FIRST YEAR HIGHER SECONDARY EXAMINATION SAY/IMP SEPTEMBER 2016

(Scheme of Valuation)

Subject : Mathematics (Science)

Code No. 418

Qn. No		Scoring Indicators	Split Score	Total Score
1.	a)	$A' = \{1,3,5,7\}$ $B' = \{1,3,5,6,7\}$	$\frac{1}{2}$ $\frac{1}{2}$ } 1	1
	b)	$A \cup B = \{2,4,6,8\}$ $(A \cup B)' = \{1,3,5,7\}$ $A' \cap B' = \{1,3,5,7\}$ $\underline{(A \cup B)' = A' \cap B'}$	$\frac{1}{2}$ $\frac{1}{2}$ } 2 1	2
	c)	$A \cap B = \{2,4,8\}$ $(A \cap B)' = \{1,3,5,6,7\}$ $A' \cup B' = \{1,3,5,6,7\}$ $\therefore (A \cap B)' = A' \cup B'$	$\frac{1}{2}$ $\frac{1}{2}$ } 2 1	2
2.	a)	False	1	1
	b)	$R = \{(2,2^3)(3,3^3)(5,5^3)(7,7^3)\}$ $= \{(2,8)(3,27)(5,125)(7,343)\}$ Remark: Give $\frac{1}{2}$ score for each pair	2	2
	c)	f is a relation Because f is a subset of A×B OR f is not a function Because the element '2' has two images	$1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$	3
3.	a)	(iv) or $\frac{121\pi}{540}$	1	1
	b)	$LHS = 3 \times \frac{1}{2} \times 2 - 4\, Sin(\pi - \pi/6) \times 1$ $= 3 - 4\, Sin\, \pi/6$ $= 3 - 4 \times \frac{1}{2}$	1 $\frac{1}{2}$ } 2	2

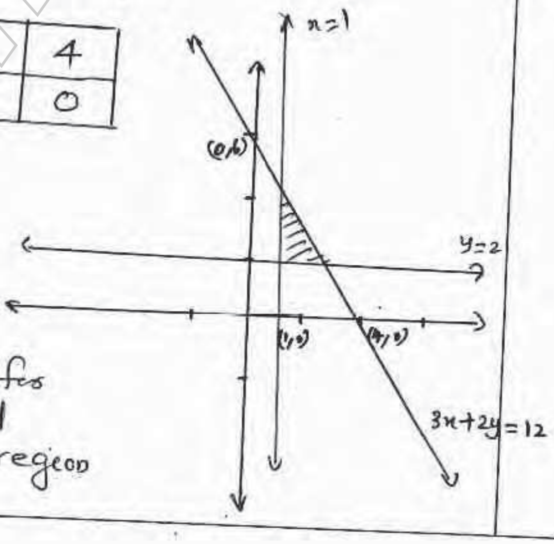
$= 3 - 2 = 1 = RHS$ $\frac{1}{2}$

Remark: For two correct values give $\frac{1}{2}$ score.

Qn.No		Scoring Indicators	Split Score	Total Score
	(c)	Given $\sin 6x+\sin 2x-\sin 4x=0$	$\frac{1}{2}$	
		$\Rightarrow 2\sin 4x \cos 2x-\sin 4x=0$	$\frac{1}{2}$	
		$\Rightarrow \sin 4x\left(2\cos 2x-1\right)=0$	$\frac{1}{2}$	
		$\sin 4x=0$ or $2\cos 2x-1=0$	$\frac{1}{2}$	
		$4x=n\pi$ or $2\cos 2x=1$ $\cos 2x=\frac{1}{2}=\cos \pi/3$	$\frac{1}{2}+\frac{1}{2}$	4
		$x=\frac{n\pi}{4}$ or $2x=2n\pi\pm\pi/3$ $x=n\pi\pm\pi/6$ $n\in Z$	$\frac{1}{2}+\frac{1}{2}$	
		Remark: Only for $\sin x=0$ then $x=n\pi$ $(\frac{1}{2})$ $\cos x=\cos y$ then $x=2n\pi\pm y$ $(\frac{1}{2})$ $\sin x+\sin y=2\sin\frac{x+y}{2}\cos\frac{x-y}{2}$ $(\frac{1}{2})$		
4	(a)	$P(1)=x^1-y^1$ is divisible by $(x-y)$, which is true	1	
	b)	Suppose $P(k)$ is true, $P(k)$: x^k-y^k is divisible by $(x-y)$	1	
		Now consider $P(k+1)$: $x^{k+1}-y^{k+1}$		
		$=x^k\cdot x-y^k\cdot y$	$\frac{1}{2}$	
		$=x^k\cdot x-x^k\cdot y+x^k\cdot y-y^k\cdot y$	$\frac{1}{2}$	
		$=x^k(x-y)+y(x^k-y^k)$	$\frac{1}{2}$ 2	
		which is divisible by $(x-y)$ ∴ By PMI it is true for all Natural number	$\frac{1}{2}$	4

Qn.No		Scoring Indicators	Split Score	Total Score
5.	(a)	Real Part = −3 Imaginary = $\sqrt{7}$	½ + ½	1
	b)	$a+ib = 1+i\sqrt{3} \Rightarrow a=1,\ b=\sqrt{3}$		
		$r=\sqrt{a^2+b^2} = 2$	½ + ½	
		$r\cos\theta = 1 \Rightarrow \cos\theta = 1/2$ $r\sin\theta=\sqrt{3} \Rightarrow \sin\theta = \sqrt{3}/2$	½	
		or		2.
		$\tan\theta=\sqrt{3}$		
		$\therefore \theta = \pi/3$	½	
	c)	$x^2-2x+3=0$		
		$a=1 \quad b=-2 \quad c=3$		
		$\therefore x = \frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{2\pm\sqrt{4-12}}{2}$	1	
		$=\frac{2\pm\sqrt{-8}}{2}$	½	2.
		$=\frac{2\pm i\sqrt{8}}{2}$ or $\frac{2\pm i2\sqrt{2}}{2}$	½	
		$= 1\pm i\sqrt{2}$		
6.	(a)	(iv) or $3x-1 \geq 5 \quad x \in R$	1	1
	(b)			4

x	0	4
y	6	0



Give (1) score for each line and (1) for feasible region

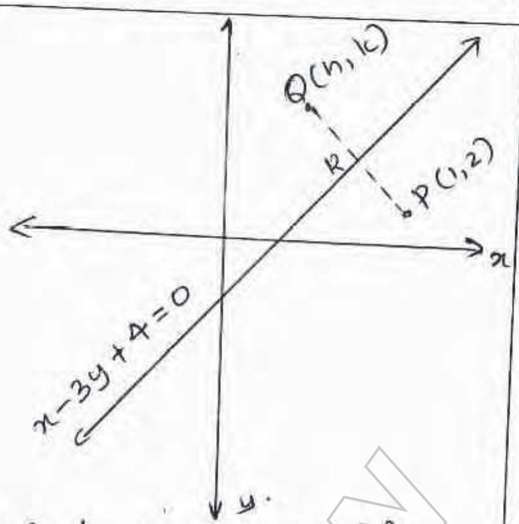
Qn.No	Scoring Indicators	Split Score	Total Score
7.	a) (iv) or 360	1	1
	b) No. of ways $= {}^nC_r = {}^5C_3$	1½	2
	$= 10$	½	
	c) $2n C_3 = 11 \cdot {}^nC_3$ $\frac{2n!}{(2n-3)!\,3!} = 11 \cdot \frac{n!}{(n-3)!\,3!}$		
	$\Rightarrow 2n(2n-1)(2n-2) = 11 \cdot n(n-1)(n-2)$	1	3
	$\Rightarrow 8n-4 = 11n-22$	1	
	$\Rightarrow 3n = 18 \Rightarrow n = 6$	1	
	Remark: Only for (b) or (c) ${}^nC_r = \frac{n!}{(n-r)!\,r!}$ give (½) score		
	Remark. 7(b) using ${}^2C_1\,{}^3C_2 + {}^2C_2\,{}^3C_1 + {}^2C_0\,{}^3C_3 = 10$ give (2) score.		
OR 7	(a) 1	1	1
	(b) ${}^{2n}C_3 : {}^nC_3 = 12 : 1$		
	$\Rightarrow \frac{{}^{2n}C_3}{{}^nC_3} = \frac{12}{1}$	½	
	$\frac{\frac{2n!}{(2n-3)!\,3!}}{\frac{n!}{(n-3)!\,3!}} = \frac{12}{1}$	½	2
	$\frac{2n(2n-1)(2n-2)}{n(n-1)(n-2)} = \frac{12}{1}$	½	
	$4n = 20 \Rightarrow n = 5$	½	

Qn.No		Scoring Indicators	Split Score	Total Score
	c.	Arrangement of letters is of the form _ E _ U _ A _ I _ O _ There are five vowels and three consonents. No of arrangements of Vowels $= 5P_5 = 5! = 120$	1	
		No of arrangements of three consonents in 6 places $= 6P_3 = 120$	1	3
		∴ Required number of arrangements $= 5P_5 \times 6P_3 = 120 \times 120 = 14400$ **Remark:** Only for $nP_r = \frac{n!}{(n-r)!}$ (½) score.	1	
8	a)	$(a+b)^4 = a^4 + 4C_1 a^3b + 4C_2 a^2b^2 + 4C_3 ab^3 + b^4$ OR $\Rightarrow a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$	1	1
	b)	$(\sqrt5+\sqrt6)^4 = (\sqrt5)^4 + 4(\sqrt5)^3\sqrt6 + 6(\sqrt5)^2(\sqrt6)^2 + 4\sqrt5(\sqrt6)^3 + (\sqrt6)^4$	1	
		$(\sqrt5-\sqrt6)^4 = (\sqrt5)^4 - 4(\sqrt5)^3\sqrt6 + 6(\sqrt5)^2(\sqrt6)^2 - 4\sqrt5(\sqrt6)^3 + (\sqrt6)^4$	1	3
		$(\sqrt5+\sqrt6)^4 + (\sqrt5-\sqrt6)^4 = 2(\sqrt5)^4 + 12(\sqrt5)^2(\sqrt6)^2 + 2(\sqrt6)^4$	½	
		$= 2\times25 + 12\times5\times6 + 2\times36$ $= \underline{482}$.	½.	

Remark Correct answer using the formula $(a+b)^4 + (a-b)^4$ give 3 score

Qn.No		Scoring Indicators	Split Score	Total Score
9	a)	(iv) or $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}$	1	1
	b)	$a=1,\quad r=\frac{2}{3}\quad n=5$	½	
		$S_n = \frac{a(1-r^n)}{(1-r)}$	½	
		$= \frac{1\left[1-\left(\frac{2}{3}\right)^5\right]}{1-2/3}$	½	2
		$=\left(\frac{243-32}{243}\right)\times 3 = \underline{\underline{\frac{211}{81}}}$	½	
	c)	$S_n = 0.6+0.66+0.666+\cdots$ n terms		
		$= 6(0.1+.11+.111+\cdots$ n terms$)$	½	
		$=\frac{6}{9}\left[.9+.99+.999+\cdots\right.$ n terms$\left.\right)$	½	
		$=\frac{6}{9}\left[\left(1-\frac{1}{10}\right)+\left(1-\frac{1}{10}\right)+\cdots\right.$ n terms$\left.\right]$	½	
		$=\frac{6}{9}\left[n-\frac{1}{10}\left(1+\frac{1}{10}+\frac{1}{100}+\cdots\right.\right.$ n terms$\left.\left.\right)\right.$		2.
		$=\frac{6}{9}\left[n-\cancel{\frac{1}{10}}\times\frac{\cancel{10}}{9}\left(1-\frac{1}{10^n}\right)\right]$	½.	
		$=\frac{6}{81}\left[9n-\left[1-\frac{1}{10^n}\right)\right]$		
10.	a)	(iv) or 2/3	1	1
	b)	$y-y_1=m(x-x_1)$	½	
		$m=-2;\ (x_1,y_1)=(-3,0)$	½	
		eqⁿ is $y-0=-2(x-^-3)$	½	2
		$\underline{y=-2x-6}$	½	
		<u>Remark</u>: Using intercept form $y=m(x-d)\quad m=-2,\ d=-3$		

give (2) score.

Qn.No		Scoring Indicators	Split Score	Total Score
	(c)		1/2	
		Let Q (h,k) be the image of P(1,2) $x-3y+4=0$ —(1) bisect PQ at R $R\left(\frac{h+1}{2},\frac{k+2}{2}\right)$	1/2	
		R lies on (1)		3
		$\frac{h+1}{2}-3\left(\frac{k+2}{2}\right)+4=0$	1/2	
		$\Rightarrow h-3k+3=0$ —(2) Slope of PQ = $\frac{-1}{\text{Slope of (1)}}$	1/2	
		$\frac{k-2}{h-1}=\frac{-1}{\frac{-1}{-3}} \Rightarrow 3h+k=5$ (3)	1/2	
		$\therefore h=\frac{6}{5}$ and $k=\frac{7}{5}$	1/2	
		Image $\left(\frac{6}{5},\frac{7}{5}\right)$ Remark: For correct answer using any alternative method give (3) score.		

Qn.No		Scoring Indicators	Split Score	Total Score
11	a)	$\frac{x^2}{9} - \frac{y^2}{16} = 1$ $a=3$ $b=4$		
		Foci are $(\pm ae, 0)$ or $(\pm c, 0)$	½	
		$= (\pm 5, 0)$	½	
		Vertices are $(\pm a, 0) = (\pm 3, 0)$	½ + ½	
		eccentricity, $e = \frac{\sqrt{a^2+b^2}}{a}$ or $\frac{c}{a}$	½	
		$= \frac{5}{3}$	½	4
		length of latus rectum $= \frac{2b^2}{a}$	½	
		$= \frac{32}{3}$	½	
		Remark: Only for $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ or $\frac{x^2}{9} - \frac{y^2}{16} = 1$ (½) score		
12	(a)	True	1	1
	(b)	let $P(x, y, z)$ be the point such that $PA = PB$	½	
		$\sqrt{(x-3)^2 + (y-4)^2 + (z+5)^2} =$	½	
		$\sqrt{(x+2)^2 + (y-1)^2 + (z-4)^2}$	½	2
		$\Rightarrow 10x + 6y - 18z - 29 = 0$	½	
		Remark: For distance formula give (½) score		

Qn.No		Scoring Indicators	Split Score	Total Score
13.	a	$\sec^2 x$	1	1
	b)	$\lim_{x\to 0}\frac{e^{3x}-1}{x} = 3\lim_{x\to 0}\frac{e^{3x}-1}{3x}$	1	2
		$= 3\times 1 = 3$	1	
		Remark: Only $\lim_{x\to 0}\frac{e^{x}-1}{x} = 1$ give (½) score		
	c)	$\frac{df(x)}{dx} = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$	½	
		$\frac{d}{dx}\cos x = \lim_{h\to 0}\frac{\cos(x+h)-\cos x}{h}$	½	
		$= \lim_{h\to 0}\frac{-2\sin\left(\frac{2x+h}{2}\right)\sin\frac{h}{2}}{h}$	½	3
		$= \lim_{h\to 0}\frac{-2\sin\left(x+\frac{h}{2}\right)\sin(h/2)}{\left(\frac{h}{2}\right)\times 2}$	½	
		$= -\sin x$	1	
		Remark (1) $\frac{d}{dx}\cos x = -\sin x$ (1) Score		
		OR		
13	(a)	$\cos x$	1	1
	(b)	$\lim_{x\to 0}\frac{\sin ax}{\sin bx} = \lim_{x\to 0}\frac{\left(\frac{\sin ax}{ax}\right)ax}{\left(\frac{\sin bx}{bx}\right)bx}$	1	
		$= \frac{a}{b}\lim_{x\to 0}\frac{\frac{\sin ax}{ax}}{\frac{\sin bx}{bx}} = \frac{a}{b}$	½+½	2

Remark: Only for $\lim_{\theta\to 0}\frac{\sin\theta}{\theta} = 1$ (½) score.

Qn.No		Scoring Indicators	Split Score	Total Score
	c)	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$	½	
		$\frac{dy}{dx} = \frac{(3+7\cos x)(5\cos x) - (4+5\sin x)(-7\sin x)}{(3+7\cos x)^2}$	1½	
		$= \frac{15\cos x + 35\cos^2 x + 28\sin x + 35\sin^2 x}{(3+7\cos x)^2}$	½	3
		$= \frac{15\cos x + 28\sin x + 35}{(3+7\cos x)^2}$	½	
14	a)	$\sqrt{2}$ is a complex no OR It is false that $\sqrt{2}$ is not a complex number.	1	1
	b)	Assume that $\sqrt{11}$ is rational	½	
		$\sqrt{11} = \frac{a}{b} \Rightarrow 11 = \frac{a^2}{b^2}$ $\Rightarrow a^2 = 11b^2$ $\Rightarrow$ 11 divides a	½	
		let $a = 11.c$ $a^2 = 121c^2$ $11b^2 = 121c^2$ $b^2 = 11c^2$.	½	3
		∴ 11 divides b	½	
		11 divides both a and b, ...	½	
		which is a contradiction		
		∴ $\sqrt{11}$ is irrational	½	

<table>
<tr><th>Qn.No</th><th></th><th>Scoring Indicators</th><th>Split Score</th><th>Total Score</th></tr>
<tr><td>15.</td><td>a)</td><td>$\sqrt{8}$ or $2\sqrt{2}$</td><td>1</td><td>1</td></tr>
<tr><td></td><td>b)</td><td>
<table>
<tr><th>Marks</th><th>x_i</th><th>f_i</th><th>$f_i x_i$</th><th>x_i^2</th><th>$f_i x_i^2$</th></tr>
<tr><td>0-10</td><td>5</td><td>5</td><td>25</td><td>25</td><td>125</td></tr>
<tr><td>10-20</td><td>15</td><td>8</td><td>120</td><td>225</td><td>1800</td></tr>
<tr><td>20-30</td><td>25</td><td>15</td><td>375</td><td>625</td><td>9375</td></tr>
<tr><td>30-40</td><td>35</td><td>16</td><td>560</td><td>1225</td><td>19600</td></tr>
<tr><td>40-50</td><td>45</td><td>6</td><td>270</td><td>2025</td><td>12150</td></tr>
<tr><td></td><td></td><td>50</td><td>1350</td><td></td><td>43050</td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1350}{50} = 27$</td><td>½+½</td><td></td></tr>
<tr><td></td><td></td><td>$\sigma = \sqrt{\frac{\sum x_i^2 f_i}{N} - (\bar{x})^2}$</td><td>½</td><td></td></tr>
<tr><td></td><td></td><td>$= \sqrt{\frac{43050}{50} - 27^2}$</td><td></td><td>4</td></tr>
<tr><td></td><td></td><td>$= 11.49$</td><td>½</td><td></td></tr>
<tr><td></td><td></td><td>$C.V = \frac{\sigma}{\bar{x}} \times 100$</td><td>½</td><td></td></tr>
<tr><td></td><td></td><td>$= \frac{11.49 \times 100}{27} = 42.56$</td><td>½</td><td></td></tr>
<tr><td></td><td></td><td>Remarks
For correct answer using any other alternative method give (4) score.</td><td></td><td></td></tr>
</table>

Qn.No		Scoring Indicators	Split Score	Total Score
16.	a)	0.2	1	1
	b)	$P(NSS) = \frac{32}{60}$		
		$P(NCC) = \frac{30}{60}$		
		$P(NSS \cap NCC) = \frac{24}{60}$	1/2	
	(i)	$P(NSS \cup NCC) =$		
		$= P(NSS) + P(NCC) - P(NSS \cap NCC)$	1/2	
		$= \frac{32}{60} + \frac{30}{60} - \frac{24}{60}$	1/2	2
		$= \frac{38}{60}$	1/2	
	(ii)	$P(NSS' \cap NCC')$		
		$= P(NSS \cup NCC)'$	1/2	
		$= 1 - P(NSS \cup NCC)$	1/2	
		$= 1 - \frac{38}{60}$	1/2	2
		$= \frac{22}{60}$	1/2	
		Remark: Only for $n(NSS) = 32$, $n(NCC) = 30$, $n(NSS \cap NCC) = 24$ $\left.\right\}$ (1/2) score.		

Qn.No	Scoring Indicators	Split Score	Total Score
1.	Rajhmathan. K. Chattanchal HSS		
2.	Fr. Thomson Grace MKLM HSS, Kannamaloor, Kolla		
3.	Shareef. Chalil RACHSS, Katmeni Kozhikode.		
4.	Anilkumar. K, N.S.S. H.S.S. Vaiappelly		
5.	Ummer. C. GTJ.H.SS. Neduvallan. Palakkad.		
6.	N. Sasikumar, Govt HSS Vechoochira Colony. Pathanamthitta		
7.	Subhash K.K, SRKGVMHSS Puranattukara Thrissur		
8.	Antoney. P St. Joseph's HSS Tvpm		
9.	B. Jayadev, SNM HSS Purakkad, Alappuzha		
10.	Biju Joseph St. Mary's HSS Kaliyar		
11.	Mini Das EMS HSS Melukavu Kottayam		