

$\frac{1}{12}$ **ANSWER KEY**

IMPROVEMENT October  
 FIRST YEAR HIGHER SECONDARY EXAMINATION JUNE - 2022

PART-~~H~~/H/III

SUBJECT: MATHEMATICS (COMMERCE)

CODE NO: FY 855

VERSION: C

80 SCORES

2 1/2 HOURS

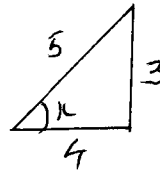
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.	i)	$A = \{ 2, 4, 6 \}$	1	
	ii)	$\phi, \{ 2 \}, \{ 4 \}, \{ 6 \}, \{ 2, 4 \}, \{ 4, 6 \}$ $\{ 2, 6 \}, \{ 2, 4, 6 \}$	2	3
2.	i)	c) $[ 0, \infty )$	1	
	ii)		2	3
3.		$a = -1, b = 1, c = -2$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-1 \pm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

$$\frac{2}{12}$$

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.		$a_n = \frac{n}{n+1}$		
		$a_1 = \frac{1}{1+1} = \frac{1}{2}$		
		$a_2 = \frac{1}{2+1} = \frac{1}{3}$	$\frac{1}{2}$	
		$a_3 = \frac{1}{3+1} = \frac{1}{4}$		
		$a_4 = \frac{1}{4+1} = \frac{1}{5}$	$\frac{1}{2}$	
		Ans: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$	3	3
7.	i.	b) $y = 0$	1	
	ii)	$y - y_1 = m(x - x_1)$	$\frac{1}{2}$	
		$y - 3 = -4(x + 2)$	$\frac{1}{2}$	
		$4x + y + 5 = 0$	1	3.
8.		$(x - h)^2 + (y - k)^2 = r^2$	1	
		$(x - 0)^2 + (y - 2)^2 = 2^2$	1	
		$x^2 + y^2 - 4y = 0$	1	3.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9.		<p>put <math>1+x = y</math> then <math>x \rightarrow 0, y \rightarrow 1</math></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	4

$\frac{4}{12}$

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

5  
12

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
16.	i	d) 45	1	
	ii	$5C_2 + 6C_3 = \frac{5 \times 4}{1 \times 2} + \frac{6 \times 5 \times 4}{1 \times 2 \times 3}$ $= 10 + 20 = 30$	2	
			1	4
17.	i	$n+1$	1	
	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	4
18.		<p>3, <math>A_1, A_2, A_3, A_4, A_5, A_6, 24</math> is AP</p> <p><math>a = 3</math> <math>b = 24</math>, <math>n = 8</math></p> <p><math>T_n = a + (n-1)d</math></p> <p><math>24 = 3 + (8-1)d</math></p> <p><math>\therefore d = 3</math></p> <p>Six numbers between 3 and 24 is 6, 9, 12, 15, 18 and 21</p>	1	
			2	
			1	4

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

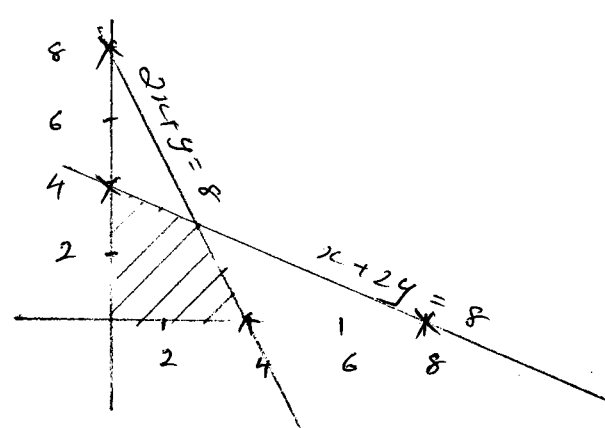
7  
12

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
21.	i	If $n^2$ is even then $n$ is even	1	
	ii	<p>Let <math>\sqrt{2} = \frac{a}{b}</math> Squaring</p> $2 = \frac{a^2}{b^2} \Rightarrow a^2 = 2b^2$ <p><math>\Rightarrow 2</math> divides <math>a</math>. Therefore there exists an integer 'c' such that <math>a = 2c</math>. Then <math>a^2 = 4c^2</math> and <math>a^2 = 2b^2</math></p> $2b^2 = 4c^2 \Rightarrow b^2 = 2c^2$ <p><math>\Rightarrow 2</math> divides <math>b</math>. But we have already shown that <math>2</math> divides <math>a</math></p> <p><math>\Rightarrow 2</math> is the common factor of <math>a</math> and <math>b</math> which contradicts.</p> <p><math>\therefore \sqrt{2}</math> is irrational.</p>	1 1 1	4
22.	i	4, 6, 7, 8, 10, 12, 12, 13		
		Median = $\frac{8+10}{2} = 9$	1	
	ii	<p>Mean deviation about median</p> $= \frac{\sum_{k=1}^n  x_k - M }{n}$ <p><math> x_k - M </math> are 5, 3, 2, 1, 1, 3, 3, 4</p> <p><math>\therefore \frac{\sum  x_k - M }{n} = \frac{22}{8} = 2.75</math></p>	1 1	4

8  
12

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



Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score						
24	iii	$LHS = \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x}$ $= \frac{2 \sin \left(\frac{5x+3x}{2}\right) \cos \left(\frac{5x-3x}{2}\right)}{2 \cos \left(\frac{5x+3x}{2}\right) \cdot \cos \left(\frac{5x-3x}{2}\right)}$ $= \frac{\sin 4x \cancel{\cos x}}{\cos 4x \cancel{\cos x}}$ $= \tan 4x = RHS$	1 1 1	6						
25.		<table style="display: inline-table; margin-right: 20px;"> <tr><td><math>x + 2y = 8</math></td></tr> <tr><td>x   0   8</td></tr> <tr><td>y   4   0</td></tr> </table> <table style="display: inline-table;"> <tr><td><math>2x + y = 8</math></td></tr> <tr><td>x   0   4</td></tr> <tr><td>y   8   0</td></tr> </table> 	$x + 2y = 8$	x   0   8	y   4   0	$2x + y = 8$	x   0   4	y   8   0	1/1 4	6
$x + 2y = 8$										
x   0   8										
y   4   0										
$2x + y = 8$										
x   0   4										
y   8   0										
26.	i)	$y^2 = 4ax$ $a = 3$ <p>Equation of parabola, <math>y^2 = 4 \cdot 3 \cdot x</math></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 <math>(\pm c, 0) = (\pm\sqrt{7}, 0)</math></p> <p>Vertices <math>(\pm a, 0) = (\pm 4, 0)</math></p> <p>Eccentricity, <math>e = \frac{c}{a} = \frac{\sqrt{7}}{4}</math></p> <p>Length of Latus rectum = <math>\frac{2b^2}{a}</math></p> $= \frac{2 \cdot 9}{4}$ $= \frac{9}{2}$	<p>1</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1/2</p>	
27.	i	<p>Let <math>f(x) = \sin x</math></p> $\frac{d}{dx} f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\sin(x+h) - \sin x}{h}$ $= \lim_{h \rightarrow 0} \cos\left(x + \frac{h}{2}\right) \frac{\sin\left(\frac{h}{2}\right)}{h}$ $= \lim_{h \rightarrow 0} \cos\left(x + \frac{h}{2}\right) \cdot \lim_{h \rightarrow 0} \frac{\sin \frac{h}{2}}{\frac{h}{2}}$ $= \cos x \cdot 1 = \underline{\underline{\cos x}}$	<p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p>	6.

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
27	ii	<p>Given <math>y = \frac{\cos x}{1 + \sin x}</math></p> $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$ $= \frac{(1 + \sin x) \frac{d}{dx} \cos x - \cos x \cdot \frac{d}{dx}(1 + \sin x)}{(1 + \sin x)^2}$ $= \frac{(1 + \sin x)(-\sin x) - \cos x(0 + \cos x)}{(1 + \sin x)^2}$ $= \frac{-1}{1 + \sin x}$	1  1/2  1  1/2	6

28.

$x_i$	$f_i$	$f_i x_i$	$x_i^2$	$f_i x_i^2$
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

- i) Mean,  $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{577}{25} = 23.08$  1
- ii) Variance =  $\frac{\sum f_i x_i^2}{N} - (\bar{x})^2$   
 $= \frac{15147}{25} - (23.08)^2 = 73.19$  1
- iii) Standard deviation =  $\sqrt{73.19} = 8.5$  1

6.

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  1	
	ii	a) $P(\text{red}) = \frac{4}{9}$ b) $P(\text{not yellow}) = P(\text{red}) + P(\text{blue})$ $= \frac{4}{9} + \frac{3}{9}$ $= \frac{7}{9}$ $=$	2  1  1 *	6.