1/11

ANSWER KEY

First YEAR HIGHER SECONDARY Impvt EXAMINATION October 2022

PART-I/II/III

SUBJECT: Mathematics (Sc)

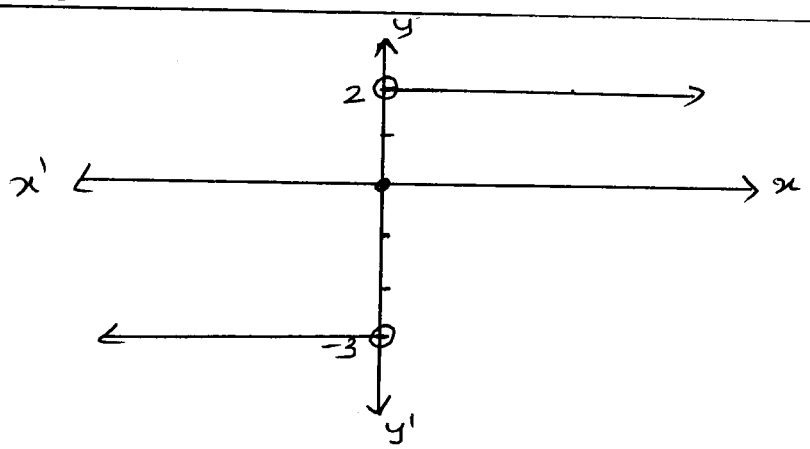
CODE NO: FY 827 **VERSION:** A

60 **SCORES** 2 **HOURS**

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1	(a)	$A = \{2, 3, 5\}$	1	3
	(b)	$A \times B = \{(2,5), (2,6), (3,5), (3,6), (5,5), (5,6)\}$	1	
	(c)	$2^{mn} = 2^{3\times2} = 2^6 = 64$	1	
		Remarks: (i) Using A if (b) and (c) are correct give 1 score each. (ii) (c) For formula give $\frac{1}{2}$ score.		
2		$\sin x = \frac{-4}{5}$	1	3
		$\tan x = \frac{4}{3}$	1	
		$\sec x = -\frac{5}{3}$	1	
		Remarks: $\sin x = \frac{4}{5}$, $\tan x = \frac{4}{3}$, $\sec x = \frac{5}{3}$ give 2 score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
3	(a)	$a_5 = 5(5+2) = 35$	1	
	(b)	$t_8 = t_1 + 7d \Rightarrow 24 = 3+7d$		
		$\Rightarrow d = 3$	1	3
		Numbers are, 3, 6, 9, 12, 15, 18, 21, 24.	1	
		Remarks: (i) $a_n = a+(n-1)d$, give $\frac{1}{2}$ score (ii) For direct answer give 2 score		
4	(a)	$m = \tan 45^\circ$ $= 1$	1	
	(b)	$y - y_1 = m(x - x_1)$	1	3
		$y - 2 = 1(x-1)$	1	
		$x - y + 1 = 0$		
		Remarks: $m = \tan\theta$ give $\frac{1}{2}$ score.		
5		$r = \sqrt{2^2+3^2} = \sqrt{13}$	1	
		$(x-h)^2 + (y-k)^2 = r^2$	1	3
		$(x-2)^2 + (y-2)^2 = (\sqrt{13})^2$	1	
		$x^2+y^2-4x-4y-5 = 0$		
		Remarks: (i) Distance formula $\frac{1}{2}$ score (ii) Alternative method give full score.		
6	(a)	(iv) (0, 1, 2)	1	
	(b)	x co-ordinate $= 0$	1	
		$0 = \frac{\ell x_2 + m x_1}{\ell + m}$	$\frac{1}{2}$	
		$0 = \frac{6\ell - 4m}{\ell + m}$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$\frac{l}{m} = \frac{2}{3}$		
		$l : m = 2 : 3$	$\frac{1}{2}$	3
		Remarks: For any alternative method give full score.		
7		$\lim_{x \to 0^-} 2x+3 = 3$	1	
		$\lim_{x \to 0^+} 3(x+1) = 3$	1	3
		$\therefore \lim_{x \to 0} f(x) = 3$	1	
		Remark: LHL = RHL give $\frac{1}{2}$ score.		
8		Assume $\sqrt{7}$ is rational (not irrational)	1	
		Let $\sqrt{7} = \frac{a}{b}$, a and b are integers,		
		$b \neq 0$, a and b have no common factor.	$\frac{1}{2}$	
		Squaring both sides,		
		$7 = \frac{a^2}{b^2} \Rightarrow 7b^2 = a^2$		
		$\Rightarrow$ 7 divides a	$\frac{1}{2}$	3
		$\therefore a = 7c \Rightarrow a^2 = 49c^2$		
		$\therefore 49c^2 = 7b^2$		
		$\Rightarrow b^2 = 7c^2$		
		$\Rightarrow$ 7 divides b	$\frac{1}{2}$	
		$\therefore$ 7 divides both a and b,		
		which is a contradiction to our assumption.	$\frac{1}{2}$	
		$\therefore \sqrt{7}$ is irrational		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9	(a)	$A' = \{1, 4, 5, 6\}$	$\frac{1}{2}$	
		$B' = \{1, 2, 6\}$	$\frac{1}{2}$	
	(b)	$A \cup B = \{2, 3, 4, 5\}$	1	4
		$(A \cup B)' = \{2, 3, 4, 5\}' = \{1, 6\}$ —— ①	1	
		$A' \cap B' = \{1, 6\}$ —— ②	$\frac{1}{2}$	
		$\therefore (A \cup B)' = A' \cap B'$	$\frac{1}{2}$	
10	(a)		2	4
	(b)	Domain = $\mathbb{R}$	1	
		Range = $\{-3, 0, 2\}$	1	
		Remark: Drawing coordinate axes give $\frac{1}{2}$ score.		
11	(a)	$P(1)$: $1 = \frac{3^1 - 1}{2} = 1$	1	
		$\therefore$ $P(1)$ is true.		
	(b)	Assume $P(k)$ is true.		
		$P(k)$: $1 + 3 + 3^2 + \cdots + 3^{k-1} = \frac{3^k - 1}{2}$	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$P(k+1) = 1+3+3^2+\cdots+3^{k-1}+3^k$ $= \frac{3^k-1}{2} + 3^k$ $= \frac{3^k-1+2\cdot 3^k}{2}$ $= \frac{3^{k+1}-1}{2}$ $\therefore$ $P(k+1)$ is true. $\therefore$ By PMI the statement is true for all n. Remark: Analysing $P(n)$ give full score.	1 1	4
12	(a)	$n=17$ $17C_{17}$ $= 1$	$\frac{1}{2}$ $\frac{1}{2}$	
	(b)	Number of arrangements begin with $P = \frac{11!}{3!\,2!\,4!}$ Remarks: (i) N→3, D→2, E→4 give 1 score. (ii) Number of arrangements $= \frac{12!}{3!\,2!\,4!}$ give 1 score.	3	4
13	(a)	7	1	
	(b)	$T_{r+1} = {}^6C_r\,(x^2)^{6-r}\left(\frac{1}{x}\right)^r$ $12-3r=0$ $r=4$	1 $\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$T_{4+1} = T_5 = {}^6C_4$	$\frac{1}{2}$	4
		Remark: Formula for general term give 1 score.		
14		$S_n = 7 + 77 + 777 + \ldots$ to n terms.	1	
		$= \frac{7}{9}(9 + 99 + \ldots$ n terms $)$	1	
		$= \frac{7}{9}[(10-1) + (10^2-1) + \ldots$ n terms $]$	1	4
		$= \frac{7}{9}\left[\frac{10(10^n-1)}{9} - n\right]$	1	
		Remarks: $S_n = \frac{a(r^n-1)}{r-1}$ give 1 score.		
15	(a)	x intercept $= -3$	1	
		slope $= \frac{1}{2}$	1	
	(b)	$d = \left\lvert \frac{Ax_1 + By_1 + C}{\sqrt{A^2+B^2}} \right\rvert$	1	4
		$= \left\lvert \frac{1-6+3}{\sqrt{1^2+2^2}} \right\rvert = \left\lvert \frac{-2}{\sqrt{5}} \right\rvert$	1	
		$= \frac{2}{\sqrt{5}}$		
		Remarks: (i) $\frac{x}{a} + \frac{y}{b} = 1$ give 1 score.		
		(ii) $y = mx + c$ give $\frac{1}{2}$ score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
16		$a=5,\ b=3,\ c=4$ foci $=(\pm c, 0)$ $=(\pm 4, 0)$ Vertices $=(\pm a, 0)$ $=(\pm 5, 0)$ $e=\frac{c}{a}$ $=\frac{4}{5}$ Latus rectum $=\frac{2b^2}{a}$ $=\frac{18}{5}$ Remarks: (i) $a=5,\ b=3$ give 1 score. (ii) $c=\sqrt{a^2-b^2}$ give 1 score.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	4
17	(a)	$P(A\cup B)=P(A)+P(B)-P(A\cap B)$ $=0.42+0.48-0.16$ $=0.74$	1 1	4
	(b)	$P(A'\cap B')=P(A\cup B)'$ $=1-P(A\cup B)$ $=1-.74=0.26$	$\frac{1}{2}$ 1 $\frac{1}{2}$	
18	(a)	$\cos x=\frac{1}{2}$ $\cos x=\cos\frac{\pi}{3}$ $\cos x=\cos y \Rightarrow x=2n\pi\pm y$ $\Rightarrow x=2n\pi\pm\frac{\pi}{3}$	1 1 1	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(b)	$\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \frac{2 \sin 4x \cos x}{2 \cos 4x \cos x}$	2	3
		(For numerator: 1 score, denominator 1 score)		
		$= \tan 4x$	1	
		Remarks: Score		
		For $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$ $(\frac{1}{2})$		
		$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$ $(\frac{1}{2})$		
19	(a)	$z^{-1} = \frac{1}{1+i}$	1	6
		$= \frac{1}{1+i} \frac{1-i}{1-i}$	$\frac{1}{2}$	
		$= \frac{1}{2} - \frac{i}{2}$	$\frac{1}{2}$	
	(b)	$z = r(\cos\theta + i \sin\theta)$	1	
		$r = \sqrt{2}$	$\frac{1}{2}$	
		$\theta = \frac{\pi}{4}$	$\frac{1}{2}$	
		$z = \sqrt{2}\left(\cos\frac{\pi}{4} + i \sin\frac{\pi}{4}\right)$		
	(c)	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$	1	
		$= \frac{-1 \pm \sqrt{1-8}}{4}$	$\frac{1}{2}$	
		$= \frac{-1 \pm i\sqrt{7}}{4}$	$\frac{1}{2}$	
		$= \frac{-1+i\sqrt{7}}{4}, \quad \frac{-1-i\sqrt{7}}{4}$		

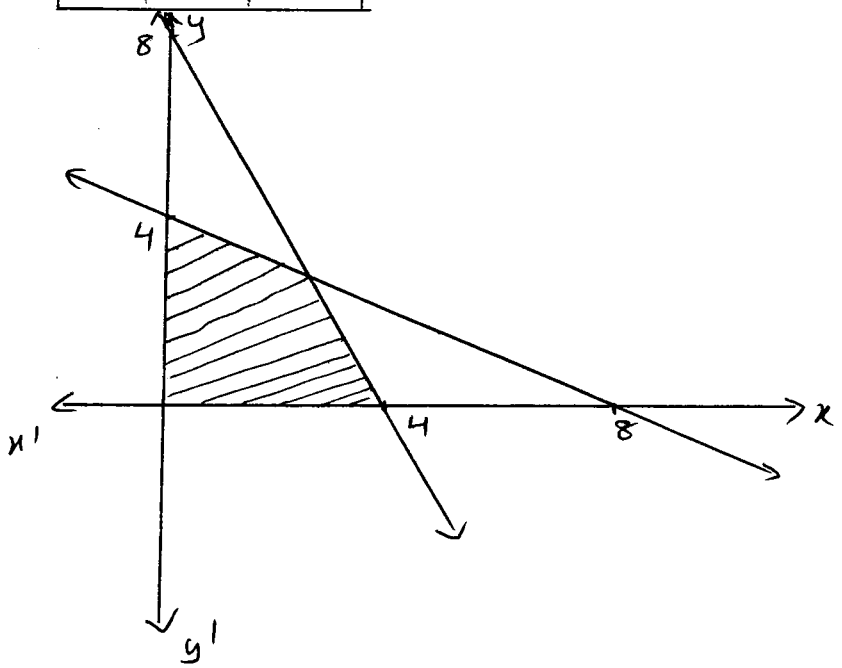
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		Remark: (a) $z^{-1} = \frac{\bar{z}}{|z|^2}$ give 1 score.		
		(b) $r = \sqrt{a^2+b^2}$ give $\frac{1}{2}$ score.		
20	(a)	$4x+3 < 6x+7$		
		$4x-6x < 7-3$	1	
		$-2x < 4$	$\frac{1}{2}$	
		$x > -2$	$\frac{1}{2}$	
		$x \in (-2, \infty)$		
	(b)			

x	0	8
y	4	0

1

x	4	0
y	0	8

1



2

6

Remarks: (i) Drawing x and y axes $\frac{1}{2}$ score

(ii) For drawing line 1 score each.

(iii) For shading $\frac{1}{2}$ score.

(iv) For alternative method score full score.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
21	(a)	$y = x^2$		
		$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$	1	
		$= \lim_{h \to 0} \frac{(x+h)^2 - x^2}{h}$	1	
		$= \lim_{h \to 0} \frac{2hx + h^2}{h}$	1	
		$= 2x$		
	(b)	$y = \frac{\cos x}{1 + \sin x}$		6
		$\frac{dy}{dx} = \frac{(1+\sin x) \cdot -\sin x - \cos x \times \cos x}{(1+\sin x)^2}$	2	
		$= \frac{-\sin x - \sin^2 x - \cos^2 x}{(1+\sin x)^2}$		
		$= \frac{-(\sin x + \sin^2 x + \cos^2 x)}{(1+\sin x)^2}$	1	
		$= \frac{-(\sin x + 1)}{(1+\sin x)^2}$		
		$= \frac{-1}{1+\sin x}$		
		Remarks; (a) For direct answer give 1 score.		
		(b) For analysing give 3 score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
22				

class	x_i	f_i	$x_i f_i$	$(x_i-\bar{x})^2$	$f_i(x_i-\bar{x})^2$
0–10	5	5	25	484	2420
10–20	15	8	120	144	1152
20–30	25	15	375	4	60
30–40	35	16	560	64	1024
40–50	45	6	270	324	1944
		50	1350		6600

3

$$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \frac{1350}{50} = 27$$ — 1

$$\text{Variance} = \frac{\Sigma f_i (x_i-\bar{x})^2}{\Sigma f_i}$$ — 1

$$= \frac{6600}{50} = 132$$

$$\sigma = \sqrt{132} = 11.48$$ — 1

Remarks: Upto 3 correct column give 2 score,

Upto mean give 3 score.

Formula for mean, variance, standard deviation give $\frac{1}{2}$ each.

For alternative method give 6 score.

6

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