

QUESTION PAPER CODE 65/1/A
EXPECTED ANSWERS/VALUE POINTS

SECTION - A

		Marks
1.	getting $ A = 1$	½ m
	$ A^n = 1$	½ m
2.	Order 2 or degree = 1	½ m
	sum = 3	½ m
3.	Writing $\int \frac{y}{\sqrt{1+y^2}} dy = -\int \frac{x dx}{\sqrt{1+x^2}}$	½ m
	Getting $\sqrt{1+y^2} + \sqrt{1+x^2} = c$	½ m
4.	$\vec{OB} = \frac{\vec{OA} + \vec{OC}}{2}$	½ m
	$\vec{OC} = 2\vec{b} - \vec{a}$	½ m
5.	Vector Perpendicular to \vec{a} and $\vec{b} = \frac{\vec{a} \times \vec{b}}{ \vec{a} \times \vec{b} }$	
	[Finding or using]	½ m
	Required Vector = $\hat{i} - 11\hat{j} - 7\hat{k}$	½ m
6.	Writing standard form	
	$\frac{x}{3} = \frac{y}{2} = \frac{z}{-6}$ and $\frac{x}{2} = \frac{y}{-12} = \frac{z}{-3}$	½ m
	Finding $\theta = \frac{\pi}{2}$	½ m

SECTION - B

7.
$$\begin{array}{l} \text{Family A} \Rightarrow \\ \text{Family B} \Rightarrow \end{array} \begin{bmatrix} 4 & 6 & 2 \\ 2 & 2 & 4 \end{bmatrix} \begin{array}{c} \text{C} \quad \text{P} \\ \begin{bmatrix} 2400 & 45 \\ 1900 & 55 \\ 1800 & 33 \end{bmatrix} \end{array} \quad 2 \text{ m}$$

Writing Matrix Multiplication as $\begin{bmatrix} 24600 & 576 \\ 15800 & 332 \end{bmatrix}$ 1 m

Writing about awareness of balanced diet 1 m

Alt: Method

Taking the given data for all Men, all Women, all Children for each family, the solution must be given marks accordingly

8.
$$\tan \left\{ \tan^{-1} \left(\frac{1}{5} \right) + \frac{\pi}{4} \right\} = \tan \left\{ \tan^{-1} \left(\frac{\frac{2}{5}}{1 - \frac{1}{25}} \right) + \frac{\pi}{4} \right\} \quad 1 \text{ m}$$

$$= \tan \left\{ \tan^{-1} \left(\frac{5}{12} \right) + \frac{\pi}{4} \right\} \quad 1 \text{ m}$$

$$= \frac{\frac{5}{12} + 1}{1 - \frac{5}{12}} = \frac{17}{7} \quad 1+1 \text{ m}$$

9. Writing $C_1 \leftrightarrow C_2$

$$A = -2 \begin{vmatrix} 1 & a^3 & a \\ 1 & b^3 & b \\ 1 & c^3 & c \end{vmatrix}$$

$$R_1 \rightarrow R_1 - R_2 \text{ \& } R_2 \rightarrow R_2 - R_3$$

$$A = -2 \begin{vmatrix} 0 & a^3 - b^3 & a - b \\ 0 & b^3 - c^3 & b - c \\ 1 & c^3 & c \end{vmatrix} \quad 1+1 \text{ m}$$

$$A = -2(a-b)(b-c) \begin{vmatrix} 0 & a^2 + ab + b^2 & 1 \\ 0 & b^2 + c^2 + bc & 1 \\ 1 & c^3 & c \end{vmatrix} \quad 1 \text{ m}$$

$$= -2(a-b)(b-c) \{a^2 + ab + b^2 - b^2 - bc - c^2\} \quad \frac{1}{2} \text{ m}$$

$$= 2(a-b)(b-c)(c-a)(a+b+c) \quad \frac{1}{2} \text{ m}$$

10. $A = IA$

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A \quad 1 \text{ m}$$

Using elementary row transformations to get

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & -2 & 1 \\ -9 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix} A \quad 2 \text{ m}$$

$$\Rightarrow A^{-1} = \begin{bmatrix} 3 & -2 & 1 \\ -9 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix} \quad 1 \text{ m}$$

OR

$$AC = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 9 \\ 12 \\ 30 \end{bmatrix} \quad 1 \text{ m}$$

$$BC = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 \\ 8 \\ -2 \end{bmatrix} \quad 1 \text{ m}$$

$$AC + BC = \begin{bmatrix} 10 \\ 20 \\ 28 \end{bmatrix} \quad \frac{1}{2} \text{ m}$$

$$(A+B) C = \begin{bmatrix} 0 & 7 & 8 \\ -5 & 0 & 10 \\ 8 & -6 & 0 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix} \quad \frac{1}{2} \text{ m}$$

$$= \begin{bmatrix} 10 \\ 20 \\ 28 \end{bmatrix} \quad 1 \text{ m}$$

Yes, $(A+B) C = AC + BC$

$$11. \quad f(x) = \begin{cases} -2x+1 & \text{if } x < 0 \\ 1 & \text{if } 0 \leq x < 1 \\ 2x-1 & \text{if } x \geq 1 \end{cases} \quad 1\frac{1}{2} \text{ m}$$

Only possible discontinuities are at $x=0$, $x=1$

at $x=0$: at $x=1$

L. H. limit = 1 : L. H. limit = 1 1 m

$f(0) = \text{R. H. limit} = 1$: $f(1) = \text{R. H. limit} = 1$

$\therefore f(x)$ is continuous in the interval $(-1, 2)$ $\frac{1}{2}$ m

At $x=0$

L. H. D = $-2 \neq$ R. H. D = 1 1 m

$\therefore f(x)$ is not differentiable in the interval $(-1, 2)$

$$12. \quad x = a (\cos 2t + 2t \sin 2t)$$

$$y = a (\sin 2t - 2t \cos 2t)$$

$$\Rightarrow \frac{dx}{dt} = 4 \text{ at } \cos 2t \quad 1 \text{ m}$$

$$\Rightarrow \frac{dy}{dt} = 4 \text{ at } \sin 2t \quad 1 \text{ m}$$

$$\Rightarrow \frac{dy}{dx} = \tan 2t \quad \frac{1}{2} \text{ m}$$

$$\Rightarrow \frac{d^2y}{dx^2} = 2 \sec^2 2t \cdot \frac{dt}{dx} \quad 1 \text{ m}$$

$$\frac{d^2y}{dx^2} = \frac{1}{2 \text{ at } \cos^3 2t} \quad \frac{1}{2} \text{ m}$$

13. $\frac{y}{x} = \log x - \log (ax + b)$

differentiating w.r.t. x, 1 m

$$= \frac{x \frac{dy}{dx} - y}{x^2} = \frac{1}{x} - \frac{a}{ax + b} = \frac{b}{x(ax + b)}$$

$$= x \cdot \frac{dy}{dx} - y = \frac{bx}{(ax + b)} \dots\dots\dots (1) \quad 1 \text{ m}$$

differentiating w.r.t. x again

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} - \frac{dy}{dx} = \frac{(ax + b)b - abx}{(ax + b)^2}$$

$$x \frac{d^2y}{dx^2} = \frac{b^2}{(ax + b)^2} \quad 1 \text{ m}$$

Writing $\Rightarrow x^3 \frac{d^2y}{dx^2} = \left(\frac{bx}{ax+b} \right)^2$ (2) ½ m

From (1) and (2) \Rightarrow

$$x^3 \frac{d^2y}{dx^2} = \left(x \cdot \frac{dy}{dx} - y \right)^2$$
 ½ m

14. $I = \int \frac{x + \sin x - x(1 + \cos x)}{x(x + \sin x)} dx$ 1 m

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

put $x + \sin x = t$ 2 m
 $\Rightarrow (1 + \cos x) dx = dt$

$$= \log|x| - \log|x + \sin x| + c$$
 1 m

OR

$$I = \int \frac{(x-1)(x^2+x+1)+1}{(x-1)(x^2+1)} dx$$
 ½ m

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

$$= \int \left(1 + \frac{x}{x^2+1} + \frac{1}{2} \frac{1}{x-1} - \frac{1}{2} \frac{x}{x^2+1} - \frac{1}{2} \frac{1}{x^2+1} \right) dx$$
 1½ m

$$= x + \frac{1}{4} \log|x^2+1| + \frac{1}{2} \log|x-1| - \frac{1}{2} \tan^{-1}x + c$$
 1 m

$$15. \quad I = \int_0^{\frac{\pi}{2}} \frac{dx}{1+4 \tan^2 x} = \int_0^{\frac{\pi}{2}} \frac{\sec^2 x}{(1+\tan^2 x)(1+4 \tan^2 x)} dx \quad 1 \text{ m}$$

Put $\tan x = t$

$$I = \int_0^{\infty} \frac{dt}{(1+t^2)(1+4t^2)} = -\frac{1}{3} \int_0^{\infty} \frac{dt}{1+t^2} + \frac{4}{3} \int_0^{\infty} \frac{dt}{1+(2t)^2} \quad 1 \text{ m}$$

$$= -\frac{1}{3} \tan^{-1} t \Big|_0^{\infty} + \frac{4}{3 \times 2} \tan^{-1} (2t) \Big|_0^{\infty} \quad 1 \text{ m}$$

$$= -\frac{1}{3} \left(\frac{\pi}{2} \right) + \frac{2}{3} \left(\frac{\pi}{2} \right) = \frac{\pi}{6} \quad 1 \text{ m}$$

$$16. \quad I = -\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{(\sin x - \cos x)^2 - 2^2} dx \quad 1\frac{1}{2} \text{ m}$$

Put $\sin x - \cos x = t \Rightarrow t = -1$ to 0 1 m

$(\cos x + \sin x) dx = dt$

$$I = -\int_{-1}^0 \frac{dt}{t^2 - 2^2}$$

$$= -\frac{1}{4} \log \left| \frac{t-2}{t+2} \right| \Big|_{-1}^0 \quad 1 \text{ m}$$

$$= -\frac{1}{4} \{0 - \log 3\}$$

$$= \frac{1}{4} \log 3$$

}

$\frac{1}{2} \text{ m}$

17. Writing $\vec{d} = \lambda(\vec{a} \times \vec{b})$

$$= \lambda \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 4 & 2 \\ 3 & -2 & 7 \end{vmatrix} \quad 1 \text{ m}$$

$$= \lambda (32\hat{i} - \hat{j} - 14\hat{k}) \dots\dots\dots (1) \quad 1 \text{ m}$$

$$\vec{c} \cdot \vec{d} = 27$$

$$(2\hat{i} - \hat{j} + 4\hat{k}) \cdot \lambda (32\hat{i} - \hat{j} - 14\hat{k}) = 27$$

$$9\lambda = 27 \quad 1 \text{ m}$$

$$\lambda = 3$$

$$\therefore \vec{d} = 96\hat{i} - 3\hat{j} - 42\hat{k} \quad 1 \text{ m}$$

18. Lines are parallel 1/2 m

$$\therefore \text{S.D} = \left| \frac{(\vec{a}_2 - \vec{a}_1) \times \vec{b}}{|\vec{b}|} \right| \quad 1 \text{ m}$$

$$\vec{a}_2 - \vec{a}_1 = \hat{i} + 2\hat{j} + 2\hat{k} \text{ and } \vec{b} = 2\hat{i} + 3\hat{j} + 4\hat{k}$$

$$(\vec{a}_2 - \vec{a}_1) \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 2 \\ 2 & 3 & 4 \end{vmatrix}, \quad |\vec{b}| = \sqrt{29} \quad 1\frac{1}{2} + \frac{1}{2} \text{ m}$$

$$\therefore \text{S.D} = \left| \frac{2\hat{i} - \hat{k}}{\sqrt{29}} \right| = \frac{\sqrt{5}}{\sqrt{29}} \text{ or } \frac{\sqrt{145}}{29} \quad \frac{1}{2} \text{ m}$$

OR

Required equation of plane is

$$2x + y - z - 3 + \lambda(5x - 3y + 4z + 9) = 0 \rightarrow (1) \quad 1 \text{ m}$$

$$x(2 + 5\lambda) + y(1 - 3\lambda) + z(-1 + 4\lambda) + 9\lambda - 3 = 0 \quad 1 \text{ m}$$

(1) is parallel to $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$

$$\therefore 2(2 + 5\lambda) + 4(1 - 3\lambda) + 5(-1 + 4\lambda) = 0$$

$$\Rightarrow \lambda = -\frac{1}{6} \quad 1 \text{ m}$$

$$(1) \Rightarrow 7x + 9y - 10z - 27 = 0 \quad 1 \text{ m}$$

19. $P(\text{step forward}) = \frac{2}{5}$, $P(\text{step backward}) = \frac{3}{5}$ 1/2 m

He can remain a step away in either of the

ways : 3 steps forward & 2 backwards 1 m

or 2 steps forward & 3 backwards

$$\therefore \text{required possibility} = {}^5C_3 \left(\frac{2}{5}\right)^3 \left(\frac{3}{5}\right)^2 + {}^5C_2 \left(\frac{2}{5}\right)^2 \left(\frac{3}{5}\right)^3 \quad 2 \text{ m}$$

$$= \frac{72}{125} \quad \frac{1}{2} \text{ m}$$

OR

A die is thrown

Let E_1 be the event of getting 1 or 2

Let E_2 be the event of getting 3, 4, 5 or 6

Let A be the event of getting a tail

$$P(E_1) = \frac{1}{3}, P(E_2) = \frac{2}{3} \quad 1 \text{ m}$$

$$\Rightarrow P\left(\frac{A}{E_1}\right) = \frac{3}{8}, \& P\left(\frac{A}{E_2}\right) = \frac{1}{2} \quad 1 \text{ m}$$

$$P\left(\frac{E_2}{A}\right) = \frac{P(E_2) \times P\left(\frac{A}{E_2}\right)}{P(E_1) \times P\left(\frac{A}{E_1}\right) + P(E_2) \times P\left(\frac{A}{E_2}\right)} \quad 1 \text{ m}$$

$$= \frac{\frac{2}{3} \times \frac{1}{2}}{\frac{1}{3} \times \frac{3}{8} + \frac{2}{3} \times \frac{1}{2}}$$

$$= \frac{8}{11} \quad 1 \text{ m}$$

SECTION - C

20. Here $R = \{(a, b) : a, b \in \mathfrak{R} \text{ and } a - b + \sqrt{3} \in S, \text{ where}$

S is the set of all irrational numbers.}

(i) $\forall a \in \mathfrak{R}, (a, a) \in R$ as $a - a + \sqrt{3}$ is irrational

$\therefore R$ is reflexive 1½ m

(ii) Let for $a, b \in \mathfrak{R}, (a, b) \in R$ i. e. $a - b + \sqrt{3}$ is irrational

$$a - b + \sqrt{3} \text{ is irrational} \Rightarrow b - a + \sqrt{3} \in S \therefore (b, a) \in R$$

Hence R is symmetric 2 m

(iii) Let $(a, b) \in R$ and $(b, c) \in R$, for $a, b, c \in \mathfrak{R}$

$$\therefore a - b + \sqrt{3} \in S \text{ and } b - c + \sqrt{3} \in S$$

adding to get $a - c + 2\sqrt{3} \in S$ Hence $(a, c) \in R$

2½ m

$\therefore R$ is Transitive

OR

$\forall a, b, c, d, e, f \in \mathfrak{R}$

$$((a, b) * (c, d)) * (e, f) = (a + c, b + d) * (e, f)$$

1 m

$$= (a + c + e, b + d + f) \rightarrow (3)$$

$$(a, b) * ((c, d) * (e, f)) = (a, b) * (c + e, d + f)$$

1 m

$$= (a + c + e, b + d + f) \rightarrow (4)$$

$\therefore *$ is Associative

Let (x, y) be an identity element in $\mathfrak{R} \times \mathfrak{R}$

$$\Rightarrow (a, b) * (x, y) = (a, b) = (x, y) * (a, b)$$

$$\Rightarrow a + x = a, b + y = b$$

$$x = 0, y = 0$$

2 m

$\therefore (0, 0)$ is identity element

Let the inverse element of $(3, -5)$ be (x_1, y_1)

$$\Rightarrow (3, -5) * (x_1, y_1) = (0, 0) = (x_1, y_1) * (3, -5)$$

$$3 + x_1 = 0, -5 + y_1 = 0$$

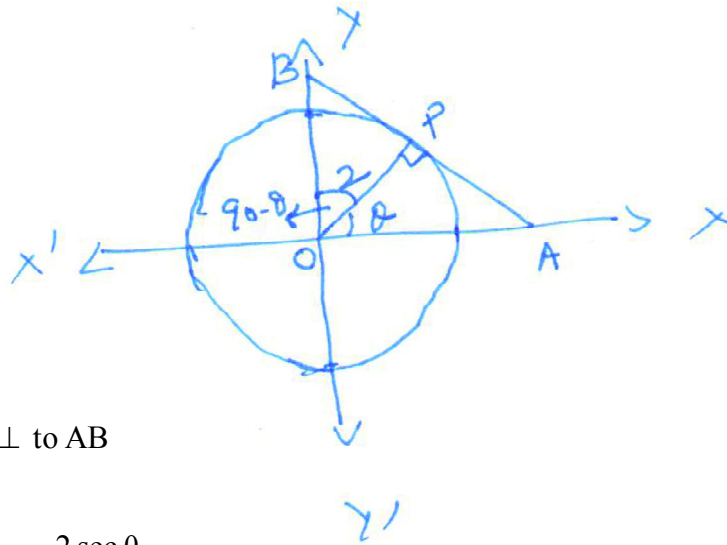
$$x_1 = -3, y_1 = 5$$

$\Rightarrow (-3, 5)$ is an inverse of $(3, -5)$

2 m

21.

Fig. ½ m



$x^2 + y^2 = 4$. OP is \perp to AB

$$\cos \theta = \frac{2}{OA} ; OA = 2 \sec \theta$$

½ m

$$\cos (90^\circ - \theta) = \frac{2}{OB}$$

$$OB = 2 \operatorname{cosec} \theta$$

½ m

$$\text{Let } S = OA + OB = 2 (\sec \theta + \operatorname{cosec} \theta) \dots\dots\dots (1)$$

1 m

$$\frac{dS}{d\theta} = 2 (\sec \theta \tan \theta - \operatorname{cosec} \theta \cdot \cot \theta)$$

1 m

$$= 2 \left(\frac{\sin^3 \theta - \cos^3 \theta}{\sin^2 \theta \cdot \cos^2 \theta} \right) \dots\dots\dots (2)$$

for maxima or minima $\frac{dS}{d\theta} = 0$

$$\Rightarrow \theta = \frac{\pi}{4},$$

1 m

$$(2) \Rightarrow \frac{d^2S}{d\theta^2} > 0 \text{ when } \theta = \frac{\pi}{4}$$

1 m

\therefore OA + OB is minimum

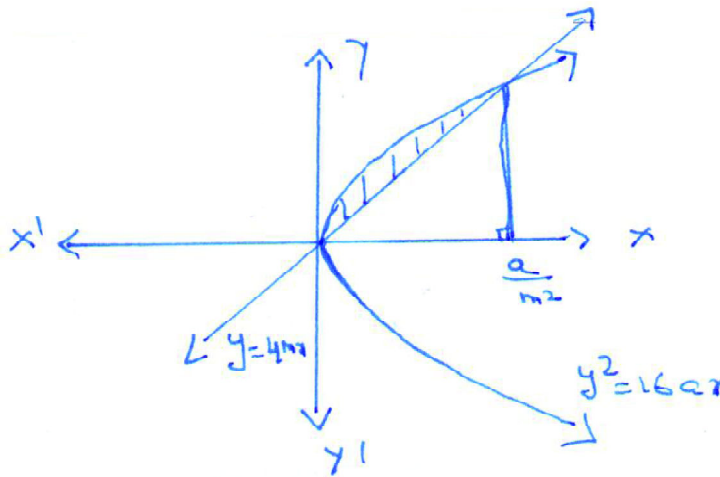
$$\Rightarrow OA + OB = 4\sqrt{2} \text{ unit}$$

½ m

22.

Figure

½ m



$$y = 4mx \rightarrow (1) \text{ and } y^2 = 16ax \rightarrow (2)$$

1 m

$$\Rightarrow x = \frac{a}{m^2}$$

$$\text{Required area} = 4\sqrt{a} \int_0^{\frac{a}{m^2}} \sqrt{x} \, dx - 4m \int_0^{\frac{a}{m^2}} x \, dx$$

2 m

$$= \frac{8}{3} \sqrt{a} x^{3/2} \Big|_0^{\frac{a}{m^2}} - 2m x^2 \Big|_0^{\frac{a}{m^2}}$$

$$= \frac{8}{3} \frac{a^2}{m^3} - \frac{2a^2}{m^3} = \frac{2}{3} \frac{a^2}{m^3}$$

2 m

$$\Rightarrow \frac{2}{3} \cdot \frac{a^2}{m^3} = \frac{a^2}{12} \text{ given}$$

$$m^3 = 8$$

$$m = 2$$

½ m

23. $(x - y) \frac{dy}{dx} = x + 2y$

$$\frac{dy}{dx} = \frac{x + 2y}{x - y}$$

$$\frac{dy}{dx} = \frac{1 + 2 \frac{y}{x}}{1 - \frac{y}{x}} = f\left(\frac{y}{x}\right) \dots\dots\dots (1)$$

∴ differential equation is homogeneous Eqn. 1 m

$y = vx$ to give

$$v + x \cdot \frac{dv}{dx} = \frac{1 + 2v}{1 - v} \quad \text{1/2 m}$$

$$\Rightarrow \int \frac{1 - v}{1 + v + v^2} dv = \int \frac{dx}{x} \quad \text{1 m}$$

$$\Rightarrow -\frac{1}{2} \int \frac{2v + 1}{1 + v + v^2} dv + \frac{3}{2} \int \frac{dv}{\left(v + \frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2} = \int \frac{dx}{x} \quad \text{1 1/2 m}$$

$$-\frac{1}{2} \log |1 + v + v^2| + \sqrt{3} \tan^{-1} \left(\frac{2v + 1}{\sqrt{3}} \right) = \log |x| + c \quad \text{1 m}$$

$$-\frac{1}{2} \log \left| \frac{x^2 + xy + y^2}{x^2} \right| + \sqrt{3} \tan^{-1} \left(\frac{2y + x}{x\sqrt{3}} \right) = \log |x| + c \quad \text{1 m}$$

OR

$$(x - h) + (y - k) \frac{dy}{dx} = 0 \quad \text{1 m}$$

$$\text{and } 1 + (y - k) \frac{d^2y}{dx^2} + \left(\frac{dy}{dx} \right)^2 = 0 \quad \text{1 m}$$

$$\Rightarrow (y-k) = \frac{-\left[1+\left(\frac{dy}{dx}\right)^2\right]}{\frac{d^2y}{dx^2}} \quad 1 \text{ m}$$

$$(1) \Rightarrow (x-h) = \frac{1+\left(\frac{dy}{dx}\right)^2}{\frac{d^2y}{dx^2}} \frac{dy}{dx} \quad 1 \text{ m}$$

Putting in the given eqn.

$$\frac{\left(1+\left(\frac{dy}{dx}\right)^2\right)^2}{\left(\frac{d^2y}{dx^2}\right)^2} \cdot \left(\frac{dy}{dx}\right)^2 + \frac{\left(1+\left(\frac{dy}{dx}\right)^2\right)^2}{\left(\frac{d^2y}{dx^2}\right)^2} = r^2 \quad 1 \text{ m}$$

$$\text{or } \left[1+\left(\frac{dy}{dx}\right)^2\right]^3 = r^2 \left(\frac{d^2y}{dx^2}\right)^2 \quad 1 \text{ m}$$

24. Eqn. of a plane through

and Points A(6, 5, 9), B (5, 2, 4) & C (-1, -1, 6) is

$$\Rightarrow \begin{vmatrix} x-6 & y-5 & z-9 \\ 2 & 3 & 2 \\ -6 & -3 & 2 \end{vmatrix} = 0 \quad 2\frac{1}{2} \text{ m}$$

$$\Rightarrow 3x - 4y + 3z - 25 = 0 \quad \rightarrow (2) \quad 1\frac{1}{2} \text{ m}$$

distance from (3, -1, 2) to (2)

$$d = \left| \frac{9+4+6-25}{\sqrt{9+16+9}} \right| = \frac{6}{\sqrt{34}} \text{ units} \quad 2 \text{ m}$$

25. Possible values of x are 0, 1, 2 and x is a random variable 1½ m

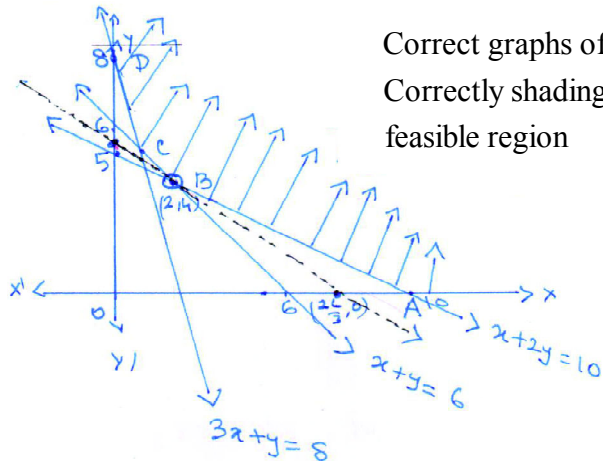
x:	P(x)	x P(x)	x ² P(x)		
0	$\frac{{}^2C_0 \times {}^5C_2}{{}^7C_2} = \frac{20}{42}$	0	0	For P(x)	1½ m
1	$\frac{{}^2C_1 \times {}^5C_1}{{}^7C_2} = \frac{20}{42}$	$\frac{20}{42}$	$\frac{20}{42}$	For x P(x)	½ m
2	$\frac{{}^2C_2 \times {}^5C_0}{{}^7C_2} = \frac{2}{42}$	$\frac{4}{42}$	$\frac{8}{42}$	For x ² P(x)	½ m

$$\sum x P(x) = \frac{24}{42}; \quad \sum x^2 P(x) = \frac{28}{42} \quad 1 \text{ m}$$

$$\text{Mean} = \sum x P(x) = \frac{4}{7}; \quad \text{variance} = \sum x^2 P(x) - \left[\sum x P(x) \right]^2 \quad 1 \text{ m}$$

$$\text{Variance} = \frac{50}{147} = \frac{2}{3} - \frac{16}{49} = \frac{50}{147}$$

26. 3 m



Correct graphs of 3 lines 3 m
 Correctly shading feasible region ½

Vertices are A (10, 0), B (2, 4), C (1, 5) & D (0, 8) 1 m

$Z = 3x + 5y$ is minimum

at B (2, 4) and the minimum Value is 26. 1 m

on Plotting ($3x + 5y < 26$)

since these it no common point with the feasible

region, Hence, $x = 2, y = 4$ gives minimum Z ½ m