KENDRIYA VIDYALAYA SANGATHAN AGRA REGION
FIRST PRE BOARD EXAMINATION 2024-25

CLASS XII SUBJECT: MATHEMATICS

MARKING SCHEME

1	c	1
2	a	1
3	a	1
4	b	1
5	c	1
6	b	1
7	c	1
8	a	1
9	b	1
10	b	1
11	b	1
12	b	1
13	a	1
14	c	1
15	b	1
16	d	1
17	b	1
18	b	1
19	a	1
20	c	1
21	$C(x)= 0.000014x^3 + 0.005x^2 + 5x + 1100$ Marginal Cost = $dC(x)/dx =0.000042x^2 + 0.010x + 5$ Marginal Cost of 200 items =Rs8.68 OR $f(x)=\sin 2x+5$ $-1 \leq \sin 2x \leq 1$ i.e $4 \leq \sin 2x+5 \leq 6$ Maximum value =6 Minimum value = 4	 1 1 1 1/2 1/2
22	Let V,S and r be volume, surface area and radius of a sphere at any time t,	

	$V=\frac{4}{3}\pi r^3 => \frac{dV}{dt}=\frac{4}{3}\pi 3r^2\frac{dr}{dt}$ $8=4\pi r^2\frac{dr}{dt} => \frac{dr}{dt}=\frac{2}{\pi r^2}$ $S=4\pi r^2 => \frac{ds}{dt}=\frac{16}{r}$ $\frac{ds}{dt}$ at r=12=> 4/3 cm^2/sec.	1 1
23	$\int_1^2 \frac{1}{x(\log x)^4}$ dx, Let logx= t,1/x dx=dt $\int_0^{\log 2}\frac{1}{(t)^4}$ dt= -⅓ $(\log 2)^{-3}$	1/2 1/2 1
24	f ′(x) = $3x^2 - 6x + 3$ = $3(x-1)^2 > 0$, in every interval of R. Therefore, the function f is increasing on R.	1 1
25	$\sin^{-1}(\cos\frac{\pi}{6})=\sin^{-1}(\frac{\sqrt{3}}{2})$ $=\frac{\pi}{3}$ OR $-1 \le (2x-3) \le 1$, $2\le 2x\le 4$, $x \in [1,2]$	1 1 1 1
26	$\int \frac{dx}{5-4x-2x^2}dx = -1/2\int \frac{dx}{\{(x+1)^2-(\frac{\sqrt{7}}{\sqrt{2}})^2\}}dx$ $= -1/2\sqrt{14}\log\left\|\frac{x+1-\frac{\sqrt{7}}{\sqrt{2}}}{x+1+\frac{\sqrt{7}}{\sqrt{2}}}\right\| + C$ OR $I=\int_0^{\frac{\pi}{4}}\log(1+\tan x)\,dx$ ………………..(1) $I=\int_0^{\frac{\pi}{4}}\log(1+\tan(\frac{\pi}{4}-x))\,dx$ $I=\int_0^{\frac{\pi}{4}}\log(1+\frac{1-\tan x}{1+\tan x})dx$ $I=\int_0^{\frac{\pi}{4}}\log(\frac{2}{1+\tan x})dx$ …………………(2) (1) + (2) $2I=\int_0^{\frac{\pi}{4}}\log 2\,dx$ $I=\frac{\pi}{8}\log 2$	2 1 1 1 1
27	$\frac{dy}{dx}=\frac{2\sin^{-1}x}{\sqrt{1-x^2}}$ $\sqrt{1-x^2}\frac{dy}{dx}=2\sin^{-1}x$	1 1

	$(1 - x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 2 = 0$	1
28	$\int \frac{x^2}{(x^2+4)(x^2+9)}\,dx$ Let $x^2 = t$, Consider $\frac{x^2}{(x^2+4)(x^2+9)} = \frac{A}{(t+4)} + \frac{B}{(t+9)}$	1
	Solving A = -4/5, B = 9/5,	1
	$\int \frac{x^2}{(x^2+4)(x^2+9)}\,dx = -\frac{4}{5}\int \frac{1}{(x^2+4)}\,dx + \frac{9}{5}\int \frac{1^2}{(x^2+9)}dx$ $= \frac{-2}{5}tan^{-1}\frac{x}{2} + \frac{3}{5}tan^{-1}\frac{x}{3}$ +c	1
29	$n(S) = {}^6C_2 = 15$	1
	Let X denote the larger of two numbers obtained ∴ X = 3, 4, 5, 6, 7 The Probability distribution is X: 3, 4, 5, 6, 7 P(X): 1/15, 2/15, 3/15, 4/15, 5/15	2
30	$(\cos^2 x)\frac{dy}{dx} + y = \tan x$	
	$\frac{dy}{dx} + y \sec^2 x = \tan x \sec^2 x$	0.5
	I.F. = $e^{\int sec^2 x\,dx} = e^{\tan x}$	1
	Sol. $y\,e^{\tan x} = \int e^{\tan x} \tan x \sec^2 x\,dx$	0.5
	$y\,e^{\tan x} = e^{\tan x}(\tan x - 1) + c$	1
	OR	
	$(1 + e^{2x})dy + (1+y^2)\,e^{x}dx = 0$ $\frac{dy}{(1+y2)} = -\frac{e^{x}dx}{(1+e^{2x})}$	1
	on integrating $\tan^{-1}y = -\tan^{-1}e^x + c$	2
31	Correct graph and shading	1.5
	(table below)	1

Corner Point	Value of z = 3x + 9y
(0,10)	90
(5,5)	60 Min.
(15,15)	180
(0,20)	180

<table>
<tr><td></td><td>Minimum value of Z is 60 at x = 5 and y = 5.
OR
Correct graph and shading

<table><tr><td>Corner Point</td><td>Value of z = 400x + 300y</td></tr><tr><td>(20,0)</td><td>8000</td></tr><tr><td>(40,0)</td><td>16000</td></tr><tr><td>(40,160)</td><td>64000 Max.</td></tr><tr><td>(20,180)</td><td>62000</td></tr></table>Maximum value of Z is 64000 at x = 40 and y = 160.</td><td>0.5

1.5

1

0.5</td></tr>
<tr><td>32</td><td>The line y=3x+2 meets X axis at x=-2/3 and its graph lies below x axis for x∈(-1,-2/3) and above x axis for x x∈ (-2/3,1)
Required area of ΔABC = $\left|\int_{-1}^{\frac{-2}{3}}(3x+2)\,dx\right| + \int_{\frac{-2}{3}}^{1}(3x+2)dx$
Calculation part
Getting answer = $\frac{13}{3}$</td><td>1

2
1
1</td></tr>
<tr><td>33</td><td>For proving Reflexive relation
For proving Symmetric relation
For proving Transitive relation
Set of elements related to 1={1,6,11}
OR
For proving Reflexive relation
For proving Symmetric relation
For proving Transitive relation
Since the relation is reflexive, symmetric and transitive so it is an equivalence relation.</td><td>1
1
2
1

1
1
2
1</td></tr>
<tr><td>34</td><td>AB = 6 I
A^{-1} = B/6,
given system of equations can be written, in matrix form, as follows
$$\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix} = \begin{bmatrix}3\\ 17\\ 7\end{bmatrix}$$
AX = C
$X = A^{-1} C$
x = 2 , y = -1 , z = 4</td><td>1.5
1

1

1.5</td></tr>
<tr><td>35</td><td>$\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}=\lambda$ …..(i)</td><td></td></tr>
</table>

	and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}=\mu$…..(ii) General point on line(i) and (ii) are (3 λ-1,5 λ-3,7 λ-5) ….(iii) (μ+2,3 $\mu + 4$,5μ+6) …….(iv) Getting 3 λ- μ=3 ….(v) 5 λ -3 μ=7 ….(vi) 7 λ -5 μ=11……(vii) Solving (v),(vi) getting value of $\lambda = 1/2$& $\mu = -3/2$ and satisfying in (vii) Point of intersection: ($\frac{1}{2}$,$-\frac{1}{2}$, $-\frac{3}{2}$) Comparing with standard equations $\overrightarrow{a_1}$= 3$\hat{\imath}$+5$\hat{\jmath}$ +7$\hat{k}$$\overrightarrow{b_1}$ = $\hat{\imath}$-2$\hat{\jmath}$ +$\hat{k}$$\overrightarrow{a_2}$ = -$\hat{\imath}$-$\hat{\jmath}$-$\hat{k}$$\overrightarrow{b_2}$ =7$\hat{\imath}$-6$\hat{\jmath}$ +$\hat{k}$ $\overrightarrow{a_2} - \overrightarrow{a_1}$ = -4$\hat{\imath}$-6$\hat{\jmath}$-8$\hat{k}$ $\overrightarrow{b_1}$x $\overrightarrow{b_2}$ = $4\hat{\imath} + 6\hat{\jmath} + 8\hat{k}$ $\overrightarrow{(a_2 - a_1)}\overrightarrow{(b_1}$x $\overrightarrow{b_2})$=-116 | $\overrightarrow{b_1}$x $\overrightarrow{b_2}$ | = √116 shortest distance =√116 units.	0.5 1 1.5 1 1 1 1.5 1 0.5 1
36	(i)1/10 (ii)31/100 (iii)24/31 OR 7/31	1 1 2
37	(i) Position vector of vector AB=$-i^{\wedge} + 3j^{\wedge} - k^{\wedge}$ (ii) Distance between aeroplane and bird =√ 11 units (iii) Direction cosines of vector AB =<$\frac{-1}{\sqrt{11}}$ $\frac{3}{\sqrt{11}}$,$\frac{-1}{\sqrt{11}}$> OR direction angles $< cos^{-1}\frac{-1}{\sqrt{11}}, cos^{-1}\frac{3}{\sqrt{11}}, cos^{-1}\frac{-1}{\sqrt{11}} >$	1 1 2
38	(i)let the length=breadth=x and height=y A.T.P. $X^2y = 500$ Surface area S = $x^2 + 4xy$	

	$dS/dx = 2x - 2000/x^2$ For maxima or minima $dS/dx = 0$, $x = 10m$ at $x = 10$, $d^2S/dx^2 > 0$ hence surface area is minimun at x=10m Min. Surface area = $300m^2$ (ii)If $x = 10m$, then $y = 5m$ Volume of tank=$x^2y = 500m^3$ New Volume=$(2x)^2y = 2000m^3$ Increase in volume of tank = $1500m^3$ %increase in volume of the tank=300%	1 1 1 1