

ANSWER KEY

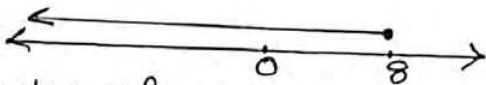
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First Year Higher Secondary Examination March 2020Subject : Mathematics (commerce)

Code No: FY 51

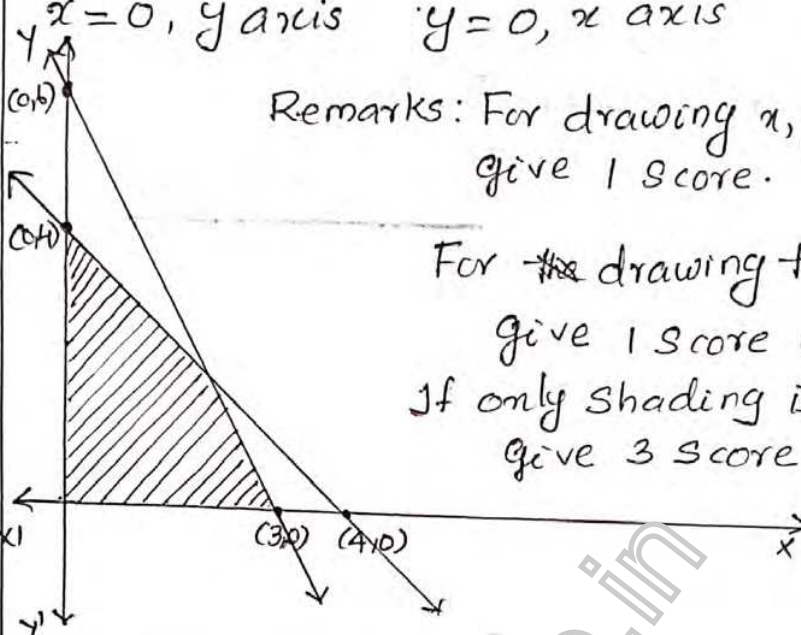
Time: 2 hrs

Score: 60

Qn No	Sub Qn	Answer Key	Score	Total
1	(i)	(c) $\{2, 4\}$	1	3
	(ii)	$B \cup C = \{1, 2, 3, 4, 5, 6\}$ Remark: If 5 elements are correct, give 1 score $(B \cup C) - A = \{5, 6\}$	1	
			1	
2	(i)	(d) $\frac{\pi}{6}$	1	3
	(ii)	$\frac{\cos(\frac{\pi}{2}-x)}{\cos(\frac{\pi}{2}+x)} = \frac{\sin x}{-\sin x} = -1$ Remark: Either $\cos(\frac{\pi}{2}-x) = \sin x$ or $\cos(\frac{\pi}{2}+x) = -\sin x$, give $\frac{1}{2}$ score Formula for $\cos(A+B)$ or $\cos(A-B)$ or $\cos \frac{\pi}{2} = 0$, give $\frac{1}{2}$ score.	1	
	(iii)	(a) 0	1	
3	(i)	$5(x-2) \leq 2(2x-1)$ $5x-10 \leq 4x-2$ $5x-4x \leq 10-2$ $x \leq 8$	1 1	3
	(ii)	 Remark: If the no. 8 is not specified, give 1 score	1	
4	(i)	(b) 0	1	
	(ii)	Let $P(k): 5^k - 5$ is divisible by 4 $P(k+1) = 5^{k+1} - 5$ $= 5^k \cdot 5 - 5$	1	
			$\frac{1}{2}$	

Qn No	Sub Qn	Answer Key	Score	Total
		$= 5^k \cdot 5 - 25 + 20$ $= 5(5^k - 5) + 20 = 4m + 5 \times 4 = 4m$	$\frac{1}{2}$	3
5		$9^{n+1} = (1+8)^{n+1} = 1 + (n+1)C_1 \cdot 8 + (n+1)C_2 \cdot 8^2 + (n+1)C_3 \cdot 8^3 + \dots$ $= 1 + (n+1)8 + 8^2 [(n+1)C_2 + (n+1)C_3 \cdot 8 + \dots]$ $= 1 + 8n + 8 + 64m$ $9^{n+1} - 8n - 9 = 64m$ <p>Remark: Expansion of $(a+b)^n$ or $(1+x)^n$ Give 1 score Proof by PMI give 2 score.</p>	<p>1 1 $\frac{1}{2}$ $\frac{1}{2}$</p>	3
6	(i) (ii)	<p>(b) y axis</p> <p>Centroid = $(\frac{0+3+0}{3}, \frac{4+2+0}{3}, \frac{0+2+1}{3})$ $= (1, 2, 1)$</p> <p>Remark: Formula for centroid: 1 score Any two correct co-ordinates, give 1 score</p>	<p>1 $\frac{1}{2}$ $\frac{1}{2}$</p>	3
7	(i) (ii)	<p>4 is not a multiple of 2 (It is false that 4 is a multiple of 2)</p> <p>Assume that $\sqrt{2}$ is rational $\therefore \sqrt{2} = \frac{p}{q}$ where p and q are prime nos. $p = \sqrt{2}q \Rightarrow p^2 = 2q^2 \Rightarrow p^2 = 2k$ $\therefore 4k^2 = 2q^2 \Rightarrow q^2 = 2k^2 \Rightarrow q = 2m$</p> <p>It is a contradiction $\therefore \sqrt{2}$ is irrational</p> <p>Remark: For writing the rule: if a divides p^2, then a divides p give 1 score</p>	<p>1 1 $\frac{1}{2}$ $\frac{1}{2}$</p>	3

Q No	Sub Qm	Answer key	Score	Total
8	(i)	(c) $P(A) = 0.2$	1	3
	(ii)	$A = \{(1,6), (6,1)\}$ $B = \{(3,3), (3,6), (6,3), (6,6)\}$ Remark: If 2 elements are correct, give $\frac{1}{2}$ score If 3 elements are correct, give 1 score For sample space, give $\frac{1}{2}$ score	1	
			1	
9	(i)	(d) $(2,9)$	1	4
	(ii)	$R = \{(-2,3), (-1,2), (0,1), (1,0), (2,-1)\}$ Remark: If 2 elements are correct, give 1 score If 3 elements are correct, give 2 score	2	
	(iii)	Range = $\{3, 2, 1, 0, -1\}$ Remark: If 3 elements are correct, give 1 score	1	
10	(i)	$A = \frac{x-y}{2}$ Remark: Formula for $\sin x + \sin y$ give 1 score	1	4
	(ii)	$\frac{\tan(\frac{\pi}{4}+x)}{\tan(\frac{\pi}{4}-x)} = \frac{\tan\frac{\pi}{4} + \tan x}{1 - \tan\frac{\pi}{4}\tan x}$ $= \frac{1 + \tan x}{1 - \tan x}$ $= \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$	1	
		Remark: Formula for $\tan(A+B)$ and $\tan(A-B)$ give $\frac{1}{2}$ score each. value of $\tan\frac{\pi}{4}$ give $\frac{1}{2}$ score For any one correct formula, give 1 score (Numerator OR Denominator)	1	

Qn No	Sub Qn	Answer Key	Score	Total												
11		$2x + y = 6$ $x + y = 4$ <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>x</td><td>0</td><td>3</td></tr> <tr><td>y</td><td>6</td><td>0</td></tr> </table> <table border="1" style="display: inline-table;"> <tr><td>x</td><td>0</td><td>4</td></tr> <tr><td>y</td><td>4</td><td>0</td></tr> </table> $x = 0, y$ axis $y = 0, x$ axis  Remarks: For drawing x, y axes give 1 score. For the drawing the lines, give 1 score each. If only shading is incorrect, give 3 score.	x	0	3	y	6	0	x	0	4	y	4	0	1+1 $\frac{1}{2} + \frac{1}{2}$ 1	4
x	0	3														
y	6	0														
x	0	4														
y	4	0														
12	(i) (a) 80 (ii) No. of arrangements = 8! Remark: For writing $8P_8$ only, give 1 score Expansion of $8!$ or $9!$ give $\frac{1}{2}$ score (iii) No. of selection of boys = $5C_3$ No. of selection of girls = $6C_4$ Total selection = $5C_3 \times 6C_4$ = $10 \times 15 = 150$ Remark: For $5C_3 + 6C_4$ give 1 score For $5P_3 \times 6P_4$ give $\frac{1}{2}$ score	1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1	4													
13	(i) (d) 10 (ii) (a) $(\pm 3, 0)$ (iii) (b) $\frac{3}{5}$ (iv) (f) $\frac{32}{5}$	1 1 1 1	4													

Qn No	Sub Qn	Answer Key	Score	Total
14	(i)	$\lim_{x \rightarrow 0} \frac{\sin mx}{\sin nx} = \lim_{mx \rightarrow 0} \frac{\sin mx \times mx}{mx}$ $= \frac{\lim_{mx \rightarrow 0} \frac{\sin mx \times mx}{mx}}{\lim_{nx \rightarrow 0} \frac{\sin nx \times nx}{nx}}$ $= \frac{m}{n} \lim_{mx \rightarrow 0} \frac{\sin mx}{mx}$ $= \frac{m}{n} \times \frac{1}{1} = \frac{m}{n}$	1 $\frac{1}{2}$ $\frac{1}{2}$	4
	(ii)	<p>Remark: For $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$, give 1 score</p> $f(x) = \frac{ax+b}{cx+d}$ $f'(x) = \frac{(cx+d) \frac{d}{dx}(ax+b) - (ax+b) \frac{d}{dx}(cx+d)}{(cx+d)^2}$ $= \frac{(cx+d)a - (ax+b)c}{(cx+d)^2}$ $= \frac{ad-bc}{(cx+d)^2}$ <p>Remark: For quotient formula, give 1 score For correct derivatives of numerator and denominator give $\frac{1}{2}$ score each</p>	1 $\frac{1}{2}$ $\frac{1}{2}$	

15	<table border="1"> <thead> <tr> <th>x_i</th> <th>$x_i - \bar{x}$</th> </tr> </thead> <tbody> <tr><td>11</td><td>2</td></tr> <tr><td>14</td><td>1</td></tr> <tr><td>10</td><td>3</td></tr> <tr><td>12</td><td>1</td></tr> <tr><td>16</td><td>3</td></tr> <tr><td>13</td><td>0</td></tr> <tr><td>14</td><td>1</td></tr> <tr><td>17</td><td>4</td></tr> <tr><td>12</td><td>1</td></tr> <tr><td>11</td><td>2</td></tr> <tr><td>130</td><td>18</td></tr> </tbody> </table>	x_i	$ x_i - \bar{x} $	11	2	14	1	10	3	12	1	16	3	13	0	14	1	17	4	12	1	11	2	130	18	$\sum x_i = 130$ $\bar{x} = \frac{130}{10} = 13$ $\sum x_i - \bar{x} = 18$ $M.D = \frac{\sum x_i - \bar{x} }{n}$ $= \frac{18}{10} = 1.8$	1 1 2	4
	x_i	$ x_i - \bar{x} $																										
11	2																											
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130	18																											
		<p>For table Remark: Formula for mean $\frac{1}{2}$ score Formula for M.D $\frac{1}{2}$ score</p>																										

Q.No	Sub Qn	Answer key	Score	Total
16	(i)	$P(A) = \frac{7}{20}$ Remark: For writing A in roster form, give $\frac{1}{2}$ score	1	4
	(ii)	$P(B) = \frac{4}{20}$ or $\frac{1}{5}$ Remark: For writing B in roster form, give $\frac{1}{2}$ score	1	
	(iii)	$P(A') = 1 - P(A)$ $= 1 - \frac{7}{20} = \frac{13}{20}$ Remark: For writing A' , give $\frac{1}{2}$ score	$\frac{1}{2}$ $\frac{1}{2}$	
	(iv)	$A \cap B = \{16\}$ $P(A \cap B) = \frac{1}{20}$	$\frac{1}{2}$ $\frac{1}{2}$	
17	(i)	$-i$	1	6
	(ii)	$z = \frac{1}{2-3i} = \frac{2+3i}{(2-3i)(2+3i)}$ $= \frac{2+3i}{4+9} = \frac{2}{13} + \frac{3}{13}i$ Real part = $\frac{2}{13}$ Imag-part = $\frac{3}{13}$ Remark: For writing the conjugate of $2-3i$, give 1 score For the answer $\frac{2+3i}{13}$, give 3 score	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
	(iii)	$(a+ib) + (a-ib) = 2a$ $(a+ib) - (a-ib) = 2bi$ Remark: If the value $\frac{2}{13} + \frac{3}{13}i$ in (ii) given for $a+ib$ in (iii) give 2 score.	1 1	
18	(i)	$y = 2x + 3$ Remark: For writing the equation $y = mx + c$, give $\frac{1}{2}$ score	1	

Q No	Sub Qn	Answer Key	Score	Total
	(ii)	$2x + 3y = 6 \Rightarrow \frac{2}{6}x + \frac{3}{6}y = \frac{6}{6}$ $\Rightarrow \frac{x}{3} + \frac{y}{2} = 1$ <p>x intercept = 3 y intercept = 2</p> <p>Remark: For the equation $\frac{x}{a} + \frac{y}{b} = 1$, Give $\frac{1}{2}$ score For the direct formula x intercept = $-\frac{c}{a}$, y intercept = $-\frac{c}{b}$, give 1 score</p>	$\frac{1}{2}$ $\frac{1}{2}$	
18	(iii)	<p>Co-ordinate of P = (a, 0) Co-ordinate of Q = (0, b) Co-ordinate of midpoint = (3, 2)</p> $\left(\frac{a+0}{2}, \frac{0+b}{2}\right) = (3, 2)$ $\frac{a}{2} = 3 \Rightarrow a = 6$ $\frac{b}{2} = 2 \Rightarrow b = 4$ <p>Equation is $\frac{x}{6} + \frac{y}{4} = 1 \Rightarrow 4x + 6y = 24$</p> <p>Remark: Formula for midpoint, give $\frac{1}{2}$ score For any other correct method, give full score The equation of the line can be written in any form.</p>	1 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	6
19	(i)	$a_n + a_{n+1} = 0$	1	
	(ii)	(c) $2b$	1	
	(iii)	$a = 2, r = 2$ $S_n = 1022$	1	

Q.No	Sub & n	Answer Key	Score	Total
19		$1022 = \frac{2(2^n - 1)}{2 - 1}$ $1022 = 2(2^n - 1)$ $511 = 2^n - 1$ $512 = 2^n$ $2^9 = 2^n$ $n = 9$ <p>Remark: Formula for sum of G.P, give 1 Score</p> <p>Formula for n^{th} term, give $\frac{1}{2}$ Score</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	6

Class	f_i	Mid x_i	$y_i = \frac{x_i - A}{h}$	y_i^2	$f_i \cdot y_i$	$f_i \cdot y_i^2$
0-20	6	10	-2	4	-12	24
20-40	8	30	-1	1	-8	8
40-60	20	50	0	0	0	0
60-80	9	70	1	1	9	9
80-100	7	90	2	4	14	28
	50				3	69

20

$A = 50$ $n = 20$ $\sum f_i = 50$

$\sum f_i y_i = 3$ $\sum f_i y_i^2 = 69$

$$\bar{x} = A + h \cdot \frac{\sum f_i y_i}{N} = 50 + 20 \times \frac{3}{50}$$

$$= \frac{256}{5} = 51.2$$

$$\sigma^2 = \frac{h^2}{N^2} \left[N \sum f_i y_i^2 - (\sum f_i y_i)^2 \right]$$

$$= \frac{400}{50 \times 50} [50 \times 69 - 9] = 550.56$$

Q.No	Sub Qn	Answer Key	Score	Total
20		$S.D = \sqrt{\text{Var}(X)} = \sigma$ $= \sqrt{550.56}$ $= 23.464$ <p>Remark: Formula for mean, give $\frac{1}{2}$ Score Formula for variance, give $\frac{1}{2}$ Score Formula for S.D, give $\frac{1}{2}$ Score For any other correct method, give full score</p>	1	6
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