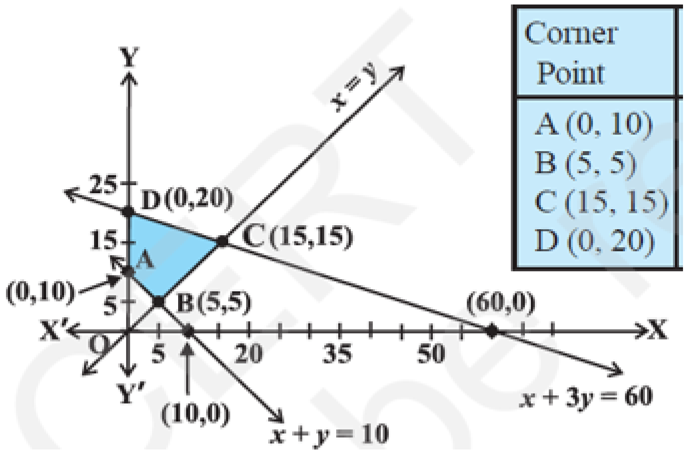
PRE-BOARD EXAM 2022-23
CLASS: XII
MATHEMATICS

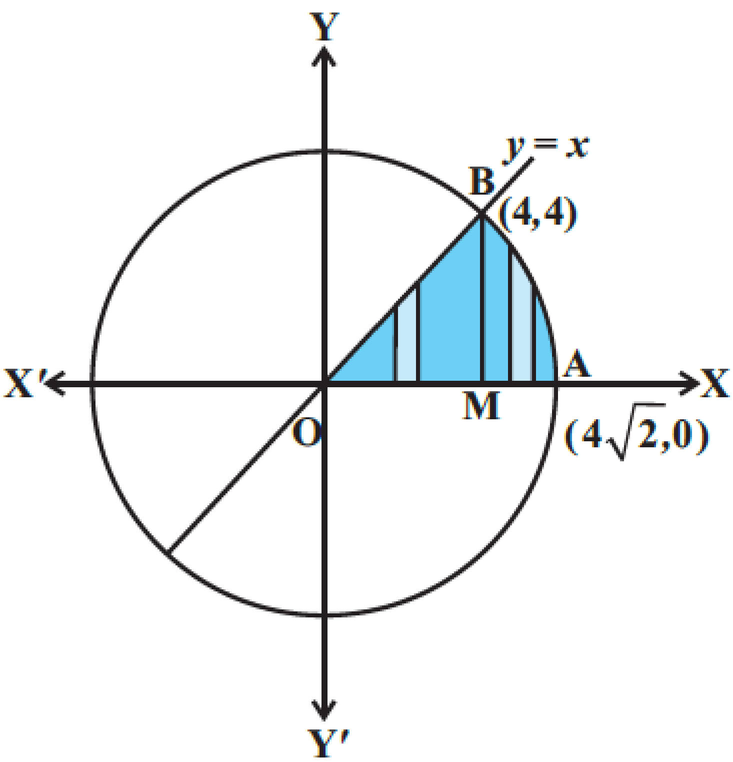
TIME: 3 hrs. **MARKING SCHEME** **Max Marks: 80**

QUESTION NUMBER	HINTS/SOLUTION	MARK(S)
1	15p + 15 q = 20 q 3p = q**CORRECT OPTION-D**	1 (d)
2	7A – I^3 -3A – 3A – A = -I**CORRECT OPTION-A**	1(a)
3	a_{32} = 5 , A_{32} = 22 a_{32} A_{32} = 110**CORRECT OPTION-D**	1(d)
4	K = $\frac{(x+9)(x-3)}{x-3}$ = 12**CORRECT OPTION-B**	1(b)
5	The strict inequality represents an open half plane and it contains the origin as (0,0) satisfies it.**CORRECT OPTION-B**	1(b)
6	f(x) = sec x**CORRECT OPTION-B**	1(b)
7	The given differential equation is $4\left(\frac{dy}{dx}\right)^3\frac{d^2y}{dx^2} = 0$. Here, m = 2 and n = 1 Hence, m + n= 3 **CORRECT OPTION-C**	1(c)
8	$ydx - xdy = 0 \Rightarrow ydx - xdy = 0 \Rightarrow \frac{dy}{y} = \frac{dx}{x}$ $\Rightarrow \int \frac{dy}{y} = \int \frac{dx}{x} + logK, K > 0 \Rightarrow \log\|y\| = \log\|x\| + \log K$ $\Rightarrow \log\|y\| = \log\ \|x\|K \Rightarrow \|y\| = \|x\|K \Rightarrow y = \pm Kx \ \Rightarrow y = Cx$ **CORRECT OPTION-A**	1(a)
9	$y\ siny/_0^x$= x sinx**CORRECT OPTION-B**	1(b)
10	Scalar Projection of $3\hat{\imath} - \hat{\jmath} - 2\hat{k}$ on vector $\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ $= \frac{(3\hat{\imath}-\hat{\jmath}-2\hat{k}).(\hat{\imath}+2\hat{\jmath}-3\hat{k})}{\|\hat{\imath}+2\hat{\jmath}-3\hat{k}\|} = \frac{7}{\sqrt{14}}$ **CORRECT OPTION-A**	1(a)
11	$12.(12)^2$ = 1728**CORRECT OPTION-A**	1(a)
12	-16 = -8 – x^2 X = $\pm 2\sqrt{2}$**CORRECT OPTION-D**	1(d)
13.	x = 3 , y = 3 x + y = 6**CORRECT OPTION-B**	1(b)
14	$\|\vec{a}\|\|\vec{b}\| \cos cos\ \theta = \|\vec{a}\|\|\vec{b}\| sin\theta$ tan θ = 1 θ = $\frac{\pi}{4}$**CORRECT OPTION-C**	1(c)
15	i.i + j.j + k.(-k) 1+1-1 = 1**CORRECT OPTION-A**	1(a)

16	$\frac{3}{5} = \frac{1}{2} + p - \frac{1}{2}p$ p = $\frac{1}{5}$**CORRECT OPTION-A**	1(a)
17	$\vec{b} = \frac{\vec{a} + \vec{oc}}{2}$ $\vec{oc}$ = $2\vec{b}$ - $\vec{a}$**CORRECT OPTION-B**	1(b)
18	$\frac{dy}{dx} = \frac{3t^2}{2t}$ = $\frac{3t}{2}$**CORRECT OPTION-D**	1(d)
19	Let, f(x)=f(y) ⇒ x = y. ∴f(x) is injective. Not surjective because co-domain ≠ range**CORRECT OPTION-A**	1(a)
20	$\vec{r}$ = - $\vec{i} + \vec{j} + \vec{k}$ Direction cosines $\left(\frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ If (a,b,c) are d.r then d.c are $\left(\frac{a}{\sqrt{a^2+b^2+c^2}}, \frac{b}{\sqrt{a^2+b^2+c^2}}, \frac{c}{\sqrt{a^2+b^2+c^2}}\right)$ **CORRECT OPTION-C**	1(c)
21	$\frac{\pi}{3} - \left[\pi - \frac{\pi}{3}\right]$ $= \frac{-\pi}{3}$ (0R) $sin^{-1}[sin\left(\frac{13\pi}{7}\right)] = sin^{-1}[sin\left(2\pi - \frac{\pi}{7}\right)]$ $= sin^{-1}[sin\left(-\frac{\pi}{7}\right)] = -\frac{\pi}{7}$	1 1 1 1
22	$\vec{a} + \vec{b} = 4i + (2 + \mu)j + 12k$ $\vec{a} - \vec{b} = 2i + (2 - \mu)j + 6k$ 8 + 4 $-\mu^2$ +72 = 0 μ = $\pm 2\sqrt{21}$	(1/2) (1/2) (1/2) (1/2)
23	$\hat{n} = \frac{i-2j+2k}{3}$ Required vector = $5(i - 2j + 2k)$	1 1
24	log y = sin x . log(sin x) $\frac{1}{y}\frac{dy}{dx} = \cos cos\, x[1 + log(\sin sin\, x)]$ $\frac{dy}{dx} = (\sin sin\, x)^{\sin sin\, x}.\ \cos cos\, x[1 + log(\sin sin\, x)]$	(1/2) 1 (1/2)
25	R'(x) = 26x + 26 M(x) = 26(7) + 26 =208	1 (1/2) (1/2)
26	$\int \frac{dx}{\sqrt{-(x^2+2x-3)}} = \int \frac{dx}{\sqrt{4-(x+1)^2}}$ $= sin^{-1}\left(\frac{x+1}{2}\right) + C\ [\int \frac{dx}{\sqrt{a^2-x^2}} = sin^{-1}\left(\frac{x}{a}\right) + C]$	(1+1) (1)

27	 **Minimum value of z is 60 at (5,5)**	3 lines (1.5) Corner points (0.5) 1
28	1. $\frac{x^2+1}{x^2-5x+6}$ = 1+ $\frac{5x-5}{(x-2)(x-3)}$ = 1 - $\frac{5}{x-2}$ + $\frac{10}{x-3}$ **∴I = x – 5 log (x - 2) + 10 log (x -3) + c**	1 1 1
29	Let I = $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{tanx}} = \int_{\pi/6}^{\pi/3} \frac{\sqrt{cosx}}{\sqrt{sinx}+\sqrt{cosx}} dx$ ..(i) $I = \int_{\pi/6}^{\pi/3} \frac{\sqrt{cos\left(\frac{\pi}{6}+\frac{\pi}{3}-x\right)}}{\sqrt{sin\left(\frac{\pi}{6}+\frac{\pi}{3}-x\right)}+\sqrt{cos\left(\frac{\pi}{6}+\frac{\pi}{3}-x\right)}} dx$ $I = \int_{\pi/6}^{\pi/3} \frac{\sqrt{sinx}}{\sqrt{cosx}+\sqrt{sinx}}$ dx ..(ii). Adding (i) and (ii), we get $2I = \int_{\pi/6}^{\pi/3} \frac{\sqrt{cosx}}{\sqrt{sinx}+\sqrt{cosx}} dx + \int_{\pi/6}^{\pi/3} \frac{\sqrt{sinx}}{\sqrt{cosx}+\sqrt{sinx}}$dx $2I = \int_{\pi/6}^{\pi/3} dx$ $= [x]_{\frac{\pi}{6}}^{\frac{\pi}{3}} = \frac{\pi}{3} - \frac{\pi}{6} = \frac{\pi}{6}$ Hence, $I = \int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{tanx}} = \frac{\pi}{12}$	(1) (1) (0.5) (0.5)
30.	$\frac{dy}{dx} = \frac{y}{x} - \frac{1}{sin\frac{y}{x}}$	(0.5) (0.5)

	put $\frac{y}{x} = v$ $v + x.\frac{dv}{dx} = v - \frac{1}{\sin v}$ $-\int \sin v\, dv = \int \frac{1}{x}\, dx$ $\cos v = \log \lvert x \rvert + c$ $\cos\left(\frac{y}{x}\right) = \log \lvert x \rvert + c$ (OR) $ydx + (x - y^2)dy = 0$ Reducing the given differential equation to the form $\frac{dx}{dy} + Px = Q$ we get, $\frac{dx}{dy} + \frac{x}{y} = y$ $I.F = e^{\int Pdy} = e^{\int \frac{1}{y} dy} = e^{\log y} = y$ The general solution is given by $x.IF = \int Q.IFdy \Rightarrow xy = \int y^2 dy$ $\Rightarrow xy = \frac{y^3}{3} + C$, which is the required general solution	(0.5) (0.5) (0.5) (0.5) (0.5) (1) (1) (0.5)
31	A: both are girls B: older is a girl $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$ $= \frac{\frac{1}{4}}{\frac{2}{4}}$ $= \frac{1}{2}$ (OR) $\Sigma P(X) = 1$ $\Rightarrow 10k^2 + 9k - 1 = 0$ $k = \frac{1}{10}$	(0.5) (1) (1) (0.5) (0.5) (1.5) (1)
32	$\lvert A \rvert = 10$ $A^{-1} = \frac{1}{10}(-\ 6\ 25\ \ -\ 24\ \ -\ 12\ 40\ \ -\ 38\ 10\ \ -\ 40\ 40\ )$ $x = 1$, $y = \frac{1}{2}$, $z = -1$ (OR) AB = 6I $A^{-1} = \frac{1}{6}B$	(1) (3) (1) (2) (1)

	X = $\frac{1}{6}$(2 2 − 4 − 4 2 − 4 2 − 1 5)(3 17 7) x = 2, y = -1, z = 4	(1) (1)
33	$\vec{a}_2 - \hat{\vec{a}}_1 = \hat{i} - \hat{k}$ $\vec{b}_1 x \vec{b}_2 = 3\hat{i} - \hat{j} - 7\hat{k}$ $\left\|\vec{b}_1 x \vec{b}_2\right\| = \sqrt{59}$ $\left(\vec{b}_1 x \vec{b}_2\right) . \left(\vec{a}_2 - \hat{\vec{a}}_1\right) = 10$ d = $\frac{10}{\sqrt{59}}$ (OR) $\vec{m} = \|i\ j\ k\ 3\ -\ 16\ 7\ 3\ 8\ -\ 5\ \|$ = 24i + 36j + 72k Required equation is (i +2j – 4k) + μ(2i + 3j + 6k)	(1) (1) (1) (1) (1) (2) (2) (1)
34	Proving reflexive, symmetric and transitive Elements related to 1 are {1,5,9}	(4.5) (0.5)
35	 To find point of intersection as (4,4) **Required area =** $\int_0^4 x\,dx + \int_4^{4\sqrt{2}} \sqrt{32 - x^2}$ **dx.** **= 8 + (4π – 8)**	(1) (1) (1/2 + ½) (1/2 + 1) (1/2)

	= 4π sq. units	
36	(1) f(x) being a polynomial function, it is differentiable in (0,12) (2) $f'(x) = -0.2x + 1.2 = -0.2(x-6)$ $f'(x) = 0 \Rightarrow x = 6$ (3). <table><tr><th>In the Interval</th><th>$f'(x)$</th><th>Conclusion</th></tr><tr><td>(0, 6)</td><td>+ve</td><td>f is strictly increasing in [0, 6]</td></tr><tr><td>(6, 12)</td><td>-ve</td><td>f is strictly decreasing in [6, 12]</td></tr></table>	(1) (0.5) (0.5) (1) (1)
37	(1) $y = \sqrt{4a^2 - x^2}$ (2) $A = \frac{x\sqrt{4a^2-x^2}}{2}$ (3) $\frac{dy}{dx} = \frac{-x^2+2a^2}{\sqrt{4a^2-x^2}}$ (4) $x = y = \sqrt{2}\,a$ and $\frac{d^2y}{dx^2} < 0$ when $x = \sqrt{2}\,a$	(1) (1) (1) (1)
38.	(1) $P(E_1) = \frac{3}{5}$ (2) $P(E/E_1) = 1$ (3) $P(E_1/E) = \frac{\frac{3}{5} X 1}{\frac{3}{5} X 1 + \frac{2}{5} X \frac{1}{3}}$ $= \frac{9}{11}$	(1) (1) (1) (1)