FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2017

SUBJECT : MATHEMATICS (SCIENCE) **CODE. NO: 618**

Qn No	Sub Qns	Answer Key/Value Points		Score	Total
1	(a)	$\frac{1}{\sqrt{2}}$	1	1	
	(b)	$\cos x = \sqrt{1-\sin^2 x} = \sqrt{1-\frac{9}{25}} = -\frac{4}{5}$	$\frac{1}{2}$		
		$\sec x = \frac{-5}{4}$	$\frac{1}{2}$		
		$\tan x = \frac{-3}{4}$	$\frac{1}{2}$		
		$\cot x = \frac{-4}{3}$	$\frac{1}{2}$	2	
		Remarks: Alternate method give full score With out negative sign give $1\frac{1}{2}$ Score			
	(c)	$\sin 6x + \sin 2x - \sin 4x = 0$	$\frac{1}{2}$		6
		$2\sin 4x \cos 2x - \sin 4x = 0$	$\frac{1}{2}$		
		$\sin 4x(2\cos 2x - 1) = 0$	$\frac{1}{2}$		
		$\sin 4x = 0$ $\left(\frac{1}{2}\right)$ $\quad \cos 2x = \frac{1}{2}$	$\frac{1}{2}$		
		$4x = n\pi$ $\quad \cos 2x = \cos\frac{\pi}{3}$			
		$x = \frac{n\pi}{4}$ $\quad x = n\pi \pm \frac{\pi}{6}$	$\frac{1}{2}$	3	
		OR			
	(a)	210	1	1	
	(b)	$\tan 75 = \tan(45+30)$	$-\frac{1}{2}$		
		$= \frac{\tan 45 + \tan 30}{1 - \tan 45 \tan 30}$	$-\frac{1}{2}$		
		$= \frac{1+\frac{1}{\sqrt{3}}}{1-\frac{1}{\sqrt{3}}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$	-1	2	
		* for formula give ½ score, Alternate method give full score * for direct answer give 1 score			
	(c)	$a\sin(B-C) = a[\sin B\cos C - \cos B \sin C]$	$-\frac{1}{2}$		
		$= a\left[bk\left(\frac{a^2+b^2-c^2}{2ab}\right) - ck\left(\frac{c^2+a^2-b^2}{2ac}\right)\right]$	-1		6

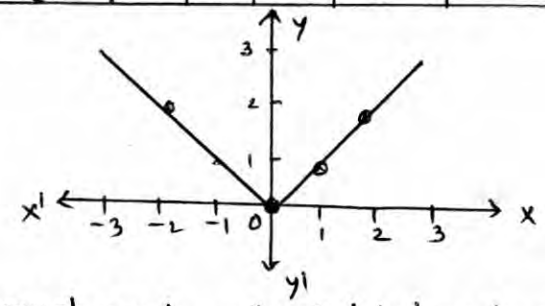
Qn No	Sub Qns	Answer Key/Value Points		Score	Total
		$= \frac{k}{2}\left[a^2+b^2-c^2-c^2-a^2+b^2\right]$	$\frac{1}{2}$		
		$= k\left[b^2-c^2\right]$			
		Similerly $b\sin(C-A) = k(c^2-a^2)$	$\frac{1}{2}$		
		$c\sin(A-B) = k(a^2-b^2)$	$\frac{1}{2}$	3	
	Remark:	$\therefore$ LHS $= 0$			
		for subtraction formula, sine formula, cosine formula give $\frac{1}{2}$ score each			
2	(a)	(ii) A	1	1	
	(b)	$A\cup B = \{a,b,c,d,e,f,g\}$			
	(i)	$A' = \{a,f,g\}$ $B' = \{b,d,e,f\}$	-1		
		$(A\cup B)' = \{f\}$, $A'\cap B' = \{f\}$	$\frac{1}{2}+\frac{1}{2}$	2	5
	(c)	$n(A\cup B) = 400$, $n(A) = 250$, $n(B) = 200$	1		
		$n(A\cap B) = n(A)+n(B)-n(A\cup B)$	$\frac{1}{2}$		
		$= 50$	$\frac{1}{2}$	2	
	Remark:	for analysing the problem give FULLSCORE			
3		Let $P(n)$: $10^{2n-1}+1$ is divisible by 11			
		$P(1) = 10+1 = 11$, $P(1)$ is true	-1		
		Assume that $P(k)$ is true, $10^{2k-1}+1$ is $d(11)$	-1		
		$P(k+1) = 10^{2k+2-1}+1$	-1		
		$= 10^{2k-1}\cdot 10^2+1$			
		$= 10^{2k-1}\left[99+1\right]+1$			4
		$= 10^{2k-1}\cdot 99 + 10^{2k-1}+1 = d(11)$	-1		
		$\therefore P(k+1)$ is true		4	
4	(a)	(iii) $R - \{1\}$	1	1	
	(b)	$R = \{(1,6),(2,7),(3,8)\}$	1		
		domain $= \{1,2,3\}$, Range $= \{6,7,8\}$	1+1	3	

Remark: for any correct two ordered pair give 1 score, corresponding domain and range give 2 score

Qn No	Sub Qns	Answer Key/Value Points		Score	Total
	(c)				6

x	-2	-1	0	1	2
$f(x)$	2	1	0	1	2

1



1 — Score: 2

Remark: for correct graph with out tabular column give FULL SCORE

5	(a)	(iii) -1	1	1	
	(b)	$a=\sqrt{3}$, $b=1$	$\frac{1}{2}$		
		$r=2$	$\frac{1}{2}$		
		$\tan\theta = \frac{1}{\sqrt{3}}$, $\theta = \frac{\pi}{6}$ or 30°	$\frac{1}{2}$		
		$z = 2\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$	$\frac{1}{2}$	2	
		Remark: for formula give $\frac{1}{2}$ score each			
	(c)	$\sqrt{-8-6i} = x+iy$	$\frac{1}{2}$		
		$-8-6i = x^2-y^2+i\,2xy$	$\frac{1}{2}$		
		$x^2-y^2=-8$, $xy=-3$	$\frac{1}{2}$		6
		$x^2+y^2=10$	$\frac{1}{2}$		
		$x=\pm 1$, $y=\pm 3$	$\frac{1}{2}+\frac{1}{2}$	3	
		$\therefore \sqrt{-8-6i} = -1+i3$ or $1-i3$			
		Remark: Alternate method give FULL SCORE			
		for $(x^2+y^2)^2 = (x^2-y^2)^2+(2xy)^2$ give $\frac{1}{2}$ score			
6	(a)	$2x > 3x+6$	1		
		$-x > 6$ or $x < -6$	1	2	
	(b)				

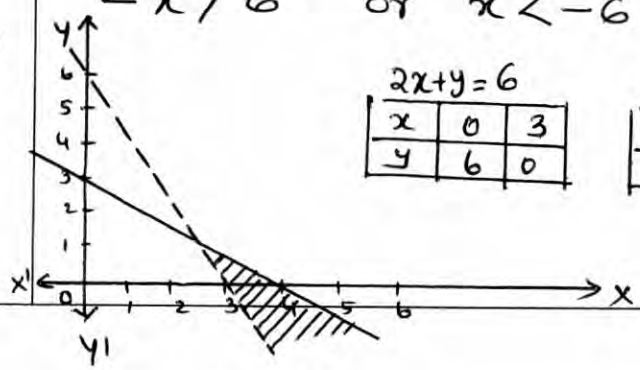
$2x+y=6$

x	0	3
y	6	0

$3x+4y=12$

x	0	4
y	3	0

$\frac{1}{2}+\frac{1}{2}$



2 — Score: 3

Qn No	Sub Qns	Answer Key/Value Points		Score	Total
	Remark	• For each line give 1 Score, • for correct line and incorrect region give $2\frac{1}{2}$ Score • with out considering doted line give FULL SCORE • for drawing axes only give $\frac{1}{2}$ Score			
7	(a)	(iii) 64	1	1	
	(b)	Number of ways $= {}^5P_2$ or 5×4	$1\frac{1}{2}$		
		$= 20$	$\frac{1}{2}$	2	
	(c)	$\frac{5!}{(5-r)!} = 2 \cdot \frac{6!}{(7-r)!}$	1		
		$\frac{5!}{(5-r)!} = \frac{2\times6\times5!}{(7-r)(6-r)(5-r)!}$	$\frac{1}{2}$		6
		$(7-r)(6-r) = 12$	$\frac{1}{2}$		
		$r^2 - 13r + 30 = 0$	$\frac{1}{2}$		
		$r = 10$ or 3	$\frac{1}{2}$	3	
		$r = 3$			
	Remark	for the formula ${}^nP_r$ give $\frac{1}{2}$ Score			
		OR			
	(a)	17 (iii)	1	1	
	(b)	${}^{12}C_2 = 66$	$1\frac{1}{2}+\frac{1}{2}$	2	
	Remark	for ${}^nC_r$ give $\frac{1}{2}$ Score			
	(c)	Total number of ways $= {}^{52}C_4$	1		
	(i)	number of ways $= 4 \times {}^{13}C_4$	1		6
		$= 2860$			
	Remark	for ${}^{13}C_4$ give $\frac{1}{2}$ Score			
	(ii)	number of ways $= 2 \times {}^{26}C_4$	1	3	
		$= 29900$			
	Remark	for ${}^{26}C_4$ give $\frac{1}{2}$ Score			
8	(a)	(iii) 0	1	1	
	(b)	$3y = -6x + 5$	$\frac{1}{2}$		
		$y = -2x + \frac{5}{3}$	$\frac{1}{2}$		

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
		$\frac{a}{r}+a+ar = \frac{13}{12}$, $-1(1+r+r^2) = \frac{13r}{12}$ $\frac{1}{2}$		
		$12r^2+25r+12=0$, $r=\frac{-4}{3}$, or $\frac{-3}{4}$ $\frac{1}{2}+\frac{1}{2}$		
		numbers are $\frac{3}{4}, -1, \frac{4}{3}$ or $\frac{4}{3}, -1, \frac{3}{4}$ $\frac{1}{2}$	3	6
	(c)	$t_n = (2n+1)n^2 = 2n^3+n^2$ 1		
		$\Sigma t_n = 2\Sigma n^3 + \Sigma n^2 = 2\frac{n^2(n+1)^2}{4} + \frac{n(n+1)(2n+1)}{6}$ $\frac{1}{2}+\frac{1}{2}$	2	
		$= \frac{n(n+1)}{2}\left[n(n+1)+\frac{2n+1}{3}\right]$		
	Remark	for writing the formula for Σn^2, Σn^3, give $\frac{1}{2}$ Score each		
11	(a)	(iii) 11 1	1	
	(b)	$a=x$, $b=\frac{1}{x}$, $n=10$		
		$T_{r+1} = {}^nC_r a^{n-r} b^r = {}^{10}C_r x^{10-2r}$ $\frac{1}{2}+\frac{1}{2}$		3
		$10-2r=0$, $r=5$ $\frac{1}{2}+\frac{1}{2}$		
		the term is ${}^{10}C_5 = 630$	2	
12	(a)	(ii) $\sqrt{19}$ 1	1	
	(b)	Let c be (x_3, y_3, z_3)		
		$\left(\frac{3-1+x_3}{3}, \frac{-5+7+y_3}{3}, \frac{7-6+z_3}{3}\right) = (1,2,3)$ $\frac{1}{2}$		3
		$2+x_3=3$ $2+y_3=6$ $z_3+1=9$		
		$x_3=1$ $y_3=4$ $z_3=8$ $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$	2	
		C is $(1,4,8)$		
	Remark	formula for centroid give ½ Score		
13	(a)	(ii) 1 1	1	
	(b)	$\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x} = \lim_{y\to 1}\frac{y^{\frac{1}{2}}-1^{\frac{1}{2}}}{y-1}$ $1+x=y$, $x\to 0, y\to 1$ 1		
		$= \frac{1}{2}$ 1	2	
	Remark	for alternati method give FULLSCORE, $\lim_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}$ give $\frac{1}{2}$ Score.		
	(c)	$f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} = \lim_{h\to 0}\frac{\sin(x+h)-\sin x}{h}$, $\frac{1}{2}+\frac{1}{2}$		
		$= \lim_{h\to 0}\frac{2\cos\left(\frac{x+h+x}{2}\right)\sin\left(\frac{x+h-x}{2}\right)}{h}$ 1		

Qn No	Sub Qns	Answer Key/Value Points		Score	Total
		$= \lim_{h \to 0} \frac{2\cos\left(x+\frac{h}{2}\right)\sin h}{h} = \cos x$	$\frac{1}{2}+\frac{1}{2}$	3	
	Remark	for direct answer give 1 Score			
14	(a)	If a number is not divisible by 3 then it is not divisible by 9	1	1	
	(b)	Assume that $\sqrt{5}$ is rational, $\sqrt{5} = \frac{a}{b}$ a and b have no common factors	1		
		$a^2 = 5b^2 \Rightarrow$ 5 divides a			4
		$a = 5k$, $a^2 = 25k^2$, $5b^2 = 25k^2$, $b^2 = 5k^2$ $\Rightarrow$ 5 divides b	1		
		It is a contradiction, our assumption is wrong	1	3	
15	(a)	(i) $\frac{3}{4}$	1		
		(ii) $\frac{1}{2}$ (for any answer give 1 Score)	1		
		(iii) 1	1	3	
	(b)	$n(S) = 36$			
	(i)	$n(A) = 6$, $P(A) = \frac{1}{6}$	$\frac{1}{2}$		
	Remark	For writing $\{(1,1),(2,2)(3,3)(4,4)(5,5)(6,6)\}$ give ½ Score	$\frac{1}{2}$		5
	(ii)	$n(B) = 5$	$\frac{1}{2}$		
		$P(B) = \frac{5}{36}$	$\frac{1}{2}$	2	
	Remark	$B = \{(2,6)(3,5)(4,4)(5,3)(6,2)\}$ give ½ Score for writing the sample space S give ½ Score			
16	(a)	$\sum x = 30$, $\bar{x} = \frac{\sum x}{n} = 6$	$\frac{1}{2}+\frac{1}{2}$		
		$\sum x^2 = 220$, $\sigma^2 = \frac{\sum x^2}{n} - (\bar{x})^2 = \frac{220}{5} - 36 = 8$,	$\frac{1}{2}+\frac{1}{2}$	2	
	Remark	for writing correct formula for variance give ½ Score			
	(b)				5

x	f	fx	$\lvert x-\bar{x}\rvert$	$f\lvert x-\bar{x}\rvert$
5	7	35	9	63
10	4	40	4	16
15	6	90	1	6
20	3	60	6	18
25	5	125	11	55
	25	350		158

1

$\bar{x} = \frac{\sum fx}{N} = \frac{350}{25} = 14$ $\frac{1}{2}+\frac{1}{2}$

$MD(\bar{x}) = \frac{\sum f\lvert x-\bar{x}\rvert}{N} = \frac{158}{25} = 6.32$ $\frac{1}{2}+\frac{1}{2}$ 3

Remark Alternate method give FULL SCORE