JEE MAIN Sept. 2020

QUESTION PAPER WITH SOLUTION

MATHEMATICS _ 3 Sep. _ SHIFT - 2

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Q.1 If $x^3dy+xy\,dx=x^2dy+2y\,dx$; $y(2)=e$ and $x>1$, then $y(4)$ is equal to:

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

Sol. **2**

$(x^3 - x^2)dy = (2 - x)\,ydx$

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

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

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

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

$$\ln|y|=\frac{2}{x}-\ln|x|+\ln|x-1|+c$$

$x = 2$, $y = e$

$1 = 1 - \ln2 + c \Rightarrow c = \ln2$

$$\ln|y|=\frac{2}{x}-\ln|x|+\ln|x-1|+\ln2$$

put $x = 4$

$$\ln|y|=\frac{1}{2}-2\ln2+\ln3+\ln2$$

$$\ln y=\ln\left(\frac{3}{2}\right)+\frac{1}{2}$$

$$y=\frac{3}{2}\cdot e^{\frac{1}{2}}=\frac{3}{2}\sqrt{e}$$

Q.2 Let A be a 3×3 matrix such that $\text{adj}\,A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 0 & 2 \\ 1 & -2 & -1 \end{bmatrix}$ and B=adj(adj A).

If $|A| = \lambda$ and $|(B^{-1})^T| = \mu$, then the ordered pair, $(|\lambda|, \mu)$ is equal to:

(1) $\left(9, \frac{1}{81}\right)$ (2) $\left(9, \frac{1}{9}\right)$ (3) $\left(3, \frac{1}{81}\right)$ (4) (3, 81)

Sol. **3**

adjA = $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 0 & 2 \\ 1 & -2 & -1 \end{bmatrix} \Rightarrow$ |adjA| = 9

$\Rightarrow |A|^2 = 9 \Rightarrow |A|=3 = |\lambda|$

B = adj (adjA) = |A|. A = 3A

$|(B^T)^{-1}| = \frac{1}{|B^T|} = \frac{1}{|B|} = \frac{1}{|3A|} = \frac{1}{27 \times 3} = \frac{1}{81} = \mu$

$|\lambda|, \mu = \left(3, \frac{1}{81}\right)$

Q.3 Let a,b,c $\in R$ be such that $a^2+b^2+c^2=1$, If $a\cos\theta = b\cos\left(\theta + \frac{2\pi}{3}\right) = c\cos\left(\theta + \frac{4\pi}{3}\right)$, where $\theta = \frac{\pi}{9}$, then the angle between the vectors $a\hat{i} + b\hat{j} + c\hat{k}$ and $b\hat{i} + c\hat{j} + a\hat{k}$ is

(1) $\frac{\pi}{2}$ (2) $\frac{2\pi}{3}$ (3) $\frac{\pi}{9}$ (4) 0

Sol. **1**

$\cos\alpha = \frac{ab + bc + ca}{a^2 + b^2 + c^2}$

$a\cos\theta = b\cos(\theta + \frac{2\pi}{3}) = c\cos\left(\theta + \frac{4\pi}{3}\right) = \lambda$

$$\frac{1}{a} = \frac{\cos\theta}{\lambda}, \frac{1}{b} = \frac{\cos\left(\theta + 2\frac{\pi}{3}\right)}{\lambda}, \frac{1}{c} = \frac{\cos\left(\theta + \frac{4\pi}{3}\right)}{\lambda}$$

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{1}{\lambda}\left[\cos\theta + \cos\left(\theta + \frac{2\pi}{3}\right) + \cos\left(\theta + \frac{4\pi}{3}\right)\right]$$

$$= \frac{1}{\lambda}\frac{\sin\left[(3)\left(\frac{\pi}{3}\right)\right]}{\sin\left(\frac{\pi}{3}\right)} . \cos\left[\frac{\theta + \theta + \frac{4\pi}{3}}{2}\right]$$

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

$\sum ab = 0$

$\cos\alpha = 0$

$$\alpha = \frac{\pi}{2}$$

Q.4 Suppose f(x) is a polynomial of degree four, having critical points at –1,0,1. If $T = \{x \in R \mid f(x) = f(0)\}$, then the sum of squares of all the elements of T is:

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

Sol. **4**

$f'(x) = k(x + 1)x(x-1)$

$f'(x) = k[x^3 - x]$

Integrating both sides

$$f(x) = k\left[\frac{x^4}{4} - \frac{x^2}{2}\right] + c$$

$f(0) = c$

$$f(x) = f(0) \Rightarrow k\left(\frac{x^4}{4} - \frac{x^2}{2}\right) + c = c$$

$$\Rightarrow k\frac{x^2}{4}\left(x^2 - 2\right) = 0$$

$\Rightarrow x = 0, \pm\sqrt{2}$

sum of all of squares of elements = $0^2 + (\sqrt{2})^2 + (-\sqrt{2})^2$

= 4

Q.5 If the value of the integral $\int_0^{1/2} \frac{x^2}{(1-x^2)^{3/2}} dx$ is $\frac{k}{6}$, then k is equal to:

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

Sol. **4**

$$\int_0^{\frac{1}{2}} \frac{x^2}{(1-x^2)^{\frac{3}{2}}} dx$$

$x = \sin\theta$

$$\int_0^{\frac{\pi}{6}} \frac{\sin^2\theta}{\cos^3\theta} . \cos\theta d\theta$$

$$\int_0^{\frac{\pi}{6}} \tan^2\theta d\theta = [\tan\theta - \theta]_0^{\frac{\pi}{6}}$$

$$\Rightarrow \left(\frac{1}{\sqrt{3}} - \frac{\pi}{6}\right) = \frac{k}{6}$$

$$\frac{2\sqrt{3}-\pi}{6} = \frac{k}{6}$$

$k = 2\sqrt{3} - \pi$

Q.6 If the term independent of x in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$ is k, then 18 k is equal to:

(1) 5 (2) 9 (3) 7 (4) 11

Sol. **3**

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

$$= {}^9C_r \frac{3^{9-2r}}{2^{9-r}} (-1)^r . x^{18-3r}$$

18 - 3r = 0

$\Rightarrow$ r=6

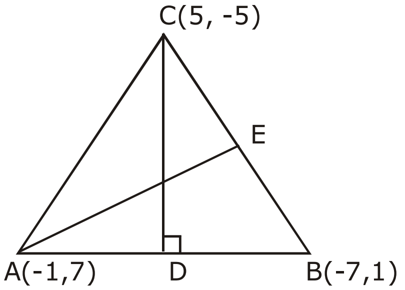
$$= {}^9C_r \left(\frac{3^{-3}}{2^3}\right) = k$$

$$= \frac{7}{18} = k \Rightarrow 18k = 7$$

7. If a ΔABC has vertices A(−1,7), B(−7,1) and C(5,−5), then its orthocentre has coordinates:

(1) (−3,3) (2) $\left(-\frac{3}{5},\frac{3}{5}\right)$ (3) $\left(\frac{3}{5},-\frac{3}{5}\right)$ (4) (3,−3)

Sol. **1**



equation of CD
y + 5 = -1 (x - 5)
x + y = 0 .....(1)
equation of AE
y - 7 = 2 (x + 1)
2x - y = -9 ....(2)
from (1) & (2)
x = -3, y = 3
Othocentre = (-3, 3)

Q.8. Let e_1 and e_2 be the eccentricities of the ellipse, $\frac{x^2}{25}+\frac{y^2}{b^2}=1$ (b<5) and the hyperbola, $\frac{x^2}{16}-\frac{y^2}{b^2}=1$ respectively satisfying $e_1e_2=1$. If α and β are the distances between the foci of the ellipse and the foci of the hyperbola respectively, then the ordered pair (α,β) is equal to:

(1) (8,12) (2) $\left(\frac{24}{5},10\right)$ (3) $\left(\frac{20}{3},12\right)$ (4) (8,10)

Sol. **4**

$\alpha = 10e_1$
$\beta = 8e_2$

$b^2 = 25\left(1-e_1^2\right)$
$b^2 = 16\left(e_2^2-1\right)$

$(e_1e_2)^2 = 1$

$$\left(1-\frac{b^2}{25}\right)\left(1+\frac{b^2}{16}\right)=1$$

$$\Rightarrow 1 + \frac{b^2}{25} - \frac{b^2}{25} - \frac{b^4}{400} = 1$$

$$\Rightarrow \frac{9}{16.25} b^2 = \frac{b^4}{400} \Rightarrow b^2 = 9$$

$$\left.\begin{matrix} e_1 = \frac{4}{5} \\ e_2 = \frac{5}{4} \end{matrix}\right] = \left.\begin{matrix} \alpha = 2ae_1 = 10 \times \frac{4}{5} = 8 \\ \beta = 2ae_2 = 8 \times \frac{5}{4} = 10 \end{matrix}\right] = (\alpha, \beta) = (8, 10)$$

Q.9 If z_1, z_2 are complex numbers such that $Re(z_1)=|z_1-1|$, $Re(z_2)=|z_2-1|$ and $\arg(z_1-z_2)=\frac{\pi}{6}$, then $Im(z_1+z_2)$ is equal to:

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

Sol. **1**

$z_1 = x_1 + iy_1$, $z_2 = z_2 + iy_2$

$x_1^2 = (x_1 - 1)^2 + y_1^2$ .....(1)

$\Rightarrow y_1^2 - 2x_1 + 1 = 0$

$x_2^2 = (x_2 - 1)^2 + y_2^2$

$y_2^2 - 2x_2 - 1 = 0$ ....(2)

from equation (1) – (2)

$(y_1^2 - y_2^2) + 2(x_2 - x_1) = 0$

$(y_1 + y_2)(y_1 - y_2) = 2(x_1 - x_2)$

$$y_1 + y_2 = 2\left(\frac{x_1 - x_2}{y_1 - y_2}\right)$$

$$\arg(z_1 - z_2) = \frac{\pi}{6}$$

$$\tan^{-1}\left(\frac{y_1 - y_2}{x_1 - x_2}\right) = \frac{\pi}{6}$$

$$\Rightarrow \frac{y_1 - y_2}{x_1 - x_2} = \frac{1}{\sqrt{3}}$$

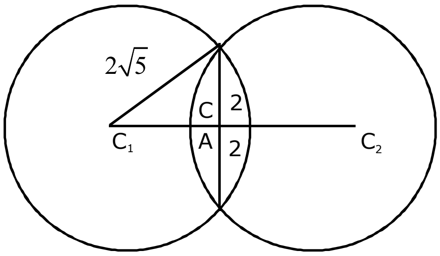
$$\therefore y_1 + y_2 = 2\sqrt{3}$$

Q.10 The set of all real values of λ for which the quadratic equations, $(\lambda^2+1)x^2-4\lambda x+2=0$ always have exactly one root in the interval (0,1) is:
(1) (–3,–1) (2) (2,4) (3) (1,3] (4) (0,2)

Sol. **3**
$f(0)\ f(1) \le 0$
$\Rightarrow (2)\ [\lambda^2 - 4\lambda + 3] \le 0$
$(\lambda - 1)(\lambda - 3) \le 0$
$\Rightarrow \lambda \in [1, 3]$
at $\lambda = 1$
$2x^2 - 4x + 2 = 0$
$\Rightarrow (x - 1)^2 = 0$
$x = 1, 1$
$\therefore \lambda \in (1, 3]$

Q.11 Let the latus ractum of the parabola $y^2=4x$ be the common chord to the circles C_1 and C_2 each of them having radius $2\sqrt{5}$. Then, the distance between the centres of the circles C_1 and C_2 is:
(1) 8 (2) $8\sqrt{5}$ (3) $4\sqrt{5}$ (4) 12

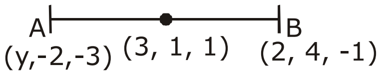
Sol. **1**



$C_1C_2 = 2C_1A$
$(C_1A)^2 + 4 = (2\sqrt{5})^2$
$C_1A = 4$
$C_1C_2 = 8$

Q.12 The plane which bisects the line joining the points (4,–2,3) and (2,4,–1) at right angles also passes through the point:
(1) (0,–1,1) (2) (4,0,1) (3) (4,0,–1) (4) (0,1,–1)

Sol. **3**



a = 2, b = -6
c = 4
equation of plane
$2(x - 3) + (-6)(y - 1) + 4(z - 1) = 0$

$\Rightarrow$ 2x - 6y + 4z = 4
passes through (4, 0, -1)

Q.13 $\lim\limits_{x\to a}\dfrac{(a+2x)^{\frac{1}{3}}-(3x)^{\frac{1}{3}}}{(3a+x)^{\frac{1}{3}}-(4x)^{\frac{1}{3}}}(a\neq 0)$ is equal to :

(1) $\left(\frac{2}{9}\right)^{\frac{4}{3}}$ (2) $\left(\frac{2}{3}\right)^{\frac{4}{3}}$ (3) $\left(\frac{2}{3}\right)\left(\frac{2}{9}\right)^{\frac{1}{3}}$ (4) $\left(\frac{2}{9}\right)\left(\frac{2}{3}\right)^{\frac{1}{3}}$

Sol. **3**
Apply L-H Rule

$$\lim_{x\to a}\frac{\frac{2}{3}(a+2x)^{\frac{-2}{3}}-3^{\frac{1}{3}}.\frac{1}{3}x^{-\frac{2}{3}}}{\frac{1}{3}(3a+x)^{\frac{-2}{3}}-4^{\frac{1}{3}}.\frac{1}{3}x^{-\frac{2}{3}}}$$

$$\Rightarrow\frac{\frac{2}{3}(3a)^{\frac{-2}{3}}-\frac{1}{3^{\frac{2}{3}}}.\left(a^{-\frac{2}{3}}\right)}{\frac{1}{3}(4a)^{\frac{-2}{3}}-\frac{1}{3}.4^{\frac{1}{3}}\left(a^{-\frac{2}{3}}\right)}$$

$$=\frac{2}{3}.\left(\frac{2}{9}\right)^{\frac{1}{3}}$$

Q.14 Let $x_i(1\le i\le 10)$ be ten observations of a random variable X. If $\sum\limits_{i=1}^{10}(x_i-p)=3$ and $\sum\limits_{i=1}^{10}(x_i-p)^2=9$ where $0\neq p\in R$, then the standard deviation of these observations is :

(1) $\frac{7}{10}$ (2) $\frac{9}{10}$ (3) $\sqrt{\frac{3}{5}}$ (4) $\frac{4}{5}$

Sol. **2**
Standard deviation
is free from shifting
of origin

S . D = $\sqrt{\text{variance}}$

$$= \sqrt{\frac{9}{10} - \left(\frac{3}{10}\right)^2}$$

$$= \sqrt{\frac{9}{10} - \frac{9}{100}}$$

$$= \sqrt{\frac{81}{100}} = \frac{9}{10}$$

Q.15 The probability that a randomly chosen 5–digit number is made from exactly two digits is :

(1) $\frac{134}{10^4}$ (2) $\frac{121}{10^4}$ (3) $\frac{135}{10^4}$ (4) $\frac{150}{10^4}$

Sol. **3**

Total case = $9(10^4)$

fav. case = ${}^9C_2\,(2^5 - 2) + {}^9C_1\,(2^4 - 1)$

= 1080 + 135 = 1215

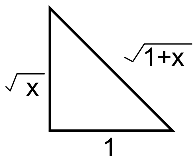
Prob = $\frac{1215}{9 \times 10^4} = \frac{135}{10^4}$

Q.16 If $\int \sin^{-1}\left(\sqrt{\frac{x}{1+x}}\right)dx = A(x)\tan^{-1}\left(\sqrt{x}\right) + B(x) + C$, where C is a constant of integration, then the ordered pair (A(x),B(x)) can be:

(1) $\left(x+1, -\sqrt{x}\right)$ (2) $\left(x-1, -\sqrt{x}\right)$ (3) $\left(x+1, \sqrt{x}\right)$ (4) $\left(x-1, \sqrt{x}\right)$

Sol. **1**

$$\int \sin^{-1}\sqrt{\frac{x}{1+x}}\,dx$$



$$\int \underset{\text{I}}{\tan^{-1}\sqrt{x}}\,.\,\underset{\text{II}}{1}\,dx$$

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

put $x = t^2 \Rightarrow dx = 2t\,dt$

$= x\tan^{-1}\sqrt{x} - \int \frac{(t^2)(2tdt)}{(1+t^2)(2t)}$

$= x\tan^{-1}\sqrt{x} - t + \tan^{-1} t + c$

$= x\tan^{-1}\sqrt{x} - \sqrt{x} + \tan^{-1}\sqrt{x} + c$

$A(x) = x + 1,\ B(x) = -\sqrt{x}$

Q.17 If the sum of the series $20+19\frac{3}{5}+19\frac{1}{5}+18\frac{4}{5}+\ldots$ upto n^{th} term is 488 and the n^{th} term is negative, then:

(1) n=60 (2) n=41 (3) n^{th} term is –4 (4) n^{th} term is $-4\frac{2}{5}$

Sol. **3**

$20+\frac{98}{5}+\frac{96}{5}+\ldots\ldots$

$S_n = 488$

$\Rightarrow \frac{n}{2}\left[2\times 20+(n-1)\left(\frac{-2}{5}\right)\right] = 488$

$\Rightarrow 20n - \frac{n^2}{5} + \frac{n}{5} = 488$

$\Rightarrow 100n - n^2 + n = 2440$

$= n^2 - 101n + 2440 = 0$

$\Rightarrow n = 61 \text{ or } 40$

for $n = 40$, $T_n = 20 + 39\left(\frac{-2}{5}\right) = +ve$

$n = 61$, $T_n = 20 + 60\left(\frac{-2}{5}\right) = 20 - 24 = -4$

Q.18 Let p, q, r be three statements such that the truth value of $(p \wedge q) \rightarrow (\sim p \vee r)$ is F. Then the truth values of p, q, r are respectively :

(1) F, T, F (2) T, F, T (3) T, T, F (4) T, T, T

Sol. **3**

$(p \wedge q) \rightarrow (\sim q \vee r)$

Possible when

$p \wedge q \rightarrow T$

$\sim q \vee r \rightarrow F$

$$\left.\begin{array}{l} p \rightarrow T \\ q \rightarrow T \\ r \rightarrow F \end{array}\right] \qquad \begin{array}{l} p \wedge q \Rightarrow T \\ \sim q \vee r \rightarrow F \vee F \Rightarrow F \\ T \rightarrow F \Rightarrow F \end{array}$$

Q.19 If the surface area of a cube is increasing at a rate of 3.6 cm^2/sec, retaining its shape; then the rate of change of its volume (in cm^3/sec), when the lenght of a side of the cube is 10cm, is :

(1) 9 (2) 10 (3) 18 (4) 20

Sol. **1**

$A = 6a^2$

$a \rightarrow$ side of cube

$$\frac{dA}{dt} = 6\left(2a\frac{da}{dt}\right) \Rightarrow 3.6 = 12 \times 10\frac{da}{dt} \Rightarrow \frac{da}{dt} = \frac{3}{100}$$

$v = a^3$

$$\frac{dV}{dt} = 3a^2\frac{da}{dt}$$

$$= 3 \times 100 \times \frac{3}{100}$$

$= 9cm^3$ / sec

Q.20 Let R_1 and R_2 be two relations defined as follows:

$R_1 = \{(a,b) \in R^2 : a^2 + b^2 \in Q\}$ and

$R_2 = \{(a,b) \in R^2 : a^2 + b^2 \notin Q\}$, where Q is the set of all rational numbers. Then :

(1) R_1 is transitive but R_2 is not transitive

(2) R_1 and R_2 are both transitive

(3) R_2 is transitive but R_1 is not transitive

(4) Neither R_1 nor R_2 is transitive

Sol. **4**

for R_1

Let $a = 1 + \sqrt{2}$, $b = 1 - \sqrt{2}$, $c = 8^{\frac{1}{4}}$

aR_1b $a^2 + b^2 = (1 + \sqrt{2})^2 + (1 - \sqrt{2})^2 = 6 \in Q$

bR_1c $b^2 + c^2 = (1 - \sqrt{2})^2 + \left(8^{\frac{1}{4}}\right)^2 = 3 \in Q$

$aR_1c \Rightarrow a^2+c^2 = \left(1+\sqrt{2}\right)+\left(8^{1/4}\right)^2 = 3+4\sqrt{2} \notin Q$

R_1 is not transitive

R_2

let $a = 1 + \sqrt{2}$, $b = \sqrt{2}$, $c = 1- \sqrt{2}$

aR_2b $a^2 + b^2 = 5 + 2\sqrt{2} \notin Q$

bR_2c $b^2 + c^2 = 5 - 2\sqrt{2} \notin Q$

aR_2c $a^2 + c^2 = 6 \in Q$

R_2 is not transitive

Q.21 If m arithmetic means (A.Ms) and three geometric means (G.Ms) are inserted between 3 and 243 such that 4^{th} A.M. is equal to 2^{nd} G.M., then m is equal to____

Sol. **39**

3, ..., 243
m A.M.

$d = \frac{b-a}{n+1} = \frac{243-3}{m+1} = \frac{240}{m+1}$

4^{tn} A.M = 3 + 4d = $3+4\left(\frac{240}{m+1}\right)$

$3+\frac{960}{m+1} = 27$

$= \frac{960}{m+1} = 24$

$\Rightarrow$ m = 39

3,............,243
3 G.M

$243 = 3(r)^4$

r = 3

2^{nd} G.M. = ar^2 = 27

Q.22 Let a plane P contain two lines $\vec{r}=\hat{i}+\lambda\left(\hat{i}+\hat{j}\right),\lambda\in R$ and $\vec{r}=-\hat{j}+\mu\left(\hat{j}-\hat{k}\right),\mu\in R$. If $Q(\alpha,\beta,\gamma)$ is the foot of the perpendicular drawn from the point M(1,0,1) to P,then $3(\alpha+\beta+\gamma)$ equals _____

Sol. **5**

$$\left.\begin{aligned}\vec{r} &= \hat{i}+\lambda\left(\hat{i}+\hat{j}\right)\\ \vec{r} &= -\hat{j}+\mu\left(\hat{j}-\hat{k}\right)\end{aligned}\right]$$

$$\vec{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 0 \\ 0 & 1 & -1 \end{vmatrix}$$

= (-1, 1 ,1)
equation of plane
-1(x - 1) + 1(y - 0) + 1(z - 0) = 0
$\Rightarrow$ x - y - z - 1 = 0
foot of $\perp^r$ from m(1, 0, 1)

$$\frac{x-1}{1} = \frac{y-0}{-1} = \frac{z-1}{-1} = -\frac{(1-0-1-1)}{3}$$

$$x-1=\frac{1}{3} \quad \left|\frac{y}{-1}=\frac{1}{3}\right| \quad =\frac{z-1}{-1}=\frac{1}{3}$$

$$x = \frac{4}{2}, y = \frac{-1}{3}, z = \frac{2}{3}$$

$$\Rightarrow \left.\begin{array}{l} \alpha = \frac{4}{3} \\ \beta = \frac{-1}{3} \\ \gamma = \frac{2}{3} \end{array}\right]$$

$$\alpha+\beta+\gamma = \frac{4}{3} - \frac{1}{3} + \frac{2}{3} = \frac{5}{3}$$

$3(\alpha+\beta+\gamma) = 5$

Q.23 Let S be the set of all integer solutions, (x, y, z), of the system of equations
x – 2y + 5z = 0
–2x + 4y + z = 0
–7x + 14y + 9z = 0
such that $15 \le x^2 + y^2 + z^2 \le 150$. Then, the number of elements in the set S is equal to ____

Sol. **8**
x - 2y + 5z = 0 .....(1)
-2x + 4y + z = 0 ....(2)
-7x + 14y + 9z = 0 .....(3)
2.(1) + (2) we get z = 0, x = 2y

$15 \le 4y^2 + y^2 \le 150$
$\Rightarrow 3 \le y^2 \le 30$
$y \in \left[-\sqrt{30}, -\sqrt{3}\right] \cup \left[\sqrt{3}, \sqrt{30}\right]$
$y = \pm 2, \pm 3, \pm 4, \pm 5$
no. of integer's in S is 8

Q.24 The total number of 3–digit numbers, whose sum of digits is 10, is ____
Sol. **54**
Let xyz be 3 digit number
$x + y + z = 0$ where $x \ge 1,\ y \ge 0, z \ge 0$

$\left.\begin{matrix} x - 1 \ge 0 \\ t \ge 0 \end{matrix}\right] x - 1 = t$

$\Rightarrow t + y + z = 9$

${}^{9+3-1}C_{3-1} = {}^{11}c_2 = 55$
but for t = 9, x = 10 not possible
total numbers = 55 - 1 = 54

Q.25 If the tangent to the curve, $y=e^x$ at a point (c,e^C) and the normal to the parabola, $y^2=4x$ at the point (1,2) intersect at the same point on the x-axis, then the value of c is ____
Sol. **4**
Tangent at (c, e^c) $y - e^c = e^c (x - c)$ ....(1)
normal to parabola $y - 2 = -1 (x - 1)$
$x + y = 3$ ...(2)
at x-axis y = 0 at x-axis y = 0
in (1), x = c - 1 in (2), x = 3
$c - 1 = 3 \Rightarrow c = 4$

Admission
OPEN

जब इन्होंने पूरा किया अपना सपना
तो आप भी पा सकते है लक्ष्य अपना

JEE MAIN RESULT 2019

Nitin Gupta
Marks **335** 13th (2019) | Marks **149** 12th (2018)

Shiv Modi
Marks **318** 13th (2019) | Marks **153** 12th (2018)

Ritik Bansal
Marks **308** 13th (2019) | Marks **218** 12th (2018)

Shubham Kumar
Marks **300** 13th (2019) | Marks **153** 12th (2018)

KOTA'S PIONEER IN DIGITAL EDUCATION

1,95,00,000+ viewers | **72,67,900+** viewing hours | **2,11,000+** Subscribers

SERVICES	SILVER	GOLD	PLATINUM
Classroom Lectures (VOD)			
Live interaction	NA		
Doubt Support	NA		
Academic & Technical Support	NA		
Complete access to all content	NA		
Classroom Study Material	NA		
Exercise Sheets	NA		
Recorded Video Solutions	NA		
Online Test Series	NA		
Revision Material	NA		
Upgrade to Regular Classroom program	**Chargeable**	**Chargeable**	**Free**
Physical Classroom	NA	NA	
Computer Based Test	NA	NA	
Student Performance Report	NA	NA	
Workshop & Camp	NA	NA	
Motion Solution Lab- Supervised learning and instant doubt clearance	NA	NA	
Personalised guidance and mentoring	NA	NA	

FEE STRUCTURE

CLASS	SILVER	GOLD	PLATINUM
7th/8th	FREE	₹ 12,000	₹ 35,000
9th/10th	FREE	₹ 15,000	₹ 40,000
11th	FREE	₹ 29,999	₹ 49,999
12th	FREE	₹ 39,999	₹ 54,999
12th Pass	FREE	₹ 39,999	₹ 59,999

+ Student Kit will be provided at extra cost to Platinum Student.

* **SILVER (Trial)** Only valid 7 DAYS or First 10 Hour's Lectures.

** **GOLD (Online)** can be converted to regular classroom (Any MOTION Center) by paying difference amount after lockdown.

*** **PLATINUM (Online + Regular)** can be converted to regular classroom (Any MOTION Center) without any cost after lockdown.

New Batch Starting from :
16 & 23 September 2020

Zero Cost EMI Available

MOTION™

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