - 4y + 12 = 0$$

Equation of circle

$$(x - 4)^2 + (y - 6)^2 + \lambda(3x - 4y + 12) = 0$$

It touches x-axis.

$\therefore$ put $y = 0$ and make $D = 0$

$$(x - 4)^2 + 36 + \lambda(3x + 12) = 0$$

$$\Rightarrow x^2 + (3\lambda - 8)x + 52 + 12\lambda = 0$$

$D = 0$

$$(3\lambda - 8)^2 - 4(12\lambda + 52) = 0$$

$$\Rightarrow \lambda = 12, \frac{-4}{3}$$

For $\lambda = \frac{-4}{3}$, circle touches positive x-axis.

$$(x - 4)^2 + (y - 6)^2 - \frac{4}{3}(3x - 4y + 12) = 0$$

$$r = \frac{10}{3}$$

17.
18.
19.
20.

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

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JEE Main (Session-1) 2025

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21. The sum of squares of roots of $|x-2|^2 - |x-2| - 2 = 0$ and $x^2 - 2|x-3| - 5 = 0$ equals to

Answer (42)

Sol. $|x-2|^2 - |x-2| - 2 = 0$

Let $|x-2| = t$

$t^2 - t - 2 = 0$

$t^2 - 2t + t - 2 = 0$

$t(t-2) + 1(t-2) = 0$

$(t+1)(t-2) = 0$

$t = -1, t = 2$

$\therefore |x-2| = -1, |x-2| = 2$

Number + possible $\Rightarrow x-2 = \pm 2$

$\Rightarrow x = 0, 4$

$x^2 - 2|x-3| - 5 = 0$

when $x < 3$

$x^2 + 2(x-3) - 5 = 0$

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

$x = \frac{-2 \pm \sqrt{4+44}}{2}$

$x = \frac{-2 \pm 4\sqrt{3}}{2}$

$x = -1 \pm 2\sqrt{3}$

When $x \geq 3$

$\Rightarrow x^2 - 2x + 6 - 5 = 0$

$\Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x-1)^2 = 0$

$\Rightarrow x = 1$ (rejected)

$\therefore$ Sum of square of roots

$= 4^2 + (-1+2\sqrt{3})^2 + (-1-2\sqrt{3})^2$

$= 16 + 1 + 12 + 1 + 12 = 42$

22.

23.

24.

25.



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