MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON WEDNESDAY 21st JANUARY 2026) **TIME : 3:00 PM TO 6:00 PM**

MATHEMATICS — TEST PAPER WITH SOLUTION

1. The largest $n \in N$ for which 7^n divides 101! is :

(1) 15 (2) 16

(3) 17 (4) 18

Ans. **(2)**

Sol. $101! = 2^{\alpha}3^{\beta}5^{\gamma}7^{\delta}$

$$\text{Exp }(7) = \left[\frac{101}{7}\right] + \left[\frac{101}{7^2}\right] = 16$$

2. Let $f(x) = x^3 + x^2f'(1) + 2xf''(2) + f''(3)$, then the value of $f'(5) =$

(1) $\frac{117}{5}$ (2) 1

(3) –27 (4) $\frac{-117}{5}$

Ans. **(1)**

Sol. $f'(x) = 3x^2 + 2xf'(1) + 2f''(2)$

$f''(x) = 6x + 2f'(1)$

$f''(2) = 12 + 2f'(1)$

$\therefore f'(x) = 3x^2 + 2xf'(1) + 2(12 + 2f'(1))$

$f'(x) = 3x^2 + 2(x + 2)f'(1) + 24$

Putting, $x = 1$

$f'(1) = 3 + 6f'(1) + 24$

$-5f'(1) = 27 \Rightarrow f'(1) = \frac{-27}{5}$

$$\therefore f''(2) = 12 + 2\left(\frac{-27}{5}\right) = 12 - \frac{54}{5} = \frac{6}{5}$$

$$\therefore f'(x) = 3x^2 - \frac{54}{5}x + \frac{12}{5}$$

$$\therefore f'(5) = 75 - 54 + \frac{12}{5} = \frac{117}{5}$$

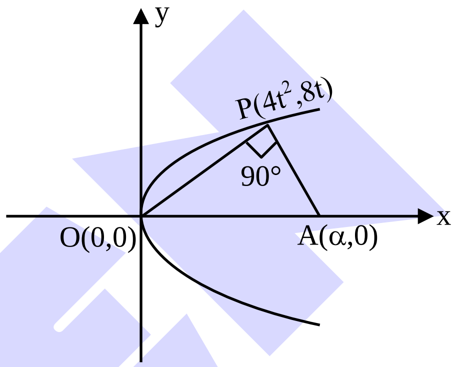
3. Let O be the vertex of the parabola $y^2 = 16x$. The locus of centroid of ΔOPA. When P lies on parabola and A lies on x-axis and $\angle OPA = 90°$, is

(1) $y^2 = 8(3x - 16)$ (2) $9y^2 = 8(3x - 16)$

(3) $y^2 = 8(3x + 16)$ (4) $9y^2 = 8(3x + 16)$

Ans. **(2)**

Sol.



Let centroid G(h, k)

$3h = \alpha + 4t^2$ …(1)

$3k = 8t$ …(2)

$m_{OP} \times m_{PA} = -1$

$$\Rightarrow \frac{8t}{4t^2} \times \frac{8t}{4t^2 - \alpha} = -1$$

$\Rightarrow 16 = \alpha - 4t^2$ …(3)

(1) + (3)

$\Rightarrow 3h + 16 = 2\alpha$

$$\Rightarrow \alpha = \frac{3h + 16}{2} \quad \text{…(4)}$$

Putting α from (4) & t from (2) in (3)

$$\Rightarrow 16 = \frac{3h+16}{2} - 4 \times \frac{9k^2}{64}$$

$$\Rightarrow 16 = \frac{3h+16}{2} - \frac{9k^2}{16}$$

$256 = 24h + 128 - 9k^2$

$\Rightarrow 9k^2 = 24h - 128$

$9y^2 = 24x - 128$

$9y^2 = 8(3x - 16)$

4. $a_1, \frac{a_2}{2}, \frac{a_3}{2^2}, \ldots, \frac{a_{10}}{2^9}$ are in G.P. with common ratio $\frac{1}{\sqrt{2}}$ and $a_1 + a_2 + \ldots + a_{10} = 62$, then $a_1 =$

(1) $2\left(\sqrt{2}-1\right)$ (2) $2\left(\sqrt{2}+1\right)$

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

Ans. (1)

Sol. $\frac{a_2}{2a_1} = \frac{a_3}{2a_2} = \frac{a_4}{2a_3} = \ldots = \frac{a_{10}}{2a_9} = \frac{1}{\sqrt{2}}$

$\therefore$ $a_1, a_2, a_3, \ldots, a_{10}$ are in G.P. with common ratio $\sqrt{2}$

$$\therefore \sum_{i=1}^{10} a_i = \frac{a_1((\sqrt{2})^{10}-1)}{\sqrt{2}-1} = 62$$

$$\Rightarrow a_1 = 2(\sqrt{2}-1)$$

5. If $4\int_0^1 \cot^{-1}(1-2x+4x^2)\,dx = a\tan^{-1}2 + b\ell n5$, then $(a + b)$ is equal to

(1) 6 (2) 8

(3) 3 (4) 5

Ans. (3)

Sol. Let $I = \int_0^1 \cot^{-1}(1-2x+4x^2)\,dx$

$$I = \int_0^1 \left(\cot^{-1}(2x-1) - \cot^{-1}(2x)\right)dx \quad \ldots(1)$$

Applying king

$$I = \int_0^1 \left(-\cot^{-1}(2x-1) + \cot^{-1}(2x-2)\right)dx \quad \ldots(2)$$

From (1) & (2)

$$2I = \int_0^1 \left(\cot^{-1}(2x-2) - \cot^{-1}(2x)\right)dx$$

$$= \int_0^1 \cot^{-1}(2x-2)\,dx - \int_0^1 \cot^{-1}(2x)\,dx$$

Applying King

$$= \int_0^1 \cot^{-1}(-2x)\,dx - \int_0^1 \cot^{-1}(2x)\,dx$$

$$= \int_0^1 (\pi - \cot^{-1}(2x))\,dx - \int_0^1 \cot^{-1}(2x)\,dx$$

$$= \int_0^1 (\pi - 2\cot^{-1}(2x))\,dx$$

$$= \pi - 2\int_0^1 (\cot^{-1}2x).1\,dx$$

By parts

$$= \pi - 2\left[\left(x\cot^{-1}2x\right)_0^1 + \int_0^1 \frac{2x}{1+4x^2}\,dx\right]$$

Let $1 + 4x^2 = t$

$8x\,dx = dt$

$$= \pi - 2\left[\cot^{-1}2 + \frac{1}{4}\int_1^5 \frac{dt}{t}\right]$$

$$= \pi - 2\cot^{-1}2 - \frac{1}{2}\ell n5$$

$$2I = 2\tan^{-1}2 - \frac{1}{2}\ell n5$$

$$\Rightarrow 4I = 4\tan^{-1}2 - \ell n5$$

$$= a\tan^{-1}2 + b\ell n5$$

$$\Rightarrow a + b = 4 - 1 = 3$$

6. Let α and β be the roots of an equation

$x^2 + 2ax + (3a + 10) = 0$ such that $\alpha < 1 < \beta$.

Then the set of all possible values of α is

(1) $\left(-\infty, \frac{-11}{5}\right) \cup (5, \infty)$ (2) $(-\infty, -3)$

(3) $(-\infty, -8) \cup (5, \infty)$ (4) $\left(-\infty, \frac{-11}{5}\right)$

Ans. **(4)**

Sol. $\because \alpha < 1 < \beta$

$f(1) < 0$

$\Rightarrow 1 + 2a + (3a + 10) < 0$

$\Rightarrow 5a + 11 < 0$

$a < \frac{-11}{5}$

$\therefore\ a \in \left(-\infty, \frac{-11}{5}\right)$

7. Given $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ & $B = \begin{bmatrix} -29 & 49 \\ -13 & 18 \end{bmatrix}$

such that $(A^{15} + B)\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$, then value of (x, y) satisfying above equation

(1) $x = 11, y = 1$ (2) $x = -1, y = 2$

(3) $x = 1, y = 5$ (4) $x = 11, y = 2$

Ans. **(4)**

Sol. Here $A^n = \begin{bmatrix} 2n+1 & -4n \\ n & -2n+1 \end{bmatrix}$

$\Rightarrow A^{15} = \begin{bmatrix} 31 & -60 \\ 15 & -29 \end{bmatrix}$

$\Rightarrow A^{15} + B = \begin{bmatrix} 2 & -11 \\ 2 & -11 \end{bmatrix}$

Now $(A^{15} + B)\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 2 & -11 \\ 2 & -11 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$\Rightarrow 2x - 11y = 0$

$\Rightarrow$ option (D) satisfies the equation

8. The number of solutions of equation tan3x = cotx in $x \in (0, 2\pi)$ is

(1) 4 (2) 6

(3) 2 (4) 8

Ans. **(4)**

Sol. tan3x = cotx

$\tan 3x = \tan\left(\frac{\pi}{2} - x\right)$

$3x = n\pi + \frac{\pi}{2} - x$

$4x = (2n+1)\frac{\pi}{2}$

$x = (2n+1)\frac{\pi}{8} \quad n \in I$

In $x \in (0, 2\pi)$

$x = \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$

$\therefore$ Number of solutions are 8

$\Rightarrow$ option(4) is correct

9. Let the line L pass through the point (–3,5,2) and make equal angle with the positive coordinate axes. If distance of L from the point (–2,r,1) is $\sqrt{\frac{14}{3}}$, then sum of all possible values of r is

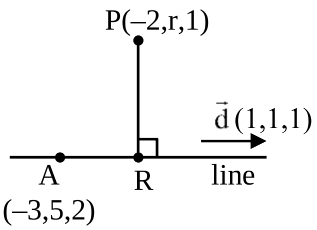
(1) 4 (2) 10

(3) 21 (4) 2

Ans. **(2)**

Sol. Equation line is : $\dfrac{x+3}{1}=\dfrac{y-5}{1}=\dfrac{z-2}{1}=\lambda$

$\therefore$ General point R on line is R(λ–3, λ+5, λ+2)



$\overrightarrow{PR} \equiv (\lambda-1, \lambda+5-r, \lambda+1)$

Now $\overrightarrow{PR}\cdot\vec{d}=0$

$\Rightarrow (\lambda-1)1+(\lambda+5-r)1+(\lambda+1)1=0$

$\Rightarrow 3\lambda-r+5=0$

$\Rightarrow \lambda=\dfrac{r-5}{3}$

$\therefore\ R\equiv\left(\dfrac{r-5}{3}-3, \dfrac{r-5}{3}+5, \dfrac{r-5}{3}+2\right)$

$R\equiv\left(\dfrac{r-14}{3}, \dfrac{r+10}{3}, \dfrac{r+1}{3}\right)$

Now

$PR=\sqrt{\dfrac{14}{3}} \Rightarrow (PR)^2=\dfrac{14}{3}$

$\Rightarrow\left(\dfrac{r-14}{3}+2\right)^2+\left(\dfrac{r+10}{3}-r\right)^2+\left(\dfrac{r+1}{3}-1\right)^2=\dfrac{14}{3}$

$\Rightarrow \dfrac{(r-8)^2}{9}+\dfrac{(10-2r)^2}{9}+\dfrac{(r-2)^2}{9}=\dfrac{14}{3}$

$\Rightarrow (r^2-16r+64)+(100+4r^2-40r)+(r^2-4r+4)=42$

$\Rightarrow 6r^2-60r+126=0$

$\Rightarrow r^2-10r+21=0$

$\Rightarrow r=3, 7$

sum of possible value of r is = 10

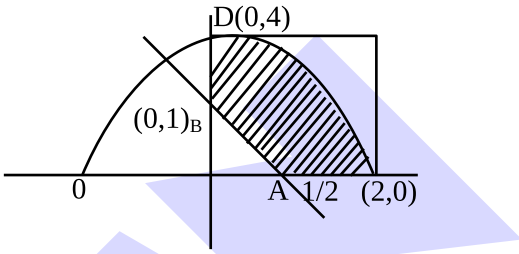
10. If area bounded by curve $1-2x\le y\le 4-x^2$ & $x, y\ge 0$ is equal to $\dfrac{\alpha}{\beta}$ where G.C.D (α, β) = 1. Find α + β.

(1) 73 (2) 69

(3) 70 (4) 54

Ans. (1)

Sol.



Required area $=\dfrac{2}{3}\times8-\dfrac{1}{2}\times\dfrac{1}{2}\times1$

$=\dfrac{16}{3}-\dfrac{1}{4}=\dfrac{61}{12}=\dfrac{\alpha}{\beta}$

$\Rightarrow \alpha+\beta=73$

11. Lines L_1 & L_2 are

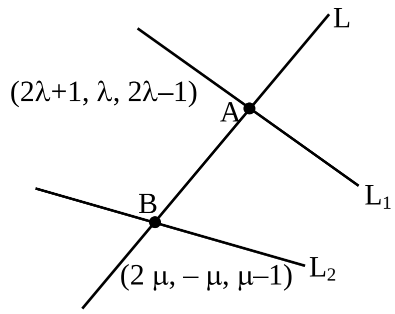
$\dfrac{x-1}{2}=\dfrac{y}{1}=\dfrac{z+1}{2}$ & $\dfrac{x}{2}=\dfrac{y}{-1}=\dfrac{z+1}{1}$ respectively, if a line L with direction ratios (1, 1, 1) intersects L_1 & L_2 at A & B respectively, then Find $(AB)^2$:

(1) 27 (2) 26

(3) 18 (4) 9

Ans. (1)

Sol.



D.R. of AB is (2λ –2μ +1, λ + μ, 2λ –μ)

D.R of L is given as (1, 1, 1)

$\therefore$

$$2\lambda - 2\mu + 1 = \lambda + \mu = 2\lambda - \mu$$

$$\boxed{\lambda - 3\mu + 1 = 0} \qquad \boxed{\lambda - 2\mu = 0}$$

$$\boxed{\lambda - 2\mu}$$

$$\boxed{\mu = 1}$$

$$\boxed{\lambda = 2}$$

$\therefore$ A(5, 2, 3)

B (2, –1, 0)

$\therefore$ $AB^2 = 9 + 9 + 9 = 27$

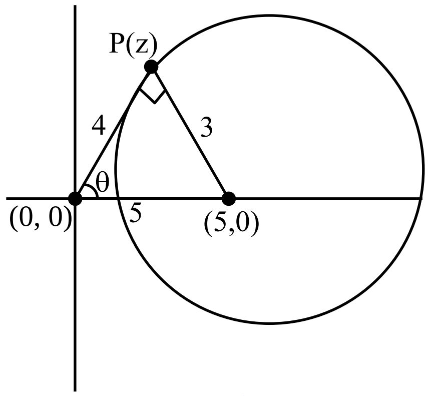
12. Let z_0 be the complex number satisfying $|z - 5| \le 3$ and having maximum positive argument, then $34\left|\dfrac{5z_0 - 12}{5iz_0 + 16}\right|^2$ is equal to

(1) 16 (2) 26

(3) 12 (4) 20

Ans. **(4)**

Sol.



$|z - 5| \le 3$

For arg(z) to be maximum, z lies at P.

$z \equiv (4\cos\theta, 4\sin\theta)$

$$\equiv \left(4\cdot\left(\frac{4}{5}\right), 4\left(\frac{3}{5}\right)\right) = \left(\frac{16}{5}, \frac{12}{5}\right) = \frac{16}{5} + \frac{12i}{5}$$

$$\text{Now, } 34\left|\frac{5z_0 - 12}{5iz_0 + 16}\right|^2 = 34\left|\frac{(16+12i) - 12}{(16i - 12) + 16}\right|^2$$

$$= 34\left|\frac{4 + 12i}{16i + 4}\right|^2$$

$$= 34\left(\frac{16 + 144}{256 + 16}\right) = 34\left(\frac{160}{272}\right) = 20$$

13. Let $f(x)=\lim\limits_{n\to\infty}\left(\frac{1}{n^3}\sum\limits_{k=1}^{n}\left[\frac{k^2}{3^x}\right]\right)$ (where $[\cdot]$ represents greatest integer function) then $12\sum\limits_{j=1}^{\infty}f(j)$ is equal to.

(1) 1 (2) 2

(3) 3 (4) 4

Ans. (2)

Sol. $\sum\limits_{k=1}^{n}\left(\frac{k^2}{3^x}-1\right)<\sum\limits_{k=1}^{n}\left[\frac{k^2}{3^x}\right]\le\sum\limits_{k=1}^{n}\frac{k^2}{3^x}$

$$\frac{n(n+1)(2n+1)}{6.3^x}<\sum_{k=1}^{n}\left[\frac{k^2}{3^x}\right]\le\frac{n(n+1)(2n+1)}{6.3^x}$$

$$\lim_{n\to\infty}\frac{n(n+1)(2n+1)}{6n^3.3^x}<\lim_{n\to\infty}\frac{1}{n^3}\sum_{k=1}^{n}\left[\frac{k^2}{3^x}\right]\le\lim_{n\to\infty}\frac{n(n+1)(2n+1)}{6.3^x.n^3}$$

$$\frac{1}{3^{x+1}}<\lim_{n\to\infty}\frac{1}{n^3}\sum_{k=1}^{n}\left[\frac{k^2}{3^x}\right]\le\frac{1}{3^{x+1}}$$

$$\Rightarrow f(x)=\frac{1}{3^{x+1}}$$

$$\Rightarrow 12\sum_{j=1}^{\infty}f(j)=12\sum_{j=1}^{\infty}\frac{1}{3^{j+1}}=12\left[\frac{1}{9}+\frac{1}{27}+---\infty\right]$$

$$=12.\frac{\frac{1}{9}}{1-\frac{1}{3}}=12\cdot\frac{\frac{1}{9}}{\frac{2}{3}}=2$$

14. If probability distribution is given by

x	0	1	2	3
P(x)	$\frac{8a-1}{30}$	$\frac{4a-1}{30}$	$\frac{2a+1}{30}$	b

If $\sigma^2+\mu^2=2$ where σ is standard deviation and μ is means of distribution then $\frac{a}{b}$ is

(1) $\frac{1000}{71}$ (2) $\frac{1110}{71}$

(3) $\frac{990}{71}$ (4) $\frac{994}{71}$

Ans. (2)

Sol. $\sigma^2=\sum xi^2P(x_i)-\mu^2$

$$\sigma^2+\mu^2=\sum xi^2P(x_i)$$

$$\Rightarrow 1\left(\frac{4a-1}{30}\right)+4\left(\frac{2a+1}{30}\right)+ab=2$$

$4a + 8a + 3 + 30 + ab = 60$

$12a + 30 \times a \times b = 57$

$4a + 90\, b = 19$

$$\sum P(i)=\frac{8a-1}{3}+\frac{4a-1}{30}+\frac{2a+1}{30}+b=1$$

$14a + 30b = 31$

$$a=\frac{37}{19},\quad b=\frac{213}{19\times 90}$$

$$\Rightarrow \frac{a}{b}=\frac{1110}{71}$$

15. If the line $\alpha x + 4y - \sqrt{7}=0$, $\alpha\in R$ touches the ellipse $3x^2 + 4y^2 = 1$ at the point P in the first quadrant then one of the focal distance of P is

(1) $\frac{1}{\sqrt{3}}-\frac{1}{2\sqrt{11}}$ (2) $\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{5}}$

(3) $\frac{1}{\sqrt{3}}-\frac{1}{2\sqrt{5}}$ (4) $\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{7}}$

Ans. **(4)**

Sol. $\alpha x + 4y - \sqrt{7}=0$ touches $3x^2 + 4y^2 = 1$

$\therefore c^2 = a^2m^2 + b^2$

$$\frac{7}{16}=\frac{1}{3}\times\frac{\alpha^2}{16}+\frac{1}{4}\Rightarrow \alpha = 3, -3$$

Tangent is $3x + 4y - \sqrt{7}=0$

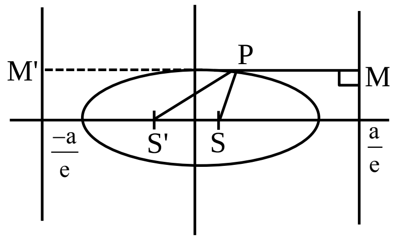
Let the point of contact is $P(x_1y_1)$

$\therefore$ Tangent is $3xx_1 + 4yy_1 = 1$

$$\therefore\ \frac{3x_1}{3}=\frac{4y_1}{4}=\frac{1}{\sqrt{7}}$$

$\therefore P\left(\frac{1}{\sqrt{7}},\frac{1}{\sqrt{7}}\right)$

ecc. $=\sqrt{1-\frac{3}{4}}=\frac{1}{2}$



PS = e (PM)

$=e\left(\frac{a}{e}-\frac{1}{\sqrt{7}}\right)$

$=\frac{1}{2}\left(\frac{2}{\sqrt{3}}-\frac{1}{\sqrt{7}}\right)=\frac{1}{\sqrt{3}}-\frac{1}{2\sqrt{7}}$

$PS'=e(PM')=\frac{1}{2}\left(\frac{a}{e}+\frac{1}{\sqrt{7}}\right)=\frac{1}{2}\left(\frac{1}{\sqrt{7}}+\frac{2}{\sqrt{3}}\right)$

$=\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{7}}$

$\Rightarrow$ (D) option correct

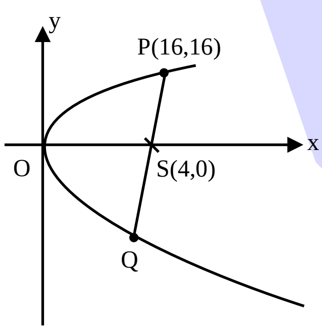
16. Let $y^2 = 16x$, from point (16,16) a focal chord is passing. Point (α,β) divides the focal chord internally in ratio 2 : 3 then minimum value of $(\alpha + \beta)$ is

(1) 22 (2) 11

(3) 9 (4) 10

Ans. (2)

Sol.



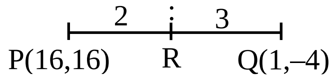
$y^2 = 16x$

for P(16,16) , $t_1 = 2$

$\therefore$ Other end Q is $t_2=\frac{-1}{2}$

i.e. Q (1, – 4)

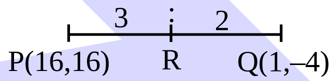
Case-I :



$R\left(\frac{2+48}{5},\frac{-8+48}{5}\right)$ i.e. $R(10,8)$

$\therefore \alpha+\beta=18$

Case = II :

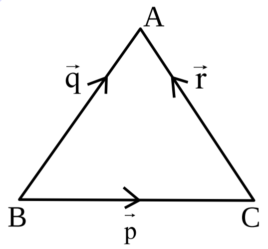


$R\left(\frac{32+3}{5},\frac{-12+32}{5}\right)$ i.e. R (7,4)

$\therefore\ \alpha+\beta=11$

Minimum value of $\alpha+\beta=11$

17. If three vectors are given as shown



If angle between $\vec{p}$ and $\vec{q}$ is θ and $\cos\theta=\frac{1}{\sqrt{3}}$

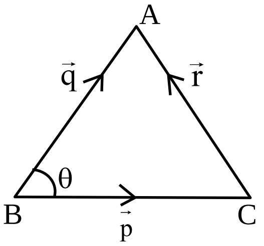
$|\vec{p}|=2\sqrt{3}$, $|\vec{q}|=2$ then find $|\vec{p}\times(\vec{q}-3\vec{r})|^2-3|r|^2$

(1) 100 (2) 102

(3) 104 (4) 108

Ans. (3)

Sol.



$\vec{p}+\vec{r}=\vec{q}$

$\vec{r}=\vec{q}-\vec{p}$

$$\cos\theta=\frac{|p|^2+|q|^2-|r|^2}{2|p||q|}$$

$$\frac{1}{\sqrt{3}}=\frac{12+4-|r|^2}{2\times 2\sqrt{3}\times 2}$$

$\Rightarrow |r|^2=8$

$|\vec{p}\times(\vec{q}-3\vec{r})|^2-3|r|^2$

$=|\vec{p}\times(\vec{q}-3(\vec{q}-\vec{p}))|^2-3|r|^2$

$=4|\vec{p}\times\vec{q}|^2-3|r|^2$

$=4\times 4\times 3\times 4\times\dfrac{2}{3}-24=104$

18. Let set

$A=\{2,3,4,5,9\}$ and $R=\{(x,y):2x\le 3y,x,y\in A\}$

If ℓ is number of elements in R and m is the number of elements required to make R symmetric then find $\ell+m$

Ans. **(25)**

Sol. $y\ge\dfrac{2x}{3}$

$$\left.\begin{array}{ll} x=2 & y=2,3,4,5,9\\ x=3 & y=2,3,4,5,9\\ x=4 & y=3,4,5,9\\ x=5 & y=4,5,9\\ x=9 & y=9\end{array}\right\}\ell=18$$

$$\begin{array}{c|c} & \begin{array}{ccccc}2&3&4&5&9\end{array}\\ \begin{array}{c}2\\3\\4\\5\\9\end{array} & \left[\begin{array}{ccccc}\checkmark&\checkmark&\checkmark&\checkmark&\checkmark\\ \checkmark&\checkmark&\checkmark&\checkmark&\checkmark\\ \times&\checkmark&\checkmark&\checkmark&\checkmark\\ \times&\times&\checkmark&\checkmark&\checkmark\\ \times&\times&\times&\times&\checkmark\end{array}\right]\end{array}$$

$m=7$

$\ell+m=25$

19. If $\left(\dfrac{1}{^{15}C_0}+\dfrac{1}{^{15}C_1}\right)\left(\dfrac{1}{^{15}C_1}+\dfrac{1}{^{15}C_2}\right)$

$\ldots\ldots\left(\dfrac{1}{^{15}C_{12}}+\dfrac{1}{^{15}C_{13}}\right)=\dfrac{\alpha^{13}}{^{14}C_0\,.^{14}C_1\ldots\ldots\,^{14}C_{12}}$,

Then 30α is equal to

(1) 16 (2) 32

(3) 15 (4) 28

Ans. **(2)**

Sol. $$\prod_{r=0}^{12}\left(\frac{1}{^{15}C_r}+\frac{1}{^{15}C_{r+1}}\right)=\prod_{r=0}^{12}\frac{\frac{16}{r+1}\,.^{15}C_r}{^{15}C_r\,.^{15}C_{r+1}}$$

$$=\prod_{r=0}^{12}\frac{16}{(r+1)\cdot\frac{15}{r+1}\,.^{14}C_r}=\prod_{r=0}^{12}\frac{\left(\frac{16}{15}\right)}{^{14}C_r}$$

$$=\frac{\left(\frac{16}{15}\right)^{13}}{^{14}C_0\,.^{14}C_1\,\_\_\_\_\,^{14}C_{12}}\Rightarrow\alpha=\frac{16}{15}$$

$\Rightarrow 30\alpha=32$

20. If $x\in\left[\dfrac{-\sqrt{3}}{2},\dfrac{1}{\sqrt{2}}\right]$, then maximum value of the expression $\left(\sin^{-1}x\right)^2+\left(\cos^{-1}x\right)^2$ is $\dfrac{n\pi^2}{n+7}$ (where $n\in N$) then n is equal to

Ans. **(29)**

Sol. $\left(\sin^{-1}x\right)^2+\left(\cos^{-1}x\right)^2$

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

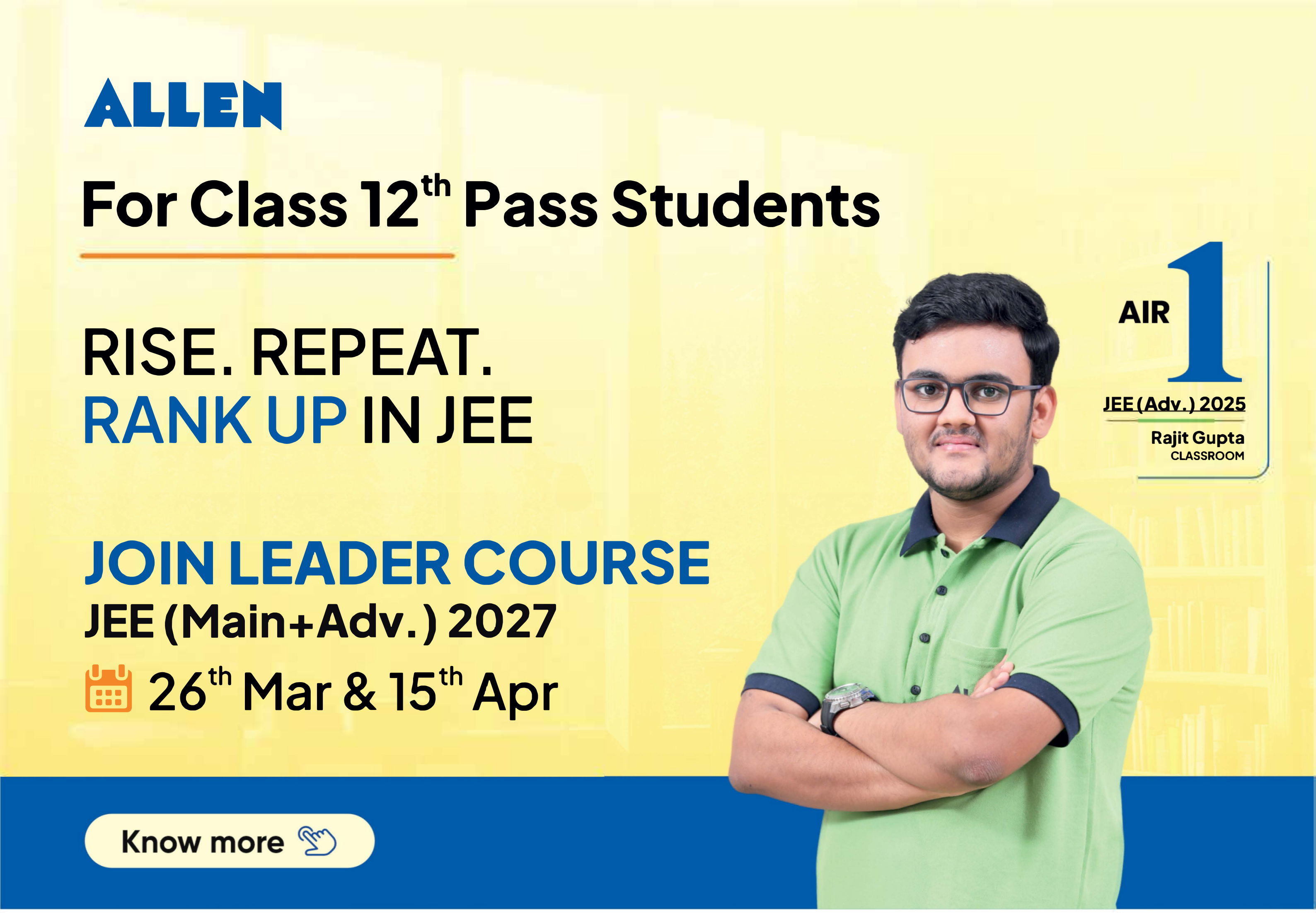
$=\dfrac{\pi^2}{4}-2\left(\sin^{-1}x\right)\left(\dfrac{\pi}{2}-\sin^{-1}x\right)$

$=2\left(\sin^{-1}x-\dfrac{\pi}{4}\right)^2+\dfrac{\pi^2}{8}$ where $\sin^{-1}x\in\left[\dfrac{-\pi}{3},\dfrac{\pi}{4}\right]$

Then max value occurs at $\sin^{-1}x=\dfrac{-\pi}{3}$

Which is $2\left(\dfrac{\pi}{3}+\dfrac{\pi}{4}\right)^2+\dfrac{\pi^2}{8}=\dfrac{29\pi^2}{36}=\dfrac{n\pi^2}{n+7}$

$\Rightarrow n=29$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