FIRST SEMESTER

Basic Mathematics

(الرياضيات الاساسية)

(Answers)

Sultanate of Oman
Ministry of Education

Diploma, Bilingual Private Schools, Basic Mathematics

First Semester-First Session
Academic Year: 2023/2024

Answer Scheme

<u>Question One</u>: (Multiple-Choice Items) **[14 marks]**
Each item carries 1 mark.

Item #	Answer	Taxonomy	Topic	Page
1	$x + 7$	Knowledge	Algebraic methods	3
2	$x + 5$	Knowledge	Algebraic methods	2
3	6	Application	Algebraic methods	9
4	2	Reasoning	Algebraic methods	13+22
5	$\log_2 8 = 3$	Knowledge	Exponential and Logarithms	52+53
6	$\log_b 12$	Knowledge	Exponential and Logarithms	54
7	2.95	Application	Exponential and Logarithms	57
8	$\frac{1}{2}\log_2 x$	Application	Exponential and Logarithms	58
9	$[-2, 0]$	Knowledge	Differentiation	138
10	1	Application	Differentiation	139
11	5	Knowledge	Measures of location and spread	10
12	13	Application	Measures of location and spread	13+16
13	$21 - 25$	Application	Measures of location and spread	26
14	2754	Reasoning	Measures of location and spread	18+20

Extended Response Questions

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
15 (**4**marks)	$\frac{x^2+10x+24}{x^2+x-12}$		➢ In the second step the student will get 1 mark for correct factor of numerator and 1 mark for correct factor of denominator. ➢ If the student didn't write the cancelation step, then the student will get 2marks for the last step.	Knowledge	Algebraic methods	3
	$=\frac{(x+6)(x+4)}{(x+4)(x-3)}$	1 + 1				
	$=\frac{(x+6)\cancel{(x+4)}}{\cancel{(x+4)}(x-3)}$	1				
	$=\frac{x+6}{x-3}$	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
16 (**5**marks)	By using the remainder theorem if g(x)is divided by $(ax-b)$ then the remainder is $\mathrm{g}\left(\frac{b}{a}\right)$		➢ If the student didn't write the last step, the student will lose 0.5 mark. ➢ If the student uses algebraic division with correct steps, the student will get 2.5 marks only.	Application	Algebraic methods	11
	$\frac{b}{a}=\frac{1}{2}$	0.5				
	$\mathrm{g}\left(\frac{1}{2}\right)=4\left(\frac{1}{2}\right)^{4}-3\left(\frac{1}{2}\right)^{2}+3\left(\frac{1}{2}\right)-1$	0.5+0.5+0.5				
	$\mathrm{g}\left(\frac{1}{2}\right)=4\left(\frac{1}{16}\right)-3\left(\frac{1}{4}\right)+\frac{3}{2}-1$	0.5+0.5+0.5				
	$\therefore \mathrm{g}\left(\frac{1}{2}\right)=\frac{1}{4}-\frac{3}{4}+\frac{3}{2}-1$	0.5				
	$\therefore \mathrm{g}\left(\frac{1}{2}\right)=0$	1				
	The remainder is 0					

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
17 (**4**marks)	$x+1 \overline{)\, x^3+5x^2+3x-1}$ x^2+4x-1 $-x^3-x^2$ $4x^2+3x-1$ $-4x^2-4x$ $-x-1$ $x+1$ 0 0 $\therefore f(x)=(x+1)(x^2+4x-1)$	0.5+0.5+0.5 0.5 0.5 0.5 0.5 0.5	-	Application	Algebraic methods	4

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
18 (**3**marks)	$x = -3$	0.5	-	Reasoning	Algebraic methods	7
	$f(-3) = (-3)^3 - (-3)^2 - 9(-3) + 11$	0.5+0.5+0.5				
	$f(-3) = -27 - 9 + 27 + 11$					
	$f(-3) = 2 \neq 0$	0.5+0.5				
	$\therefore (x+3)$ is not a factor of $f(x)$					

Or

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
18 (**3**marks)	$x+3 \overline{)\, x^3 - x^2 - 9x + 11}$ $x^2 - 4x + 3$ $-x^3 - 3x^2$ $-4x^2 - 9x + 11$ $4x^2 + 12x$ $3x + 11$ $-3x - 9$ 2	0.5 0.5 0.5 0.5	-	Reasoning	Algebraic methods	7
	Since the remainder $= 2 \neq 0$	0.5+0.5				
	$\therefore (x+3)$ is not a factor of $f(x)$					

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
19 (**3**marks)	$x+1=3^2$	1+1	-	Knowledge	Exponential and Logarithms	53
	$x+1=9$	0.5				
	$x=8$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
20 (**3**marks)	$\log_2 \frac{x}{8} = 1$	1	-	Application	Exponential and Logarithms	55
	$\frac{x}{8} = 2^1 = 2$	1				
	$x = 16$	1				

or

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
20 (**3**marks)	$\log_2 x - \log_2 2^3 = 1$	0.5	-	Application	Exponential and Logarithms	55
	$\log_2 x - 3\log_2 2 = 1$	0.5				
	$\log_2 x - 3 = 1$	0.5				
	$\log_2 x = 4$	0.5				
	$x = 2^4 = 16$	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
21 (**4**marks)	$5^{2x} - 6\,(5^x) + 5 = 0$ is a quadratic equation of 5^x		-	Application	Exponential and Logarithms	58
	$(5^x - 1)(5^x - 5) = 0$	1+1				
	$5^x = 1 \quad \rightarrow \quad x = 0$	0.5+0.5				
	$5^x = 5 \quad \rightarrow \quad x = 1$	0.5+0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
22 (**4**marks)	LHS $= \log_a(a^2\, x)$		-	Reasoning	Exponential and Logarithms	55
	$= \log_a(a^2) + \log_a\, x$	1+1				
	$= 2\log_a a \;+\; n$	1+0.5				
	$= 2 + n$	0.5				
	= RHS					

or

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
22 (**4**marks)	Let $x = a^n$	0.5	-	Reasoning	Exponential and Logarithms	55
	$\therefore\ \log_a(a^2x) = \log_a(a^2a^n)$	1				
	$= \log_a(a^{2+n})$	1				
	$= (2+n)\log_a a$	1				
	$= 2 + n$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
23 (**3**marks)	$f'(x) = 2x - 10$	1	-	Knowledge	Differentiation	138
	$f(x)$ is increasing when $f'(x) \geq 0$ for all values of x on $a < x < b$					
	$\therefore 2x - 10 \geq 0$	1				
	$2x \geq 10$	0.5				
	$x \geq 5$	0.5				

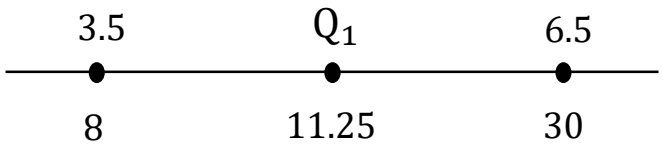
Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	chapter	Page
24 (**5**marks)	$\frac{dy}{dx} = 6x^2 + 12x$	1	-	Application	Differentiation	140
	$\frac{d^2y}{dx^2} = 12x + 12$	1				
	at $x = 0 \rightarrow \frac{d^2y}{dx^2} = 12 > 0$	0.5+0.5				
	$(0, 0)$ is a local minimum point	0.5				
	at $x = -2 \rightarrow \frac{d^2y}{dx^2} = -12 < 0$	0.5+0.5				
	$(-2, 8)$ is a local maximum point	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
25 (**2**marks)	$f'(x) = -11 - 3x^2$	1	-	Reasoning	Differentiation	138
	$-x^2 \leq 0$ for all real values of x	0.5				
	$-11 - 3x^2 \leq 0$ for all real values of x	0.5				
	$\therefore f(x)$ is decreasing for all real values of x					

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
26 (**5**marks)	$\bar{x} = \frac{\sum xf}{\sum f}$ $= \frac{1\times11+2\times16+4\times9+20\times1+30\times3}{11+16+9+1+3}$	2.5 + 1	-	Knowledge	Measures of location and spread	10
	$= \frac{189}{40}$	0.5+0.5				
	$=$ OMR 4.725	0.5				

or

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
26 (**5**marks)	x | f | xf 1 | 11 | 11 2 | 16 | 32 4 | 9 | 36 20 | 1 | 20 30 | 3 | 90	2.5	If the student calculates correctly $\sum xf = 189$ $\sum f = 40$ and writes it directly in the table , then the student will get 4.5 marks for the table.	Knowledge	Measures of location and spread	10
	$\bar{x} = \frac{\sum xf}{\sum f} = \frac{189}{40}$	1+1				
	$=$ OMR 4.725	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
27 a) (**4**marks)	$n = 45$		-	Application	Measures of location and spread	14
	Lower quartile Q_1 is the $\frac{n}{4}$th of 45 $= \frac{45}{4} = 11.25$th value	1				
	Using interpolation					
						
	$\frac{Q_1 - 3.5}{6.5 - 3.5} = \frac{11.25 - 8}{30 - 8}$	0.5+0.5 + 0.5+0.5				
	$\frac{Q_1 - 3.5}{3} = \frac{3.25}{22}$					
	$Q_1 = 3 \times \left(\frac{3.25}{22}\right) + 3.5$	0.5				
	$Q_1 = 3.943$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
27 b) (**4**marks)	$n = 6$		-	Application	Measures of location and spread	18
	$\sum x = 6 + 7 + 5 + 3 + 10 + 8 = 39$	1				
	$\sum x^2 = 36 + 49 + 25 + 9 + 100 + 64 = 283$	1				
	Variance $= \sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$					
	$\therefore \sigma^2 = \frac{283}{6} - \left(\frac{39}{6}\right)^2$	1				
	$\therefore \sigma^2 \simeq 4.92$	0.5				
	Standard deviation $= \sigma = \sqrt{\sigma^2}$					
	$\therefore \sigma = \sqrt{4.92} \simeq 2.22$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
28 (**3**marks)	$\bar{x} = \frac{\sum xf}{\sum f}$		-	Reasoning	Measures of location and spread	11
	$1.7 = \frac{p + 10 + 3}{p + 6}$	1				
	$1.7(p + 6) = p + 13$	0.5				
	$1.7p - p = 13 - 10.2$					
	$0.7\ p = 2.8$	0.5				
	$p = \frac{2.8}{0.7} = 4$	1				

"End of the Answer scheme"

Sultanate of Oman
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Diploma, Bilingual Private Schools, Basic Mathematics

First Semester-Second Session

Academic Year: 2023/2024

Answer Scheme

Question One: (Multiple-choice Items) **[14 marks]**

Each item carries 1 mark

Item #	Answer	Taxonomy	Topic	Page
1	$x^2 - 8$	Knowledge	Algebraic methods (Pure Mathematics 2)	2
2	$x + 5$	Knowledge	Algebraic methods (Pure Mathematics 2)	3
3	$x + 4$	Application	Algebraic methods (Pure Mathematics 2)	8
4	6	Reasoning	Algebraic methods (Pure Mathematics 2)	12
5	$4^2 = 16$	Knowledge	Exponential and Logarithms (Pure Mathematics 2)	52
6	$\frac{\log_{10} 9}{\log_{10} 7}$	Knowledge	Exponential and Logarithms (Pure Mathematics 2)	59
7	2.86	Application	Exponential and Logarithms (Pure Mathematics 2)	57
8	$\log_5 9$	Application	Exponential and Logarithms (Pure Mathematics 2)	54
9	$[-2,\ 0]$	Knowledge	Differentiation (Pure Mathematics 2)	138
10	$(0, 9)$	Application	Differentiation (Pure Mathematics 2)	139
11	$20 - 30$	Knowledge	Measures of location and spread (Statistics 1)	12
12	19	Application	Measures of location and spread (Statistics 1)	10
13	75	Application	Measures of location and spread (Statistics 1)	10
14	25	Reasoning	Measures of location and spread (Statistics 1)	18

Extended Response Questions

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
15 (4marks)	$\frac{x^2+9x+20}{(x+5)^2}$		➢ In the second step the student will get 1 mark for correct factor of numerator and 1 mark for correct factor of denominator. ➢ If the student didn't write the cancelation step, then the student will get 2marks for the last step.	Knowledge	Algebraic methods	3
	$=\frac{(x+5)(x+4)}{(x+5)(x+5)}$	1 + 1				
	$=\frac{\cancel{(x+5)}(x+4)}{(x+5)\cancel{(x+5)}}$	1				
	$=\frac{x+4}{x+5}$	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
16 (4marks)	$x-2 \;\overline{)\; x^3+5x^2-9x-12}$ $-x^3+2x^2$ x^2+7x+5	0.5+0.5+0.5 0.5	-	Application	Algebraic methods	4
	$7x^2-9x-12$ $-7x^2+14x$	0.5				
	$5x-12$ $-5x+10$	0.5				
	-2	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
17 (5marks)	$g(-1) = 9$	0.5+0.5	-	Application	Algebraic methods	12
	$k(-1)^4 - 2(-1)^3 + 6(-1)^2 - 2 = 9$	0.5+0.5+0.5				
	$k + 2 + 6 - 2 = 9$	0.5+0.5+0.5				
	$k + 6 = 9$	0.5				
	$k = 3$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
18 (3marks)	To show that $(x+p)$ is a factor of $f(x)$ we need to show that the value of $f(-p)=0$	0.5	-	Reasoning	Algebraic methods	7
	$\therefore f(x)=(x+p+1)^5-(x^5+p^5+1)$					
	$f(-p)=((-p)+p+1)^5-((-p)^5+p^5+1)$	0.5+0.5				
	$=(0+1)^5-(0+1)$	0.5+0.5				
	$=0$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
19 (3marks)	$x - 7 = 3^2$	0.5+1	-	Knowledge	Exponential and Logarithms	53
	$x - 7 = 9$	0.5				
	$x = 16$	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
20 (3marks)	$\log_{10}(5\times 4x)=2$	1	-	Application	Exponential and Logarithms	55
	$\log_{10}(20x)=2$	0.5				
	$20x=10^2$	0.5+0.5				
	$x=\frac{100}{20}=5$	0.5				

or

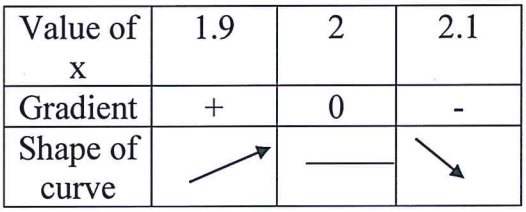
Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
20 (3marks)	$\log_{10}(5\times 4x)=\log_{10}100$	1	Alternative solution	Application	Exponential and Logarithms	55
	$\log_{10}(20x)=\log_{10}100$	0.5				
	$20x=100$	1				
	$x=\frac{100}{20}=5$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
21 (4marks)	$\log 4^x = \log 3^{x+1}$	0.5+0.5	If the student solves the question by using ln with correct steps, the student will get 2marks.	Application	Exponential and Logarithms	57
	$x \log 4 = (x+1) \log 3$	0.5+0.5				
	$x \log 4 = x \log 3 + \log 3$	0.5				
	$x \log 4 - x \log 3 = \log 3$					
	$x (\log 4 - \log 3) = \log 3$	0.5				
	$x \left(\log \frac{4}{3}\right) = \log 3$	0.5				
	$x = \frac{\log 3}{\log\left(\frac{4}{3}\right)} \approx 3.819$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
22 (4marks)	LHS= $\log_a y + 3\log_a 2$		-	Reasoning	Exponential and Logarithms	60
	$= \log_a\left(\frac{a^6}{8}\right) + \log_a 2^3$	0.5+0.5				
	$= \log_a(a^6) - \log_a 8 + \log_a 8$	0.5+0.5+0.5				
	$= \log_a(a^6)$	0.5				
	$= 6\log_a a$	0.5				
	$= 6$	0.5				
	=RHS					

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
22 (4marks)	$y = \frac{a^6}{8}$		**Alternative solution**	Reasoning	Exponential and Logarithms	60
	$\log_a y = \log_a\left(\frac{a^6}{8}\right)$	0.5+0.5				
	$\log_a y = \log_a(a^6) - \log_a 8$	0.5+0.5				
	$\log_a y = \log_a(a^6) - \log_a 2^3$	0.5				
	$\log_a y + 3\log_a 2 = \log_a(a^6)$	0.5				
	$\log_a y + 3\log_a 2 = 6\log_a a$	0.5				
	$\log_a y + 3\log_a 2 = 6$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
23 (3marks)	$f'(x) = 2x - 6$	1	-	Knowledge	Differentiation	138
	$f(x)$ is decreasing when $f'(x) \leq 0$ for all values of x on $a < x < b$					
	$\therefore 2x - 6 \leq 0$	1				
	$2x \leq 6$	0.5				
	$x \leq 3$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
24 (5marks)	$\frac{dy}{dx} = 4 - 2x$	1	-	Application	Differentiation	140
	$\frac{dy}{dx} = 0 \rightarrow 4 - 2x = 0$	0.5				
	$x = 2$	0.5				
	When $x = 2$, $y = 8 - 4 = 4$	0.5				
	(2,4) is a stationary point					
		0.5+0.5+0.5				
	(2,4) is a local maximum point	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
24 (5marks)	$\frac{dy}{dx} = 4 - 2x$	1	**Alternative solution**	Application	Differentiation	140
	$\frac{dy}{dx} = 0 \rightarrow 4 - 2x = 0$	0.5				
	$x = 2$	0.5				
	When $x = 2$, $y = 8 - 4 = 4$	0.5				
	(2,4) is a stationary point					
	$\frac{d^2y}{dx^2} = -2$	1				
	at $x = 2 \rightarrow \frac{d^2y}{dx^2} = -2 < 0$	0.5				
	(2,4) is a local maximum point	1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
25 (2marks)	$\frac{dy}{dx} = 3x^2 - 12$	0.5	-	Reasoning	Differentiation	141
	$\frac{d^2y}{dx^2} = 6x$	0.5				
	at $x = b \rightarrow \frac{d^2y}{dx^2} = 6b = 12$	0.5				
	$\therefore b = 2$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
26 (**5**marks)	The lower quartile = 20	1	-	Knowledge	Measures of location and spread	13 + 16
	The median= 26	1				
	The upper quartile = 37	1				
	The Range = 62 − 12 = 50	1 1				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
27 a) (**4**marks)	$n = 26$		-	Application	Measures of location and spread	13
	Q_1 is the $\frac{n}{4}$th of 26 $= \frac{26}{4} = 6.5$th value	0.5				
	$\therefore Q_1 = \frac{2+2}{2} = 2$	0.5+0.5				
	Q_3 is the $\frac{3n}{4}$th of 26 $= \frac{3\times26}{4} = 19.5$th value	0.5				
	$\therefore Q_3 = \frac{8+8}{2} = 8$	0.5+0.5				
	$\because \text{IQR} = Q_3 - Q_1$					
	$\therefore \text{IQR} = 8 - 2 = 6$	0.5+0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
27 b) (4marks)	<table><tr><th>Class interval</th><th>Frequency f</th><th>Midpoint x</th><th>fx</th><th>fx^2</th></tr><tr><td>$1-3$</td><td>8</td><td>2</td><td>16</td><td>32</td></tr><tr><td>$4-6$</td><td>22</td><td>5</td><td>110</td><td>550</td></tr><tr><td>$7-9$</td><td>6</td><td>8</td><td>48</td><td>384</td></tr><tr><td>$10-12$</td><td>9</td><td>11</td><td>99</td><td>1089</td></tr><tr><td>Total</td><td>45</td><td></td><td>274</td><td>2055</td></tr></table>	0.5 0.5 0.5 0.5+0.5	-	Application	Measures of location and spread	19
	$\text{Variance} = \sigma^2 = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$					
	$\therefore \sigma^2 = \frac{2055}{45} - \left(\frac{274}{45}\right)^2$	1				
	$\therefore \sigma^2 \simeq 8.59$	0.5				

Item # \ Total Mark	Answer	Step Mark	Instruction	Taxonomy	Chapter	Page
28 (3marks)	$\bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$		-	Reasoning	Measures of location and spread	9
	$7.6 = \frac{15 \times 4.2 + 20 \bar{x}_2}{15 + 20}$	1				
	$7.6 \times 35 = 63 + 20 \bar{x}_2$	0.5+0.5				
	$20 \bar{x}_2 = 203$					
	$\bar{x}_2 = \frac{203}{20} = 10.15$	1				

"End of the Answer scheme"

Sultanate of Oman
Ministry of Education

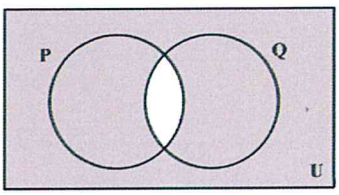
Answer Scheme

Applied Mathematics – Grade 12

Academic Year 2022-2023: First Semester-First Session

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Question One: (Multiple choice) **[14 marks]**
Each item carries 1 marks

Item #	Answer	Taxonomy	Topic	Page
1	7	Knowledge	Sequences & Series	400
2	3	Knowledge	Sequences & Series	404
3	-4	Application	Sequences & Series	412
4	10.40	Knowledge	Financial Mathematics	425
5	585	Knowledge	Financial Mathematics	427
6	52590.19	Application	Financial Mathematics	433
7	18.35%	Reasoning	Financial Mathematics	445
8	$\frac{1}{8}$	Knowledge	Probability	464
9	0.93	Knowledge	Probability	465
10	$\frac{2}{3}$	Application	Probability	466
11	0.8	Reasoning	Probability	484+485
12	$x \leq -2$	Knowledge	Logic	498
13	$p \veebar q$	Application	Logic	501
14		Application	Logic	500

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	***2 marks*** **Since the sequence $5, 8, 11, 14, \ldots$ is arithmetic** $\therefore u_1 = 5$ $d = 8 - 5 = 3$ or $d = 11 - 8 = 3$ or $d = 14 - 11 = 3$	1 1	Knowledge	Sequences & Series	401

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
16	***6 marks***		Application	Sequences & Series	408
	$u_1 = 9000$	1			
	$r = 1 + 0.08 = 1.08$	1			
	$n = 3$	1			
	$\therefore$ **The compound interest at the end of 3 years =** u_4				
	Since $u_{n+1} = u_1 \times r^n$				
	$\therefore u_4 = u_{3+1}$	0.5			
	$= 9000 \times (1.08)^3$	0.5+0.5+0.5			
	$= \$\,11337.408$	1			
	• **Remark:** If the student substitutes the values of u_1, r, n directly on the formula $u_{n+1} = u_1 \times r^n$, then the student gets 4.5 marks **directly**				

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
17		*3 marks*	Reasoning	Sequences & Series	415
	$S_2 = u_1 + u_2$	1			
	$2 = -1 + u_2$	0.5			
	$u_2 = 2 + 1 = 3$	0.5			
	$\therefore r = \frac{u_2}{u_1} = \frac{3}{-1} = -3$	1			
	Alternative Solution Since $u_1 = -1$ and $S_2 = 2$ $\because S_n = \frac{u_1 (r^n - 1)}{r - 1}$				
	$\therefore 2 = \frac{-1 \times (r^2 - 1)}{r - 1}$	1			
	$\therefore -2 = \frac{(r-1)(r+1)}{(r-1)}$	1			
	$\Rightarrow -2 = r + 1$	0.5			
	$\therefore r = -3$	0.5			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
18	***5 marks***		Knowledge	Financial Mathematics	432
	a) $r = 7\%$	1			
	b) $n = 1 \times 4 = 4$	1			
	c) $Y = \$9175.57 - \$8575.30 = \$600.27$ (or $\$8575.30 \times 0.07 \times 1 \simeq \$\,600.27$)	1+0.5			
	d) The total interest earned = final balance – principal				
	$= \$9175.57 - \$7000$	1			
	$= \$2175.57$	0.5			
	(or The total interest earned $= 490 + 524.30 + 561 + 600.27$ $= \$2175.57$)				

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
19	***5 marks***		Application	Financial Mathematics	424
	220 rupees = 400 yen	1			
	x rupees = 45 yen	1			
	$\therefore x = \frac{220 \times 45}{400}$	1+1			
	$= 24.75$ rupees	1			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
20	***5 marks*** **Cost of travellers cheques** $= \frac{\text{amount of foreign currency}}{\text{selling exchange rate}} \times 101\ \%$ $\therefore 7894.39 = \frac{4500}{x} \times 1.01$ $\Rightarrow x = \frac{4500 \times 1.01}{7894.39}$ $\therefore x \simeq 0.576$	1+1+1+1 0.5 0.5	Application	Financial Mathematics	426

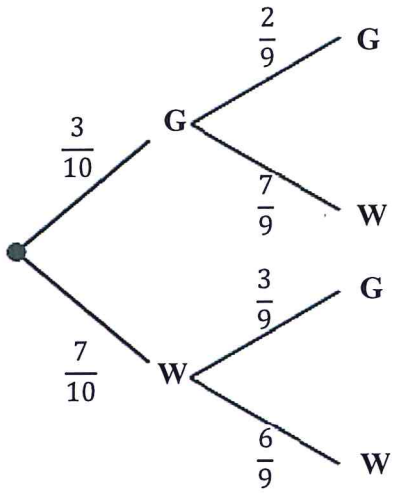
Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
21		***3 marks***	Reasoning	Financial Mathematics	441
	$r = (1+i)^c - 1$				
	$0.086 = (1+i)^2 - 1$	0.5+0.5			
	$1.086 = (1+i)^2$	0.5			
	$\therefore \sqrt{1.086} = \sqrt{(1+i)^2}$	0.5			
	$\therefore 1 + i \simeq 1.042 \quad \Rightarrow \quad i \simeq 0.042$	1			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
22	Sample Space = {HH, HT, TH, TT}	*4 marks* 1+1+1+1	Knowledge	Probability	462

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
23	 P(at least one marbles is white)=P(GW or WG or WW) $= \frac{3}{10} \times \frac{7}{9} + \frac{7}{10} \times \frac{3}{9} + \frac{7}{10} \times \frac{6}{9}$ $= \frac{21}{90} + \frac{21}{90} + \frac{42}{90}$ $= \frac{84}{90} \simeq 0.93$	***5 marks*** 1+1+1 0.5+0.5+0.5 0.5	Application	Probability	479
	P (at least one marbles is white) =1- P(No white) = 1- P(GG) $= 1 - \left(\frac{3}{10} \times \frac{2}{9}\right)$ $= 1 - \frac{6}{90} \simeq 0.93$	***5 marks*** 1 1 1+1 1			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
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Item #	Answer	Marks	Taxonomy	Topic	Page
24		***5 marks***	Application	Probability	485
	$P(A \cap B) = \frac{4}{22}$	1			
	$P(B) = \frac{4+11}{22} = \frac{15}{22}$	1+1			
	$P(A\|B) = \frac{P(A \cap B)}{P(B)}$				
	$\therefore P(A\|B) = \frac{4/22}{15/22} = \frac{4}{15}$	1+1			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
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Item #	Answer	Marks	Taxonomy	Topic	Page
25	***3 marks*** Since A and B are independent events $\therefore P(A \cap B) = P(A) \times P(B)$ $\because P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\therefore\ 0.6 = P(A) + 0.4 - 0.4\,P(A)$ $0.6 - 0.4 = (1 - 0.4)\,P(A)$ $\therefore\ P(A) = \frac{0.2}{0.6} = \frac{1}{3}$	0.5+0.5+0.5 1 0.5	Reasoning	Probability	484 + 489

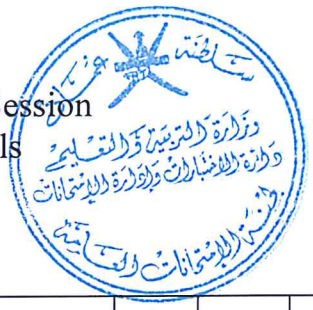
Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
26	p | q | $\neg q$ | $p \wedge \neg q$ T | T | **F** | F T | F | T | **T** F | T | F | F F | F | **T** | F	***3 marks*** 1 mark for each correct letter	Knowledge	Logic	497 + 503

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
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Item #	Answer	Marks	Taxonomy	Topic	Page
27		***4 marks***	Application	Logic	504
	$2 < x < 8$ means: $x < 8$ and $x > 2$	1			
	$\neg(2 < x < 8) = \neg(2 < x \quad \wedge \quad x < 8)$	1			
	$= \neg(2 < x) \vee \neg(x < 8)$	0.5+0.5			
	which means $x \leq 2 \quad or \quad x \geq 8$	0.5+0.5			

Answers Scheme
End of Year Exam 2022-2023: First Semester/First Session
Applied Mathematics – Bilingual Private Schools



<table>
<tr><th>Item #</th><th>Answer</th><th>Marks</th><th>Taxonomy</th><th>Topic</th><th>Page</th></tr>
<tr><td rowspan="2">28</td><td>LHS = $p \vee (\neg p \wedge q)$
$= (p \vee \neg p) \wedge (p \vee q)$
$= \mathrm{U} \wedge (p \vee q)$
$= p \vee q$
$=$ RHS</td><td>3 marks

1
1
1</td><td rowspan="2">Reasoning</td><td rowspan="2">Logic</td><td rowspan="2">503</td></tr>
<tr><td><u>Alternative Solution:</u>
Prove using truth table
<table>
<tr><th>p</th><th>q</th><th>$\neg p$</th><th>$\neg p \wedge q$</th><th>$p \vee (\neg p \wedge q)$</th><th>$p \vee q$</th></tr>
<tr><td>T</td><td>T</td><td>F</td><td>F</td><td>T</td><td>T</td></tr>
<tr><td>T</td><td>F</td><td>F</td><td>F</td><td>T</td><td>T</td></tr>
<tr><td>F</td><td>T</td><td>T</td><td>T</td><td>T</td><td>T</td></tr>
<tr><td>F</td><td>F</td><td>T</td><td>F</td><td>F</td><td>F</td></tr>
</table>
$\therefore\ p \vee (\neg p \wedge q) = p \vee q$</td><td>3 marks</td></tr>
</table>

"End of the Answer scheme"

SULTANATE OF OMAN
MINISTRY OF EDUCATION
GENERAL EDUCATION DIPLOMA
BILINGUAL PRIVATE SCHOOLS
End of First Semester Exam– First Session– Applied Mathematics – 2021/2022

Marking Guide

Part One: (Multiple choice): 14 × 1 = 14 marks

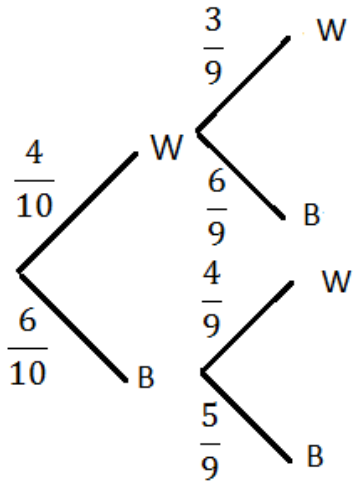
Item No.	Answer	Page(s)	Topic	Cognitive domain
1	5n-1	400	Sequence	Knowledge
2	13604.89	408	Sequence	Application
3	685	413	Sequence	Application
4	5	415	Sequence	Reasoning
5	10.80	425	Financial Mathematics	Knowledge
6	$5484.38	444	Financial Mathematics	Knowledge
7	4	429	Financial Mathematics	Application
8	$5000	426	Financial Mathematics	Application
9	10.6%	445	Financial Mathematics	Reasoning
10	$\frac{1}{6}$	465	Probability	Knowledge
11	0.8	485	Probability	Application
12	$\frac{1}{8}$	477	Probability	Application
13	0.14	485	Probability	Application
14	$\frac{31}{32}$	471	Probability	Reasoning

Part two: Extended Response:

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
15	$u_1 = 20 - (-3)^1$ $= 20 + 3$ $= 23$ $u_2 = 20 - (-3)^2$ $= 20 - 9$ $= 11$	5 marks 1 1 0.5 1 1 0.5	Sequence	401	Knowledge
16	u_1=3000 r=1+0.05=1.05 n=2006-1998=8 $u_{n+1}=u_1 \times r^n$ $u_9=3000\times(1.05)^8$ = 4432.4≈4433 koalas	5 marks 1 1 1+1 1	Sequence	420	Application
17	The sum of the first n odd numbers is an arithmetic series with u_1=1 and d=2 $S_n = \frac{n}{2}(2u_1 + (n-1)d)$ $S_n = \frac{n}{2}\big(2 + 2(n-1)\big) = \frac{n}{2}(2 + 2n - 2)$ $S_n = \frac{n}{2} \times 2n = n^2$	3 marks 1 1 1	Sequence	414	Reasoning
18	(a)The interest rate per compound period (r) is 6% (b) The number of periods (n) is 1×5=5 (c) x= 10099.82 (d) The final balance (A)= &10099.82+$605.99=$10705.81	6 marks 1 1+1 1 1+1	Financial Mathematics	431	Knowledge

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
19	6 marks a) From the table, the monthly repayments on each \$1000 for 3 years (36 months) at 10.0%p.a.$= \$32.2672 \times 18 = \$580.8096$ per month b) Total repayments$= \$\$580.8096 \times 36$ $= \$20909.1456$ c) Interest $= \$20909.1456 - \$18000$ $= \$2909.1456$	1 1 1 1 1 1	Financial Mathematics	446	Application
20	6 marks $100\ euro \rightarrow 150$ Australian dollars $1\ euro \rightarrow$? Australian dollars $1\ euro = \frac{150}{100}$ $= 1.50$Australian dollars 500 euro is equivalent to 750 Australian dollars So the person cannot afford to buy the item.	1 1+1 1 1 1	Financial Mathematics	424	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
21	$i = \frac{0.068}{12} = 0.0057$ $r = (1 + 0.0057)^{12} - 1$ $r = 0.0706$ .... *i.e.*. effective rate 7.06%p.a $i = \frac{0.069}{4} = 0.01725$ $r = (1 + 0.01725)^{4} - 1$ $r = 0.0708$ ... . *i.e.*. effective rate 7.08%p.a. Thus, the better rate for an investment is 6.9% p.a. compound quarterly.	4 marks 0.5 0.5 0.5 0.5 0.5 0.5 1	Financial Mathematics	441	Reasoning
22	a) $\frac{4}{36} = \frac{1}{9}$ b) $\frac{2}{36} = \frac{1}{18}$	2 Marks 1 1	Probability	468	Knowledge
23	Sample space={HH,TH,HT,TT}	4 Marks 1+1+1+1	Probability	462	Knowledge

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
24	a)  b) $P(WW) = \frac{4}{10} \times \frac{3}{9}$ $= \frac{12}{90} = \frac{2}{15}$	7 marks 3 marks (0.5 for each branch) 1+1+1 1	Probability	478	Application

Q. No.	Answer	Mark	Topic	Page	Cognitive domain
25	T: represents students who like tea C: represents students who like coffee $P(T) = \frac{60}{100} = \frac{3}{5}, P(C) = \frac{50}{100} = \frac{1}{2}$ $P(T \cup C) = \frac{80}{100} = \frac{4}{5}$ $P(T \cap C) = \frac{60}{100} + \frac{50}{100} - \frac{80}{100}$ $P(T \cap C) = \frac{30}{100} = \frac{3}{10}$ $P(T\|C) = \frac{\frac{3}{10}}{\frac{1}{2}}$ $P(T\|C) = \frac{3}{5}$	4 marks 0.5+0.5+0.5 0.5 0.5+0.5 1	Probability	486	Application
26	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $0.6 = (0.2 + 0.3) + (0.3 + a) - 0.3$ $0.6 = 0.5 + a$ $a = 0.1$	4 marks 0.5+0.5+0.5+0.5 1 1	Probability	484	Reasoning

(End of the Marking Guide)