FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2018

SUBJECT : Mathematics (Commerce) CODE. NO: 153.

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
1.	a)	ii) or 1	1	3
	b)	Power set = $\{\phi, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$	2	
		Remark : b) ½ marks for each correct two subsets.		
2.	a)	(iii) or 5	1	3
	b)	$R = \{(1,2), (1,3), (2,1), (2,3), (3,1), (3,2)\}$	1	
		Range $= \{1, 2, 3\}$	1	
3.	a)	Conjugate $= 2i + 1$	1	3
	b)	$\frac{1+2i}{2-i} = \frac{1+2i}{2-i} \times \frac{2+i}{2+i}$	1	
		$= \frac{2+i+4i+2i^2}{4+1}$	½	
		$= \frac{0+5i}{5}$	½	
		$= 0 + i$		
4.	a)	20	1	2
	b)	$^nP_4 = 20 \cdot {}^nP_2$		
		$\frac{n!}{(n-4)!} = 20 \cdot \frac{n!}{(n-2)!}$	1	

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		$1 = \frac{20}{(n-2)(n-3)}$		
		$(n-2)(n-3) = 20$		3
		$n = 7$	1	
5.	a)	$a_1 = 2,\ a_2 = 6$.	½	
		$r = \frac{6}{2} = 3$	½	
	b)	3, A_1, A_2, A_3 243 are in G.P	1	
		$a_5 = a \cdot r^4 = 243$		
		$3 \cdot r^4 = 243$		
		$r^4 = 81$		
		$r = 3$	1	3
		∴ Terms are 9, 27 and 81.		
		Remark: a) $d = 6 - 2 = 4$ give (1) Score		
6	a)	Slope $= \frac{8-6}{4-^-2} = \frac{2}{6} = \frac{1}{3}$	1.	
	b)	Slope $= \frac{24-12}{k-8} = \frac{12}{k-8}$	1.	
		Since the lines are perpendicular,		
		we have $\frac{1}{3} \times \frac{12}{k-8} = -1$		
		$k - 8 = -4$	1	3

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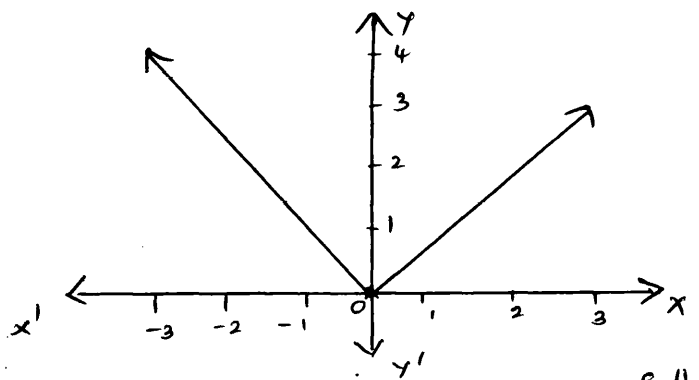
		$k = 4$.		
		Remark: a) give ($\frac{1}{2}$) Score for $m = \frac{y_2 - y_1}{x_2 - x_1}$		
		b) give $\frac{1}{2}$ Score for $m_1 \times m_2 = -1$.		
7.	a)	(ii) or $P(A) + P(B)$	1	
	b)	$P(A) + P(B) = P(A \cup B) + P(A \cap B)$		
		$= 0.6 + 0.2$		
		$= 0.8$.	1	
		$P(A') + P(B') = 1 - P(A) + 1 - P(B)$		
		$= 2 - (P(A) + P(B))$		
		$= 2 - 0.8$	1	3
		$= 1.2$		
8.	a)	$A = \{-1, 0, 1\}$	1	
	b)	x: −3 −2 −1 0 1 2 3; $y = \lvert x \rvert$: 3 2 1 0 1 2 3	1	
			2	4
		Remark: For correct graph give full score.		

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9.	a)	P(1): LHS = 2 RHS = $1^2+1 = 2$ LHS = RHS	1	
	b)	Assume that P(k) is true ie, P(k): $2+4+6+\cdots+2k = k^2+k$	1	
		we will show that P(k+1) is true. $P(k+1) = 2+4+6+\cdots+2k+2(k+1)$	1	
		$= k^2+k+2(k+1)$ $= k^2+k+2k+2$ $= k^2+2k+1+k+1$ $= (k+1)^2+(k+1)$	1	4
		$\therefore$ P(k+1) is true.		
10.	a)	$x^2-2x+2 = 0$ $x = \frac{2 \pm \sqrt{4-8}}{2}$	1	
		$= \frac{2 \pm 2i}{2} = 1 \pm i$	1	
	b)	$1+i = r(\cos\theta + i\sin\theta)$	½	
		$1 = r\cos\theta$ $1 = r\sin\theta$ $r^2 = 2,\ r = \sqrt{2}$	½	

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		$\cos\theta = \frac{1}{\sqrt{2}}$ $\sin\theta = 1/\sqrt{2}$	½	
		$\theta = \pi/4$	½	4
		$\therefore 1+i = \sqrt{2}(\cos\pi/4 + i\sin\pi/4)$		
11.	a)	$T_{r+1} = {}^{n}C_r\, a^{n-r} b^r$	½	
		$= {}^{9}C_r\, x^{9-r} \cdot \left(\frac{2}{x^2}\right)^r$	½	
	b)	For term independent of x,		
		we have $x^{9-r} \cdot x^{-2r} = x^0$	1	
		$x^{9-3r} = x^0$		
		$9-3r = 0$	1	
		$r = 3$		
		$\therefore T_{3+1} = {}^{9}C_3 \cdot x^6 \left(\frac{2}{x^2}\right)^3 = {}^{9}C_3 \cdot 2^3$	1	4.
		$= 672$		
		Remark: b) For direct expansion, give full score.		
12	a)	Slope $= -1$	1	
	b)	Slope of perpendicular line $= 1$	1	
		Equation of the line passing through $(2,4)$ is $y - y_1 = m(x - x_1)$	½	
		$y - 4 = 1(x-2)$	½	
		$y = x + 2$		

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	c)	Point of intersection of $x+y=4$ and $y=x+2$ is $(1,3)$ Remark : a) give ½ score for $m=-a/b$ or $y=mx+c$. b) give ½ score for $m_1 \times m_2 = -1$. c) give ½ score for $x=1$, ½ score for $y=3$.	1	4.
13	a)	$a_9 = a_1 + 8d$ $= 25 + 8 \times -3 = 25-24 = 1$	1	
	b)	$S_n = 116$.		
		$\frac{n}{2}[2a+(n-1)d] = 116$	1	
		$\frac{n}{2}[50+(n-1)(-3)] = 116$		
		$n[50-3n+3] = 232$	1	
		$n[53-3n] = 232$		
		$3n^2 - 53n + 232 = 0$	½	
		$n = \frac{53 \pm 5}{6}$	½	
		$n = \frac{48}{6}$ or $\frac{58}{6}$.		4.
		$n = 8$.		
		Remark: a) $a_n = a+(n-1)d$, give ½ Score.		

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14	a)	$\frac{x^2}{25} + \frac{y^2}{9} = 1$	1	
	b)	$a^2 = 25,\ b^2 = 9,\ c^2 = a^2 - b^2 = 25 - 9 = 16$	1	
		$a = 5,\ b = 3,\ c = 4.$		
		foci $= (\pm c, 0) = (\pm 4, 0)$	½	
		Vertices $= (\pm a, 0) = (\pm 5, 0)$	½	
		eccentricity, $e = \frac{c}{a} = \frac{4}{5}$	1	4.
		Remark: a) for $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ give ½ score.		
		b): give ½ score for each formula.		
15.	a)	Distance from x-axis $= \sqrt{3^2 + 4^2}$		
		$= 5$	1.	
	b)	Let 3rd vertex be (x_3, y_3, z_3)		
		$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3}\right) = (3, 4, 0)$		
		$\frac{0 + 4 + x_3}{3} = 2 \ ;\ x_3 = 2$	1	
		$\frac{4 + 5 + y_3}{3} = 4 \ ;\ y_3 = 3$	1	
		$\frac{1 + 0 + z_3}{3} = 0 \ ;\ z_3 = -1$	1.	4.
		$\therefore$ Third vertex is $(2, 3, -1)$		
		Remark: b) for formula of centroid give ½ score:		

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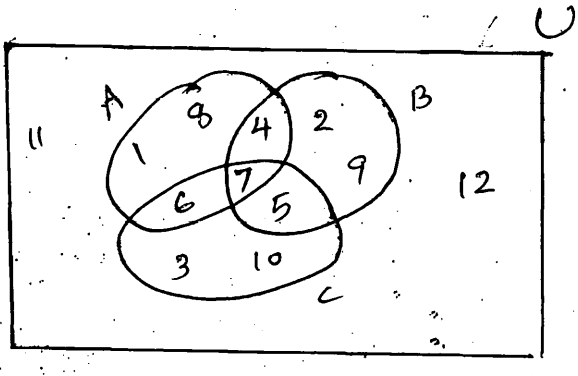
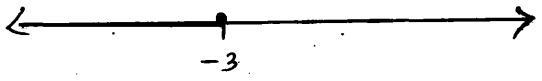
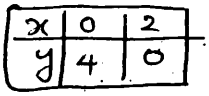
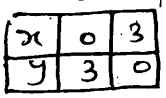
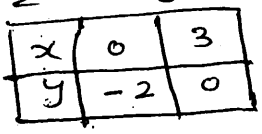
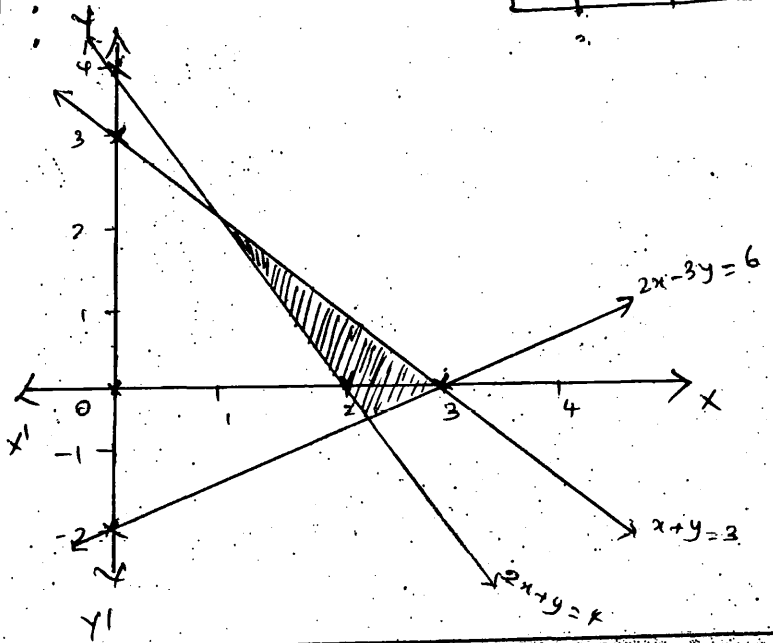
16.	a)	left limit $= 4+k$	½	
		Right limit $= 7$	½	
		$4+k = 7$	½	
		$k = 3$	½	
	b)	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$	½	4
		$= \lim_{h\to 0} \frac{(x+h)^2 - x^2}{h}$	½	
		$= \lim_{h\to 0} (2x+h)$	½	
		$= 2x$	½	
		Remark; (b) Direct derivative give ½ Score.		
17.	a)	Converse : If x is divisible by 3 then it is divisible by 9.	1.	
	b)	Assume that $\sqrt{5}$ is not irrational $\sqrt{5} = a/b$, where a and b have no common factors other than 1.	1.	
		Squaring $5 = \frac{a^2}{b^2} \Rightarrow a^2 = 5b^2$	½	
		$\Rightarrow a$ is divisible by 5	½	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
		$a = 5k$.		
		$25k^2 = 5b^2$	½	
		$b^2 = 5k^2 \Rightarrow$ b is divisible by 5		
		which is a contradiction to the statement that a and b have no common factors other than 1.	½	4
18	a)	(i) or (3, 5)	1	
	b)	i) 	3	6
		ii) $B \cup C = \{2, 3, 4, 5, 6, 7, 9, 10\}$	1	
		$A - (B \cup C) = \{1, 8\}$	1	
19.	a.	$\frac{\pi}{12} = \frac{\pi}{12} \times \frac{180}{\pi}$	½	
		$= 15^\circ$	½	
	b)	$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$	1	
		$= \frac{1}{2} + \frac{1}{3} \Big/ 1 - \frac{1}{2} \cdot \frac{1}{3} = 1$	½	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
		$A + B = 45^\circ$	½	
	c.	$\cos A = \frac{b^2+c^2-a^2}{2bc}$	1.	
		$= \frac{24^2+30^2-18^2}{2\times24\times30}$	1	6.
		$= \frac{4}{5}$	1.	
20.	a)	$3x-3 \leq 2x-6$	½	
		$x \leq -3$	½	
			1.	
	b)	$2x+y=4$  $x+y=3$  $2x-3y=6$. 	1	
			3	6.

Remark: (b) Deduct ½ mark for wrong shading. give full score for correct graph without table.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
21.	a)	No: of words = $6P_6$ or $6!$ or 720	1	
		No: of words begining with A $5P_5$ or $5!$ or 120	1	
	b)	6 6 Part I Part II 5 4 $\rightarrow {}^6C_5 \times {}^6C_4$ or 90 4 5 $\rightarrow {}^6C_4 \times {}^6C_5$ or 90 Total = 90 + 90 = 180.	2 2	6
22.				

Marks	f_i	C.f	mid x_i	$\lvert x_i - 34 \rvert$	$f_i \lvert x_i - 34 \rvert$
0-10	4	4	5	29	116.
10-20	8	12	15	19	152
20-30	9	21	25	9	81
30-40	10	31	35	1	10
40-50	7	38	45	11	77
50-60	5	43	55	21	105
60-70	4	47	65	31	124
70-80	3	50	75	41	123
					788.

	a)	Median $= 30 + \left(\frac{25-21}{10}\right)10 = 34$	2	6.
	b)	M.D (median) $= \frac{788}{50} = 15.76$	2	
		Remark: (a) give 1 score for formula of median. (b) give 1 score for formula of mean deviation.	2	

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23				

x_i	f_i	$x_i f_i$	$x_i^2 f_i$
4	3	12	48
8	5	40	320
11	9	99	1089
17	5	85	1445
20	4	80	1600
24	3	72	1728
32	1	32	1024
	30	420	7254

a)	$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \frac{420}{30} = 14$	1	
b)	$S.D = \sqrt{\frac{7254}{30} - (14)^2}$ $= \sqrt{45.8}$ $= 6.77$	2.	
c)	Coefficient of variation $= \frac{S.D}{\text{Mean}} \times 100$ $= 48.36$	. 1	6

Remark: give full score for using alternate formula.

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24.	a)	A → NCC, B → NSS		
		$P(A) = \frac{30}{60}$ $P(B) = \frac{32}{60}$ $P(A \cap B) = \frac{24}{60}$	1.	
		$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	½	
		$= \frac{30}{60} + \frac{32}{60} - \frac{24}{60} = \frac{38}{60} = \frac{19}{30}$	½	
	b)	$P(A' \cap B') = 1 - P(A \cup B)$	1	
		$= 1 - \frac{19}{30} = \frac{11}{30}$	1	
	c)	$P(B \cap A') = P(B) - P(A \cap B)$	1	
		$= \frac{32}{60} - \frac{24}{60} = \frac{8}{60} = \frac{2}{15}$	1	6.