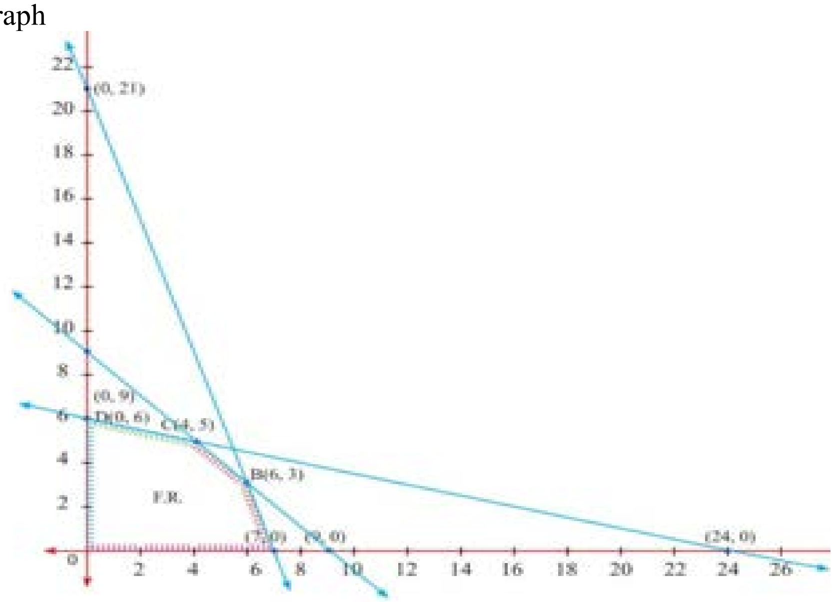
PRE-BOARD 2 EXAMINATION 2025-26

CLASS XII MATHEMATICS(041) MARKING SCHEME

Q1.	(a)	1
Q2.	(c)	1
Q3.	(c)	1
Q4.	(c)	1
Q5.	(c)	1
Q6.	(d)	1
Q7.	(a)	1
Q8.	(c)	1
Q9.	(a)	1
Q10.	(d)	1
Q11.	(c)	1
Q12.	(b)	1
Q13.	(b)	1
Q14.	(c)	1
Q15.	(a)	1
Q16.	(d)	1
Q17.	(a)	1
Q18.	(a)	1
Q19.	(d)	1
Q20.	(a)	1
Q21.	sin^{-1} [k tan (2 $\cos^{-1}\frac{\sqrt{3}}{2}$)]) = $\frac{\pi}{3}$ ⇒ k$\tan$ (2× $\frac{\pi}{6}$) = sin ($\frac{\pi}{3}$) ⇒k tan(π /3) = $\frac{\sqrt{3}}{2}$ ⇒k$\sqrt{3}$= $\frac{\sqrt{3}}{2}$ ⇒k=$\frac{1}{2}$ OR $2\tan^{-1} x + \tan^{-1}\frac{2x}{1+x^2} = \frac{4\pi}{3}$ ⇒$2\tan^{-1} x + 2\tan^{-1} x = \frac{4\pi}{3}$ {proving $\sin^{-1}\frac{2x}{1+x^2} = 2\tan^{-1} x$ ⇒$4\tan^{-1} x = \frac{4\pi}{3}$ ⇒x=$tan\frac{\pi}{3} = \sqrt{3}$	½ ½ ½ ½ 1 1

Q22.	$\frac{dy}{dx} = \frac{1}{tan\left(\frac{\pi}{4}+\frac{x}{2}\right)} \times sec^2\left(\frac{\pi}{4}+\frac{x}{2}\right) \times \frac{1}{2}$ $= \frac{1}{2s \quad (\frac{\pi}{4}+\frac{x}{2})\frac{\pi}{4}+\frac{x}{2})}$ $= \frac{1}{cosx}$ =secx	1 ½ ½
Q23.	$\int \frac{dx}{\sqrt{9x-4x^2}} = \int \frac{dx}{\sqrt{\left(\frac{9}{4}\right)^2 - (4x^2 - 9x + \left(\frac{9}{4}\right)^2)}}$ $= \frac{1}{2}\sin^{-1}\left[\frac{2x-\frac{9}{4}}{\frac{9}{4}}\right] + c$ $= \frac{1}{2}\sin^{-1}\frac{8x-9}{9}$+c	½ 1 ½
Q24.	Given: $\frac{da}{dt} = \frac{2cm}{s}$ & a=10 cm A= $\frac{\sqrt{3}}{4}a^2$ $\frac{dA}{dt} = \frac{\sqrt{3}}{4} \times 2a \times \frac{da}{dt}$ $= 10\sqrt{3}cm^2/s$	½ 1 ½
Q25.	f '(x)=cos x-sin x f '(x)=0 ⇒x= $\frac{\pi}{4}$ f '(x)>0, x∈ $(0, \frac{\pi}{4})$ ⇒f(x) is strictly increasing f '(x)<0, x∈ $(\frac{\pi}{4}, \frac{\pi}{2})$ ⇒f(x) is strictly decreasing OR $\frac{dy}{dx} = \frac{x.\frac{1}{x} - lo \quad .1}{x^2}$ $\frac{dy}{dx} = 0 \Rightarrow 1 - logx = 0$ ⇒x =e ⇒ maximum value of y is 1/ e	½ ½ ½ ½ ½ ½ ½ ½
Q26	$x\sqrt{1+y} = -y\sqrt{1+x}$ On squaring both sides $(x\sqrt{1+y})^2 = (-y\sqrt{1+x})^2$ $\Rightarrow (x^2 - y^2) + (x^2y - xy^2) = 0$	½ ½ ½ ½

	$\Rightarrow(x-y)(x+y+xy)=0$ $\Rightarrow$x=y or x+ y-xy=0 but x$\neq y$ $\Rightarrow$ y=−x/1+x $\Rightarrow$dy/dx =-1/(1+x)^2	½ ½ ½ ½
Q27.	Let $I=\int_0^1 \frac{log\,(1+x)}{1+x^2}\,dx$ $\quad put\ x = tan\theta$ $=\int_0^{\frac{\pi}{4}} log\,(1+tan\ \theta)\ d\theta \ldots\ldots(i)$ $\quad$ dx=sec$^2\theta\ d\theta$ $=\int_0^{\frac{\pi}{4}} log\,(1+tan\,(\frac{\pi}{4}-\theta)\ d\theta$ using $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$ $=\int_0^{\frac{\pi}{4}} log\,(\frac{2}{1+tan\theta})\ d\theta$……………(ii) adding (i)&(ii) $2\ I=\frac{\pi}{8}\,log2$ *OR* *Let* $I=\int_0^1 log\,(\frac{1}{x}-1)\,dx$ $=\int_0^1 log\,(\frac{1-x}{x})\,dx$………..(i) $=\int_0^1 log\,(\frac{1-(1-x)}{1-x})dx$………..(i)apllying$\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$ $=\int_0^1 log\,(\frac{x}{1-x})\,dx$……….(ii) adding (i)&(ii) and getting 2I =0	1 ½ ½ ½ 1 ½ 1
Q28.	$\frac{dy}{dx} = \frac{2x^2+x}{x^2+x^2+x+1}$ $\quad$ variable separable form $\Rightarrow\int dy = \int \frac{2x^2+x}{x^2+x^2+x+1}\,dx = \int \frac{2x^2+x}{(x+1)(x^2+1)}\,dx$ $\Rightarrow$y=$\int \left(\frac{\frac{1}{2}}{x+1} + \frac{\frac{3}{2}x}{x^2+1} - \frac{\frac{1}{2}}{x^2+1}\right)dx$ The general solution is $\Rightarrow$y=$\frac{1}{2}\,log\lvert x+1\rvert + \frac{3}{4}\,log\lvert x^2+1\rvert - \frac{1}{2}x\ + C$ OR Writing the linear differential equation in the standard form	½ ½ 1 1 ½

	$\frac{dy}{dx}+\frac{y}{x}=cosx+\frac{sinx}{x}$ With P=$\frac{1}{x}$ and Q=cosx +$\frac{sinx}{x}$ Finding the IF=x Writing the General solution is xy=xsinx +c Finding C=0 & writing the $particular\ solution\ as\ xy=xsinx$	½ ½ 1 ½
Q29.	$let I=\int log\ log\ (logx)\ .1dx+\int\frac{1}{(logx)^2}dx$ $=xlog(logx)-\int\frac{1}{xlogx}x\ dx+\int\frac{1}{(logx)^2}dx$ $=xlog(logx)-\int\frac{1}{logx}.1dx+\int\frac{1}{(logx)^2}dx$ $=xlog(logx)-\{\frac{x}{logx}-\int x\times\frac{-1}{(logx)^2)}\frac{1}{x}dx+\int\frac{1}{(logx)^2}dx$ $=xlog(logx)-\frac{x}{logx}-\int\frac{1}{(logx)^2}dx+\int\frac{1}{(logx)^2}dx+C$ $=xlog(logx)-\frac{x}{logx}+C$ *OR* $\int[\sqrt{tan\ x}+\sqrt{cot\ x}]dx$ $=\int\frac{\sqrt{sinx}}{(\sqrt{cosx}}+\frac{\sqrt{cosx}}{\sqrt{sinx}})\ dx$ $=\int\frac{sinx+cosx}{\sqrt{sinxcosx}}dx$ Put t=sinx-cosx $=\int\frac{dt}{\sqrt{\frac{1-t^2}{2}}}$ $\frac{dt}{dx}=sinx+cosx$ $=\sqrt{2}\int\frac{dt}{\sqrt{1-t^2}}$ $\therefore\ t^2=1-2sinx\ cosx$ $\Rightarrow$ sinx cosx=$\frac{1-t^2}{2}$ $=\sqrt{2}\sin^{-1}t$ +C=$\sqrt{2}\ \sin^{-1}(sinx-cosx)$+C	½ ½ ½ 1 ½ ½ ½ 1 ½ ½
Q30.	For graph  	2

<table>
<tr><td></td><td>Corner points and maximum value of Z=33 at (4,5)
<table><tr><td>Corner points</td><td>Value of Z</td></tr><tr><td>(0,0)</td><td>0</td></tr><tr><td>(7,0)</td><td>14</td></tr><tr><td>(6,3)</td><td>27</td></tr><tr><td>(4,5)</td><td>33</td></tr><tr><td>(0,6)</td><td>30</td></tr></table></td><td>1</td></tr>
<tr><td>Q31.</td><td>P(success)=P(S)=$\frac{1}{6}$ P(Failure)=P(F)=$\frac{5}{6}$
P(A wins)=P(A wins in the 1st throw or in the 2nd throw or 3rd throw or…….)
$=\frac{1}{6}+\left(\frac{5}{6}\right)^2\frac{1}{6}+\left(\frac{5}{6}\right)^4\frac{1}{6}+$……………..
$=\frac{\frac{1}{6}}{1-\frac{25}{36}}$
$=\frac{6}{11}$
P(B wins)=$1-P(A)$
$=\frac{5}{11}$</td><td>½
1½

1</td></tr>
<tr><td>Q32.</td><td>Reflexive
Symmetric
Transitive
Equivalence relation
[(2,5)] ={(1,4), (2,5), (3,6), (4,7), (5,8), (6,9)}
OR
Proof for One one function
Checking for onto
Correct result for onto</td><td>1
1
1
1
1

2
2
1</td></tr>
<tr><td>Q33.</td><td>Let A=$\begin{bmatrix}1 & -1 & 1\\ 1 & -2 & -2\\ 2 & 1 & 3\end{bmatrix}$
the product$\begin{bmatrix}-4 & 4 & 4\\ -7 & 1 & 3\\ 5 & -3 & -1\end{bmatrix}\begin{bmatrix}1 & -1 & 1\\ 1 & -2 & -2\\ 2 & 1 & 3\end{bmatrix}=\begin{bmatrix}8 & 0 & 0\\ 0 & 8 & 0\\ 0 & 0 & 8\end{bmatrix}=8I$
$\Rightarrow writing\ \ A^{-1}=\begin{bmatrix}-4 & 4 & 4\\ -7 & 1 & 3\\ 5 & -3 & -1\end{bmatrix}$ $as\ \ AA^{-1}=I$
Writing system of equations AX=B⇒X=A^{-1}B
Finding x=3, y=−2& z=−1</td><td>1
1
1
2</td></tr>
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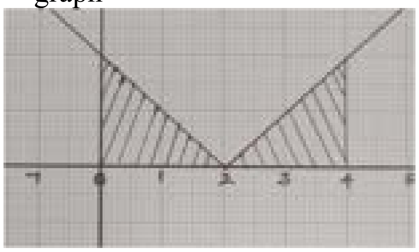
<tr><td>Q34.</td><td>graph

Required area=2 $\int_2^4 y dx$
$=\int_2^4 (x-2)dx$ =4 sq .units</td><td>2

1
2</td></tr>
<tr><td>Q35.</td><td>Writing the given straight lines $\vec{r} = (\hat{\imath} - 2\hat{\jmath} + 3\hat{k}) + t(-\hat{\imath} + \hat{\jmath} - 2\hat{k})$…….(i)
$\vec{r} = (\hat{\imath} - \hat{\jmath} - \hat{k}) + s(\hat{\imath} + 2\hat{\jmath} - 2\hat{k}) \dots\dots (ii)$
$\overrightarrow{a_1} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ $\overrightarrow{b_1} = -\hat{\imath} + \hat{\jmath} - 2\hat{k}$
$\overrightarrow{a_2} = \hat{\imath} - \hat{\jmath} - \hat{k}$ $\overrightarrow{b_2} = \hat{\imath} + 2\hat{\jmath} - 2\hat{k}$
$$\overrightarrow{a_2} - \overrightarrow{a_1} = \hat{\jmath} - 4\hat{k}$$
$$\overrightarrow{b_1} \times \overrightarrow{b_2} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ -1 & 1 & -2 \\ 1 & 2 & -2 \end{vmatrix} = 2\hat{\imath} - 4\hat{\jmath} - 3\hat{k}$$
$\lvert \overrightarrow{b_1} \times \overrightarrow{b_2} \rvert = \sqrt{29}$
Shortest distance $= \left\lvert \frac{(\overrightarrow{a_2} - \overrightarrow{a_1}).\overrightarrow{b_1} \times \overrightarrow{b_2}}{\lvert \overrightarrow{b_1} \times \overrightarrow{b_2} \rvert} \right\rvert$
$$= \frac{8}{\sqrt{29}}\ units$$
OR
$\frac{x-4}{-2} = \frac{y}{6} = \frac{z-1}{-3} = \lambda$…………(i)
Any point on (i) can be taken as$(-2\lambda+2, 6\lambda-3, -3\lambda+9)$
Direction ratios of PM$\langle -2\lambda + 2,\ \ 6\lambda - 3,\ \ -3\lambda + 9 \rangle$
PM perpendicular to (i)
$$-2(-2\lambda + 2) + 6(6\lambda - 3) - 3(-3\lambda + 9) = 0$$
$\lambda=1$
$\therefore PM = \sqrt{45} = 3\sqrt{5}$ units.</td><td>1
½
½
1
½
1
½
1
1
1
1
1</td></tr>
<tr><td>Q36.</td><td>(i)$\overrightarrow{OP} = -2\hat{\imath} + \hat{\jmath} + 3\hat{k}$
$\overrightarrow{OQ} = 3\hat{\imath} + 4\hat{\jmath} - \hat{k}$
$$P\vec{Q} = 5\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$$
(ii) $\overrightarrow{RQ} = P\vec{Q} - P\vec{R} = 2\hat{\jmath} - 2\hat{k}$</td><td>1</td></tr>
</table>

	(iii) $cos\theta = \frac{\overrightarrow{PQ}.\overrightarrow{PR}}{\lvert\overrightarrow{PQ}\rvert\lvert\overrightarrow{PR}\rvert} = \frac{25+3+8}{\sqrt{50}\sqrt{30}} = \frac{36}{5\sqrt{15}}$ finding θ OR (iii) $\overrightarrow{os} = \frac{1.\overrightarrow{OQ}+2.\overrightarrow{OQ}}{1+2} = \frac{-\hat{\imath}+2\hat{\jmath}+5\hat{k}}{3}$	1 2
Q37.	$(i)\,\frac{dy}{dx} = 4 - x$=g(x) $(ii)\,\frac{d^2y}{dx^2} = -1 < 0$⇒g' (x)<0⇒growth of the plant decreases in first three day $(iii)\,\frac{dy}{dx} = 0 \Rightarrow \mathrm{x} = 4$ it will take 4 days for the plant to grow to the maximum height OR Maximum height= $4\times 4 - \frac{1}{2}\times 4^2$ =16--8=8 cm	1 1 2
Q38.	$E_1: loan\ at\ fixed\ rate$ $E_2: loan\ at\ floating\ rate$ $E_3: loan\ at\ variable\ rate$ $\mathrm{P}(E_1) = 0.1$ $\mathrm{P}(E_2) = 0.2$ $\mathrm{P}(E_3) = 0.7$ $\mathrm{P}(A/E_1) = 0.05$ $\mathrm{P}(A/E_2) = 0.03$ $\mathrm{P}(A/E_3) = 0.01$ (i)P(A)= 0.018 (ii) $P(E_3/A) = \frac{7}{18}$	2 2