	MARKING SCHEME (SET 1)	
	PRE BOARD-II (2023-24)	
	CLASS-XII MATHEMATICS	
S.NO		Marks
Q.1	**Answer -(D) =16** $adj(4x)=\lambda(adjA)$ $4^2(adj.A)=\lambda(adj.A)=\lambda=4^2=16$	1
Q.2	$Answer(a)$ $\vert A\vert=3 \text{ and } A^{-1}=\begin{bmatrix}3 & -1\\ \frac{-5}{3} & \frac{2}{3}\end{bmatrix}$ $A^{-1}=\frac{1}{\vert A\vert}(adjA)$ $adj.A=\vert A\vert A^{-1}=3\begin{bmatrix}3 & -1\\ \frac{-5}{3} & \frac{2}{3}\end{bmatrix}=\begin{bmatrix}9 & -3\\ -5 & 2\end{bmatrix}$	1
Q.3	Answer-(C) K=6 if f(x) is continous at x=$\frac{\pi}{2}$ then $\lim_{x\to\frac{\pi}{2}} f(x)=f(\pi/2)$ $\lim_{x\to\frac{\pi}{2}}\frac{k\cos x}{\pi-2x}=3$ $k\lim_{x\to\frac{\pi}{2}}\frac{\sin(\frac{\pi}{2}-x)}{2(\pi/2-x)}=3$ $\frac{k}{2}\lim_{x\to\frac{\pi}{2}}\frac{\sin(\pi/2-x)}{(\pi/2-x)}=3$ $\frac{k}{2}\times1=3$ $k=6$	1
Q.4	Solution:- Answer-(a) =-5I $\begin{vmatrix}x & -3 & 1\\ 2 & y & 1\\ 1 & 1 & z\end{vmatrix}$ $A.(adjA)=\vert A\vert I-(1)$ $\vert A\vert=\begin{vmatrix}x & -3 & 1\\ 2 & y & 1\\ 1 & 1 & z\end{vmatrix}$ $=x(yz-1)+3(2z-1)+1(2-y)$ $\vert A\vert=xyz-x+6z-3+2-y$ $\vert A\vert=xyz-(x+y-6z)-1$ $=7-11-1$ $=-5$ $from(1)$ $A.(adjA)=-5I$	1

Q.5	Answer-(d) Let AD be the median through vertex A $= \overrightarrow{AB} + \overline{AC} = 2\overrightarrow{AD}$ $= \overline{AD} = \frac{1}{2}(\overrightarrow{AB} + \overline{AC})$ $\frac{1}{2}(2i + k + 3i - j + 4k)$ $= \frac{1}{2}(3i + j + 5k)$ $\left\lvert\overrightarrow{AD}\right\rvert = \sqrt{\frac{9}{4} + \frac{1}{4} + \frac{25}{4}} = \sqrt{\frac{35}{2}}$	1
Q.6	Answer(b) Solution-As Degree p=1, Order q=3 $\therefore 2p - 3q = 2 - 9$ =-7	1
Q.7	Answer(d) Solution:- $Z = px + qy$ $15p + 15q = 0 \times p + 20q$ $\Rightarrow 15p = 5q$ $\Rightarrow 3p = q$	1
Q.8	Answer(a) Solution:- As for a unit vector $\left\lvert p\hat{i} + p\hat{j} + p\hat{k}\right\rvert = 1$ $\sqrt{p^2 + p^2 + p^2} = 1$ $p = \pm\frac{1}{\sqrt{3}}$	1
Q.9	Answer(c) Solution:- $I = \int_0^{\frac{\pi}{2}} \log(\tan\ x)dx ------(1)$ $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ $I = \int_0^{\frac{\pi}{2}} \log\{\tan(\frac{\pi}{2} - x)\}dx$ $I = \int_0^{\frac{\pi}{2}} \log \cot x dx -------(2)$ $equation(1) + (2)$ $2I = \int_0^{\frac{\pi}{2}} \log(\tan\ x + \cot x)dx$ $2I = \int_0^{\frac{\pi}{2}} \log 1 dx$ $I = 0$	1
Q.10	Answer(a)	

	$\begin{vmatrix} \log_3 2^9 & \log_2 2^3 \\ \log_3 2^3 & \log_2 3^2 \end{vmatrix}$ $\begin{vmatrix} 9\log_3 2 & \frac{1}{2}\log_2 3 \\ 3\log_3 2 & \frac{2}{2}\log_2 3 \end{vmatrix}$ $\because \log_a p^{m^n} = \frac{n}{p}\log_a m$ $\begin{vmatrix} 9\log_3 2 & \frac{1}{2}\log_2 3 \\ 3\log_3 2 & \log_2 3 \end{vmatrix} = (9\log_3 2 \times \log_2 3) - (\frac{1}{2}\log_2 3)(3\log_3 2)$ $\Delta = 9(\log_3 2 \times \log_2 3) - \frac{3}{2}(\log_2 3 \times \log_3 2)$ $= 9 - \frac{3}{2} = \frac{15}{2} \because \log_b^a \times \log_a^b = 1$	1
Q.11	Solution: Ans-(c)	1
Q.12	Answer(b) Solution:- $\overrightarrow{AB} = -6i - 2\hat{j} + 3\hat{k}$, $\overrightarrow{BC} = -2i + 3j - 6k$, $\overrightarrow{CD} = 6i + 2j - 3k$ $\overrightarrow{DA} = 2i - 3j + 6k$, $clear \lvert\overrightarrow{AB}\rvert = \lvert\overrightarrow{BC}\rvert = \lvert\overrightarrow{CD}\rvert = \lvert\overrightarrow{DA}\rvert and \overrightarrow{AC}, \overrightarrow{BD} = 0$ Hence ABCD is a rhombus.	1
Q.13	Answer(b) Solution:- Diagonal elements of matrix A are all Zero and all other elements satisfy $a_{ij} = -a_{ji}$ for all i and j. So A is Skew symmetric matrix.	1
Q.14	Answer (c) Solution:- Let A be event of getting an even number on the die and B be the event of getting a spade card. Clearly A and B are independent Such that P(A)= $\frac{1}{2}$ and P(B)= $\frac{1}{4}$ Required probability $P(A \cap B) = P(A).P(B)$ $= \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$	1
Q.15	Solution: Ans(b)	1

	$y = c_1 e^x + c_2 e^{-x}$ $\frac{dy}{dx} = c_1 e^x - c_2 e^{-x}$ $\frac{d^2y}{dx^2} = c_1 e^x + c_2 e^{-x}$ $\frac{d^2y}{dx^2} = y$ $\frac{d^2y}{dx^2} - y = 0$	
Q.16	Solution:- Ans (C)	1
	$\frac{3}{1} = \frac{2}{p} = \frac{9}{3}$ $P = \frac{2}{3}$	
Q.17	Solution:- Ans(a)	1
	$f(x) = \tan x - x$ $f'(x) = \sec^2 x - 1$ $= \lvert \sec x \rvert \geq 1$ $= \sec^2 x \geq 1$ $= \sec^2 x - 1 \geq 0$ $= f'(x) \geq 0$ = always increasing	
Q.18	Solution:-Ans(d) = -1 $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$ $\frac{1+\cos 2\alpha}{2} + \frac{1+\cos 2\beta}{2} + \frac{1+\cos 2\gamma}{2} = 1$ $= \cos 2\alpha + \cos 2\beta + \cos 2\lambda = -1$	1
Q.19	Solution:- Ans(a) Both (A) and ® are true and ® is the correct explanation of (A)	1
Q.20	Solution:-Ans(c) (A) is true but(R) is false.	1
Q.21	Solution:-	

	$\tan^{-1}\left[2\sin(2\cos^{-1}\frac{\sqrt{3}}{2})\right]$ $=\tan^{-1}\left[2\sin(2.\frac{\pi}{6})\right]$ $=\tan^{-1}\left[2\sin\frac{\pi}{3}\right]$ $=\tan^{-1}\left[2.\frac{\sqrt{3}}{2}\right]$ $=\tan^{-1}(\sqrt{3})$ $=\frac{\pi}{3}$ *OR* $=\cos^{-1}(2x-3)$ $=-1\le 2x-3\le 1$ $=2\le 2x\le 4$ $=1\le x\le 2$ $domain[1,2]$	1/2 1/2 1 1 1/2 1/2
Q.22	Solution:- $f(x)=x^4-4x$ on R $f'(x)=4x^3-4$ $=4(x-1)(x^2+x+1)$ $=4(x-1)(x^2+x+1)=0$ $=x=1\in R$, $x^2+1+1\neq 0$ $=(1,\infty)$	1/2 1/2 1

Q.23	Solution:- $R(x) = 13x^2 + 26x + 15$ Marginal revenue $MR = \frac{dR}{dx} = 26x + 26$ When x=7 We have MR=26×7+26 =208 OR $m = \frac{dy}{dx} = -3x^2 + 6x + 9$ $\Rightarrow \frac{dm}{dx} = -6x + 6$ $\max\ slope$ $\Rightarrow \frac{dm}{dx} = 0$ $\Rightarrow 6x = 6$ $\Rightarrow x = 1$ $\frac{d^2m}{dx^2} = -6 \prec 0\ for x = 1$ $curve$ $y = -x^3 + 3x^2 + 9x - 27$ $at, x = 1$ $y = -16$ $point\,(1, -16)$ $\max\ slope$ $m = 3 + 6 + 9$ $= 12$	1 1 1/2 1/2 1/2 1/2

Q.24	$\int_0^{\frac{\pi}{2}} 2\log \sin x - \log \sin 2x)dx$ $I = \int_0^{\frac{\pi}{2}} \left(\frac{\sin^2 x}{2\sin x.\cos x} \right) dx$ $I = \int_0^{\frac{\pi}{2}} \log\left(\frac{\tan x}{2} \right) dx ---------(i)$ $I = \int_0^{\frac{\pi}{2}} \left(\frac{\tan(\frac{\pi}{2} - x)}{2} \right) dx ---------(ii)$ $equ.(i) + (ii)$ $2I = \log\left(\frac{1}{4}\right) \int_0^{\frac{\pi}{2}} 1dx$ $= \log \frac{1}{4} [x]_0^{\frac{\pi}{2}}$ $2I = \frac{\pi}{2} \log \frac{1}{4}$ $I = \frac{\pi}{4} \log\left(\frac{1}{4}\right)$	1/2 1/2 1/2 1/2
Q.25	$f(x) = x^3 - 18x^2 + 96$ $f'(x) = 3x^2 - 36x + 96$ Now $= f'(x) = 0$ $\Rightarrow (x-8)(x-4) = 0$ $x = 4, 8$ $f(4) = 160$ $f(8) = 128$ $f(0) = 0$ $f(9) = 135$ Hence the least value is 0. the least value of f(n) in[0,9] is 0.	1/2 1/2 1/2 1/2
	Section-C	
Q.26	Solution:-	

$$\int \frac{x}{x^4 - x^2 + 1} dx$$

Let

$x^2 = t$

$2n\,dx = dt$

$$I = \frac{1}{2}\int \frac{1}{t^2 - t + 1} dt$$ 1/2

$$= \frac{1}{2}\int \frac{1}{\left(t - \frac{1}{2}\right)^2 \left(\frac{\sqrt{3}}{2}\right)^2} dt$$ 1

$$= \frac{1}{2}\,\frac{2}{\sqrt{3}} \tan^{-1}\left[\frac{\tan - \frac{1}{2}}{\frac{\sqrt{3}}{2}}\right]$$ 1

$$= \frac{1}{\sqrt{3}} \tan^{-1}\left(\frac{2x^2 - 1}{\sqrt{3}}\right) + c$$ 1/2

Q.27 Solution:-

X	0	1	2	3	4
P(X)	0	k	4k	2k	k

we have

$= \text{p}(0) + \text{p}(1) + \text{p}(2) + \text{p}(3) + \text{p}(4) = 1$

$= 0 + k + 4k + 2k + k = 1$

$\Rightarrow k = \frac{1}{8}$ 1/2

(i) $\text{p}(\text{x} = 1) = \text{p}(1) = \text{k} = \frac{1}{8}$ 1/2

(ii) $\text{p}(\text{x} \le 2) = \text{p}(0) + \text{p}(1) + \text{p}(2)$

$= 0 + \text{k} + 4\text{k}$

$= 5\,\text{k}$

$= 5 \times \frac{1}{8} = \frac{5}{8}$ 1

(iii) $\text{p}(\text{x} \le 2) = \text{p}(2) + \text{p}(3) + \text{p}(4)$

$= 4\,\text{k} + 2\,\text{k} + \text{k}$

$= 7\,\text{k}$

$= 7 \times \frac{1}{8} = \frac{7}{8}$ 1

Q.28 Solution:-

	$\int \frac{1}{x(x^n+1)}dx$	
	by multiplyin g both Nr and Dr by x^{n-1}	
	$\frac{1}{x(x^n+1)} = \frac{x^{n-1}}{x^{n-1}.x(x^n+1)}$	
	put $x^n = t$	
	$n\,x^{n-1}dx = dt$	1/2
	$\int \frac{1}{x(x^n+1)}dx = \int \frac{x^{n-1}}{x^n(x^n+1)}dx = \frac{1}{n}\int \frac{1}{t(t+1)}dt$	
	$\frac{1}{t(t+1)} = \frac{A}{t} + \frac{B}{t+1}$	1
	$A = 1, \quad B = -1$	
	we get	
	$\frac{1}{t(t+1)} = \frac{1}{t} - \frac{1}{(1+t)}$	1/2
	$= \int \frac{1}{x(x^n+1)}dx = \frac{1}{n}\int \left\{\frac{1}{t} - \frac{1}{t+1}\right\}dt$	
	$= \frac{1}{n}\left[\log\lvert t\rvert - \log\lvert t+1\rvert\right] + c$	1/2
	$= \frac{1}{n}\log\left\lvert \frac{x^n}{x^n+1} \right\rvert + c$	1/2
	Solution:-OR	
	$I = \int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx$ equ(i)	
	$I = \int_0^{\pi} \frac{(\pi - x)\sin(\pi - x)}{1+\cos^2(\pi - x)}$	1/2
	$I = \int_0^{\pi} \frac{(\pi - x)\sin x}{1+\cos^2 x}dx$ equ(ii)	
	Add (i) + (ii)	1
	$I = \frac{1}{2}\int_0^{\pi} \frac{(x+\pi-x)\sin}{1+\cos^2 x}dx$	
	$= \frac{\pi}{2}\int_0^{\pi} \frac{\sin x}{1+\cos^2 x}dx$	
	put cosx = y	1/2
	$I = -\frac{\pi}{2}\int_1^{-1} \frac{1}{1+y^2}dy$	
	$= \frac{-\pi}{2}\left[\tan^{-1} y\right]_1^{-1}$	1/2
	$= \frac{\pi^2}{4}$	1/2

Q.29	$(x^2 + yx^2)dy + (y^2 + x^2y^2)dx = 0$ $(x^2 - yx^2)dy = -(y^2 + x^2y^2)dx$ $\Rightarrow -x^2(y-1)dy = -y^2(1+x^2)dx$ $\left(\frac{1}{\text{y}} - \frac{1}{y^2}\right)dy = \left(\frac{1}{x^2} + 1\right)dx$ $\int\left(\frac{1}{y} - \frac{1}{y^2}\right)dy = \int\left(\frac{1}{x^2} + 1\right)dx$ $\log\lvert y\rvert + \frac{1}{y} = -\frac{1}{x} + x + c$ $given \text{ x} = 1, \text{ y} = 1$ $\text{c} = 1$ $\therefore \quad \log\lvert \text{y}\rvert + \frac{1}{y} = \frac{1}{x} + x + 1$	 1/2 1/2 1 1/2 1/2
	OR	
	$(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^3$ $\frac{dy}{dx} - \frac{1}{x+1}y = e^{3x}(x+1)^2$ $I.f = e^{-\int\frac{1}{x+1}dx}$ $= \text{e}^{\text{-log(x+1)}}$ $= \frac{1}{\text{x}+1}$ $\text{y.(I.f)} = \int \text{Q.(If)dx} + \text{c}$ $\text{y.(I.f)} = \int \text{e}^{3x}(x+1)^2.\frac{1}{x+1}dx + c$ $\frac{y}{x+1} = \int (x+1)e^{3x}dx + c$ $= (\text{x}+1)\left(\frac{\text{e}^{3x}}{3}\right) - \int (1)\left(\frac{e^{3x}}{3}\right)dx + c$ $\frac{\text{y}}{\text{x}+1} = \frac{1}{3}(x+1)e^{3x} - \frac{e^{3x}}{9} + c$	 1 1/2 1/2 1

Q.30	Solution:- . for *correct* graph The value of Z is maximum at (0,20) and (15,15) maximum value of z is 180. The minimum value of z is 60 at (5,5) OR for correct graph z is minimum for A(10,0) i.e $x = 10, y = 0$	2 1 2 1
Q.31	$\sin y = x\sin(a+y)$ $x = \frac{\sin y}{\sin(a+y)}$ $\frac{dx}{dy} = \frac{\sin(a+y).\cos y - \sin y\cos(a+y)}{\sin^2(a+y)}$ $\frac{dx}{dy} = \frac{\sin(a+y-y)}{\sin^2(a+y)}$ $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$	 1 1 1
32	Solution :- *for* correct fig parabolla $4y = 3x^2$ and the line $2y = 3x + 12$ $\frac{3x^2}{4} = \frac{3x}{2} + 6$ $x^2 = 2x + 8$ intersect each other at (4,12) and (-2,3) $A = \int_2^4 \left[\left(\frac{3x}{2}+6\right) - \frac{3x^2}{4} dx\right.$ $= \left[\frac{3x}{4} + 6x - \frac{x^3}{4}\right]_{-2}^{4}$ $= 27$ sq unit	1 1 $1\frac{1}{2}$ 1 1/2
Q.33	Solution:-	

	(i) Reflexive : since $a - b = a - b$, is true whether $(a, b) \in A \times A$ $\Rightarrow (a, b), \ (a, b) \in R$ $\Rightarrow$ So, R is reflexive (ii) Symmetric : Let $[(a, b), (c, d)] \in R$ where $(a, b), (c, d) \in A \times A$ $\Rightarrow a - b = c - d$ $\Rightarrow c - d = a - b$ $\Rightarrow ((c, d), (a, b) \in R$ $\Rightarrow$ So R is Symmetric (iii) Transitive : Let $((a, b), (c, d) \in R$ and $((c, d), (e, f)) \in R$ $\Rightarrow a - b = c - d = e - f$ $\Rightarrow a - b = e - f$ $\Rightarrow ((a, b), (e, f)) \in R$ R is trasitive Hence R is an equivalenc e relation Equivalenc e class [(3,4)] is given by {(1,2) (2,3) (3,4) (4,5) (5,6) (6,7) (7,8) (8,9) (9,10)}	1 1 $1\frac{1}{2}$ 1/2 1
	OR	
	(i) one - one - Let $x_1, x_2 \in R - \left\{\frac{3}{5}\right\}$ be any two element then $f(x_1) = f(x_2)$ $\frac{3x_1 + 2}{5x_1 - 3} = \frac{3x_2 + 2}{5x_2 - 3}$ $\Rightarrow -19x_1 = -19x_2$ $\Rightarrow x_1 = x_2$ So f is one - one (ii) onto : Let $y \in R - \left\{\frac{3}{5}\right\}$ be any element then $f(x) = y$ $\frac{3x + 2}{5x - 3} = y$ $\Rightarrow x(3 - 5y) = -2 - 3y$ $\Rightarrow x = \frac{3y + 2}{5y - 3}$ *for* every $y \in R - \left\{\frac{3}{5}\right\}$, *we* have $x \in R - \left\{\frac{3}{5}\right\}$ *So* f is on to.	1 1 $\frac{1}{2}$ 1 1/2 1
Q.34	Solution:	

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$|A| = 11 \neq 0$
$Adj.A = \begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}$
$A^{-1} = \frac{1}{|A|}(Adj.A) = \frac{1}{11}\begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}$
and given system of equation
$x - 2y = 10$
$2x + y + 3z = 8$
$-2y + z = 7$
$\begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ 8 \\ 7 \end{bmatrix}$
$A\times = B$
Since $|A| = 27 \neq 0$
$X = A^{-1}B$
$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{11}\begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}\begin{bmatrix} 10 \\ 8 \\ 7 \end{bmatrix} = \frac{1}{11}\begin{bmatrix} 44 \\ -33 \\ 11 \end{bmatrix} = \begin{bmatrix} 4 \\ -3 \\ 1 \end{bmatrix}$
$x = 4, y = -3, z = 1$
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<td>Q.35</td>
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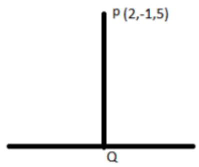
Solution:- $\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11} = \lambda$
$\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11}$
$Q \quad (10\lambda + 11, -4\lambda - 2, -11\lambda - 8)$ equ.(i)
direction ration of PQ are
$10\lambda + 11 - 2, --4\lambda - 2 + 1, -11\lambda - 8 - 5$
i.e $10\lambda + 9, -4\lambda - 1, -11\lambda - 13$


if PQ is perpendicu lar to the given line then
$10(10\lambda + 9) - 4(-4\lambda - 1) - 11(-11\lambda - 13) = 0$
$\Rightarrow \lambda = -1$
Substituti ng in (1) we get the foot of perpendicu lar as Q(1,2,3)
Length of perpendicu lar
$PQ = \sqrt{(2-1) + (-1-2)^2 + (5-3)^2} = 14$

OR
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1
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$1\frac{1}{2}$</td>
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	$x+1=2y=-12z$ x = y + 2 = 6z - 6 i.e $\frac{x+1}{1}=\frac{y-0}{\frac{1}{2}}=\frac{z-0}{\left(\frac{-1}{12}\right)}$ and $\frac{x-0}{1}=\frac{y+2}{1}=\frac{z-1}{1/6}$ *vector* equation $\vec{r}=(-\hat{i}+0\hat{j}+0\hat{k})+\lambda(\hat{i}+\frac{1}{2}\hat{j}-\frac{1}{12}\hat{k})$ *and* $\vec{r}=(0\hat{i}-2\hat{j}+\hat{k})+\mu(\hat{i}+\hat{j}+\frac{1}{6}\hat{k})$ $\vec{a}_1=-\hat{i}+0\hat{j}+0\hat{k}$ $\vec{a}_2=0\hat{i}-2\hat{j}+\hat{k}$ $\vec{b}_1=\hat{i}+\frac{1}{2}\hat{j}-\frac{1}{12}\hat{k}$ $\vec{b}_2=\hat{i}+\hat{j}+\frac{1}{6}\hat{k}$ $b_1\neq b_2$ lines are either intersecti ng or skew lines shortest distance $=\left\|\frac{(\bar{a}_2-\bar{a}_1).(\bar{b}_1\times\bar{b}_2)}{\|\bar{b}_1\times\bar{b}_2\|}\right\|$ $\bar{b}_1\times\bar{b}=\begin{vmatrix} i & j & k \\ 1 & 1/2 & -\frac{1}{12} \\ 1 & 1 & \frac{1}{6}\end{vmatrix}$ $=\frac{1}{6}i-\frac{1}{4}j+\frac{1}{2}k$ $\|\bar{b}_1\times\bar{b}\|=\frac{7}{12}$ *shortest* distance $=2$ unit	1 1 1 1/2 1 1/2
Q.36	Solution:- (i) Event E_1, E_2 and E_3 are mutually exclusive and exhuastive $\therefore\ P(E_1)+P(E_2)+P(E_3)=1$ $\Rightarrow\frac{1}{3}+\frac{1}{6}+P(E_3)=1$ $\Rightarrow P(E_3)=\frac{1}{2}$ $(ii)\quad P\left(\frac{A}{E_3}\right)=1$ $(iii)\quad P(E_3/A)=\frac{\frac{1}{2}\times1}{\frac{1}{3}\times\frac{1}{4}+\frac{1}{6}\times\frac{1}{8}+\frac{1}{2}\times1}=\frac{24}{29}$ *OR* $P(E_1/A)+P(E_2/A)+P(E_3/A)=1$	1 1 2 2
Q.37	Solution:-	

$(i)\ \vec{A} = (2\hat{i}+8\hat{j}+4\hat{k})-(6\hat{i}+8\hat{j}+4\hat{k}) = 15\hat{i}+0\hat{j}+0\hat{k}$

$\vec{B} = (6\hat{i}+16\hat{j}+10\hat{k})-(6\hat{i}+8\hat{j}+4\hat{k}) = 0\hat{i}+18\hat{j}+6\hat{k}$

Components of $\vec{A}$ and $\vec{B}$ are 15, 0, 0 and 0,8,6 respective ly. **1**

(ii) Vector $\vec{N}$ perpendicu lar to $\vec{A}$ and $\vec{B}$ is given by

$$\vec{N} = \vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 15 & 0 & 0 \\ 0 & 8 & 6 \end{vmatrix} = 0\hat{i}-90\hat{j}+120\hat{k}$$

Components of $\vec{N}$ are 0, -90, 120. **1**

(iii) $|\vec{N}| = \sqrt{0^2+(-90)^2+(120)^2} = \sqrt{22500} = 150$ m.

it is given that $\vec{F} = 910\,\vec{S}$

$$= 910\left(2\frac{\sqrt{3}}{7}\hat{i}-\frac{6}{7}\hat{j}+\frac{1}{7}\hat{k}\right)$$

$$= 260\sqrt{3}\,\hat{i} - 780\hat{j}+130\hat{k}$$

$$\vec{F}.\vec{N} = (260\sqrt{3}\,\hat{i} - 780\hat{j}+130\hat{k}).(0\hat{i}-90\hat{j}+120\hat{k})$$

$= 85800$ watts **2**

(iii)OR

Let θ be the angle between $\vec{N}$ and $\vec{S}$.Then

$$\cos\theta = \frac{\vec{N}.\vec{S}}{|\vec{N}||\vec{S}|}$$

$$\cos\theta = \frac{(0\hat{i}-90\hat{j}+120\hat{k}).\left(2\frac{\sqrt{3}}{7}\hat{i}-\frac{6}{7}\hat{j}+\frac{1}{7}\hat{k}\right)}{150\times 1}$$

$$= \frac{660}{7\times 150}$$ **2**

$$\theta = \cos^{-1}\frac{22}{35}$$

Q.38 Solution:-

(i) Perimeter=100+100+100+x100+x

= (400+2x)m

Total covered area is area of trapezium

$$= \frac{1}{2}[100+100+2x].a$$

$$= (100+x)\sqrt{10000-x^2}\ m^2$$ **2**

$(ii)\quad A = (100+x)\sqrt{10000-x^2}$

for maximum area $\frac{dA}{dx} = 0$ and $\frac{d^2A}{dx^2} < 0$ for x

$$= \quad \frac{dA}{dx} = \frac{(100+x)(-2x)}{2\sqrt{1000-x^2}}+\sqrt{10000-x^2}$$

$$= \frac{-100x-x^2+10000-x^2}{\sqrt{10000-x^2}}$$

$$\frac{dA}{dx} = \frac{-2x^2-100x+10000}{\sqrt{10000-x^2}}$$

for maximum area

$$\frac{dA}{dx} = 0 \Rightarrow -2x^2-100x+10000 = 0$$

$$\Rightarrow x^2+50x-5000 = 0$$

$$\Rightarrow (x+100)(x-50) = 0$$

$$\Rightarrow x = -100(rejected)or\ x = 50\text{ m}$$

$$\frac{d^2A}{dx^2} < 0 \text{ for } x = 50$$

Hence, area is maximum for x = 50 m. **2**