JEE Main (Phase-II) 2020

Memory Based Questions & Solutions

SUBJECT

MATHEMATICS

Date: 04 September, 2020 (Shift-1)

Time: 3 PM to 6 PM

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MATHEMATICS

1. If $a_1, a_2, a_3, \ldots\ldots a_n$ are in Arithmetic Progression, whose common difference is an integer such that $a_1 = 1$, $a_n = 300$ and $n \in [15, 50]$, then (S_{n-4}, a_{n-4}) is

(1) (2491, 247) (2) (2490, 248) (3) (2590, 249) (4) (248, 2490)

Ans. (2)

Sol. $a_n = a_1 + (n - 1)d$ $\Rightarrow$ $300 = 1 + (n - 1)d$

$$\Rightarrow \quad d = \frac{299}{(n-1)} = \frac{13 \times 13}{(n-1)} = \text{integer}$$

So $n - 1 = \pm 13, \pm 23, \pm 299, \pm 1$

$\Rightarrow$ $n = 14, -12, 24, -22, 300, -298, 2, 0$

But $n \in [15, 50]$ $\Rightarrow$ $n = 24$ $\Rightarrow$ $d = 13$

Hence $S_{n-4} = S_{20} = \frac{20}{2}[2(1) + (20 - 1)(13)] = 10[2 + 247] = 2490$

$a_{n-4} = a_{20} = a_1 + 19d$
$= 1 + 19 \times 13$
$= 1 + 247$
$= 248$

2. If $\lim_{x \to x} \frac{x^2 f^2(t) - t^2 f^2(x)}{t - x} = 0$ and $f(1) = e$ then solution of $f(x) = 1$ is

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

Ans. (1)

Sol. $\lim_{x \to x} \frac{x^2 f^2(t) - t^2 f^2(x)}{t - x} = 0$

using L'Hospital

$$\lim_{x \to x} \frac{x^2 2f^2(t) f'(t) - 2tf^2(x)}{1} = 0$$

$x^2 2f(x)f'(x) - 2x f^2(x) = 0$

$2x f(x) [xf'(x) - f(x)] = 0$

$f(x) \neq 0$ so $xf'(x) = f(x)$

$$x\frac{dy}{dx} = y$$

$$\frac{1}{y}dy = \frac{1}{x}dx$$

Integration $\ell n\, y = \ell n\, x + \ell n\, c$

$y = cx$ $\Rightarrow$ $f(x) = cx$

Now $f(1) = x = e$

So $f(x) = ex$

Now $f(x) = 1$

$ex = 1$ $\Rightarrow$ $x = \frac{1}{e}$

3. Minimum value of $2^{\sin x} + 2^{\cos x}$ is

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

Ans. (1)

Sol. Using A.M. $\geq$ G.M.

$$\frac{2^{\sin x}+2^{\cos x}}{2} \geq \sqrt{2^{\sin x}.2^{\cos x}} \qquad \frac{2^{\sin x}+2^{\cos x}}{2} \geq 2^{\frac{\sin x+\cos x}{2}} \quad ....(1)$$

Now $-\sqrt{2} \leq \sin x + \cos x = \sqrt{2}$

So $-\frac{1}{\sqrt{2}} \leq \frac{\sin x+\cos x}{2} \leq \frac{1}{\sqrt{2}}$

minimum value of $2^{\frac{\sin x+\cos x}{2}} = 2^{-\frac{1}{\sqrt{2}}}$

so by (1)

minimum value of $2^{\frac{2^{\sin x}+2^{\cos x}}{2}} = 2^{-\frac{1}{\sqrt{2}}}$ minimum value of $2^{\sin x}+2^{\cos x} = 2^1.2^{-\frac{1}{\sqrt{2}}} = 2^{1-\frac{1}{\sqrt{2}}}$

4. If $\bar{a} = 2\hat{i}+\hat{j}+2\hat{k}$ then the value of $\left|\hat{i}\times\left(\bar{a}\times\hat{i}\right)\right|^2 + \left|\hat{j}\times\left(\bar{a}\times\hat{j}\right)\right|^2 + \left|\hat{k}\times\left(\bar{a}\times\hat{k}\right)\right|^2$ is

Ans. 18.00

Sol. Let $\vec{a} = x\hat{i} = x\hat{i}+y\hat{j}+z\hat{k}$

$\hat{i}\times\left(\vec{a}\times\hat{i}\right) = \left(\hat{i}.\hat{i}\right)\vec{a} - \left(\vec{a}.\hat{i}\right)\hat{i} = y\hat{j}+z\hat{k}$

similarly $\hat{j}\times\left(\vec{a}\times\hat{j}\right) = x\hat{i}+z\hat{k}$ and $\hat{k}\times\left(\vec{a}\times\hat{k}\right) = x\hat{i}+y\hat{k}$

$\left|\hat{i}\times\left(\vec{a}\times\hat{i}\right)\right|^2 + \left|\hat{j}\times\left(\vec{a}\times\hat{j}\right)\right|^2 + \left|\hat{k}\times\left(\vec{a}\times\hat{k}\right)\right|^2$

$\left|y\hat{j}+z\hat{k}\right|^2 + \left|x\hat{i}+z\hat{k}\right|^2 + \left|x\hat{i}+y\hat{j}\right|^2 = 2|a|^2 = 2(9) = 18$

5. $\int_0^n \{x\}dx, \int_0^n [x]dx$ and $10(n^2-n)$ are in Geometric progression, where {x}, [x] represents fractional part function and greatest integral function respectively, find n if $n \in N$ and $n > 1$

Ans. 21.00

Sol. $\int_0^n \{x\}dx = n\int_0^1 xdx = n\left(\frac{x^2}{2}\right)_0^1 = \frac{n}{2}$

and $\int_0^n [x]dx = \int_0^n (x-\{x\})dx = \left(\frac{x^2}{2}\right)_0^n - \int_0^n \{x\}dx = \frac{n^2}{2} - \frac{n}{2}$

now $\frac{n}{2}, \frac{n^2-n}{2}$ and $10(n^2 - n)$ are in Geometric progression

$= \left(\frac{n^2-n}{2}\right)^2 = \frac{n}{2}.10(n^2-n) \Rightarrow \frac{n^2(n-1)^2}{4} = 5.n^2(n-1)$

$\Rightarrow$ n - 1 = 20 $\Rightarrow$ n = 21

6. The ratio of three consecutive terms in expansion of $(1 + x)^{n+5}$ is 5 : 10 : 14, then greatest coefficient is

(1) 252 (2) 462 (3) 792 (4) 320

Ans. (2)

Sol. Let three consecutive term are T_r, T_{r+1}, T_{r+2}

Hence $\frac{T_r}{T_{r+1}} = \frac{5}{10}$ and $\frac{T_{r+1}}{T_{r+2}} = \frac{10}{14}$

$\frac{T_{r+1}}{T_r} = 2$ $\qquad$ $\frac{^{n+5}C_r}{^{n+5}C_{r+1}} = \frac{5}{7}$

$\frac{^{n+5}C_r}{^{n+5}C_{r-1}} = 2$ $\qquad$ $\frac{^{n+5}C_{r+1}}{^{n+5}C_r} = \frac{7}{5}$

$\frac{(n+1)-r+1}{r} = 2$ $\qquad$ $\frac{(n+5)-)(r+1)+1}{r+1} = \frac{7}{5}$

$n - r + 6 = 2r$ $\qquad$ $\frac{n-r+5}{r+1} = \frac{7}{5}$

$n - 3r + 6 = 0$ .... (i)

$5n - 5r + 25 = 7r + 7$ .... (ii)

Multiply equation (i) by 5

$5n - 15r + 30 = 0$

$5n - 12r + 18 = 0$

- $\quad$ + $\quad$ -

$- 3r + 12 = 0 \Rightarrow r = 4, n = 6$

Hence greatest coefficient will be of middle term = $^{n+5}C_5 = {}^{11}C_5 = 462$

7. There are 6 multiple choice questions in a paper each having 4 options of which only one is correct. In how many ways a person can solve exactly four correct, if he attempted all 6 questions.

(1) 134 (2) 135 (3) 136 (4) 137

Ans. (2)

Sol. No. of ways of giving wrong answer = 3

required no. of ways $= {}^6C_4 (1)^4 \times (3)^2$

$= 15(9) = 135$

8.

Class	0-10	10 - 20	20-30
f	2	x	2

If variance of variable is 50 than x =

(1) 5 (2) 6 (3) 4 (4) 3

Ans. (3)

Sol.

x_i	5	15	25
f_i	2	x	2

$$\overline{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{10 + 15x + 50}{4 + x}$$

$$= \frac{60 + 15x}{4 + x} = 15$$

$$\sigma^2 = 50 = \frac{\sum f_i x_i^2}{\sum f_i} - (\overline{x})^2$$

$50 = \frac{50 + 225x + 1250}{4 + x} - (15)^2$

$50 = \frac{1300 + 225x}{4 + x} - 225$

$\Rightarrow$ 275(4 + x) = 1300 + 225 x $\Rightarrow$ 50x = 200 $\Rightarrow$ x = 4

9. Two persons A and B play a game of throwing a pair of dice until one of them wins. A will win if sum of numbers on dice appear to be 6 and B will win, if sum is 7. What is the probability that A wins the game if A starts the game.

(1) $\frac{31}{61}$ (2) $\frac{30}{61}$ (3) $\frac{29}{61}$ (4) $\frac{32}{61}$

Ans. (2)

Sol. Sum 6 $\to$ (1, 5), (5, 1), (3, 3), (2, 4), (4, 2)

Sum 4 $\to$ (1, 6), (6, 1), (5, 2), (2, 5), (3, 4), (4, 3)

$P(A \text{ wins}) = P(A) + P(\bar{A}) . P(\bar{B}) . P(A) + P(\bar{A})\ P(\bar{B}) . P(\bar{A}) . P(\bar{B}) .P(A) + ...$

this is infinite G.P. with common ratio $P(\bar{A}) \times P(\bar{B})$

Probability of a wins $= \frac{P(A)}{1 - P(\bar{A})P(\bar{B})}$

$= \frac{\frac{5}{36}}{1 - \frac{31}{36} . \frac{30}{36}} = \frac{30}{61}$

10. If ω is an imaginary cube roots of unity such that $(2 + \omega)^2 = a + b\omega$, $b \in R$ then value of a + b is

(1) 1 (2) 6 (3) 8 (4) 5

Ans. (2)

Sol. $(2 + \omega)^2 = a + b\omega$

$4 + \omega^2 + 4\omega = a + b\omega \quad \because \quad 1 + \omega^2 = -\omega$

$3 + 3\omega = a + b\omega$

$(a - 3) + \omega(b - 3) = 0$

$(a - 3) + \left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)(b - 3) = 0$

$(a - 3) - \frac{1}{2}(b - 3) + i\,\frac{\sqrt{3}}{2}(b - 3) = 0$

compare real and imaginary part from both sides

$(a - 3) - \frac{1}{2}(b - 3) = 0$ and $b - 3 = 0 \Rightarrow b = 3$ and a = 3 hence a + b = 6

11. Centre of a circle S passing through the intersection points of circles $x^2 + y^2 - 6x = 0$ & $x^2 + y^2 - 4y = 0$ lies on the line $2x - 3y + 12 = 0$ then circle S passes through

(1) (– 3, 1) (2) (– 4, – 2) (3) (1, 2) (4) (– 3, 6)

Ans. (4)

Sol. By family of circle, passing intersection of given circle will be member of

$S_1 + \lambda S_2 = 0$ family $(\lambda \neq 1)$

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

$(\lambda + 1)x^2 + (\lambda + 1)y^2 - 6x - 4\lambda y = 0$ $\quad x^2 + y^2 - \dfrac{6}{\lambda+1}x - \dfrac{4\lambda}{\lambda+1}y = 0$

Centre $\left(\dfrac{3}{\lambda+1}, \dfrac{2\lambda}{\lambda+1}\right)$

centre lies on $2x - 3y + 12 = 0$

$2\left(\dfrac{3}{\lambda+1}\right) - 3\left(\dfrac{2\lambda}{\lambda+1}\right) + 12 = 0$

$6\lambda + 18 = 0$

$\lambda = -3$

Circle $x^2 + y^2 + 3x - 6y = 0$

12. $\displaystyle\int_{\pi/6}^{\pi/3} \tan^3 x.\sin^2 3x(2\sec^2 x.\sin^2 3x + 3\tan x.\sin 6x)dx$

(1) $-\dfrac{1}{36}$ (2) $-\dfrac{1}{72}$ (3) $-\dfrac{1}{18}$ (4) $\dfrac{1}{36}$

Ans. (3)

Sol. $\displaystyle\int_{\pi/6}^{\pi/3} \left(\frac{\frac{d}{dx}(\tan^4 x)}{2}.\sin^4 3x + \tan^4 x.\frac{\frac{d}{dx}(\sin^4 3x)}{2} \right) = \frac{1}{2}\int_{\pi/6}^{\pi/3} \frac{d}{dx}(\tan^4 x.\sin^4 3x)dx$

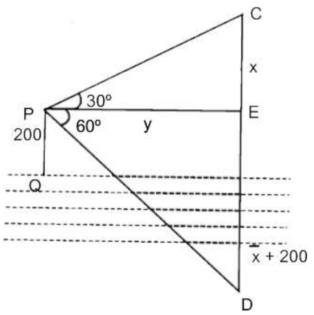
$= \dfrac{1}{2}\left[\tan^4 x.\sin^4 3x\right]_{\pi/6}^{\pi/3} = \dfrac{1}{2}.\left[(3)^4 \times 0 - \dfrac{1}{\left(\sqrt{3}\right)^4}\right] = -\dfrac{1}{2} \times \dfrac{1}{9} = -\dfrac{1}{18}$

13. From a pt 200 m above a lake, the angle of elevation of a cloud is 30° and the angle of depression of its reflection in take is 60° then the distance of cloud from the point is

(1) 400 m (2) $400\sqrt{2}$m (3) $400\sqrt{3}$m (4) 200 m

Ans. (1)

Sol.



$\tan 30^o = \dfrac{x}{y} = \dfrac{1}{\sqrt{3}} \Rightarrow y = \sqrt{3}x$ and $\tan 60^o = \dfrac{x + 400}{y}$

x + 400 = 3x

2x = 400, x = 200

$\sin 30^o = \dfrac{200}{PC} \Rightarrow PC = 400$

14. The contrapositive of statement ;
"If f(x) is continuous at x = a then f(x) is differentiable at x = a"
(1) If f(x) is continuous at x = a then f(x) is not continuous at x = a
(2) If f(x) is not differentiable at x = a then f(x) is not continuous at x = a
(3) If f(x) is differentiable at x = a then f(x) is continuous at x = a
(4) If f(x) is differentiable at x = a then f(x) is not continuous at x = a

Ans. (2)

Sol. Contrapositive of $p \Rightarrow q$ is $\sim q \Rightarrow \sim p$

15. If equation of directrix of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is x = 4, then normal to the ellipse at point $(1, \beta), (\beta > 0)$ passes through the point (where eccentricity of the ellipse is $\frac{1}{2}$)

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

Ans. (1)

Sol. $\frac{a}{e}=4 \quad \Rightarrow a = 4e \quad \Rightarrow a = 2$

$b^2 = a^2(1 - e^2) = 3$

$(1, \beta)$ lies on $\frac{x^2}{4}+\frac{y^2}{3}=1 \Rightarrow \frac{1}{4}+\frac{\beta^2}{3}=1 \qquad \beta^2=\frac{9}{4} \quad \Rightarrow \beta=\frac{3}{2} (\because \beta>0)$

Normal at $(1, \beta) \qquad \Rightarrow \frac{a^2x}{1}-\frac{b^2y}{\beta}=a^2-b^2 \qquad \Rightarrow 4x-\frac{3y}{\beta}=1$

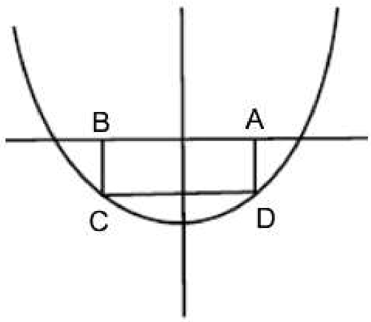
So equation of normal is 4x - 2y = 1

16. If point A and B lie on x axis and points C and D lie on the curve $y = x^2 - 1$ below the x-axis then maximum area of rectangle ABCD is

(1) $\frac{4\sqrt{3}}{3}$ (2) $\frac{4\sqrt{3}}{9}$ (3) $\frac{4\sqrt{3}}{27}$ (4) $\frac{8\sqrt{3}}{9}$

Ans. (2)

Sol.



$A(\alpha, 0), \beta(-\alpha, 0) \qquad \Rightarrow \qquad D(\alpha, \alpha^2-1) \qquad$ Area (ABCD) = (AB)(AD)

$\Rightarrow \qquad S=(2\alpha)(1-\alpha^2)=2\alpha-2\alpha^3$

$\frac{ds}{d\alpha}=2-6\alpha^2=0 \qquad \Rightarrow \qquad \alpha^2=\frac{1}{3} \qquad \Rightarrow \qquad \alpha=\frac{1}{\sqrt{3}}$

Area $= 2\alpha-2\alpha^3=\frac{2}{\sqrt{3}}-\frac{2}{2\sqrt{3}}=\frac{4}{3\sqrt{3}}$

17. If α, β are roots of $x^2 - x + 2\lambda = 0$ and α, γ are roots of $3x^2 - 10x + 27\lambda = 0$ then value of $\frac{\beta\gamma}{\lambda}$ is

(1) 27 (2) 18 (3) 9 (4) 15

Ans. (2)

Sol. Given $3\alpha^2 - 10\alpha + 27\lambda = 0$ .... (i)

$3\alpha^2 - 3\alpha + 6\lambda = 0$ .... (ii)

Subtract $-7\alpha + 21\lambda = 0$

$3\lambda = 0$

by (ii) $9\lambda^2 - 3\lambda + 2\lambda = 0$

$\Rightarrow \quad \lambda = 0, \frac{1}{9}$

$\therefore$ given equation are $x^2 - x + \frac{2}{9} = 0$ and $3x^2 - 10x + 3 = 0$

$\therefore \quad \alpha = \frac{1}{3}, \beta = \frac{2}{3}, \alpha = \frac{1}{3}, \gamma = 3$

$\therefore \quad \frac{\beta\gamma}{\lambda} = \frac{\frac{2}{3}.3}{\frac{1}{9}} = 18$

18. PQ is a diameter of circle $x^2 + y^2 = 4$. If perpendicular distances of P and Q from line x + y = 2 are α and β respectively then maximum value of α, β is

Ans. 2

Sol. Let $P(2\cos\theta, 2\sin\theta)$ $\therefore$ $Q(-2\cos\theta, -2\sin\theta)$

given line x + y - 2 = 0

$\therefore \quad \alpha = \frac{|2\cos\theta + 2\sin\theta - 2|}{\sqrt{2}}$

$\beta = \frac{|-2\cos\theta - 2\sin\theta - 2|}{\sqrt{2}}$

$\therefore \quad \alpha, \beta = \sqrt{2}(\cos\theta + \sin\theta - 1).\sqrt{2}(\cos\theta + \sin\theta + 1)$

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

$\therefore$ maximum $\alpha, \beta = 2$

19. If $\frac{dy}{dx} - \frac{y - 3x}{\ell n(y - 3x)} = 3$, then

(1) $\frac{\ell n(y-3x)}{2} = x + c$

(2) $\frac{\ell n^2(y-3x)}{2} = x + c$

(3) $\frac{\ell n(y-3x)}{2} = x^2 + c$

(4) $\frac{\ell n^2(y-3x)}{2} = x^2 + c$

Ans. (2)

Sol. $\frac{dy}{dx} - \frac{y - 3x}{\ell n(y - 3x)} - 3 = 0$

$\frac{dy}{dx} - 3 = \frac{y-3x}{\ell n(y-3x)}$ $\qquad$ $\frac{dy}{dx}(y-3x) = \frac{y-3x}{\ell n(y-3x)}$

$\int \frac{\ell n(y-3x)}{(y-3x)} d(y-3x) = \int dx$ $\qquad$ Let $\ell n(y-3x) = t$

$\frac{1}{(y-3x)} d(y-3x) = dt$ $\qquad$ $\int t dt = \int dx$

$\frac{t^2}{2} = x + c$

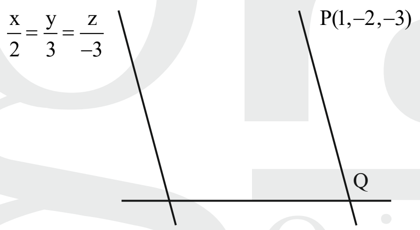
$\frac{(\ell n(y-3x))^2}{2} = x + c$

20. The distance of point (1, – 2, – 3) from plane x – y + z = 5 measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is

(1) 7 $\qquad$ (2) $\frac{1}{7}$ $\qquad$ (3) 1 $\qquad$ (4) 5

Ans. (4)

Sol.



Equation PQ

$\frac{x-1}{2} = \frac{y+2}{3} = \frac{z+3}{-6} = \lambda$

Let $Q \equiv (2\lambda+1, 3\lambda-2, -6\lambda-3)$

Q lies on x - y + z = 5

$\Rightarrow \quad (2\lambda+1) - (3\lambda-2)(-6\lambda-3) = 5 \qquad \Rightarrow \quad \lambda = -\frac{5}{7}$

$PQ = \sqrt{\left(1+\frac{3}{5}\right)^2 + \left(-2+\frac{29}{7}\right)^2 + \left(-3-\frac{9}{7}\right)^2} = \sqrt{\frac{100}{49} + \frac{225}{49} + \frac{900}{49}} = \sqrt{\frac{1225}{49}} = \frac{35}{7} = 5$

21. If $f(x) = \begin{cases} \frac{1}{2}(|x|-1), & |x|>1 \\ \tan^{-1} x, & |x| \le 1 \end{cases}$ then f(x) is

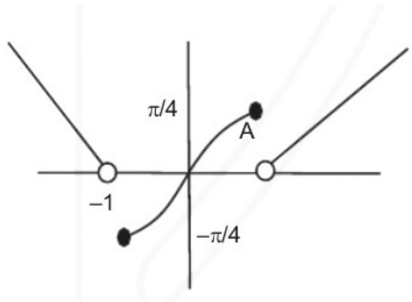
(1) continuous for $x \in R - \{0\}$ $\qquad$ (2) continuous for $x \in R - \{0, 1, -1\}$

(3) not continuous for $x \in \{-1, 0, 1\}$ $\qquad$ (4) f(x) is continuous for $x \in R - \{1, -1\}$

Ans. (4)

Sol. $\left\{\begin{matrix} \frac{|x|-1}{2}, & |x|>1 \\ \tan^{-1} x & |x| \le 1 \end{matrix}\right\}$

Graph of f(x) is



f(x) is not continuous at x = -1, 1

22. Suppose $X_1, X_2, \ldots\ldots\ldots\ldots X_{50}$ are 50 sets each having 10 elements and $Y_1, Y_2, \ldots\ldots\ldots\ldots Y_n$ are n sets each having 5 elements. Let $\bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^{n} Y_i = Z$ and each element of Z belong to exactly 25 of X_i and exactly 6 of Y_i then value of n is

(1) 20 (2) 22 (3) 24 (4) 26

Ans. (3)

Sol. $\bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^{n} Y_i = Z$ $\quad \therefore \frac{10 \times 50}{25} = \frac{5n}{6}$ $\quad \Rightarrow n = 24$

23. Let A is 3 × 3 matrix such that $Ax_1 = B_1, Ax_2 = B_2\ Ax_3 = B_3$ where

$$x_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad x_2 = \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix} \quad x_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$B_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad B_2 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \quad B_3 = \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix}$$

find the |A|

(1) 0 (2) 1 (3) 2 (4) 3

Ans. (3)

Sol. Let $A = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$ $\quad Ax_1 = B_1 \Rightarrow A = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = s$

$a_1 + a_2 + a_3 = 1$
$b_1 + b_2 + b_3 = 0$
$c_1 + c_2 + c_3 = 0$
similar $2a_2 + a_3 = 0$ and $a_3 = 0$
$2b_2 + b_3 = 2$ $\quad b_3 = 0$
$2c_2 + c_3 = 0$ $\quad c_3 = 2$
$\therefore$ $a_2 = 0, b_2 = 1, c_2 = -1,$
$a_1 = 1, b_1 = -1, c_1 = -1$

$$A = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ -1 & -1 & 2 \end{bmatrix} \quad \therefore |A| = 2$$

gravity
Orienting Intelligence

JEE MAIN 2020
PHASE 1

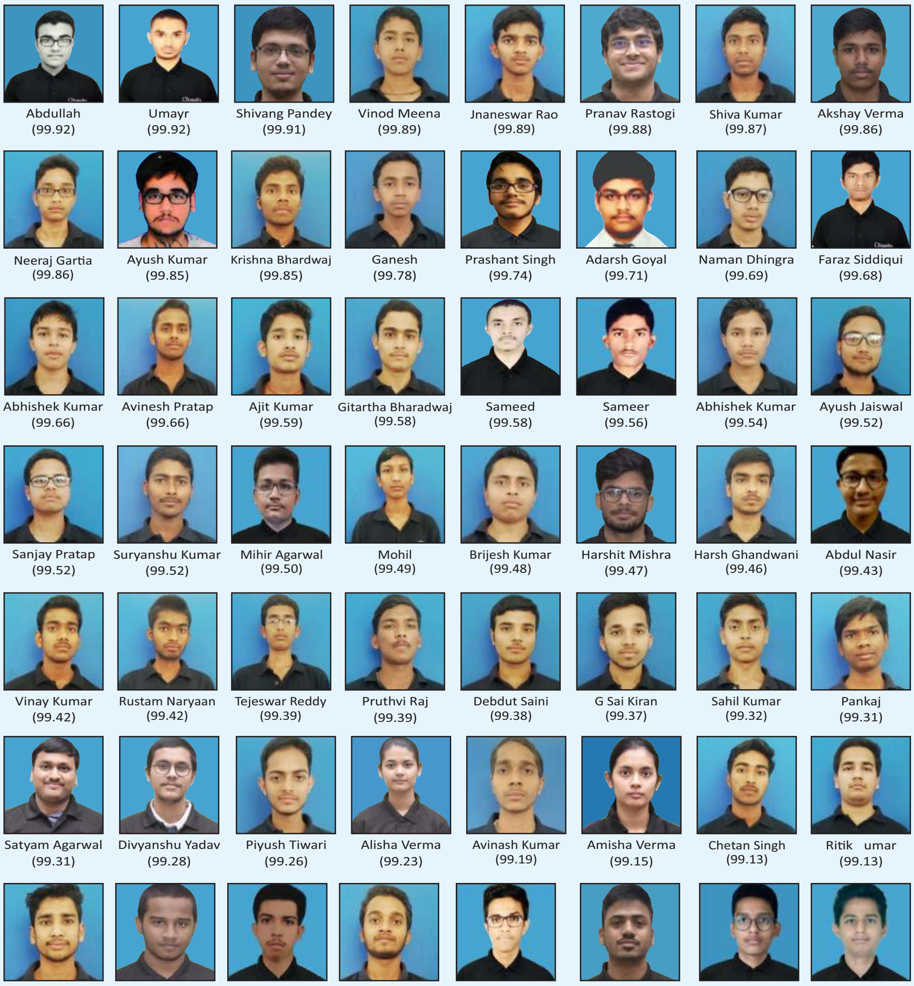
JEE Main - 2020 | Best Result in U.P.

Aditya Pandey
Percentile
99.936
City Topper
Application No. 200310320565
DOB - 23-12-2002

65 Students Above 99 Percentile

145 Students Above 98 Percentile

208 Students Above 97 Percentile



Abdullah (99.92)	Umayr (99.92)	Shivang Pandey (99.91)	Vinod Meena (99.89)	Jnaneswar Rao (99.89)	Pranav Rastogi (99.88)	Shiva Kumar (99.87)	Akshay Verma (99.86)
Neeraj Gartia (99.86)	Ayush Kumar (99.85)	Krishna Bhardwaj (99.85)	Ganesh (99.78)	Prashant Singh (99.74)	Adarsh Goyal (99.71)	Naman Dhingra (99.69)	Faraz Siddiqui (99.68)
Abhishek Kumar (99.66)	Avinesh Pratap (99.66)	Ajit Kumar (99.59)	Gitartha Bharadwaj (99.58)	Sameed (99.58)	Sameer (99.56)	Abhishek Kumar (99.54)	Ayush Jaiswal (99.52)
Sanjay Pratap (99.52)	Suryanshu Kumar (99.52)	Mihir Agarwal (99.50)	Mohil (99.49)	Brijesh Kumar (99.48)	Harshit Mishra (99.47)	Harsh Ghandwani (99.46)	Abdul Nasir (99.43)
Vinay Kumar (99.42)	Rustam Naryaan (99.42)	Tejeswar Reddy (99.39)	Pruthvi Raj (99.39)	Debdut Saini (99.38)	G Sai Kiran (99.37)	Sahil Kumar (99.32)	Pankaj (99.31)
Satyam Agarwal (99.31)	Divyanshu Yadav (99.28)	Piyush Tiwari (99.26)	Alisha Verma (99.23)	Avinash Kumar (99.19)	Amisha Verma (99.15)	Chetan Singh (99.13)	Ritik umar (99.13)
Shubham Kumar (99.10)	Randheer (99.08)	Aryansh Tripathi (99.06)	Saurabh Maurya (99.03)	Mohammad Affan (99.03)	Pradumna Awasthi (99.02)	Harsh (99.02)	Abhay (99.01)

SCHOOL INTEGRATED PROGRAM (SIP)

Tradition of Gravity Continues,
Once Again Historical Result,
100% Students Cracked
JEE Main
(Based on Last Yr Cut off)

2020

80 Out of 80
Cracked JEE Main

We had three Batches
of 55, 15 and 10.

Many Top Ranks are
from these Batches

2019

JEE Main	JEE Adv.
79 Out of 80 in JEE Main	50 Out of 79 in JEE Adv.

2018

JEE Main	JEE Adv.
83 Out of 85 in JEE Main	62 Out of 83 in JEE Adv.

2017

JEE Main	JEE Adv.
80 Out of 85 in JEE Main	63 Out of 80 in JEE Adv.

2016

JEE Main	JEE Adv.
39 Out of 40 in JEE Main	31 Out of 39 in JEE Adv.

Selections Engineering 2019

gravity
Orienting Intelligence


Tarun
194 AIR (General)


Aniket Agarwal
337 AIR (General)


Shubh Sahu
494 AIR (General)


Shlok Nemani
497 AIR (General)

50 out of 79 Cracked JEE Advanced from SIP (School Integrated Program)

4 Ranks under 500 (General Category) | 2 Ranks under 10 (Reserved Category)

126 Selections in JEE Advanced | 61 Students above 99 Percentile in JEE Main 2019


Sanjana
AIR - 3*


Akash
AIR - 4*


Priyanka
AIR - 68*

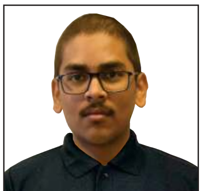

Bibek Lakra
AIR - 150*


Neha Raj
AIR - 177*


Arindam
AIR - 809 (General EWS)


Priyam
AIR - 1378 (General)


Mihir Chawla
AIR - 2237 (General)


Madhur Kumar
AIR - 2382 (General)


Manish Kumar
AIR - 2388 (General)


Saumya Raj
AIR - 2656 (General)


Raghav
AIR - 2659 (General)


Ritveek
AIR - 2709 (General)


Vanshaj
AIR - 2787 (General)


Subir Gupta
AIR - 2881 (General)


Aryan Rastogi
AIR - 3167 (General)


Devansh
AIR - 3600 (General)


Abhisht Bose
AIR - 3784 (General)