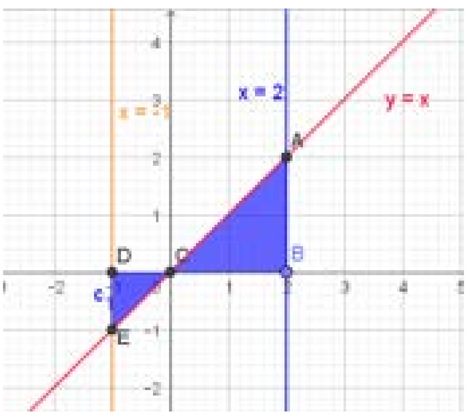
KENDRIYA VIDYALAYA SANGATHAN , BENGALURU REGION
FIRST PRE BOARD EXAMINATION (2025-26)
MATHEMATICS CLASS XII
MARKING SCHEME

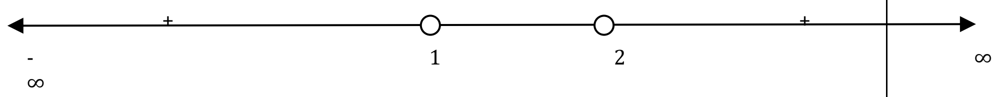
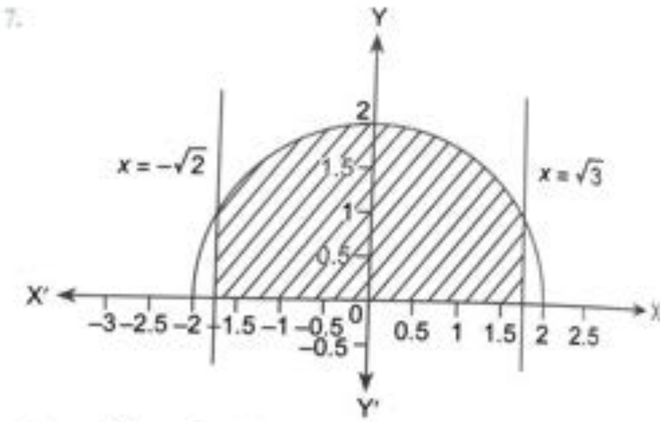
1.	(b)	1m
2	(b)	1m
3	(c)	1m
4	(c)	1m
5	(c)	1m
6	(c)	1m
7	(a)	1m
8	(b)	1m
9	(d)	1m
10	(c)	1m
11	(c)	1m
12	(c)	1m
13	(d)	1m
14	(a)	1m
15	(d)	1m
16	(d)	1m
17	(c)	1m
18	(b)	1m
19	(a)	1m
20	(b)	1m

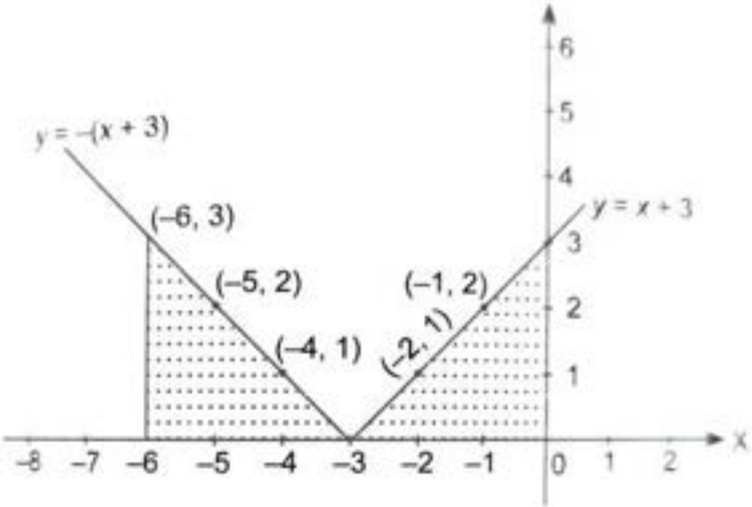
21	**a)** $tan^{-1}\left[2\,sin(\,2\,cos^{-1}\left(\frac{\sqrt{3}}{2}\right))\right]=tan^{-1}\left[2\,sin(\,2\times\frac{\pi}{6})\right]$ $= tan^{-1}\left[2\times\frac{\sqrt{3}}{2}\right]=$ $=tan^{-1}\sqrt{3} \quad =\frac{\pi}{3}$ OR (b) : **:** $sin^{-1}\left(\frac{-1}{2}\right) = -\,sin^{-1}\left(\frac{1}{2}\right) = -\frac{\pi}{6}$	**1/2m** **1/2m** **1m** **1/2m**

	$cos^{-1}\left(\frac{-1}{2}\right) = \pi - cos^{-1}\left(\frac{1}{2}\right) = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$ $tan^{-1}(1) == \frac{\pi}{4}$ $\therefore sin^{-1}\left(\frac{-1}{2}\right) + 2\,cos^{-1}\left(\frac{-1}{2}\right) + tan^{-1}(1) = \frac{-\pi}{6} + \frac{2\pi}{3} + \frac{\pi}{4} = \frac{3\pi}{4}$	**1/2m** **1/2m** **1/2m**
22	$cos\,y = x\,cos\,(a + y)$ $x = \frac{\cos y}{\cos(a+y)}$ $\frac{dx}{dy} = \frac{-\cos(a+y)\,siny + cosysin(a+y)}{cos^2(a+y)}$ $\frac{dx}{dy} = \frac{\sin a}{cos^2(a+y)}$ $\frac{dy}{dx} = \frac{cos^2(a+y)}{\sin a}$	1m **1/2m** **1/2m**
23	(a) $\int \frac{2 + 2Sinx.cosx}{2\,Cos^2x}\, e^x\,.dx = \int(\,Sec^2x + Tanx\,)\,e^x\,.$ $= e^x.Tanx + C$ (b) : $= \int_0^2 x\,dx + \left\lvert \int_{-1}^0 x\,dx \right\rvert$ $= \frac{5}{2}.$  	1m 1m **1m** **1/2m** figure **1/2m**

24	$f(x) = \frac{\sin^2 \lambda x}{x^2}$ is continuous at $x = 0$ Then $f(0) = \lim_{x \to 0} \frac{\sin^2 \lambda x}{x^2}$ $= \lim_{x \to 0} \frac{\sin^2 \lambda x}{x^2} = \lim_{x \to 0} \left[\frac{\sin(\lambda x)}{(\lambda x)^2}\right]^2 \times \lambda^2$ $= 1 \times \lambda^2 = \lambda^2$ $\left\{\because \lim_{x \to 0} \frac{\sin x}{x} = 1\right\}$ Since function is continuous at $x = 0$. $\lambda^2 = 1$ $\lambda = \pm 1$	**1/2m** 1m **1/2m**
25	Angle between $\vec{a}$ *and* $\vec{b}$ is Sin Θ $= \frac{\lvert \vec{a} \times \vec{b} \rvert}{\lvert \vec{a} \rvert \lvert \vec{b} \rvert}$ Sin Θ $= \frac{1}{3.\frac{2}{3}}$ $\{\because \lvert \vec{a} \times \vec{b} \rvert = 1\}$ Sin Θ $= \frac{1}{2}$ Θ $= \frac{\pi}{6}$	**1/2m** **1/2m** 1m

26	(a) y= $\sin^{-1} x$ $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$ $\sqrt{1-x^2}\,\frac{dy}{dx}$ =1 $\sqrt{1-x^2}\,\frac{d^2y}{dx^2} + \frac{dy}{dx} \cdot \frac{-2x}{\sqrt{\sqrt{1-x^2}}} = 0$ (1-x^2) $\frac{d^2y}{dx^2}$ -x $\frac{dy}{dx}$ =0 (b) y = $sin^{-1}(\frac{2^{x+1}}{1+4^x})$ = $\boldsymbol{sin^{-1}}(\frac{2^x.2}{1+(2^x)^2})$ Put 2^x = tan θ Y = $sin^{-1}(\frac{2tan\,\theta}{1+tan^2\theta})$ Y = $\sin^{-1} sin\,2\theta$ Y = 2θ Y = $2\tan^{-1} 2^x$ $\frac{\boldsymbol{dy}}{\boldsymbol{dx}} = 2\frac{1}{1+(2^x)^2} \cdot \frac{d}{dx}(2^x)$ $\frac{dy}{dx} = \frac{2}{1+(4^x)}$. 2^x log 2 = $\frac{2^{x+1}}{1+(4^x)}$ log 2	1m 1m 1m 1m 1m **1/2m** **1/2m**
27	$f(x) = 2x^3 - 9x^2 + 12x + 15$ ⇒ $f'(x) = 6x^2 - 18x + 12 = 6(x^2 - 3x + 2)$ (i) For $f(x)$ to be increasing, we must have $f'(x) > 0$ ⇒ $6(x^2 - 3x + 2) > 0$ ⇒ $x^2 - 3x + 2 > 0$ [$\because 6 > 0 \therefore 6(x^2 - 3x + 2) > 0 \Rightarrow x^2 - 3x + 2 > 0$] ⇒ $(x-1)(x-2) > 0$ (See fig) ⇒ $x < 1$ or $x > 2$	1/2m 1/2m 1m

	$\Rightarrow x \in (-\infty, 1) \cup (2, \infty)$. So, $f(x)$ is increasing on $(-\infty, 1) \cup (2, \infty)$. 	1m
28(a)	**(a)** 7.  Area of the region bounded by the curve $= \int_{-\sqrt{2}}^{\sqrt{3}} \sqrt{4-x^2}\,dx$ $= \left[\frac{x}{2}\sqrt{4-x^2} + 2\sin^{-1}\frac{x}{2}\right]_{-\sqrt{2}}^{\sqrt{3}}$ $= \frac{\sqrt{3}}{2} + 2\cdot\frac{\pi}{3} + 1 + 2\cdot\frac{\pi}{4}$ $= \frac{\sqrt{3}}{2} + 1 + \frac{7\pi}{6}$	**Same distribution for (b)** **Fig. 1m** 1/2m 1/2m **1m**

	 Area of the region enclosed by the curve $y = \|x+3\|$, the x-axis between $x = -6$ and $x = 0$ is Area $= \int_{-6}^{0} \|x+3\| dx$ $= \int_{-6}^{-3} -(x+3)dx + \int_{-3}^{0} (x+3)dx$ Application of Integrals $= \left[\frac{-x^2}{2} - 3x\right]_{-6}^{-3} + \left[\frac{x^2}{2} + 3x\right]_{-3}^{0}$ $= \left(-\frac{9}{2}+9\right) - \left(-\frac{36}{2}+18\right) + \left(\frac{0}{2}+0\right) - \left(\frac{9}{2}-9\right)$ $= \frac{9}{2} - 0 + 0 + \frac{9}{2} = 9$ sq units **(b)**	
29	(a) The general point Q on the given line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ is x = 3 λ −2, y = 2 λ −1 z = 2 λ +3 Given PQ = $3\sqrt{2}$. ∴ $\sqrt{(3\lambda-2-1)^2 + (2\lambda-1-2)^2 + (2\lambda+3-3)^2} = 3\sqrt{2}$ So $\lambda = \frac{30}{7}$, And the required point P is $(\frac{56}{17}, \frac{43}{17}, \frac{111}{17})$	1m 1m 1m

(b) **:** DRs of the required lines can be obtained by calculating the determinant

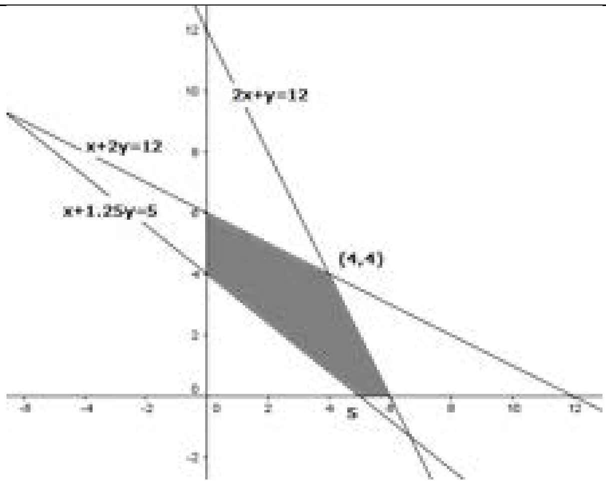
$$\begin{vmatrix} i & j & k \\ 3 & -16 & 7 \\ 3 & 8 & -5 \end{vmatrix}$$ which is equal to $24\hat{\imath} + 36\hat{\jmath} + 72\hat{k}$

$\therefore$ DRs are 24, 36, 72 2m

i.e DRs 2, 3, 6

equation of line is $\hat{r} = \hat{\imath} + 2\hat{\jmath} - 4\hat{k} + \boldsymbol{\lambda}(\boldsymbol{2}\hat{\imath} + 3\hat{\jmath} + 6\hat{k})$ 1m

30



$1\frac{1}{2}$

Corner Points	Z=600x+400y
(5,0)	3000
(6,0)	3600
(4,4)	4000=Maximum
(0,6)	2400
(0,4)	1600

1

Optimal Sol: x=4, y=4 1/2

31

Ans: E: Selecting A F: Selecting B E and F are independent events. 1/2m

$P(E) = 0.7, P[(E \cap F')U(E' \cap F)] = 0.6$ 1/2m

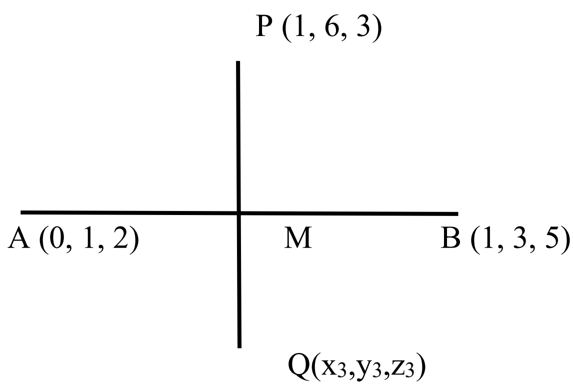
$P(E).P(F') + P(E').P(F) = 0.6$

$P(E)(1 - P(F)) + (1 - P(E))P(F) = 0.6$ 1m

$P(E) + P(F) - 2.P(E).P(F) = 0.6; 0.7 + x - 2(0.7).x = 0.6$ 1/2m

$0.1 = 0.4xx = \frac{1}{4} = P(F).$ 1/2m

32	AB = I , Given system of equations CX=D C= A^T X = C^{-1} D = =(AT)$^{-1}$D = B^TD , x=0 , y = 5 , z = 3	2m $1\frac{1}{2}$m $1\frac{1}{2}$m
33	(a) Apply the properties of definite integral and proving I = - $\pi.log2$. Appropriate (b) $\int \frac{3x+5}{x^3-x^2-x+1} dx = \int \frac{3x+5}{(x-1)^2(x+1)} dx$ $\frac{3x+5}{(x-1)^2(x+1)} = \frac{A}{(x-1)} + \frac{B}{(x-1)^2} + \frac{C}{(x+1)}$ A = $\frac{-1}{2}$, B = 4 and C = $\frac{1}{2}$ I= $\frac{1}{2}\ log\frac{x+1}{x-1}$ - $\frac{4}{x-1}$ + C	 1m 1m $1\frac{1}{2}$ $1\frac{1}{2}$
34	(a) : $\frac{dy}{dx} = \frac{y}{x} - tan\left(\frac{y}{x}\right)$, homogenous equation Let y =vx $\Rightarrow \frac{dy}{dx} = v + x\frac{dv}{dx}$ $v + x\frac{dv}{dx} = v - tanv$ $\Rightarrow \int \frac{1}{tanv} dv = -\int \frac{1}{x} dx$ $\Rightarrow \int cotv\ dv = -\int \frac{1}{x} dx$ $\Rightarrow log\|sinv\| = -log\|x\| + logC$ $\Rightarrow Log\|sinv\| = log\left\|\frac{C}{x}\right\|$ $\Rightarrow xsin\frac{y}{x} = C$ is the required solution.	1/2m 1m 1m 2m 1/2m
(b)	The given equation $(x+y+1)\frac{dy}{dx} = 1$ $\Rightarrow \frac{dx}{dy} = x + y + 1$	

	$\Rightarrow \frac{dx}{dy} - x =$y +1(L.D.E) $\therefore$ I.F. = $e^{\int -dy} = e^{-y}$ Now solution is x e^{-y}= $\int (y+1)e^{-y}$dy $\Rightarrow$ x $e^{-y} = \frac{(y+1)e^{-y}}{-1} - \int \frac{e^{-y}}{-1} dy$ $\Rightarrow$ x $e^{-y} = -(y+1)e^{-y} - e^{-y} + C$ $\Rightarrow$x = C $e^{y} - (y+2)$	$1\frac{1}{2}$m 1m 1/2m 2m
35	(a) General pt. on line (1): (2λ + 1, 3λ + 2, 4λ + 3) General pt. on line (2): (5k + 4, 2k + 1, k) Equating coordinates: 2λ + 1 = 5k + 4 → (3) 3λ + 2 = 2k + 1 → (4) Solving (3) & (4): λ = -1, k = -1 Substituting in z-coordinate: 4λ + 3 = 4(-1) + 3 = -1 & k = -1 For λ = -1, k = -1, z-coordinates are also equal. ∴ Lines intersect Point of intersection: (-1, -1, -1)	1/2m 1/2m 1m+1m 1m 1m
b	 	

	Let M be the foot of the perpendicular. Let $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3} = \lambda$ (say) General point on the line AB is x = λ , y = 2 λ + 1, z = 3 λ + 2 DRs of PM = λ – 1, 2 λ – 5, 3 λ – 1 PM is perpendicular to AB. So $a_1 a_2 + b_1 b_2 + c_1 c_2 = 0$ ⇨ $1(\lambda - 1) + 2(2\lambda - 5) + 3(3\lambda - 1) = 0$ ⇨ $\lambda - 1 + 4\lambda - 10 + 9\lambda - 3 = 0$ So $14\lambda = 14$, and $\lambda = 1$ ∴ Point M is (1, 3, 5) Let the image be Q (x_3, y_3, z_3) Now , using M as mid point of PQ $\frac{x_1+x_3}{2} = x_2 \Rightarrow \frac{1+x_3}{2} = 1$ and $x_3 = 1$ $\frac{y_1+y_3}{2} = y_2 \Rightarrow \frac{6+y_3}{2} = 3$ and $y_3 = 0$ $\frac{z_1+z_3}{2} = z_2 \Rightarrow \frac{3+z_3}{2} = 5$ and $z_3 = 7$ ∴ Image Q is (1, 0, 7)	1/2m 1m 1/2m 1m 1m 1m

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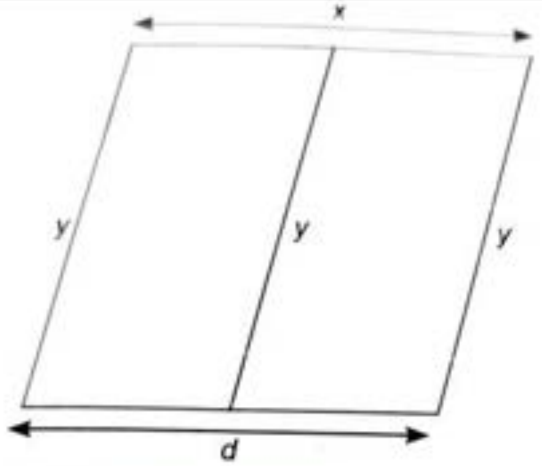
36	a) R is reflexive and transitive but not symmetric. b) No. Because n(B) is greater than n(A) c) R is neither reflexive nor symmetric nor transitive or no. of relations= 2^{12}	1m 1m 2m

37



(*i*) Total boundary material used, $2x + 3y = 300$

(*ii*) $$A = xy = \frac{1}{3}x(300 - 2x)$$ 1m

$$= \frac{1}{3}(300x - 2x^2)$$ 1m

(*iii*) (*a*) $$\frac{dA}{dx} = \frac{1}{3}(300 - 4x)$$

For critical point of area function,

$$\frac{dA}{dx} = 0 \Rightarrow 300 - 4x = 0 \Rightarrow x = 75$$ 1/2m

$$\frac{d^2A}{dx^2} = \frac{1}{3}(-4) < 0 \text{ for } x = 75$$ 1/2m

$$\therefore \text{ Maximum area} = \frac{75}{3}(300 - 150)$$

$$= 25 \times 150$$

$$= 3750 \text{ m}^2$$ 1m

	OR (iii) (b) from (a) critical point is $x = 75$ For $x < 75$, $\frac{dA}{dx} > 0$ For $x > 75$, $\frac{dA}{dx} < 0$ $\therefore x = 75$ is point of maximum. $\therefore$ Maximum area $= \frac{75}{3}(300 - 150)$ $= 25 \times 150$ $= 3750 \text{ m}^2$	
38	$A: Cab B: Metro C: Bike D: other$ $E: Late arrival$ $P(E) = P(A).P(E/A) + P(B).P(E/B) + P(C).P(E/C) + P(D).P(E/D)$ $= \frac{3}{10}.\frac{1}{4} + \frac{1}{5}.\frac{1}{3} + \frac{1}{10}.\frac{1}{12} + \frac{2}{5}.\frac{1}{10} = \frac{114}{600}$ $(b) P\left(\frac{B}{E}\right) = \frac{P(B).P\left(\frac{E}{B}\right)}{P(E)}$ $= \frac{\frac{1}{15}}{\frac{114}{600}}$ $= 40/114 = 20/57$	1/2m 1/2m 1/2m 1/2m 1m 1/2m 1/2m

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