

INDIAN SCHOOL MUSCAT

SECOND TERM EXAMINATION

FEBRUARY 2022

CLASS XI

Marking Scheme – MATHEMATICS][THEORY]

Q.NO	SET - A Answers	Marks (With split up)
I	SECTION – A	
1.	Understanding of use of $\tan(A-B)$ ----- (½ mk) Correct use of formula with substitutions ----- (½ mk) Correct values of each t ratio ----- (½ mk) Final answer ----- (½ mk)	
2.	$\text{No. of selections} = (4_{C_3} \times 9_{C_8}) + (4_{C_4} \times 9_{C_7}) \text{ ----- (½ + ½ mk)}$ $= 36 + 36 = 72 \text{ ----- (½ + ½ mk)}$	
3.	$\frac{d}{dx} \left(\frac{x-1}{x^2} \right) = \frac{x^2 \cdot 1 - (x-1) \cdot 2x}{x^4} \text{ ----- (1 mk)}$ $= \frac{2x-x^2}{x^4} = \frac{2-x}{x^3} \text{ ----- (½ + ½ mk)}$ (OR) $(2x^2 + 1)(3x + 2) = (2x^2 + 1) \cdot 3 + (3x + 2) \cdot 4x \text{ ----- (1 ½ mk)}$ $= 18x^2 + 8x + 3 \text{ ----- (½ mk)}$	
4.	Eq. of parabola is $y^2 = -4ax$ ----- (½ mk) It passes through (-1, 4) $\therefore a = 4$ ----- (1 mk) \therefore Eq is $y^2 = -16x$ ----- (½ mk)	
5.	probability that the card is a spade = $\frac{13_{C_1}}{52_{C_1}}$ ----- (½ mk) probability that the card is a king = $\frac{4_{C_1}}{52_{C_1}}$ ----- (½ mk) probability that the card is a spade or a king = $\frac{13_{C_1}}{52_{C_1}} + \frac{4_{C_1}}{52_{C_1}} - 1$ ----- (½ mk) $= \frac{13+4-1}{52} = \frac{4}{13}$ ----- (½ mk)	
6.	$n_{P_4} : n_{P_5} = 1 : 2 \Rightarrow \frac{n!}{(n-4)!} \div \frac{n!}{(n-5)!} = 1 \div 2 \text{ ----- (1 mk)}$ $\Rightarrow \frac{1}{n-4} = \frac{1}{2} \Rightarrow n = 6 \text{ ----- (1 mk)}$	

II	SECTION – B	
7.	<p>(i) Internally: $h = \frac{mx_2 + nx_1}{m+n}$, $k = \frac{my_2 + ny_1}{m+n}$, $l = \frac{mx_2 + nx_1}{m+n}$</p> $h = \frac{2(3) + 3(1)}{2+3}, k = \frac{2(4) + 3(-2)}{2+3}, l = \frac{2(-5) + 3(3)}{2+3}$ $h = \frac{9}{5}, k = \frac{2}{5}, l = \frac{-1}{5}$ $c\left(\frac{9}{5}, \frac{2}{5}, \frac{-1}{5}\right).$ <p>Used distance formula correctly with proper substitution</p> <p>Correct distance</p> <p>(OR)</p> $AB = \sqrt{(2+1)^2 + (3-2)^2 + (4+3)^2} = \sqrt{9+1+49} = \sqrt{59}$ $BC = \sqrt{(-1+4)^2 + (2-1)^2 + (-3+10)^2} = \sqrt{9+1+49} = \sqrt{59}$ $AC = \sqrt{(2+4)^2 + (3-1)^2 + (4+10)^2} = \sqrt{36+4+196} = \sqrt{236} = 2\sqrt{59}$ <p>Now, $AB + BC = \sqrt{59} + \sqrt{59} = 2\sqrt{59} = AC$</p> <p>Hence, the points A, B and C are collinear.</p> <p>Also, $AC : BC = 2\sqrt{59} : \sqrt{59} = 2 : 1$</p> <p>So, C divides AB in the ratio $2 : 1$ externally.</p> <p>(Students may directly use section formula also)</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
8.	$\cos x = -\frac{12}{13}$ and $\pi < x < \frac{3\pi}{2}$ $\Rightarrow \frac{x}{2}$ lies in II quadrant $\therefore \sin \frac{x}{2} = +\sqrt{\frac{1-\cos x}{2}} = +\frac{5}{\sqrt{26}}$ $\cos \frac{x}{2} = -\sqrt{\frac{1+\cos x}{2}} = -\frac{1}{\sqrt{26}}$ $\tan \frac{x}{2} = -5$	<p>----- ($\frac{1}{2}$ mk)</p> <p>----- (1 mk)</p> <p>----- (1 mk)</p> <p>----- ($\frac{1}{2}$ mk)</p>
9.	<p>(i) $8! = 40320$ ----- (1 mk)</p> <p>(ii) $6! \times 3! = 4320$ ----- (1 mk)</p> <p>(iii) $6! \times 2! = 1440$ ----- (1 mk)</p>	
10.	<p>LHS : $(\cos A + \cos B)^2 + (\sin A - \sin B)^2$</p> $= \left[2 \cos\left(\frac{A+B}{2}\right) \cdot \cos\left(\frac{A-B}{2}\right) \right]^2 + \left[2 \cos\left(\frac{A+B}{2}\right) \cdot \sin\left(\frac{A-B}{2}\right) \right]^2$ $= 4 \cos^2\left(\frac{A+B}{2}\right) \left[\cos^2\left(\frac{A-B}{2}\right) + \sin^2\left(\frac{A-B}{2}\right) \right]$ $= 4 \cos^2\left(\frac{A+B}{2}\right) = RHS$ <p>(OR)</p>	<p>----- (1 $\frac{1}{2}$ mk)</p> <p>----- (1 mk)</p> <p>----- ($\frac{1}{2}$ mk)</p>

	$ \begin{aligned} \text{LHS} &= \frac{\sin 8x \cos x - \sin 6x \cos 3x}{\cos 2x \cos x - \sin 3x \sin 4x} \\ &= \frac{\frac{1}{2}(2 \sin 8x \cos x) - \frac{1}{2}(2 \sin 6x \cos 3x)}{\frac{1}{2}(2 \cos 2x \cos x) - \frac{1}{2}(2 \sin 4x \sin 3x)} \\ &= \frac{(\sin 9x + \sin 7x) - (\sin 9x + \sin 3x)}{(\cos 3x + \cos x) - (\cos x - \cos 7x)} \\ &= \frac{\sin 7x - \sin 3x}{\cos 7x + \cos 3x} \\ &= \frac{2 \cos 5x \sin 2x}{2 \cos 5x \cos 2x} = \frac{\sin 2x}{\cos 2x} = \tan 2x = \text{RHS} \end{aligned} $	$\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
III	SECTION -C	
11.	$f(x) = (x-1)(x-2) = x^2 - 3x + 2$ -----($\frac{1}{2}$ mk) $f(x+h) = (x+h)^2 - 3(x+h) + 2$ -----($\frac{1}{2}$ mk) $f'(x) = \lim_{h \rightarrow 0} \frac{[(x+h)^2 - 3(x+h)+2] - [x^2 - 3x+2]}{h}$ -----(2 mks) $= \lim_{h \rightarrow 0} \frac{2xh + h^2 - 3h}{h} = 2x - 3$ -----($\frac{1}{2} + \frac{1}{2}$ mk)	
12.	<p>Solving the 2 equations $x + 2y = 10$ and $2x + y = 6$, we get,</p> <p>Centre $= (h, k) = \left(\frac{2}{3}, \frac{14}{3}\right)$ -----(1 mk)</p> $r^2 = \left(\frac{2}{3} + 1\right)^2 + \left(\frac{14}{3} - 3\right)^2 = \frac{50}{9}$ -----($\frac{1}{2}$ mk) \therefore Eq. of circle $\rightarrow \left(x - \frac{2}{3}\right)^2 + \left(y - \frac{14}{3}\right)^2 = \frac{50}{9}$ -----(2 mks) $\Rightarrow 3x^2 + 3y^2 - 4x - 28y + 50 = 0$. ---($\frac{1}{2}$ mk) (OR) Eq of ellipse is $16x^2 + 25y^2 = 400$ $\Rightarrow \frac{x^2}{25} + \frac{y^2}{16} = 1$ -----($\frac{1}{2}$ mk) Here, $a = 5$, $b = 4$ $\therefore c = \sqrt{a^2 - b^2} = 3$ -----($\frac{1}{2}$ mk) (i) foci $= (\pm 3, 0)$ (ii) vertices $= (\pm 5, 0)$ (iii) length of major axis $= 10$ (iv) length of minor axis $= 8$ (v) eccentricity $= 3/5$ (vi) LLR $= 32/5$	$\frac{1}{2}$ mk for each correct sub question
13.	Each line correctly drawn with correct feasible region ----3 mks	

	<p>Highlighting the common solution region ----- 1 mk</p>	
14.	<p>CASE STUDY:</p> $P(A) = 0.25, \quad P(B) = 0.45, \quad P(A \cap B) = 0.1$ $(i) P(A' \cap B') = 1 - P(A \cup B)$ $= 1 - (0.25 + 0.45 - 0.1) = 0.4 \quad \text{-----(2mks)}$ $(ii) P(A' \cap B) + P(A \cap B')$ $= P(A) + P(B) - 2P(A \cap B) = 0.5 \quad \text{-----(2mks)}$	
	SET - B	
4.	<p>Understanding of use of $\tan(A+B)$ ----- (½ mk) Correct use of formula with substitutions ----- (½ mk) Correct values of each t ratio ----- (½ mk) Final answer ----- (½ mk)</p>	
10.	<p>EQUATION</p> $(i) 6! = 720 \quad \text{-----(1 mk)}$ $(ii) 4! \times 5! = 2880 \quad \text{-----(1 mk)}$ $(iii) 6! \times 3! = 4320 \quad \text{-----(1 mk)}$	
13.	$f(x) = (x + 3)(x - 4) = x^2 - x - 12 \quad \text{-----(½ mk)}$ $f(x + h) = (x + h)^2 - (x + h) - 12 \quad \text{-----(½ mk)}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[(x+h)^2 - (x+h) - 12] - [x^2 - x - 12]}{h} \quad \text{-----(2 mk)}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 - h}{h} = 2x - 1 \quad \text{-----(½ + ½ mk)}$	

14.	<p>CASE STUDY:</p> $P(A) = 0.05, \quad P(B) = 0.10, \quad P(A \cap B) = 0.02$ $(i) P(A' \cap B') = 1 - P(A \cup B) = 1 - (0.05 + 0.10 - 0.02) = 0.87 \text{ ---}$ (2 mks) $(ii) P(A' \cap B) + P(A \cap B') = P(A) + P(B) - 2P(A \cap B) = 0.11 \text{ -----}$ (2 mks)	
SET - C		
1.	$n - 1_{P_3} : n_{P_4} = 1 : 9 \Rightarrow \frac{(n-1)!}{(n-4)!} \div \frac{n!}{(n-4)!} = 1 \div 9 \text{ ----- (1 mk)}$ $\Rightarrow \frac{1}{n} = \frac{1}{9} \Rightarrow n = 9 \text{ ----- (1 mk)}$	