MATHEMATICS
JEE-MAIN (September-Attempt)
2 September (Shift-1) Paper

SECTION - A

Q.1 A line parallel to the straight line 2x-y=0 is tangent to the hyperbola $\frac{x^2}{4}-\frac{y^2}{2}=1$ at the point (x_1,y_1). Then $x_1^2+5y_1^2$ is equal to :

(1) 6 (2) 10 (3) 8 (4) 5

Sol. **1**

$T : \frac{xx_1}{4}-\frac{yy_1}{2}=1$ ....(1)

t : 2x — y = 0 is parallel to T

$\Rightarrow$ T : 2x — y = λ ....(2)

Now compare (1) & (2)

$$\frac{\frac{x_1}{4}}{2}=\frac{\frac{y_1}{2}}{1}=\frac{1}{\lambda}$$

$x_1=8/\lambda$ & $y_1=2/\lambda$

(x_1,y_1) lies on hyperbola $\Rightarrow \frac{64}{4\lambda^2}-\frac{4}{2\lambda^2}=1$

$\Rightarrow 14=\lambda^2$

Now $=x_1^2+5y_1^2$

$=\frac{64}{\lambda_2}+5\frac{4}{\lambda_2}$

$=\frac{84}{14}$

= 6 Ans.

Q.2 The domain of the function $f(x)=\sin^{-1}\left(\frac{|x|+5}{x^2+1}\right)$ is $(-\infty,-a]\cup[a,\infty)$. Then a is equal to :

(1) $\frac{\sqrt{17}-1}{2}$ (2) $\frac{\sqrt{17}}{2}$ (3) $\frac{1+\sqrt{17}}{2}$ (4) $\frac{\sqrt{17}}{2}+1$

Sol. **3**

$-1\le\frac{|x|+5}{x^2+1}\le 1$

$-x^2-1\le|x|+5\le x^2+1$

case - I

$-x^2-1\le|x|+5$

this inequality is always right $\forall\ x\in R$

case - II

$|x|+5\le x^2+1$

$x^2-|x|\ge 4$

$|x|^2 - |x| - 4 \geq 0$

$$\left(|x| - \left(\frac{1+\sqrt{17}}{2}\right)\right)\left(|x| - \left(\frac{1-\sqrt{17}}{2}\right)\right) \geq 0$$

$|x| \leq \frac{1-\sqrt{17}}{2} \cup |x| \geq \frac{1+\sqrt{17}}{2}$

not possible

$$x \in \left(-\infty, \frac{-1-\sqrt{17}}{2}\right] \cup \left[\frac{1+\sqrt{17}}{2}, \infty\right)$$

$a = \frac{1+\sqrt{17}}{2}$

Q.3 If a function f(x) defined by $f(x) = \begin{cases} ae^x + be^{-x}, -1 \leq x < 1 \\ cx^2 \quad , \quad 1 \leq x \leq 3 \\ ax^2 + 2cx \ , 3 < x \leq 4 \end{cases}$ be continuous for some a, b,c $\in$ R and

f′(0)+f′(2) =e, then the value of a is :

(1) $\frac{1}{e^2 - 3e + 13}$ (2) $\frac{e}{e^2 - 3e - 13}$ (3) $\frac{e}{e^2 + 3e + 13}$ (4) $\frac{e}{e^2 - 3e + 13}$

Sol. **4**

f(x) is continuous

at x=1 $\Rightarrow \boxed{ae + \frac{b}{e} = c}$

at x=3 $\Rightarrow$ 9c = 9a + 6c $\Rightarrow$ c=3a

Now f ′(0) +f ′(2) = e

$\Rightarrow$ a – b + 4c = e

$\Rightarrow$ a – e (3a–ae) + 4.3a = e

$\Rightarrow$ a – 3ae + ae^2 + 12a = e

$\Rightarrow$ 13a – 3ae + ae^2=e

$\Rightarrow \boxed{a = \frac{e}{13 - 3e + e^2}}$

Q.4 The sum of the first three terms of a G.P. is S and their product is 27. Then all such S lie in :

(1) $(-\infty, -9] \cup [3, \infty)$ (2) $[-3, \infty)$ (3) $(-\infty, 9]$ (4) $(-\infty, -3] \cup [9, \infty)$

Sol. **4**

$\frac{a}{r}.a.ar = 27 \Rightarrow a = 3$

$\frac{a}{r}+a+ar=S$

$\frac{1}{r}+1+r=\frac{S}{3}$

$r+\frac{1}{r}=\frac{S}{3}-1$

$r+\frac{1}{r}\geq 2$ or $r+\frac{1}{r}\leq -2$

$\frac{S}{3}\geq 3$ or $\frac{S}{3}\leq -1$

$S\geq 9$ or $S\leq -3$

$S\in(-\infty,-3]\cup[9,\infty)$

Q.5 If $R=\{(x,y):x,y\in Z, x^2+3y^2\leq 8\}$ is a relation on the set of integers Z, then the domain of R^{-1} is :

(1) $\{-1,0,1\}$ (2) $\{-2,-1,1,2\}$ (3) $\{0,1\}$ (4) $\{-2,-1,0,1,2\}$

Sol. **1**

$3y^2\leq 8-x^2$

R : {(0,1), (0,–1), (1,0),(–1,0), (1,1), (1,-1)
(-1,1), (-1,-1), (2,0), (-2,0),(-2,0),(2,1),(2,-1), (-2,1),(-2,-1)}

$\Rightarrow$ R : {-2,-1,0,1,2}→{-1,0,-1}

Hence R^{-1} : {-1,0,1}→{-2,-1,0,1,2}

Q.6 The value of $\left(\frac{1+\sin\frac{2\pi}{9}+i\cos\frac{2\pi}{9}}{1+\sin\frac{2\pi}{9}-i\cos\frac{2\pi}{9}}\right)^3$ is :

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

Sol. **3**

$$\left(\frac{1+\sin\frac{2\pi}{9}+i\cos\frac{2\pi}{9}}{1+\sin\frac{2\pi}{9}-i\cos\frac{2\pi}{9}}\right)^3$$

$$=\left(\frac{1+\cos\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)+i\sin\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)}{1+\cos\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)-i\sin\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)}\right)^3$$

$$= \left(\frac{1 + \cos\frac{5\pi}{18} + i\sin\frac{5\pi}{18}}{1 + \cos\frac{5\pi}{18} - i\sin\frac{5\pi}{18}} \right)^3$$

$$= \left(\frac{2\cos\frac{5\pi}{36}\left\{\cos\frac{5\pi}{36} + i\sin\frac{5\pi}{36}\right\}}{2\cos\frac{5\pi}{36}\left\{\cos\frac{5\pi}{36} - i\sin\frac{5\pi}{36}\right\}} \right)^3$$

$$= \left(\frac{\text{cis}\left(\frac{5\pi}{36}\right)}{\text{cis}\left(\frac{-5\pi}{36}\right)} \right)^3$$

$$= \text{cis}\left(\frac{5\pi}{36} \times 3 + \frac{5\pi}{36} \times 3\right)$$

$$= \text{cis}\left(\frac{10\pi}{12}\right)$$

$$= \text{cis}\left(\frac{5\pi}{6}\right) = \boxed{-\frac{\sqrt{3}}{2} + \frac{i}{2}}$$

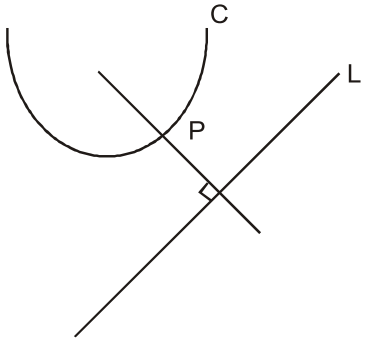
Q.7 Let P(h,k) be a point on the curve $y=x^2+7x+2$, nearest to the line, $y=3x-3$. Then the equation of the normal to the curve at P is:

(1) $x+3y-62=0$ (2) $x-3y-11=0$ (3) $x-3y+22=0$ (4) $x+3y+26=0$

Sol. **4**

C : $y = x^2 + 7x+2$

Let P : (h, k) lies on



Curve $= k = h^2+7h+2$

Now for shortest distance

$M_T \Big|_p^c = m_L = 2h+7 = 3$

h =-2

k=-8

P : (-2,-8)

equation of normal to the curve is perpendicular to L : 3x − y = 3

N : x + 3y = λ

$\downarrow$ Pass (-2,-8)

λ = -26

N : x + 3y + 26 = 0

Q.8 Let A be a 2×2 real matrix with entries from $\{0,1\}$ and $|A| \neq 0$. Consider the following two statements:

(P) If $A \neq I_2$, then $|A| = -1$

(Q) If |A|=1, then tr(A) =2,

where I_2 denotes 2×2 identity matrix and tr(A) denotes the sum of the diagonal entries of A. Then:

(1) Both (P) and (Q) are false (2) (P) is true and (Q) is false

(3) Both (P) and (Q) are true (4) (P) is false and (Q) is true

Sol. **4**

$P : A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \neq I_2$ & $|A| \neq 0$ & $|A| = 1$(false)

$Q : A = \begin{vmatrix} 1 & 1 \\ 0 & 1 \end{vmatrix} = 1$ then Tr(A) = 2 (true)

Q.9 Box I contains 30 cards numbered 1 to 30 and Box II contains 20 cards numbered 31 to 50. A box is selected at random and a card is drawn from it. The number on the card is found to be a non-prime number. The probability that the card was drawn from Box I is:

(1) $\frac{4}{17}$ (2) $\frac{8}{17}$ (3) $\frac{2}{5}$ (4) $\frac{2}{3}$

Sol. **2**

1 to 30

box I

Prime on I

{2,3,5,7,11,13,17,19,23,29}

31 to 50

box II

Prime on II

{31,37,41,43,47}

A : selected number on card is non - prime

P(A) = P(I).P(A/I) + P(II). P(A/II)

$$= \frac{1}{2} \times \frac{20}{30} + \frac{1}{2} . \frac{15}{20}$$

Now, $P(I/A) = \frac{P(II).P(A/I)}{P(A)}$

$$= \frac{\frac{1}{2}.\frac{20}{30}}{\frac{1}{2}.\frac{20}{30} + \frac{1}{2}.\frac{15}{20}} = \frac{\frac{2}{3}}{\frac{2}{3} + \frac{3}{4}} = \frac{8}{17}$$

Q.10 If p(x) be a polynomial of degree three that has a local maximum value 8 at x=1 and a local minimum value 4 at x=2; then p(0) is equal to :

(1) 12 (2) -12 (3) -24 (4) 6

Sol. **2**

$p'(1) = 0$ & $p'(2) = 0$

$p'(x) = a(x-1)(x-2)$

$$p(x) = a\left(\frac{x^3}{3} - \frac{3x^2}{2} + 2x\right) + b$$

$$p(1) = 8 \Rightarrow a\left(\frac{1}{3} - \frac{3}{2} + 2\right) + b = 8 \quad \text{...(i)}$$

$$p(2) = 4 \Rightarrow a\left(\frac{8}{3} - \frac{3.4}{2} + 2.2\right) + b = 4 \quad \text{......(ii)}$$

from equation (i) and (ii)

$a = 24$ & $b = -12$

$p(0) = b = \boxed{-12}$

Q.11 The contrapositive of the statement "If I reach the station in time, then I will catch the train" is:

(1) If I will catch the train, then I reach the station in time.
(2) If I do not reach the station in time, then I will catch the train.
(3) If I do not reach the station in time, then I will not catch the train.
(4) If I will not catch the train, then I do not reach the station in time.

Sol. **4**

Statement p and q are true

Statement, then the contra positive of the implication

$p \to q = (\sim q) \to (\sim p)$

hence correct Ans. is 4

Q.12 Let α and β be the roots of the equation, $5x^2+6x-2=0$. If $S_n = \alpha^n + \beta^n$, n=1,2,3,....., then:

(1) $5S_6+6S_5+2S_4=0$ (2) $6S_6+5S_5=2S_4$
(3) $6S_6+5S_5+2S_4=0$ (4) $5S_6+6S_5=2S_4$

Sol. **4**

$5x^2 + 6x - 2 = 0 <^{\alpha}_{\beta} = 5\alpha^2 + 6\alpha = 2$

$6\alpha - 2 = -5\alpha^2$

Simillarly

$6\beta - 2 = -5\beta^2$

$S_6 = \alpha^6 + \beta^6$

$S_5 = \alpha^5 + \beta^5$

$S_4 = \alpha^4 + \beta^4$

Now $6S_5 - 2S_4$

$= 6\alpha^5 - 2\alpha^4 + 6\beta^5 - 2\beta^4$

$= a^4(6\alpha-2) + \beta^4(6\beta-2)$

$= \alpha^4(-5\alpha^2) + \beta^4(-5\beta^2)$

$= -5(\alpha^6 + \beta^6)$

$= -5S_6$

$= 6S_5 + 5S_6 = 2S_4$

Q.13 If the tangent to the curve y=x+siny at a point (a,b) is parallel to the line joining $\left(0, \frac{3}{2}\right)$ and $\left(\frac{1}{2}, 2\right)$, then:

(1) $b = \frac{\pi}{2} + a$ (2) $|a+b| = 1$ (3) $|b-a| = 1$ (4) $b = a$

Sol. **3**

$$\left.\frac{dy}{dx}\right|_{p(a,b)}^{c} = \frac{2 - \frac{3}{2}}{\frac{1}{2} - 0}$$

$$\begin{array}{l|l} 1 + \cos b = 1 & p : (a,b) \text{ lies on curve} \\ \cos b = 0 & \quad b = a + \sin b \end{array}$$

$\boxed{b = a \pm 1}$

$b - a = \pm 1$

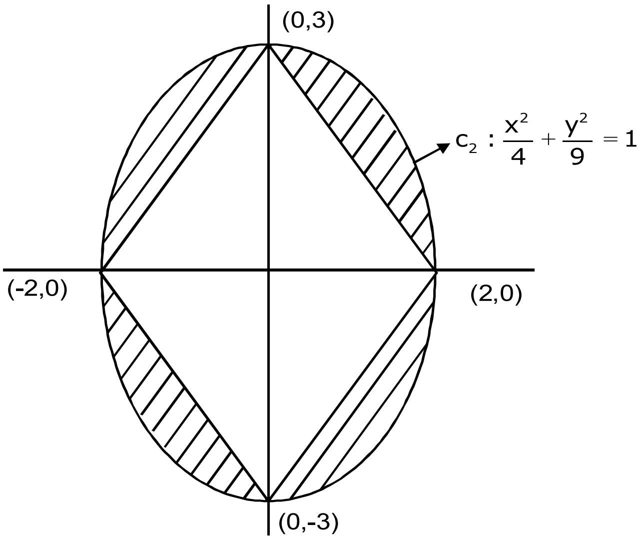
$\boxed{|b - a| = 1}$

Q.14 Area (in sq. units) of the region outside $\frac{|x|}{2} + \frac{|y|}{3} = 1$ and inside the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is:

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

Sol. **2**

$c_1 : \frac{|x|}{2} + \frac{|y|}{3} = 1$



$A = 4\left(\frac{\pi ab}{4} - \frac{1}{2}.2.3\right)$

$A = \pi\ .\ 2.\ 3 - 12$

$A = 6(\pi - 2)$

Q.15 If $|x|<1, |y|<1$ and $x \neq y$, then the sum to infinity of the following series $(x+y)+(x^2+xy+y^2)+(x^3+x^2y+xy^2+y^3)+....$ is:

(1) $\frac{x+y+xy}{(1-x)(1-y)}$ (2) $\frac{x+y-xy}{(1-x)(1-y)}$ (3) $\frac{x+y+xy}{(1+x)(1+y)}$ (4) $\frac{x+y-xy}{(1+x)(1+y)}$

Sol. **2**

$(x+y)+(x^2+xy+y^2)+(x^3+x^2y+xy^2+y^3)+....\infty$

$$= \frac{1}{(x-y)}\left\{\left(x^2-y^2\right)+\left(x^3-y^3\right)+\left(x^4-y^4\right)+...\infty\right\}$$

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

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

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

$$= \frac{x+y-xy}{(1-x)(1-y)}$$

Q.16 Let $\alpha > 0, \beta > 0$ be such that $\alpha^3 + \beta^2 = 4$. If the maximum value of the term indepen dent of x in the binomial expansion of $\left(\alpha x^{\frac{1}{9}} + \beta x^{-\frac{1}{6}}\right)^{10}$ is 10k, then k is equal to:

(1) 176 (2) 336 (3) 352 (4) 84

Sol. **2**

For term independent of x

$T_{r+1} = {}^{10}C_r \left(\alpha x^{\frac{1}{9}}\right)^{10-r} . \left(\beta x^{-\frac{1}{6}}\right)^r$

$T_{r+1} = {}^{10}C_r \alpha^{10-r} \beta^r . x^{\frac{10-r}{9}} . x^{-\frac{r}{6}}$

$\because \frac{10-r}{9} - \frac{r}{6} = 0 \Rightarrow r = 4$

$T_5 = {}^{10}C_r \alpha^6 . \beta^4$

$\because$ AM $\geq$ GM

Now $\frac{\left(\frac{\alpha^3}{2} + \frac{\alpha^3}{2} + \frac{\beta^2}{2} + \frac{\beta^2}{2}\right)}{4} \geq \sqrt[4]{\frac{\alpha^6 . \beta^4}{2^4}}$

$\left(\frac{4}{4}\right)^4 \geq \frac{\alpha^6 \beta^4}{2^4}$

$\alpha^6 . \beta^4 \leq 2^4$

${}^{10}C_4 . \alpha^6 . \beta^4 \leq {}^{10}C_4 \, 2^4$

$T_5 \leq {}^{10}C_4 2^4$

$T_5 \leq \frac{10!}{6!4!} . 2^4$

$T_5 \leq \frac{10.9.8.7.2^4}{4.3.2.1}$

maximum value of T_5 = 10. 3.7. 16 = 10k

k = 16.7.3

k = 336

Q.17 Let S be the set of all $\lambda \in R$ for which the system of linear equations

2x-y+2z=2

x-2y+λz=-4

x+λy+z=4

has no solution. Then the set S

(1) is an empty set.
(2) is a singleton.
(3) contains more than two elements.
(4) contains exactly two elements.

Sol. **4**

For no solution

$\Delta = 0$ & $\Delta_1|\Delta_2|\Delta_3 \neq 0$

$$\Delta = \begin{vmatrix} 2 & -1 & 2 \\ 1 & -2 & \lambda \\ 1 & \lambda & 1 \end{vmatrix} = 0$$

$2(-2-\lambda^2) + 1(1-\lambda) + 2(\lambda+2) = 0$

$-4 - 2\lambda^2 + 1 - \lambda + 2\lambda + 4 = 0$

$-2\lambda^2 + \lambda + 1 = 0$

$2\lambda^2 - \lambda - 1 = 0 \Rightarrow \lambda = 1, -1/2$

Equation has exactly 2 solution

Q.18 Let $X = \{x \in N : 1 \le x \le 17\}$ and $Y = \{ax + b : x \in X \text{ and } a, b \in R, a > 0\}$. If mean and variance of elements of Y are 17 and 216 respectively then a+b is equal to:

(1) -27 (2) 7 (3) -7 (4) 9

Sol. **3**

X : {1,2,.....17}

Y : {ax+b : x∈X & a, b ∈ R , a>o}

Given Var(Y) = 216

$$\frac{\sum y_1^2}{n} - (\text{mean})^2 = 216$$

$$\frac{\sum y_1^2}{17} - 289 = 216$$

$\sum y_1 = 8585$

$(a+b)^2 + (2a+b)^2 + ... + (17a+b)^2 = 8585$

$105a^2 + b^2 + 18ab = 505$ ....(1)

Now $\sum y_1 = 17 \times 17$

$a(17\times9) + 17.b = 17 \times 17$

$9a + b = 17$ ....(2)

from equation (1) & (2)

a = 3 & b = -10

a+b = −7

Q.19 Let y=y(x) be the solution of the differential equation, $\frac{2+\sin x}{y+1}\cdot\frac{dy}{dx}=-\cos x, y>0, y(0)=1.$ If $y(\pi)=a$, and $\frac{dy}{dx}$ at $x=\pi$ is b, then the ordered pair (a,b) is equal to:

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

Sol. **2**

$\int\frac{dy}{y+1}=\int\frac{-\cos x\ dx}{2+\sin x}$

ln |y+1| = -ln |2+sin x| + k

$\downarrow$ (0,1)

k = ln 4

Now C : (y+1) (2+sin x) = 4

$y(\pi)=a\Rightarrow(a+1)(2+0)=4\Rightarrow(a=1)$

$\left.\frac{dy}{dx}\right|_{x=\pi}=b\Rightarrow b=-(-1)\left(\frac{2+0}{1+1}\right)$

$\Rightarrow$ b = 1

(a,b) = (1,1)

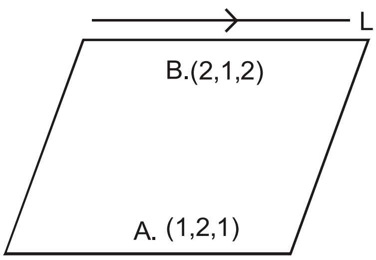
Q.20 The plane passing through the points (1,2,1), (2,1,2) and parallel to the line, 2x=3y, z=1 also passes through the point:

(1) (0,-6,2) (2) (0,6,-2) (3) (-2,0,1) (4) (2,0,-1)

Sol. **3**

$L:\begin{cases}2x=3y\\ z=1\end{cases}$ < P :(0,0,1), Q:(3,2,1)

$\vec{V}_L$ Dr of line (3,2,0)



$\vec{n}_p=\overrightarrow{AB}\times\vec{V}_L$

$\vec{n}_p=\langle 1,-1,1\rangle\times\langle 3,2,0\rangle$

$\vec{n}_p=\langle -2,+3,5\rangle$

Plane : −2(x-1)+3(y-2)+5(z -1)=0

Plane : -2x+3y+5z+2−6-5=0
Plane : 2x − 3y - 5z = -9

Q.21 The number of integral values of k for which the line, 3x+4y=k intersects the circle, $x^2+y^2-2x-4y+4=0$ at two distinct points is................

Sol. **9**

c : (1,2) & r = 1

|cp| < r

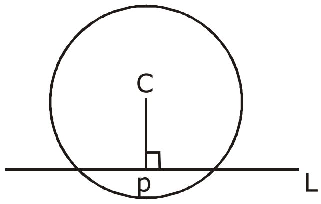
$$\left|\frac{3.1+4.2-k}{5}\right|<1$$

|11-k|<5

−5<k-11<5

6<k<16

k = 7, 8, 9, ..., 15 $\Rightarrow$ total 9 value of k



Q.22 Let $\vec{a},\vec{b}$ and $\vec{c}$ be three unit vectors such that $\left|\vec{a}-\vec{b}\right|^2+\left|\vec{a}-\vec{c}\right|^2=8$. Then $\left|\vec{a}+2\vec{b}\right|^2+\left|\vec{a}+2\vec{c}\right|^2$ is equal to :

Sol. **2**

$$\left|\vec{a}-\vec{b}\right|^2+\left|\vec{a}-\vec{c}\right|^2=8$$

$(\vec{a}-\vec{b}).(\vec{a}-\vec{b})+(\vec{a}-\vec{c})(\vec{a}-\vec{c})=8$

$a^2+b^2-2a.b+a^2+c^2-2a.c=8$

$2a^2+b^2+c^2-2a.b-2a.c=8$

a.b +a.c=-2

Now $|\vec{a}+2\vec{b}|^2+|\vec{a}+2\vec{c}|^2$

$= 2a^2+4b^2+4c^1+4\bar{a}.\bar{b}+4\bar{a}.\bar{c}$

= 2 + 4 + 4 + 4 (−2)

= 2

Q.23 If the letters of the word 'MOTHER' be permuted and all the words so formed (with or without meaning) be listed as in a dictionary, then the position of the word 'MOTHER' is.........

Sol. **309**

E H M O R T

E - - - - -	= 5!
H - - - - -	= 5!
M E - - - -	= 4!
M H - - - -	= 4!
M O E - - -	= 3!
M O H - - -	= 3!
M O R - - -	= 3!
M O T E - -	= 2!
M O T H E R	= 1
	309

Q.24. If $\lim_{x\to1}\frac{x+x^2+x^3+\ldots+x^n-n}{x-1}=820,(n\in N)$ then the value of n is equal to :

Sol. **40**

$$\lim_{x\to1}\frac{(x-1)}{x-1}+\frac{(x^2-1)}{x-1}+\ldots.+\frac{(x^n-1)}{x-1}=820$$

$\Rightarrow$ 1 + 2 + 3 + ...+n = 820

$\Rightarrow \sum n=820$

$\Rightarrow \frac{n(n+1)}{2}=820$

$\Rightarrow$ n = 40

Q.25 The integral $\int_0^2 ||x-1|-x|\,dx$ is equal to :

Sol. **1.5**

$$\int_0^2 ||x-1|-x|\,dx$$

$$=\int_0^1 |1-x-x|\,dx+\int_1^2 |x-1-x|\,dx$$

$$=\int_0^1 |2x-1|\,dx+\int_1^2 1\,dx$$

$$=\int_0^{\frac{1}{2}}(1-2x)\,dx+\int_{\frac{1}{2}}^1(2x-1)\,dx+\int_1^2 1\,dx$$

$$=\left[\left(\frac{1}{2}-0\right)-\left(\frac{1}{4}-0\right)\right]+\left(1-\frac{1}{4}\right)-\left(1-\frac{1}{2}\right)+1$$

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

$$=\frac{3}{2}$$