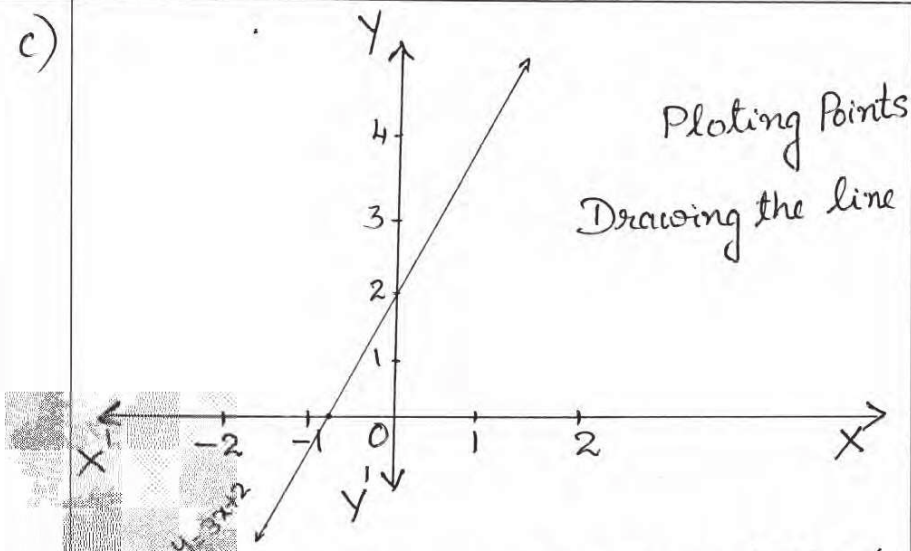
FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2017

SUBJECT : MATHEMATICS (COMMERCE) **CODE. NO: 653**

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
1.	a)	iv) $\{4\}$	1	6
	b)	$A - B = \{1, 2, 3\}$ $A' = \{5, 6, 7, 8, 9\}$	1 1 } 2	
	c)	$B' = \{1, 2, 3, 8, 9\}$ $A \cap B' = \{1, 2, 3\}$ $A - B = A \cap B'$	1 1 1 } 3	
2.	a)	iv) $R = \{(1,3), (1,5), (2,3), (2,5), (3,5)\}$	1	5
	b)	Domain $= \{1, 2, 3\}$ Range $= \{3, 5\}$	1 1 } 2	
	c)	 Plotting Points Drawing the line	1 1 } 2	

Remark: For drawing X-axis and Y-axis give ½ score.

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
3	a)	A: a) $\sin(\pi+x)$; b) $\sin\left(\frac{\pi}{2}+x\right)$; c) $\cos\left(\frac{\pi}{2}-x\right)$; d) $\sin\left(\frac{3\pi}{2}+x\right)$ — B: $-\sin x$; $\cos x$; $\sin x$; $-\cos x$	1, 1, 1, 1 } 4	5
	b)	ii) 2nd quadrant	1	
4		$P(1): 1 = 1^2 \Rightarrow P(1)$ is true $P(k): 1+3+5+\cdots+(2k-1) = k^2$ $P(k+1): 1+3+\cdots+(2k-1)+(2k+1) = k^2+2k+1$ $= (k+1)^2 \Rightarrow P(k+1)$ is true Thus by PMI, $P(n)$ is true for all $n \in N$	1, 1, 1, 1 } 4	4
5	a)	iii) $\frac{1-i}{2}$	1	
	b)	$1+i = r(\cos\theta+i\sin\theta)$ $r\cos\theta = 1$ & $r\sin\theta = 1$ $r^2 = 2 \Rightarrow r = \sqrt{2}$ $\tan\theta = 1 \Rightarrow \theta = \frac{\pi}{4}$ $\therefore 1+i = \sqrt{2}\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$	1, 1, 1 } 3	

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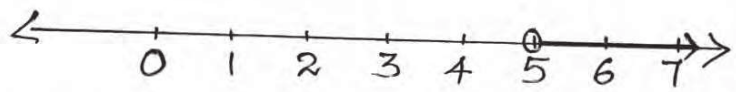
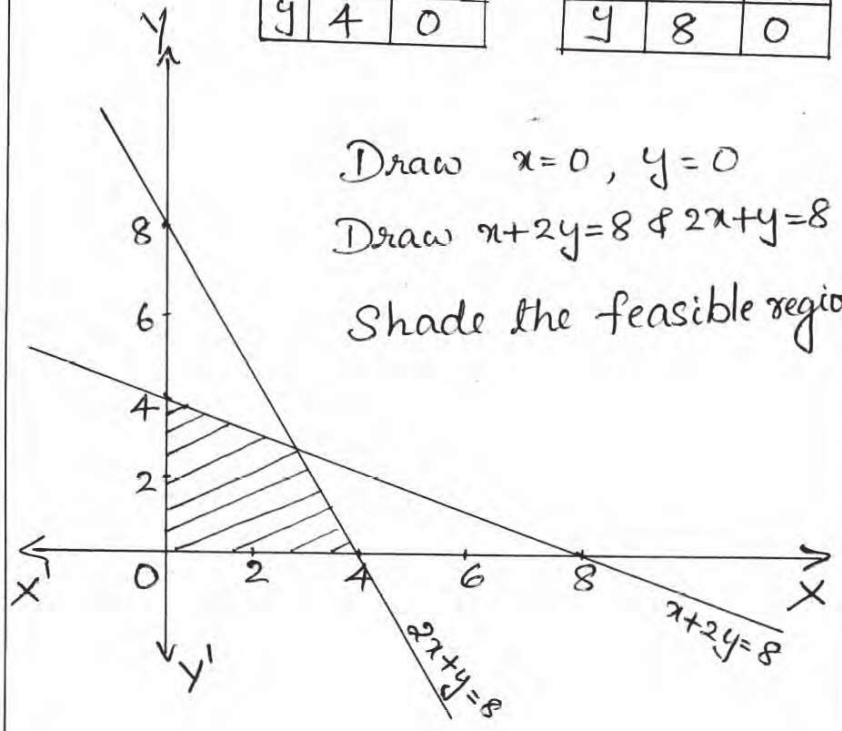
Qn No	Sub Qns	Answer Key/Value Points	Score	Total
	c)	$x = \frac{2 \pm \sqrt{(-2)^2 - 4\times1\times2}}{2\times1} = \frac{2 \pm 2i}{2} = 1 \pm i$	1	5
		Remark: For the formula $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ give ½ score		
6	a)	i) $(5, \infty)$	1	
	b)		1	
		Remark: For drawing number line give ½ score.		
	c)	$x+2y=8$ x: 0, 8 y: 4, 0 $2x+y=8$ x: 0, 4 y: 8, 0  Draw $x=0$, $y=0$ Draw $x+2y=8$ & $2x+y=8$ Shade the feasible region	1 1 1 } 3	5

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
7	a)	ii) $15C_2$	1	6
	b)	$2 \cdot \frac{n!}{(n-3)!} = \frac{(n+1)!}{(n+1-3)!}$ $\Rightarrow 2(n-2) = n+1 \Rightarrow n = 5$ Remark: For the formula for ${}^nP_r$ give one score	1 1 2	
	c)	$6 \times 6 = 36$ No: of digits used in unit place = 3 No: of digits used in 10^{th} place = 6 ∴ Total no: of 2 digit even numbers formed = $3 \times 6 = 18$	1 ½ ½ 1 2	
		OR		
	a)	iii) 22	1	
	b)	Triangles cannot be formed by the line segments (2, 3, 5), (2, 4, 6), (2, 3, 6). Since the sum of two sides of a triangle is always greater than the 3rd side ∴ No: of triangles formed = $5C_3 - 3$ $= 10 - 3$ $= 7$ Remark: for writing $5C_3$ give (1½) score	1 1 2	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
	c)	$12C_3 = 220$	1	6
		$12C_3 - 7C_3$	1	
		$= 220 - 35 = 185$	1 (2)	
		Remark: for writing answer $12C_3$ or $7C_3$ give one score		
8	a)	iii) 23^{rd} term	1	4
	b)	$t_{21} = 44C_{20}\, x^{20}$	1	
		$t_{22} = 44C_{21}\, x^{21}$	1	
		$t_{21} = t_{22} \Rightarrow \frac{44C_{20}}{44C_{21}} = x$	1 (3)	
		$\Rightarrow x = \frac{21}{24}$		
		$= \frac{7}{8}$		
9	a)	iv) $P+q-r$	1	
	b)	$a + ar + ar^2 + \dots = 5(a + ar^2 + ar^4 + \dots)$		
		$\frac{a}{1-r} = 5 \times \frac{a}{1-r^2}$	1 (2)	
		$\Rightarrow r = 4$		
		Remark: for any correct formula for sum of finite or infinite terms of a G.P give one score		

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
	c)	$5(a+4d) = 8(a+7d)$ $\Rightarrow 3a + 36d = 0$ $\Rightarrow a + 12d = 0$ $\Rightarrow a_{13} = 0$ Remark: for writing formula for 5th term or 8th term give one score	1 1 1 2	5
		OR		
	a)	iii) $2(d-c)$	1	
	b)	$ar^9 = 9$ $ar^3 = 4$ $\frac{ar^9}{ar^3} = \frac{9}{4}$ $a_7 = 6$ Remark: For any correct alternative method give full score	½ ½ ½ ½ 2	5
	c)	$a + 6d = 40$ $S_{13} = \frac{13}{2}[2a + 12d] = 13(a+6d)$ $= 13 \times 40 = 520$ Remark: For formula for sum of an A.P give ½ score	1 1 2	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
10	a)	i) $\frac{-11}{7}$	1	
	b)	Equation to any line $\perp$ to $3x+y=3$ is $x-3y=k$. Since it passes through $(2,2)$ $2-6=k \Rightarrow k=-4$ Equation of required line is $x-3y+4=0$ Remark: For any correct alternative method give full score	1 1 1 2	5
	c)	$3x+4y=5 \Rightarrow \frac{x}{(5/3)}+\frac{y}{(5/4)}=1$ x intercept $= 5/3$ y intercept $= 5/4$	1 1 2	
		OR		
	a)	iv) $\|y\|$	1	
	b)	Point of intersection is $(0,0)$ Equation of the line is $\frac{x-0}{2-0}=\frac{y-0}{3-0} \Rightarrow 3x-2y=0$ Remark: For any correct alternative method give full score	1 1 2	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
	c)	Equation to any line parallel to $3x-2y=0$ is $3x-2y+K=0$ Since it passes through (1,1), $K=-1$ Equation of the line is $3x-2y-1=0$	1 2 1	5
11	a)	$x^2+y^2-6x-4y-30=0$ $\Rightarrow (x-3)^2+(y-2)^2=16$ $\Rightarrow$ centre $=(3,2)$ Equation of the required circle is $(x-3)^2+(y-2)^2=5^2$ Remark: Formula for equation of a circle give one score	1½ ½ 2	4
	b)	Equation of Parabola, $x^2=4ay$ Since it passes through (6,−3) $36=-4a\times 3 \Rightarrow a=-3$ Equation of Parabola is $x^2=-12y$	1 ½ ½ 2	
		OR		
	a)	$a=4$ $b=2\sqrt{3}$ or $\sqrt{12}$ $b^2=a^2(1-e^2) \Rightarrow 12=16(1-e^2) \Rightarrow e=\frac{1}{2}$ Foci $=(\pm ae, 0)=(\pm 2, 0)$	½ ½ ½ ½ 2	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
	b)	$\frac{2b^2}{a} = 8 \Rightarrow 2b^2 = 8a \Rightarrow b^2 = 4a$	1	4
		$\Rightarrow a^2(e^2-1) = 4a$		
		$\Rightarrow a^2\left(\frac{9}{5}-1\right) = 4a$	½	2
		$\Rightarrow a = 5$		
		$b^2 = 4a = 4\times 5 = 20$		
		Equation of hyperbola is $\frac{x^2}{25} - \frac{y^2}{20} = 1$	½	
12	a)	iii) $(-5, -4, -5)$	1	3
	b)	In XOZ plane, $y = 0$	1	2
		$\therefore \frac{3\lambda - 1}{\lambda + 1} = 0 \Rightarrow \lambda = \frac{1}{3}$	1	
		Remark: For section formula give one score		
13	a)	$\frac{dy}{dx} = 3x^2 - 2x$	1	
	b)	$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$	1	
		$= \lim_{h\to 0} \frac{\sin(x+h) - \sin x}{h}$	1	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
		$= \lim_{h\to 0} \frac{2\cos(x+\frac{h}{2})\sin(h/2)}{h}$	½	4
		$= \lim_{h\to 0} \cos(x+\frac{h}{2}) \lim_{h\to 0} \frac{\sin(h/2)}{(h/2)}$		
		$= \cos x$	½	
		Remark: For direct answer give ½ score.		
14	a)	$\sqrt{5}$ is irrational	1	4
		3 is rational	1	
	b)	Let $\sqrt{2} = \frac{p}{q}$ where p and q have no common factors	1	
		$p^2 = 2q^2 \Rightarrow p$ is even		
		$p = 2r \Rightarrow 4r^2 = 2q^2 \Rightarrow q^2 = 2r^2$	2	
		$\Rightarrow q$ is even		
		Thus p & q have a common factor 2. This is a contradiction	1	
		$\therefore \sqrt{2}$ is irrational.		
15	a)	Arrange the numbers in ascending order 40, 54, 60, 68, 78	1	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
		Median = 60	1	2
	b)	$M.D = \frac{1}{5}[\lvert 140-60\rvert + \lvert 160-60\rvert + \lvert 168-60\rvert + \lvert 178-60\rvert + \lvert 154-60\rvert]$	1	5
		$= \frac{20+0+8+18+6}{5}$	1	3
		$= \frac{52}{5} = 10.4$	1	
16	a)	$A.M = \frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$	1	4
	b)	$Variance = \frac{1}{5}[(2-6)^2+(4-6)^2+(6-6)^2+(8-6)^2+(10-6)^2]$	1	3
		$= \frac{16+4+0+4+16}{5} = \frac{40}{5} = 8$	1	
		$S.D = \sqrt{8} = 2\sqrt{2}$	1	
		Remark: For formula of variance or S.D give one score		
17	a)	iv) 0	1	
	b) i)	{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT}	1	
	ii)	$P(E_1) = \frac{6}{8} = \frac{3}{4}$	1	

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Qn No	Sub Qns	Answer Key/Value Points	Score	Total
		$P(E_2) = \frac{4}{8} = \frac{1}{2}$	1	
		$P(E_3) = \frac{7}{8}$	1	4 6
		$P(E_1') = 1 - P(E_1)$	½	
		$= 1 - \frac{6}{8} = \frac{2}{8} = \frac{1}{4}$	½	

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