

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 = $\{ \phi, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\} \}$ Remark: b) $\frac{1}{2}$ marks for each correct $\bar{w}o$ subsets.	2	
2.	a)	(iii) or 5	1	3
	b)	$R = \{ (1,2), (1,3), (2,1), (2,3), (3,1), (3,2) \}$ Range = $\{ 1, 2, 3 \}$	1	
			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	
		$= \frac{2+i+4i+2i^2}{4+1}$	$\frac{1}{2}$	
		$= \frac{0+5i}{5}$ $= 0+i$	$\frac{1}{2}$	
4.	a)	20	1	
	b)	${}^n P_4 = 20 \cdot {}^n P_2$ $\frac{n!}{(n-4)!} = 20 \cdot \frac{n!}{(n-2)!}$	1	

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

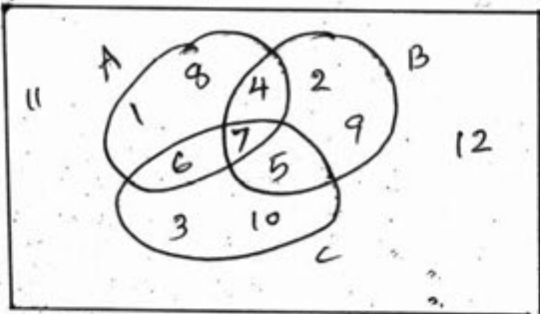
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
9.	a)	$PCD: LHS = 2$ $RHS = 1^2 + 1 = 2$ $LHS = RHS$	1	
	b)	<p>Assume that $P(k)$ is true</p> <p>i.e., $P(k): 2+4+6+\dots+2k = k^2+k$</p> <p>We will show that $P(k+1)$ is true.</p> $P(k+1) = 2+4+6+\dots+2k+2(k+1)$ $= k^2+k+2(k+1)$ $= k^2+k+2k+2$ $= k^2+2k+1+k+1$ $= (k+1)^2+(k+1)$ <p>$\therefore P(k+1)$ is true.</p>	1 1	4
10.	a)	$x^2 - 2x + 2 = 0$ $x = \frac{2 \pm \sqrt{4-8}}{2}$ $= \frac{2 \pm 2i}{2} = 1 \pm i$	1 1	
	b)	$1+i = r(\cos\theta + i\sin\theta)$ $1 = r\cos\theta$ $1 = r\sin\theta$ $r^2 = 2, r = \sqrt{2}$	1/2 1/2	

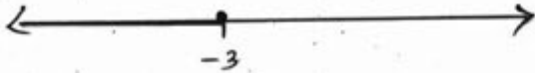
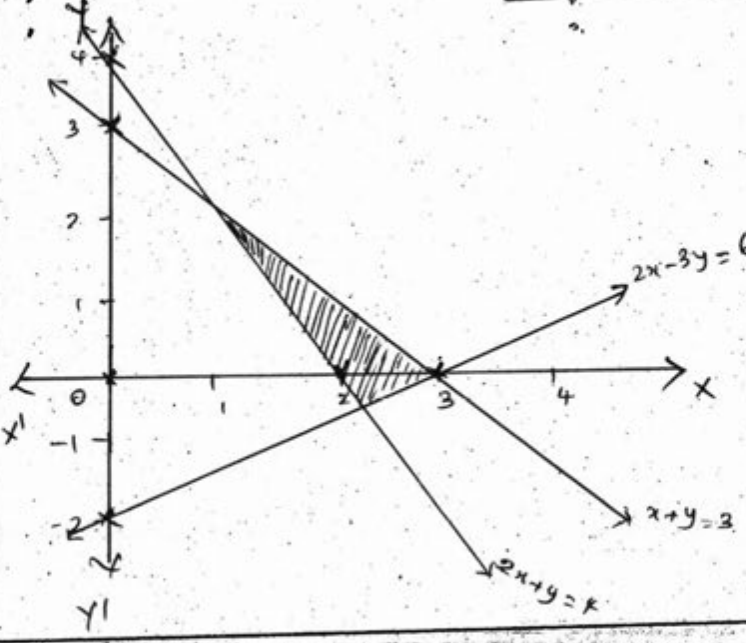
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
		$\cos \theta = \frac{1}{\sqrt{2}}, \quad \sin \theta = \frac{1}{\sqrt{2}}$ $\theta = \pi/4$ $\therefore 1+i = \sqrt{2} (\cos \pi/4 + i \sin \pi/4)$	$1/2$ $1/2$	4
11.	a)	$T_{r+1} = m C_r a^{n-r} b^r$ $= 9 C_r x^{9-r} \left(\frac{2}{x^2}\right)^r$	$1/2$ $1/2$	4
	b)	For term independent of x , we have $x^{9-r} \cdot x^{-2r} = x^0$ $x^{9-3r} = x^0$ $9-3r = 0$ $r = 3$	1 1	
		$\therefore T_{3+1} = 9 C_3 \cdot x^6 \left(\frac{2}{x^2}\right)^3 = 9 C_3 \cdot 2^3 = 672$ Remark: b) For direct expansion, give full score.	1	
12	a)	Slope = -1	1	
	b)	Slope of perpendicular line = 1 Equation of the line passing through (2,4) is $y - y_1 = m(x - x_1)$ $y - 4 = 1(x - 2)$ $y = x + 2$	1 $1/2$ $1/2$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
	c)	Point of intersection of $x+y=4$ and $y=x+2$ is $(1, 3)$ Remark: a) give $\frac{1}{2}$ score for $m = -a/b$ or $y = mx + c$. b) give $\frac{1}{2}$ score for $m_1 \times m_2 = -1$. c) give $\frac{1}{2}$ score for $x=1$, $\frac{1}{2}$ score for $y=3$.	1	4.
13	a) b)	$a_n = a_1 + (n-1)d$ $= 25 + 8 \times 8 - 3 = 25 - 24 = 1$ $S_n = 116$ $\frac{n}{2} [2a + (n-1)d] = 116$ $\frac{n}{2} [50 + (n-1)(-3)] = 116$ $n [50 - 3n + 3] = 232$ $n [53 - 3n] = 232$ $3n^2 - 53n + 232 = 0$ $n = \frac{53 \pm 5}{6}$ $n = \frac{48}{6} \text{ or } \frac{58}{6}$ $n = 8$ Remark: a) $a_n = a + (n-1)d$, give $\frac{1}{2}$ score.	1 1 1 $\frac{1}{2}$ $\frac{1}{2}$	4.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
14	a) b)	$\frac{x^2}{25} + \frac{y^2}{9} = 1$ $a^2 = 25, \quad b^2 = 9, \quad c^2 = a^2 - b^2 = 25 - 9 = 16$ $a = 5, \quad b = 3, \quad c = 4.$ <p>foci = $(\pm c, 0) = (\pm 4, 0)$</p> <p>vertices = $(\pm a, 0) = (\pm 5, 0)$</p> <p>eccentricity, $e = \frac{c}{a} = \frac{4}{5}$</p> <p>Remark: a) for $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ give $\frac{1}{2}$ score.</p> <p>b): give $\frac{1}{2}$ score for each formula.</p>	1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1	4.
15.	a) b)	<p>Distance from x-axis = $\sqrt{3^2 + 4^2}$ = 5</p> <p>Let 3rd vertex be (x_3, y_3, z_3)</p> $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3} \right) = (3, 4, 0)$ $\frac{0 + 4 + x_3}{3} = 2 \quad ; \quad x_3 = 2$ $\frac{4 + 5 + y_3}{3} = 4 \quad ; \quad y_3 = 3$ $\frac{1 + 0 + z_3}{3} = 0 \quad ; \quad z_3 = -1$ <p>\therefore Third vertex is $(2, 3, -1)$</p> <p>Remark: b) for formula of centroid give $\frac{1}{2}$ score.</p>	1. 1 1 1.	4.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
16.	a)	Left limit = $4+k$ Right limit = 7 $4+k = 7$ $k = 3$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
	b)	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$ $= \lim_{h \rightarrow 0} (2x+h)$ $= 2x$ Remark: (b) Direct derivative give $\frac{1}{2}$ score.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	4
17.	a)	Converse: If x is divisible by 3 then it is divisible by 9.	1.	
	b)	Assume that $\sqrt{5}$ is not irrational $\sqrt{5} = \frac{a}{b}$, where a and b have no common factors other than 1. Squaring $5 = \frac{a^2}{b^2} \Rightarrow a^2 = 5b^2$ $\Rightarrow a$ is divisible by 5	1. $\frac{1}{2}$ $\frac{1}{2}$	

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

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total																		
	c.	$A + B = 45^\circ$ $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ $= \frac{24^2 + 30^2 - 18^2}{2 \times 24 \times 30}$ $= \frac{4}{5}$	<p>$\frac{1}{2}$</p> <p>1.</p> <p>1</p> <p>1.</p>	<p>6.</p>																		
20.	<p>a)</p> <p>b)</p>	$3x - 3 \leq 2x - 6$ $x \leq -3$  $2x + y = 4$ <table border="1" data-bbox="432 1245 630 1332"> <tr><td>x</td><td>0</td><td>2</td></tr> <tr><td>y</td><td>4</td><td>0</td></tr> </table> $x + y = 3$ <table border="1" data-bbox="687 1245 847 1332"> <tr><td>x</td><td>0</td><td>3</td></tr> <tr><td>y</td><td>3</td><td>0</td></tr> </table> $2x - 3y = 6$ <table border="1" data-bbox="927 1245 1182 1346"> <tr><td>x</td><td>0</td><td>3</td></tr> <tr><td>y</td><td>-2</td><td>0</td></tr> </table> 	x	0	2	y	4	0	x	0	3	y	3	0	x	0	3	y	-2	0	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1.</p> <p>1</p> <p>3</p>	<p>6.</p>
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Remark: (b) Deduct $\frac{1}{2}$ mark for wrong shading. Give full score for correct graph without table.

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21.	a)	No. of words = 6P_6 or $6!$ or 720 No. of words beginning with A 5P_5 or $5!$ or 120	1 1																																																													
	b)	<table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">6</td> <td></td> </tr> <tr> <td style="text-align: center;">Part I</td> <td style="text-align: center;">Part II</td> <td></td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">$\rightarrow {}^6C_5 \times {}^6C_4$ or 90</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">$\rightarrow {}^6C_4 \times {}^6C_5$ or 90</td> </tr> </table> <p style="text-align: center;">Total = $90 + 90 = 180$.</p>	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	2 2	6																																																
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22		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Marks</th> <th>f_i</th> <th>C.F</th> <th>Mrd_x</th> <th>$x_i - 34$</th> <th>$f_i x_i - 34$</th> </tr> </thead> <tbody> <tr> <td>0-10</td> <td>4</td> <td>4</td> <td>5</td> <td>29</td> <td>116</td> </tr> <tr> <td>10-20</td> <td>8</td> <td>12</td> <td>15</td> <td>19</td> <td>152</td> </tr> <tr> <td>20-30</td> <td>9</td> <td>21</td> <td>25</td> <td>9</td> <td>81</td> </tr> <tr> <td>30-40</td> <td>10</td> <td>31</td> <td>35</td> <td>1</td> <td>10</td> </tr> <tr> <td>40-50</td> <td>7</td> <td>38</td> <td>45</td> <td>11</td> <td>77</td> </tr> <tr> <td>50-60</td> <td>5</td> <td>43</td> <td>55</td> <td>21</td> <td>105</td> </tr> <tr> <td>60-70</td> <td>4</td> <td>47</td> <td>65</td> <td>31</td> <td>124</td> </tr> <tr> <td>70-80</td> <td>3</td> <td>50</td> <td>75</td> <td>41</td> <td>123</td> </tr> <tr> <td colspan="5" style="text-align: right;">788</td> <td></td> </tr> </tbody> </table> <p>a) Median = $30 + \left(\frac{25-21}{10}\right)10 = 34$</p> <p>b) M.D (median) = $\frac{788}{50} = 15.76$</p> <p>Remark: (a) give 1 score for formula of median. (b) give 1 score for formula of mean deviation.</p>	Marks	f_i	C.F	Mrd _x	$ x_i - 34 $	$f_i x_i - 34 $	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						2 2	6
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24.	a)	$A \rightarrow NCC, B \rightarrow NSS$ $P(A) = \frac{30}{60} \quad P(B) = \frac{32}{60} \quad P(A \cap B) = \frac{24}{60}$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $= \frac{30}{60} + \frac{32}{60} - \frac{24}{60} = \frac{38}{60} = \frac{19}{30}$	1. 1/2 1/2	
	b)	$P(A' \cap B') = 1 - P(A \cup B)$ $= 1 - \frac{19}{30} = \frac{11}{30}$	1 1	
	c)	$P(B \cap A') = P(B) - P(A \cap B)$ $= \frac{32}{60} - \frac{24}{60} = \frac{8}{60} = \frac{2}{15}$	1 1	6.

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