ANSWER KEY

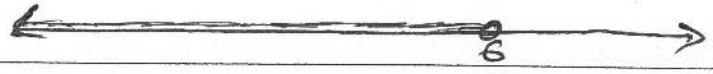
FIRST YEAR HIGHER SECONDARY EXAMINATION ....MARCH... 2024

PART-I/II/III

SUBJECT: .....MATHEMATICS Science (60)

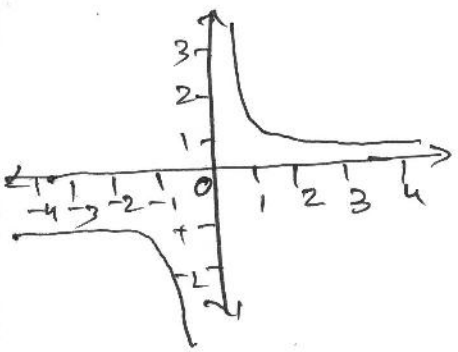
CODE NO: ..FY-427 VERSION:.....

.60.. SCORES (1/13) ...2.... HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1	(i)	c) 2^6	1	
	(ii)	$\frac{x}{3}+1=-\frac{2}{3}$	$\frac{1}{2}$	
		$x=-5$	$\frac{1}{2}$	3
		$y-\frac{2}{3}=\frac{2}{3}$	$\frac{1}{2}$	
		$y=\frac{4}{3}$	$\frac{1}{2}$	
2	(i)	$\cos(x+y)+\cos(x-y)=2\cos x\cos y$	1	
	(ii)	$\cos\left(\frac{3\pi}{4}+x\right)+\cos\left(\frac{3\pi}{4}-x\right)$		
		$=2\cos\frac{3\pi}{4}\cos x$	1	3
		$=2\times\frac{-1}{\sqrt{2}}\times\cos x$	$\frac{1}{2}$	
		$=-\sqrt{2}\cos x$	$\frac{1}{2}$	
3	(i)	$x+\frac{x}{2}+\frac{x}{3}\leq 10+\frac{x}{6}$		
		$6x+3x+2x\leq 60+x$	1	
		$11x\leq 60+x$	$\frac{1}{2}$	3
		$10x\leq 60$		
		$x\leq 6$	$\frac{1}{2}$	
	(ii)		1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		Remark Using the solution of (i). The graph of (ii) is correct give 1 score		
4	(i)	c) $nC_r = \frac{n!}{r!(n-r)!}$	(1)	
	(ii)	Out of 7 men 3 can be selected in $7C_3$ ways	(1/2)	
		Out of 5 women, 2 can be selected in $5C_2$ ways	(1/2)	3
		$\therefore$ Total number of ways $= 7C_3 \times 5C_2$	(1)	
		OR Direct answer give '2' score.		
5	(i)	2^n	(1)	
	(ii)	$\left(\frac{x}{3}+\frac{3}{x}\right)^4 = 4C_0\left(\frac{x}{3}\right)^4 + 4C_1\left(\frac{x}{3}\right)^3\left(\frac{3}{x}\right)^1 + 4C_2\left(\frac{x}{3}\right)^2\left(\frac{3}{x}\right)^2 + 4C_3\left(\frac{x}{3}\right)^1\left(\frac{3}{x}\right)^3 + 4C_4\left(\frac{3}{x}\right)^4$	(1 1/2)	3
		$= \frac{x^4}{81} + 4\cdot\frac{x^2}{9} + 6 + 4\times\frac{9}{x^2} + \frac{81}{x^4}$	(1/2)	
		$= \frac{x^4}{81} + \frac{4x^2}{9} + 6 + \frac{36}{x^2} + \frac{81}{x^4}$		
		Remarks Correct expansion of $(a+b)^n$ give 1 score		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
6	(i)	Slope $= -A/B = \frac{3}{4}$	$\frac{1}{2}$	
		$y - y_1 = m(x - x_1)$	1	
		$y + 3 = \frac{3}{4}(x - 2)$	$\frac{1}{2}$	
		$3x - 4y - 18 = 0$		
		OR		3
		Alternative method with correct answer give 2 score.		
	(ii)	$D = \left\| \frac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}} \right\|$	$\frac{1}{2}$	
		$= \left\| \frac{0 - 0 + 12}{\sqrt{3^2 + 4^2}} \right\|$		
		$= \frac{12}{5}$	$\frac{1}{2}$	
7		$x^2 = 12y$		
		$4a = 12$		
		$a = 3$	$\frac{1}{2}$	
		Focus $= (0, a)$	$\frac{1}{2}$	
		$= (0, 3)$		
		Equation of directrix $y = -a$	$\frac{1}{2}$	3
		$y = -3$	$\frac{1}{2}$	
		Length of Latus rectum $= 4a$	$\frac{1}{2}$	
		$= 12$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
8	(i)	$n\,a^{n-1}$	(1)	
	(ii)	$n \cdot 2^{n-1} = 32$	(1)	3
		$= 2^5$	(½)	
		$= 4 \cdot 2^3$		
		$n = 4$	(½)	
9	(i)	$A \cap A' = \phi$	(1)	
	(ii)	$A' = \{1, 5, 6\}$	(½)	
		$B' = \{1, 5\}$	(½)	
		$A \cap B = \{2, 3, 4\}$	1	4
		$(A \cap B)' = \{1, 5, 6\}$.	(½)	
		$A' \cup B' = \{1, 5, 6\}$	(½)	
10	(i)		(2)	
		OR Rough sketch		
	(ii)	$9 - x^2 \geq 0$	(½)	
		$x^2 \leq 9$		
		$-3 \leq x \leq 3$	(½)	
		Domain $= [-3, 3]$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$x = \sqrt{9-y^2}$	$\frac{1}{2}$	
		$0 \le y \le 3$	$\frac{1}{2}$	4
		Range $= [0,3]$		
		PR for direct correct Domain and Range give 2 score.		
11	i)	$(1-i)^2 = 1-2i+i^2$	$\frac{1}{2}$	
		$= 1-2i-1$		
		$= -2i$	$\frac{1}{2}$	
		$(1-i)^6 = (-2i)^3$	$\frac{1}{2}$	
		$= -8i^3$		
		$= 8i$	$\frac{1}{2}$	
		Using Binomial theorem give '2' score. for correct answer.		
	(ii)	$z = \frac{1-i}{1+i}$		4
		$= \frac{(1-i)(1-i)}{(1+i)(1-i)}$	1	
		$= \frac{1-2i+i^2}{2}$		
		$= -i$	$\frac{1}{2}$	
		$= 0-i$		
		Coordinate in the argand plane $= (0,-1)$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
12	(i)	$nP_r = r!\, nC_r$	(1/2)	
		$840 = r! \times 35$		
		$r! = \frac{840}{35}$		
		$r! = 24$	(1)	
		$r = 4$	(1/2)	
	(ii)	A – 1 T – 4 I – 1 U – 1 D – 1 E – 1 9	(1)	4
		Number of permutations $= \frac{9!}{4!}$	(1)	

Remarks

(i) $nP_r = \frac{n!}{(n-r)!}$ → (1/2)

$nC_r = \frac{n!}{r!\,(n-r)!}$ → (1/2)

(ii) Using the word ATTITUDE

Answer is correct give 2 score.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
13	(i)	$y-y_1 = m(x-x_1)$, $m = \frac{y_2-y_1}{x_2-x_1}$	1	4
		$y-0 = 1(x-1)$	$\frac{1}{2}$	
		$y = x-1$	$\frac{1}{2}$	
	(ii)	Slope of $\perp^r$ line to PQ $= -1$	$\frac{1}{2}$	
		$y-y_1 = m(x-x_1)$	$\frac{1}{2}$	
		$y-4 = -1(x+1)$	$\frac{1}{2}$	
		$y-4 = -x-1$		
		$x+y = 3$	$\frac{1}{2}$	
		Alternative method give full score.		
14		$a = 5$ $c = 4$ $b^2 = a^2-c^2$ $= 25-16$ $= 9$ $b = 3$	$\frac{1}{2}$	4
	(i)	Length of the minor axis $= 2b$ $= 6$	$\frac{1}{2}$	
	(ii)	Length of the Latus rectum $= \frac{2b^2}{a}$	$\frac{1}{2}$	
		$= \frac{2\times 9}{5}$	$\frac{1}{2}$	
		$= \frac{18}{5}$		
		Eccentricity $= \frac{c}{a}$	$\frac{1}{2}$	
		$= \frac{4}{5}$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
6	(iii)	Equation of the ellipse.		
		$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{1}{2}$	
		$\frac{x^2}{25} + \frac{y^2}{9} = 1$	$\frac{1}{2}$	
15	(i)	Any point with x-coordinate −ve, y and z are positive.		
		eg: $(-2, 3, 4)$	1	
	(ii)	$AB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$	$\frac{1}{2}$	4
		$= \sqrt{1^2+1^2+4^2}$	$\frac{1}{2}$	
		$= \sqrt{18}$		
		$BC = \sqrt{9+9+0} = \sqrt{18}$	1	
		$AC = \sqrt{16+4+16} = \sqrt{36}$	1	
		$AB^2 + BC^2 = AC^2$		
		$\therefore$ ΔABC is right angled		
16	(i)	$N(S) = {}^{13}C_3$	$\frac{1}{2}$	
		$P(3 \text{ balls are white}) = \frac{{}^5C_3}{{}^{13}C_3}$	$\frac{1}{2}$	
	(ii)	$P(3 \text{ balls are red}) = \frac{{}^8C_3}{{}^{13}C_3}$	1	4
	(iii)	$P(1 \text{ ball is red and Two balls are white})$		
		$= \frac{{}^8C_1 \times {}^5C_2}{{}^{13}C_3}$	2	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
17	(i)	b) $\frac{\sqrt{3}}{2}$	(1)	
	(ii)	$\frac{\sin 3x - \sin x}{\cos^2 x - \sin^2 x} = \frac{2\cos\left(\frac{3x+x}{2}\right)\sin\left(\frac{3x-x}{2}\right)}{\cos 2x}$	(1)	
		$= \frac{2\cos 2x \sin x}{\cos 2x}$	$(\frac{1}{2})$	
		$= 2\sin x$	$(\frac{1}{2})$	
	(iii)	$\tan(\theta+\phi) = \frac{\tan\theta + \tan\phi}{1 - \tan\theta\tan\phi}$	(1)	6
		$= \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{2} \times \frac{1}{3}}$	(1)	
		$= \frac{5/6}{5/6}$		
		$= 1$	$(\frac{1}{2})$	
		$\therefore \theta + \phi = \frac{\pi}{4}$	$(\frac{1}{2})$	
		Any alternative method to find $\theta+\phi = \pi/4$ give full score.		
		Remark (ii) $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$ give $(\frac{1}{2})$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
18	(i)	$a = 2$	$\frac{1}{2}$	
		$r = 4$	$\frac{1}{2}$	
		$ar^{n-1} = 32768$	$\frac{1}{2}$	
		$2 \times r^{n-1} = 32768$		
		$r^{n-1} = \frac{32768}{2}$		
		$= 16384$		
		$4^{n-1} = 4^7$		
		$n-1 = 7$		
		$n = 8$	$\frac{1}{2}$	6
	(ii)	$a + ar + ar^2 = 14$	1	
		$ar^3 + ar^4 + ar^5 = 112$	1	
		$\frac{a + ar + ar^2}{ar^3 + ar^4 + ar^5} = \frac{14}{112}$		
		$\frac{a(1 + r + r^2)}{ar^3(1 + r + r^2)} = \frac{1}{8}$		
		$\frac{1}{r^3} = \frac{1}{8}$		
		$r^3 = 8$		
		$r = 2$	$\frac{1}{2}$	
		$a(1 + 2 + 2^2) = 14$		
		$7a = 14$		
		$a = 2$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$S_n = \frac{a(r^n-1)}{r-1}$	(1/2)	
		$= \frac{2(2^n-1)}{2-1}$		
		$= 2(2^n-1)$	(1/2)	
19	(i)	$f(x) = \frac{1}{x}$		
		$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$	(1)	
		$= \lim_{h\to 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$	(1)	
		$= \lim_{h\to 0} \frac{\left[\frac{x-(x+h)}{(x+h)\times x}\right]}{h}$		
		$= \lim_{h\to 0} \frac{-h}{(x+h)\,x\times h}$		6
		$= \lim_{h\to 0} \frac{-1}{(x+h)\,x}$	(1/2)	
		$= \frac{-1}{x\times x}$		
		$= \frac{-1}{x^2}$	(1/2)	
		Remark $f'(x) = -\frac{1}{x^2}$ give 1 score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(ii)	$\frac{d}{dx}\left(\frac{x^2+1}{x^2-1}\right)$		
		$= \frac{(x^2-1)\frac{d}{dx}(x^2+1) - (x^2+1)\frac{d}{dx}(x^2-1)}{(x^2-1)^2}$	$1\frac{1}{2}$	
		$= \frac{(x^2-1)\times 2x - (x^2+1)\times 2x}{(x^2-1)^2}$	$1\frac{1}{2}$	
		$= \frac{-4x}{(x^2-1)^2}$		
		Remark Quotient Rule give 1 score.		
20.	(i)	$\bar{x} = \frac{\Sigma x_i}{n}$	$\frac{1}{2}$	
		$= \frac{80}{8}$		
		$= 10$	$\frac{1}{2}$	
		M.D about $\bar{x} = \frac{\Sigma \lvert x_i - \bar{x} \rvert}{n}$	$\frac{1}{2}$	
		$= \frac{24}{8}$	$\frac{1}{2}$	
		$= 3$		

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

(ii)

class	f_i	x_i	$f_i \times x_i$	x_i^2	$f_i \times x_i^2$
4-8	3	6	18	36	108
8-12	6	10	60	100	600
12-16	4	14	56	196	784
16-20	7	18	126	324	2268
	20		260		3760

(2)

$$\text{Variance} = \frac{\Sigma f_i x_i^2}{N} - \left(\frac{\Sigma f_i x_i}{N}\right)^2 \quad (1)$$

$$= \frac{3760}{20} - \left(\frac{260}{20}\right)^2 \quad (\tfrac{1}{2})$$

$$= 19 \quad (\tfrac{1}{2})$$

Any alternative method give full score.

Total Score: 6

First Year Mathematics (Science)

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