

1/12

ANSWER KEY

FIRST YEAR HIGHER SECONDARY EXAMINATION IMPROVEMENT October
JUNE 2022

PART-III/III

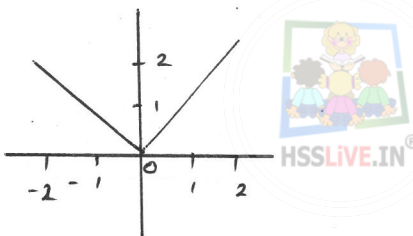
SUBJECT: MATHEMATICS (COMMERCE)

CODE NO: FY 855

VERSION: C

80 SCORES

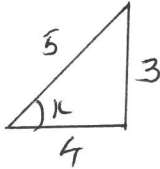
2 1/2 HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.	i)	$A = \{2, 4, 6\}$	1	
	ii)	$\phi, \{2\}, \{4\}, \{6\}, \{2, 4\}, \{4, 6\}$ $\{2, 6\}, \{2, 4, 6\}$	2	3
2.	i)	c) $[0, \infty)$	1	
	ii)		2	3
3.		$a = -1, b = 1, c = -2$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-1 \pm \sqrt{1^2 - 4(-1)(-2)}}{2(-1)}$ $= \frac{-1 \pm \sqrt{-7}}{-2} = \frac{-1 \pm i\sqrt{7}}{-2}$	1 1 1	3
4.	i)	a) $(-1, 3)$	1	
	ii)	$4x - 5x < 7 - 3$ $-x < 4$ $x > -4$, Ans: $(-4, \infty)$	1 1	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
5.	i	no. of 3 digit numbers = $5 \times 4 \times 3 = 60$	1	3
	ii)	$\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$	1	
		$x = \frac{10!}{8!} + \frac{10!}{9!}$ $= 10 \times 9 + 10 = 100$	1	
6.		$a_n = \frac{n}{n+1}$ $a_1 = \frac{1}{1+1} = \frac{1}{2}$ $a_2 = \frac{1}{2+1} = \frac{1}{3}$ $a_3 = \frac{1}{3+1} = \frac{1}{4}$ $a_4 = \frac{1}{4+1} = \frac{1}{5}$ Ans: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$	$1\frac{1}{2}$ $1\frac{1}{2}$ 3	3
7.	i.	b) $y = 0$	1	3
	ii	$y - y_1 = m(x - x_1)$ $y - 3 = -4(x + 2)$ $4x + y + 5 = 0$	$\frac{1}{2}$ $\frac{1}{2}$ 1	
8.		$(x - h)^2 + (y - k)^2 = r^2$ $(x - 0)^2 + (y - 2)^2 = 2^2$ $x^2 + y^2 - 4y = 0$	1 1 1	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9.		<p>put $1+x = y$ then $x \rightarrow 0, y \rightarrow 1$</p> $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x} = \lim_{y \rightarrow 1} \frac{\sqrt{y} - 1}{y - 1}$ $= \lim_{y \rightarrow 1} \frac{y^{1/2} - 1^{1/2}}{y - 1} = \frac{1}{2} (1)^{1/2-1}$ $= \underline{\underline{\frac{1}{2}}}$	1 1 1	3
10.	i	$P(A^c) = 1 - P(A)$ $= 1 - \frac{2}{11} = \frac{9}{11}$	1	
	ii	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $= 0.5 + 0.6 - 0.3$ $= \underline{\underline{0.8}}$	1 1	3
11.	i.	$A \times B = \{(1, 3), (1, 4), (2, 3), (2, 4), (3, 3), (3, 4)\}$	1	
	ii	$A \times C = \{(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6)\}$	1	
	iii	$(A \times B) \cap (A \times C) = \{(1, 4), (2, 4), (3, 4)\}$	2	4.
12.		<p>A - Set of students like to play cricket B - Set of students like to play Football.</p> $n(A) = 24, n(B) = 16, n(A \cup B) = 35$ $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ $35 = 24 + 16 - n(A \cap B), n(A \cap B) = 5$	1 1 1+1	4

4
12

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
13.	i	c) $7\pi/6$	1	4
	ii	$\operatorname{cosec} x = 5/3$ $\cos x = -4/5$ $\tan x = -3/4$	1	
			1	
			1	
14.	i.	$P(1): LHS = 1$ $RHS = \frac{1(1+1)}{2} = 1$ $LHS = RHS, P(1) \text{ is true}$	1	4
	ii)	$P(k): 1 + 2 + 3 + \dots + k = \frac{k(k+1)}{2} \quad \text{--- ①}$	1	
		$P(k+1): 1 + 2 + 3 + \dots + k + (k+1) = \frac{(k+1)(k+2)}{2} \quad \text{--- ②}$	1	
		$LHS = \frac{k(k+1)}{2} + (k+1) = \frac{(k+1)(k+2)}{2}$ $= RHS \text{ of } \textcircled{2}$ $\therefore P(k+1) \text{ is true, By P.M.I}$ $\therefore P(n) \text{ is true } \forall n \in \mathbb{N} \text{ by P.M.I}$	1	
15	i	$1 + i$	1	4
	ii	$\frac{1+i}{1-i} \cdot \frac{(1+i)}{(1+i)} = \frac{(1+i)^2}{1^2 - i^2} = i$	1	
	iii	$0 + i \cdot 1 =$ $r = \sqrt{0^2 + 1^2} = 1$ $\theta = \tan^{-1}(1/0) = \pi/2$ $r(\cos \theta + i \sin \theta) = 1 \cdot (\cos \pi/2 + i \sin \pi/2)$	1	
			1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
16.	i	d) 45	1	4
	ii	${}^5C_2 \times {}^6C_3 = \frac{5 \times 4}{1 \times 2} \times \frac{6 \times 5 \times 4}{1 \times 2 \times 3}$ $= 10 \times 20 = 200$	2	
			1	
17.	i	$n+1$	1	4
	ii	$(a+b)^n = {}^nC_0 a^n b^0 + {}^nC_1 a^{n-1} b^1 + \dots$ $+ \dots + {}^nC_n a^0 b^n$	1	
		$(1-2x)^5 = {}^5C_0 1^5 (-2x)^0 + {}^5C_1 1^4 (-2x)^1$ $+ {}^5C_2 1^3 (-2x)^2 + {}^5C_3 1^2 (-2x)^3 +$ ${}^5C_4 1^1 (-2x)^4 + {}^5C_5 1^0 (-2x)^5$	1	
		$= 1 - 10x + 40x^2 - 80x^3 + 80x^4 - 32x^5$	1	
18.		<p>3, $A_1, A_2, A_3, A_4, A_5, A_6, 24$ is AP</p> <p>$a = 3 \quad b = 24, \quad n = 8$</p> <p>$E_n = a + (n-1)d$</p> <p>$24 = 3 + (8-1)d$</p> <p>$\therefore d = 3$</p> <p>Six numbers between 3 and 24 is 6, 9, 12, 15, 18 and 21</p>	1	4
			2	
			1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
19.	i)	$3x + 4y = 12$ divided by 12 $\frac{x}{4} + \frac{y}{3} = 1$	1	
	ii	Distance $d = \frac{ ax_1 + by_1 + c }{\sqrt{a^2 + b^2}}$ OR $\left \frac{c}{\sqrt{a^2 + b^2}} \right $ $= \left \frac{3 \times 0 + 4 \times 0 - 12}{\sqrt{3^2 + 4^2}} \right = \frac{12}{5}$	1	4
20	i	b) (2, 3, 0)	1	
	ii	Distance formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$ $A(-2, 3, 5), B(1, 2, 3), C(7, 0, -1)$ $ AB = \sqrt{(1 - (-2))^2 + (2 - 3)^2 + (3 - 5)^2}$ $= \sqrt{9 + 1 + 4} = \sqrt{14}$ $ BC = \sqrt{(7 - 1)^2 + (0 - 2)^2 + (-1 - 3)^2}$ $= \sqrt{36 + 4 + 16} = \sqrt{56} = 2\sqrt{14}$ $ AC = \sqrt{(7 - (-2))^2 + (0 - 3)^2 + (-1 - 5)^2}$ $= \sqrt{81 + 9 + 36} = \sqrt{126} = 3\sqrt{14}$ $ AB + BC = AC $ A, B, C are collinear.	1/2 1/2 1/2 1/2 1	4

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
23.	i	$A' = \{1, 3, 5, 7\}$ $B' = \{1, 3, 5, 6, 7\}$	1	
	ii	$(A \cup B)' = \{2, 4, 6, 8\}$ $(A \cup B)' = \{1, 3, 5, 7\} \text{ --- (1)}$ $A' \cap B' = \{1, 3, 5, 7\} \text{ --- (2)}$ From ① & ② $(A \cup B)' = A' \cap B'$	1/2 1/2 1/2 1/2	
	iii	$A \cap B = \{2, 4, 8\}$ $(A \cap B)' = \{1, 3, 5, 6, 7\} \text{ --- (1)}$ $A' \cup B' = \{1, 3, 5, 6, 7\} \text{ --- (2)}$ From ① and ② $(A \cap B)' = A' \cup B'$	1/2 1/2 1/2 1/2	6.
24.	i	$\sin(A-B) = \sin A \cos B - \cos A \sin B$	1	
	ii	$\sin 15 = \sin(45-30)$ $= \sin 45 \cos 30 - \cos 45 \sin 30$ $= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \cdot \frac{1}{2}$ $= \frac{\sqrt{3} - 1}{2\sqrt{2}}$	1/2 1/2 1/2 1/2	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score												
24	iii	$LHS = \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x}$ $= \frac{2 \sin \left(\frac{5x+3x}{2} \right) \cos \left(\frac{5x-3x}{2} \right)}{2 \cos \left(\frac{5x+3x}{2} \right) \cdot \cos \left(\frac{5x-3x}{2} \right)}$ $= \frac{\sin 4x \cancel{\cos 2x}}{\cos 4x \cancel{\cos 2x}}$ $= \tan 4x = RHS$	1 1 1	6												
25.		$x + 2y = 8$ <table><tr><td>x</td><td>0</td><td>8</td></tr><tr><td>y</td><td>4</td><td>0</td></tr></table> $2x + y = 8$ <table><tr><td>x</td><td>0</td><td>4</td></tr><tr><td>y</td><td>8</td><td>0</td></tr></table>	x	0	8	y	4	0	x	0	4	y	8	0	1/1 4	6
x	0	8														
y	4	0														
x	0	4														
y	8	0														
26.	i)	$y^2 = 4ax$ $a = 3$ <p>Equation of parabola, $y^2 = 4 \cdot 3 \cdot x$</p> $y^2 = 12x$	1 1													

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
26.	ii	$\frac{x^2}{16} + \frac{y^2}{9} = 1$ $a^2 = 16, \quad b^2 = 9$ $c^2 = a^2 - b^2 = 16 - 9 = 7$ $c = \pm\sqrt{7}$ <p>Foci $(\pm c, 0) = (\pm\sqrt{7}, 0)$</p> <p>Vertices $(\pm a, 0) = (\pm 4, 0)$</p> <p>Eccentricity, $e = \frac{c}{a} = \frac{\sqrt{7}}{4}$</p> <p>Length of Latus rectum = $\frac{2b^2}{a}$</p> $= \frac{2 \cdot 9}{4}$ $= \frac{9}{2}$	<p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>	6
27.	i	<p>Let $f(x) = \sin x$</p> $\frac{d}{dx} f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\sin(x+h) - \sin x}{h}$ $= \lim_{h \rightarrow 0} \frac{2 \cos\left(\frac{x+h}{2}\right) \sin\left(\frac{h}{2}\right)}{h}$ $= \lim_{h \rightarrow 0} \cos\left(x + \frac{h}{2}\right) \cdot \lim_{h \rightarrow 0} \frac{\sin \frac{h}{2}}{\frac{h}{2}}$ $= \cos x \times 1 = \underline{\underline{\cos x}}$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score																																													
27	ii	<p>Given $y = \frac{\cos x}{1 + \sin x}$</p> $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{u \cdot \frac{dv}{dx} - v \cdot \frac{du}{dx}}{v^2}$ $= \frac{(1 + \sin x) \frac{d}{dx} \cos x - \cos x \cdot \frac{d}{dx} (1 + \sin x)}{(1 + \sin x)^2}$ $= \frac{(1 + \sin x)(-\sin x) - \cos x(0 + \cos x)}{(1 + \sin x)^2}$ $= \frac{-1}{1 + \sin x}$	<p>1</p> <p>1/2</p> <p>1</p> <p>1/2</p>	6																																													
28.		<table border="1"> <thead> <tr> <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> </thead> <tbody> <tr><td>8</td><td>2</td><td>16</td><td>64</td><td>128</td></tr> <tr><td>11</td><td>3</td><td>33</td><td>121</td><td>363</td></tr> <tr><td>17</td><td>4</td><td>68</td><td>289</td><td>1156</td></tr> <tr><td>20</td><td>1</td><td>20</td><td>400</td><td>400</td></tr> <tr><td>25</td><td>5</td><td>125</td><td>625</td><td>3125</td></tr> <tr><td>30</td><td>7</td><td>210</td><td>900</td><td>6300</td></tr> <tr><td>35</td><td>3</td><td>105</td><td>1225</td><td>3675</td></tr> <tr> <td>$N = 25$</td><td>577</td><td></td><td></td><td>15147</td></tr> </tbody> </table> <p>i Mean, $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{577}{25} = 23.08$</p> <p>ii Variance = $\frac{\sum f_i x_i^2}{N} - (\bar{x})^2$ $= \frac{15147}{25} - (23.08)^2 = 73.19$</p> <p>iii Standard deviation = $\sqrt{73.19} = 8.5$</p>	x_i	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$	8	2	16	64	128	11	3	33	121	363	17	4	68	289	1156	20	1	20	400	400	25	5	125	625	3125	30	7	210	900	6300	35	3	105	1225	3675	$N = 25$	577			15147	<p>3</p> <p>1</p> <p>1</p> <p>1</p>	6.
x_i	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$																																													
8	2	16	64	128																																													
11	3	33	121	363																																													
17	4	68	289	1156																																													
20	1	20	400	400																																													
25	5	125	625	3125																																													
30	7	210	900	6300																																													
35	3	105	1225	3675																																													
$N = 25$	577			15147																																													

12
-12

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
29.	i	$P(\text{not } A \text{ and not } B) = P(A' \cap B')$ $= P(A \cup B)'$ $= 1 - P(A \cup B)$ $= 1 - \{P(A) + P(B) - P(A \cap B)\}$ $= 1 - \left\{ \frac{1}{3} + \frac{1}{5} - \frac{1}{15} \right\}$ $= 1 - \frac{7}{15} = \frac{8}{15}$	1	
	ii	a) $P(\text{red}) = \frac{4}{9}$	2	
		b) $P(\text{not yellow}) = P(\text{red}) + P(\text{blue})$	1	
		$= \frac{4}{9} + \frac{3}{9}$ $= \frac{7}{9}$	1	
			★	6.