Second Semester

Pure Mathematics

(الرياضيات البحتة)

(Answers)

Sultanate of Oman
Ministry of Education

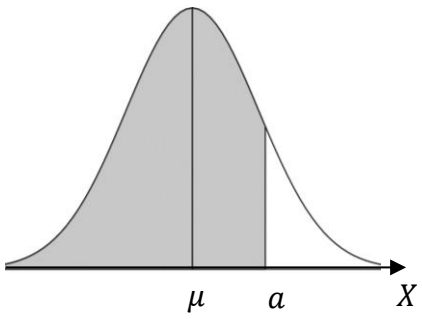
Diploma, Bilingual Private Schools, Pure Mathematics

Second Semester-First Session
Academic Year: 2022/2023

Answer Scheme

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

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

Item #	Answer	Taxonomy	Topic	Page
1	$1 + \log x$	Knowledge	Log. & Exponential Functions (PM2&3*)	38
2	$\log_a 3$	Knowledge	Log. & Exponential Functions (PM2&3*)	41+42
3	2	Application	Log. & Exponential Functions (PM2&3*)	52+53
4	$-\frac{1}{3}\cos 3x + c$	Knowledge	Integration (PM2&3*)	127
5	$2\,e^{2x} + c$	Knowledge	Integration (PM2&3*)	128
6	$\frac{1}{5}\ln\lvert 5x - 2\rvert + c$	Knowledge	Integration (PM2&3*)	129
7	$\tan^{-1}\frac{x}{8} + c$	Application	Integration (PM2&3*)	137
8	3	Reasoning	Integration (PM2&3*)	142
9	-1	Knowledge	Vectors (PM2&3*)	178
10	66.8°	Application	Vectors (PM2&3*)	191
11	$\frac{1}{\sqrt{65}}\mathbf{i} - \frac{8}{\sqrt{65}}\mathbf{j}$	Application	Vectors (PM2&3*)	190 + 193
12		Knowledge	Normal Distribution (P&S1*)	132
13	0.4090	Application	Normal Distribution (P&S1*)	128
14	71	Reasoning	Normal Distribution (P&S1*)	136

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	$\ln\left(\frac{a}{b}\right) = \ln a - \ln b$ $= 5 - 3$ $= 2$	***2 marks*** 0.5+0.5 1	Knowledge	Log. & Exponential Functions	50

Item #	Answer	Marks	Taxonomy	Topic	Page
16	***3 marks*** $e^{2x} = 9$ Take the natural logarithm both side $\ln e^{2x} = \ln 9$ $2x \ln e = \ln 9$ $2x = \ln 9$ $x = \frac{\ln 9}{2} \simeq 1.0986$	0.5 0.5 + 0.5 0.5 0.5 0.5	Application	Log. & Exponential Functions	50

Item #	Answer	Marks	Taxonomy	Topic	Page
17	***4 marks*** Take logarithms of both sides $\log 4^{x+1} < \log 64$ $(x+1)\log 4 < \log 64$ $x+1 < \frac{\log 64}{\log 4}$ $x+1 < 3$ $x < 3-1$ $x < 2$	0.5+0.5 0.5 0.5 0.5 0.5 1	Application	Log. & Exponential Functions	53
	<u>Alternative solution:</u> $4^{x+1} < 4^3$ $\log 4^{x+1} < \log 4^3$ $(x+1)\log 4 < 3\log 4$ $x+1 < 3$ $x < 2$	***4 marks*** 0.5 0.5+0.5 0.5+0.5 0.5 1			

Item #	Answer	Marks	Taxonomy	Topic	Page
18		***3marks***	Reasoning	Log. & Exponential Functions	43
	$\log_n a = 1.5$, $n^{1.5} = a$	1			
	$\log_n b = 2.5$, $n^{2.5} = b$	1			
	$L\text{HS} = na$				
	$= n.n^{1.5}$	0.5			
	$= n^{2.5} = b = \text{RHS}$	0.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
19	***5 marks*** $\int_0^8 f(x)\,dx$ $\approx \frac{1}{2} \times 2\,(12.2 + 2(17.8 + 21.4 + 23.3) + 24.5)$ $= 161.7$	1+0.5+0.5+0.5+0.5+0.5+0.5 1	Knowledge	Integration	125

Item #	Answer	Marks	Taxonomy	Topic	Page
20	***6 marks***		Application	Integration	139
	$\frac{3x-6}{(x-2)(x+2)} \equiv \frac{A}{(x-2)} + \frac{B}{(x+2)}$	1			
	$\frac{3x-6}{(x-2)(x+2)} = \frac{A(x+2)+B(x-2)}{(x-2)(x+2)}$				
	Equate the numerators				
	$3x-6 = A(x+2)+B(x-2)$	1			
	If $x = 2 \longrightarrow 4A = 0 \longrightarrow A = 0$	0.5+0.5			
	If $x = -2 \longrightarrow -4B = -12 \longrightarrow B = 3$	0.5+0.5			
	$\therefore \int \frac{3x-6}{(x-2)(x+2)}\,\mathrm{d}x = \int \left(\frac{3}{x+2}\right)\mathrm{d}x$	1			
	$= 3\ln\lvert x+2\rvert + c$	1			
	Remark: If the student uses another method correctly rather than partial fraction integration→ will get 3 marks out of 6 marks only.				

Item #	Answer	Marks	Taxonomy	Topic	Page
21	**Let** $u = x + 1$ $\quad$ $\mathrm{d}v = \cos x \ \mathrm{d}x$ $\mathrm{d}u = \mathrm{d}x$ $\quad$ $v = \sin x$ **Integrating by parts** $\int \mathrm{u} \frac{dv}{dx} \mathrm{d}x = uv - \int v \frac{\mathrm{d}u}{\mathrm{d}x} \mathrm{d}x$ $\int (x+1) \cos x \ \mathrm{d}x$ $= (x+1) \sin x - \int \sin x \ \mathrm{d}x$ $= (x+1) \sin x - (-\cos x) + c$ $= (x+1) \sin x + \cos x + c$	***6 marks*** 0.5 + 0.5 0.5 + 0.5 1+1 1 1	Application	Integration	148

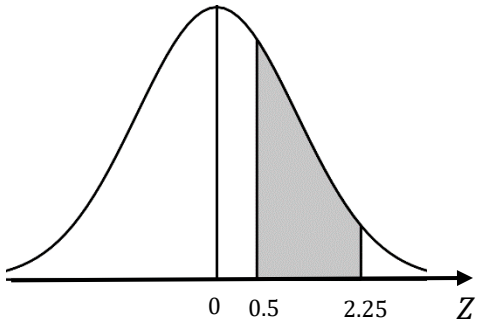
Item #	Answer	Marks	Taxonomy	Topic	Page
22	***4 marks*** **LHS** $= \int_0^1 \frac{1-e^x}{e^x}\ \mathrm{d}x$ $= \int_0^1 \frac{1}{e^x} - \frac{e^x}{e^x}\ \mathrm{d}x$ $= \int_0^1 e^{-x} - 1\ \mathrm{d}x$ $= [-e^{-x} - x]_0^1$ $= (-e^{-1} - 1) - (-1 - 0)$ $= -\frac{1}{e}$ = **RHS**	0.5+0.5 0.5+0.5 0.5+0.5 0.5+0.5	Reasoning	Integration	138

Item #	Answer	Marks	Taxonomy	Topic	Page
23	***3marks*** $(4\mathbf{i}-8\mathbf{j}+9\mathbf{k})-(2\mathbf{i}+7\mathbf{j}+6\mathbf{k})$ $=(4-2)\mathbf{i}+(-8-7)\mathbf{j}+(9-6)\mathbf{k}$ $=2\mathbf{i}-15\mathbf{j}+3\mathbf{k}$	0.5+0.5+0.5 0.5+0.5+0.5	Knowledge	Vectors	179

Item #	Answer	Marks	Taxonomy	Topic	Page
24	***4 marks*** $d^2 = (10-2)^2 + (1+5)^2 + (3-6)^2$ $d^2 = (8)^2 + (6)^2 + (-3)^2$ $d^2 = 64 + 36 + 9$ $d^2 = 109$ $d = \sqrt{109} \approx 10.44$	0.5+0.5+0.5 0.5+0.5+0.5 0.5 0.5	Application	Vectors	194

Item #	Answer	Marks	Taxonomy	Topic	Page
25	$\mathbf{m} + 7\mathbf{n} = \begin{pmatrix}10\\4\end{pmatrix} + 7\begin{pmatrix}-4\\-1\end{pmatrix}$ $= \begin{pmatrix}10-28\\4-7\end{pmatrix}$ $= \begin{pmatrix}-18\\-3\end{pmatrix}$ $= -18\mathbf{i} - 3\mathbf{j}$ $= -3(6\mathbf{i} + \mathbf{j})$	***2marks*** 0.5 0.5 0.5 0.5	Reasoning	Vectors	197

Item #	Answer	Marks	Taxonomy	Topic	Page
26		***4 marks***	Knowledge	Normal Distribution	119 + 120
	$\mu = 100$	1			
	$\sigma = 110 - 100 = 10$	1			
	Area under the curve $= 1$	1			
	The percentage of area lies below the mean $= 50\ \%$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
27	***7 marks***		Application	Normal Distribution	133
	Since $X \sim \mathrm{N}(70, 8^2) \quad \rightarrow \quad \mu = 70, \sigma = 8$	0.5+0.5			
	$\mathrm{P}(74 \leq X \leq 88)$				
	$= \mathrm{P}\left(\frac{74-70}{8} \leq Z \leq \frac{88-70}{8}\right)$	1+1			
	$= \mathrm{P}(0.5 \leq Z \leq 2.25)$	0.5+0.5			
					
	$= \mathrm{P}(Z \leq 2.25) - \mathrm{P}(Z \leq 0.5)$	0.5 + 0.5			
	$= 0.9878 - 0.6915$	0.5 + 0.5			
	$= 0.2963$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
28	***3 marks*** **Since** $\mathrm{P}(X \leq 68) = 0.7881$ $\therefore \mathrm{P}\left(Z \leq \frac{68-\mu}{\sigma}\right) = 0.7881$ From the table → $z = 0.8$ $z = \frac{68-\mu}{\sigma} \quad \rightarrow \quad 0.8 = \frac{68-\mu}{25}$ $0.8 \times 25 = 68 - \mu$ $20 = 68 - \mu$ $\therefore \mu = 68 - 20 \longrightarrow \mu = 48$	 0.5 1 0.5 0.5 + 0.5	Reasoning	Normal Distribution	139

"End of the Answer scheme"

Sultanate of Oman
Ministry of Education

Diploma, Bilingual Private Schools, Pure Mathematics

Second Semester-Second Session
Academic Year: 2022/2023

Answer Scheme

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

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

Each item carries 1 mark

Item #	Answer	Taxonomy	Topic	Page
1	$-\log x$	Knowledge	Log. & Exponential Functions (PM2&3*)	40
2	$\log_a 8$	Knowledge	Log. & Exponential Functions (PM2&3*)	41+42
3	$\frac{5}{3}$	Application	Log. & Exponential Functions (PM2&3*)	52
4	$\frac{1}{7}$	Knowledge	Integration (PM2&3*)	127
5	$8\tan x + c$	Knowledge	Integration (PM2&3*)	132
6	$\ln\lvert 4x-3\rvert + c$	Knowledge	Integration (PM2&3*)	137
7	$\tan^{-1}\frac{x}{5} + c$	Application	Integration (PM2&3*)	136
8	5	Reasoning	Integration (PM2&3*)	142
9	1	Knowledge	Vectors (PM2&3*)	178
10	59.74°	Application	Vectors (PM2&3*)	190
11	$\sqrt{20}$	Application	Vectors (PM2&3*)	190
12	120	Knowledge	Normal Distribution (P&S1*)	120
13	0.4364	Application	Normal Distribution (P&S1*)	130
14	58	Reasoning	Normal Distribution (P&S1*)	136

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

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	$\ln(ab) = \ln a + \ln b$ $= 16 + 2$ $= 18$	*2 marks* 0.5+0.5 1	Knowledge	Log. & Exponential Functions	50

Item #	Answer	Marks	Taxonomy	Topic	Page
16		*3 marks*	Application	Log. & Exponential Functions	50
	Since $2\,e^{4x} = 10 \rightarrow \therefore\ e^{4x} = 5$	0.5			
	Take the natural logarithm both side				
	$\ln e^{4x} = \ln 5$	0.5 +0.5			
	$4x \ln e = \ln 5$	0.5			
	$4x = \ln 5$	0.5			
	$x = \frac{\ln 5}{4}$	0.5			
	$x \simeq 0.40$				

	Answer	Marks	Taxonomy	Topic	Page
17	$6^{x-2} < 216$ Take logarithms of both sides $\log 6^{x-2} < \log 216$ $(x-2)\log 6 < \log 216$ $x - 2 < \dfrac{\log 216}{\log 6}$ $x - 2 < 3$ $x < 3 + 2$ $x < 5$ **Alternative solution:** $6^{x-2} < 6^3$ $\log 6^{x-2} < \log 6^3$ $(x-2)\log 6 < 3\ \log 6$ $x - 2 < 3$ $x < 5$	*4 marks* 0.5+05 0.5 0.5 0.5 0.5 1 *4 marks* 0.5 0.5+0.5 0.5 1 1	Application	Log. & Exponential Functions	53

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

Item #	Answer	Marks	Taxonomy	Topic	Page
18		*3marks*	Reasoning	Log. & Exponential Functions	40
	$\text{LHS} = \frac{\log 343}{\log 49} = \frac{\log 7^3}{\log 7^2}$	0.5+0.5			
	$= \frac{3 \log 7}{2 \log 7}$	0.5+0.5			
	$= \frac{3}{2}$ $= \text{RHS}$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
19	$\int_2^{10} f(x)\,dx$ $\approx \frac{1}{2} \times 2\,(10.5 + 2(15.5 + 18.4 + 20.2) + 22.4)$ $=141.1$	***5 marks*** 1+0.5+0.5+0.5+0.5+ 0.5+0.5 1	Knowledge	Integration	125

Item #	Answer	Marks	Taxonomy	Topic	Page
20	***6 marks***		Application	Integration	139
	$\frac{6x-18}{(x+1)(x-3)} \equiv \frac{A}{(x+1)} + \frac{B}{(x-3)}$	1			
	$\frac{6x-18}{(x+1)(x-3)} = \frac{A(x-3)+B(x+1)}{(x+1)(x-3)}$	1			
	Equate the numerators				
	$6x-18 = A(x-3)+B(x+1)$	1			
	If $x = 3 \longrightarrow 4B = 0 \longrightarrow B = 0$	0.5			
	If $x = -1 \longrightarrow -4A = -24 \longrightarrow A = 6$	0.5			
	$\therefore \int \frac{6x-18}{(x+1)(x-3)}\,dx = \int \left(\frac{6}{x+1}\right) dx$	1			
	$= 6\ln\lvert x+1\rvert + c$	1			
	Remark: If the student uses another method correctly rather than partial fraction integration→ will get 3 marks out of 6 marks only.				

Item #	Answer	Marks	Taxonomy	Topic	Page
21	***6 marks*** **Let** $u = x$ $\quad$ $\mathrm{d}v = \cos x \ \mathrm{d}x$ $\mathrm{d}u = \mathrm{d}x$ $\quad$ $v = \sin x$ **Integrating by parts** $\int x \cos x \ \mathrm{d}x = uv - \int v \frac{\mathrm{d}u}{\mathrm{d}x} \mathrm{d}x$ $= x \sin x - \int \sin x \ \mathrm{d}x$ $= x \sin x - (-\cos x) + c$ $= x \sin x + \cos x + c$	0.5 + 0.5 0.5 + 0.5 1+1 1 1	Application	Integration	148

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

Item #	Answer	Marks	Taxonomy	Topic	Page
22	***4 marks***		Reasoning	Integration	138
	LHS $= \int_0^1 \frac{e^{-x}+1}{e^{-x}}\ dx$				
	$= \int_0^1 \frac{e^{-x}}{e^{-x}} + \frac{1}{e^{-x}}\ dx$	0.5+0.5			
	$= \int_0^1 1 + e^{x}\ dx$	0.5+0.5			
	$= [\boldsymbol{x + e^{x}}]_{\boldsymbol{0}}^{\boldsymbol{1}}$	0.5+0.5			
	$= (\boldsymbol{1 + e}) - (\boldsymbol{0 + 1})$	0.5+0.5			
	$= \boldsymbol{e}$ = **RHS**				

Answers Scheme

End of Year Exam 2022-2023: Second Semester/Second Session

Pure Mathematics – Bilingual Private Schools

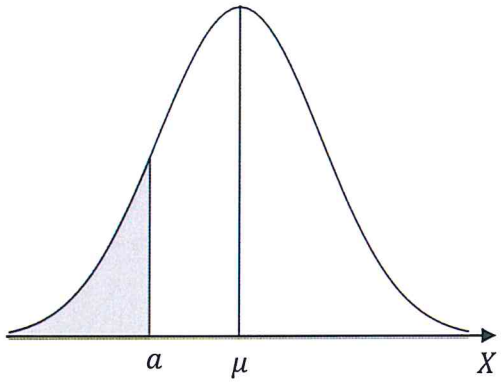
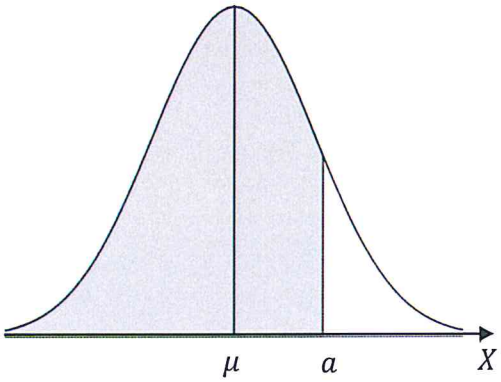
Item #	Answer	Marks	Taxonomy	Topic	Page
23	$\begin{pmatrix} 6 \\ -2 \\ 11 \end{pmatrix} + \begin{pmatrix} 3 \\ 8 \\ -1 \end{pmatrix}$ $= \begin{pmatrix} 6+3 \\ -2+8 \\ 11+(-1) \end{pmatrix}$ $= \begin{pmatrix} 9 \\ 6 \\ 10 \end{pmatrix}$	*3marks* 0.5+0.5+0.5 0.5+0.5+0.5	Knowledge	Vectors	179

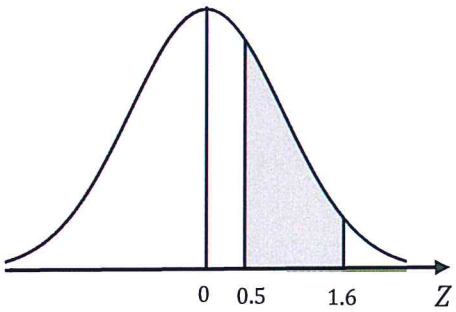
Answers Scheme
End of Year Exam 2022-2023: Second Semester/Second Session
Pure Mathematics – Bilingual Private Schools

Item #	Answer	Marks	Taxonomy	Topic	Page
24		***4 marks***	Application	Vectors	193
	Magnitude $= \sqrt{(2)^2 + (5)^2}$	0.5+0.5			
	$= \sqrt{29}$	1			
	$\therefore$ The unit vector $= \frac{1}{\sqrt{29}}(2\mathbf{i} - 5\mathbf{j})$	0.5+0.5			
	$= \frac{2}{\sqrt{29}}\mathbf{i} - \frac{5}{\sqrt{29}}\mathbf{j}$	0.5+0.5			

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

Item #	Answer	Marks	Taxonomy	Topic	Page
25		*2marks*	Reasoning	Vectors	197
	$\mathbf{m} + 7\mathbf{n} = (9\mathbf{i} - 4\mathbf{j}) + 7(3\mathbf{i} + 2\mathbf{j})$	0.5			
	$= 9\mathbf{i} - 4\mathbf{j} + 21\mathbf{i} + 14\mathbf{j}$	0.5			
	$= 30\mathbf{i} + 10\mathbf{j}$	0.5			
	$= 10(3\mathbf{i} + \mathbf{j})$	0.5			

Item #	Answer	Marks	Taxonomy	Topic	Page
26	i) 	***4 mark*** 2 (1 mark for the position of a + 1 mark for the correct shaded area)	Knowledge	Normal Distribution	132 + 136
	ii) 	2 (1 mark for the position of a + 1 mark for the correct shaded area)			

Item #	Answer	Marks	Taxonomy	Topic	Page
27	***7 marks***		Application	Normal Distribution	133
	Since $X \sim \mathrm{N}(65, 10^2) \rightarrow \mu = 65, \sigma = 10$	0.5+0.5			
	$\mathrm{P}(70 \leq X \leq 81)$				
	$= \mathrm{P}\left(\frac{70-65}{10} \leq Z \leq \frac{81-65}{10}\right)$	1 + 1			
	$= \mathrm{P}(0.5 \leq Z \leq 1.6)$	0.5+0.5			
					
	$= \mathrm{P}(Z \leq 1.6) - \mathrm{P}(Z \leq 0.5)$	0.5 + 0.5			
	$= 0.9452 - 0.6915$	0.5 + 0.5			
	$= 0.2537$	1			

Item #	Answer	Marks	Taxonomy	Topic	Page
28		*3 marks*	Reasoning	Normal Distribution	141
	Since $\mathrm{P}(X \leq 92) = 0.9938$				
	$\therefore \mathrm{P}\left(Z \leq \frac{92-\mu}{\sigma}\right) = 0.9938$				
	From the table → $\therefore z = 2.50$	0.5			
	$z = \frac{92-\mu}{\sigma} \quad \rightarrow \quad 2.50 = \frac{92-72}{\sigma}$	1			
	$\sigma \times 2.50 = 92 - 72$	0.5			
	$\therefore \sigma = \frac{92-72}{2.50} \quad \rightarrow \quad \sigma = 8$	1			

"End of the Answer scheme"

Sultanate of Oman
Ministry of Education

Answer scheme
Pure Mathematics
(Second semester)
(First session)

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

Item #	Answer	Taxonomy	Topic	Page
1	$y = -2$	Knowledge	Function e^x and $\ln x$	93
2	1	Application	Function e^x and $\ln x$	95
3	$e, 2e$	Reasoning	Function e^x and $\ln x$	95
4	$\frac{1}{x}$	Knowledge	Differentiation	114
5	$(-1, -2)$	Application	Differentiation	107
6	$5x^4 \sin 2x + 2x^5 \cos 2x$	Application	Differentiation	131
7	$4(e^x - e^{-x})(e^x + e^{-x})$	Reasoning	Differentiation	111
8	x	Knowledge	Further Differentiation	202
9	-1	Application	Further Differentiation	205
10	1	Reasoning	Further Differentiation	207
11	$\ln 2$	Knowledge	Integration	258
12	$\frac{1}{16}(1 + x^2)^8 + c$	Application	Integration	264
13	$2(e^3 - 1)$	Application	Integration	267
14	1	Reasoning	Integration	259

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	$e^{4x+1} = 28$ Taking ln both sides $\ln(e^{4x+1}) = \ln 28$ $4x + 1 = \ln 28$ $4x = (\ln 28) - 1$ $x = \dfrac{(\ln 28) - 1}{4}$ $x = 0.58$	***4marks*** 1 1 1 0.5 0.5	Knowledge	Function e^x and $\ln x$	95
16	$f(x) = e^{3x+2} - 5.$ $y = e^{3x+2} - 5$ $x = e^{3y+2} - 5$ $x + 5 = e^{3y+2}$ $\ln(x + 5) = 3y + 2$ $\ln(x + 5) - 2 = 3y$ $y = \dfrac{\ln(x + 5) - 2}{3}$	***5marks*** 1 1 1 1 1	Application	Function e^x and $\ln x$	94

17	Since the graphs cut the y-axis ($x = 0$) using $f(x) = 1 + e^x$ $f(0) = 1 + e^0 = 2$ and $f(x) = 1 + e^{-x}$ $f(0) = 1 + e^0 = 2$ So $B\ (0, 2)$	***2 marks*** 0.5 0.5 0.5 0.5	Reasoning	Function e^x and $\ln x$	94
18	$y = 2x \tan x + \sin x + 10x - 8$ $\frac{dy}{dx} = 2 \tan x + 2x\ sec^2 x + \cos x + 10 - 0$	***5marks*** 1+1+1+1+1	Knowledge	Differentiation	134
19	$f(x) = \frac{(x-5)}{3x}$ $f'(x) = \frac{3x(1) - 3(x-5)}{9x^2}$ $f'(x) = \frac{3x - 3x + 15}{9x^2} = \frac{15}{9x^2}$ $f'(1) = \frac{15}{9(1)^2} = \frac{5}{3}$	***4 marks*** 1+1+1 0.5 0.5	Application	Differentiation	123

20	$y = 3\cos x$ At $x = \frac{\pi}{2}$ then $y = 3\cos\left(\frac{\pi}{2}\right)$ $y = 0$ Point $\left(\frac{\pi}{2}, 0\right)$ $\frac{dy}{dx} = -3\sin x$ The gradient at $x = \frac{\pi}{2}$, $\frac{dy}{dx} = -3\sin\left(\frac{\pi}{2}\right) = -3$ So the gradient of the normal is $\frac{dy}{dx} = \frac{1}{3}$ Equation of the normal $y - y_1 = m(x - x_1)$ $y - 0 = \frac{1}{3}\left(x - \frac{\pi}{2}\right)$ $y = \frac{1}{3}x - \frac{\pi}{6}$ $y = \frac{2x - \pi}{6}$	***4 marks*** 0.5 0.5 1 0.5 0.5 1	Application	Differentiation	138

21	$\frac{d}{dx}\ln\sqrt{(ax+b)} = \frac{9}{ax+2}$ $\frac{d}{dx}\ln((ax+b))^{\frac{1}{2}} = \frac{9}{ax+2}$ $\frac{1}{2}\frac{d}{dx}\ln(ax+b) = \frac{9}{ax+2}$ $\frac{1}{2}\left(\frac{a}{ax+b}\right) = \frac{9}{ax+2}$ $\frac{1}{2}a = 9$ $a = \frac{9*2}{1} = 18$	***4 marks*** 0.5 0.5 1 1 1	Reasoning	Differentiation	115
22	$y(x+1) = 3x^2 + 2$ $y'(x+1) + y = 6x + 0$ $y'(x+1) = 6x - y$ $y' = \frac{6x-y}{(x+1)}$	***4 marks*** 1+1+1 0.5 0.5	Knowledge	Further Differentiation	209

23	$V = L^3$ $\frac{dV}{dt} = 3L^2 \frac{dL}{dt}$ $\frac{dV}{dt} = 96\ cm^3s^{-1}$ and $l = 2\ cm$ $96 = 3(2)^2 \frac{dL}{dt}$ $\frac{dL}{dt} = \frac{96\ cm^3s^{-1}}{12\ cm^2} = 8\ cms^{-1}$	***5 marks*** 1 1 1 1 1	Application	Further Differentiation	213
24	$xy + ax^2 - 2y^2 = 0$ $y + xy' + 2ax - 4yy' = 0$ $y' = \frac{-y - 2ax}{x - 4y}$ The equation of the tangent is $y = x - 1$ at (1,1) $y' = 1$ $1 = \frac{-1 - 2a}{1 - 4}$ $a = 1$	***2 marks*** 1 0.5 0.5	Reasoning	Further Differentiation	205
25	$= \int 7e^{7x}\, dx = 7\frac{e^{7x}}{7} + c$ $= e^{7x} + c$	***4 marks*** 1+1+1 1	Knowledge	Integration	268

26	$y = \int \frac{dy}{dx} dx = \int 4(2x+2)(x^2+2x+3)^3\, dx$ $y = 4\frac{(x^2+2x+3)^4}{4} + c$ $y = (x^2+2x+3)^4 + c$ To find the value c of substitute $(0, 81)$ $81 = (0+0+3)^4 + c$ $81 = 81 + c$ $c = 0$ $y = (x^2+2x+3)^4$	***5 marks*** 1+1+1 1 0.5 0.5	Application	Integration	267
27	$V = \int_0^1 \pi\left(\left(\sqrt{x}\right)^2 - x^2\right) dx$ $V = \pi \int_0^1 (x - x^2) dx$ $V = \pi \left(\frac{x^2}{2} - \frac{x^3}{3}\right)\Big\vert_0^1$ $V = \pi\left[\left(\frac{1}{2} - \frac{1}{3}\right) - (0-0)\right]$ $V = \frac{1}{6}\pi$ cubic units	***6 marks*** 1+1 0.5 1+1 1 0.5	Application	Integration	251
28	$f''(x) = 3e^x$, $f'(0) = 2$ and $f(0) = 3$ $f'(x) = \int 3e^x dx = 3e^x + c$ $f'(0) = 3e^0 + c = 2$ $3 + c = 2 \rightarrow c = -1$ $f(x) = \int (3e^x - 1) dx$ $f(x) = 3e^x - x + c$ $f(0) = 3e^0 - 0 + c$ $3 + c = 3 \rightarrow c = 0$ $f(x) = 3e^x - x$	***2 marks*** 0.5 0.5 0.5 0.5	Reasoning	Integration	267

"End of the Answer scheme"

Sultanate of Oman
Ministry of Education

Answer scheme
Pure Mathematics
(Second semester)
(Second session)

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

Each item carries 1 mark

Item #	Answer	Taxonomy	Topic	Page
1	$y = 3$	Knowledge	Function e^x and $\ln x$	92
2	2	Application	Function e^x and $\ln x$	93
3	$-e$	Reasoning	Function e^x and $\ln x$	95
4	$8e^{8x}$	Knowledge	Differentiation	110
5	$\dfrac{-2x\sin(2x) - 3\cos(2x)}{x^4}$	Application	Differentiation	132
6	-48	Application	Differentiation	106
7	2	Reasoning	Differentiation	130
8	$\dfrac{-y}{x}$	Knowledge	Further Differentiation	202
9	-1	Application	Further Differentiation	205
10	4	Reasoning	Further Differentiation	207
11	$2e^{2x+1} + c$	Knowledge	Integration	265
12	$\dfrac{1}{12}(x^3 + 3x^2 + 1)^{12} + c$	Application	Integration	264
13	$(4x + 2)^4 + 2$	Application	Integration	267
14	e	Reasoning	Integration	258

Extended Response Questions

Item #	Answer	Marks	Taxonomy	Topic	Page
15	$(e^x + 2)(e^x - 3) = 0$ $(e^x + 2) = 0$ or $(e^x - 3) = 0$ $e^x = -2$ or $e^x = 3$ When $e^x = -2 \rightarrow$ rejected When $e^x = 3 \rightarrow x = \ln 3$	***4marks*** 1 1 1 1	Knowledge	Function e^x and $\ln x$	95
16	$f(x) = e^{2x-3} + 2.$ $y = e^{2x-3} + 2$ $x = e^{2y-3} + 2$ $x - 2 = e^{2y-3}$ $\ln(x-2) = 2y - 3$ $\ln(x-2) + 3 = 2y$ $y = \dfrac{\ln(x-2)+3}{2}$	***5marks*** 1 1 1 1 1	Application	Function e^x and $\ln x$	93

17	Since the graphs cut the y-axis ($x = 0$) using $f(x) = e^x$ $f(0) = e^0 = 1$ and $f(x) = e^{-x}$ $f(0) = e^0 = 1$ So, the coordinates of B **is** $(0, 1)$	***2 marks*** 0.5 0.5 0.5 0.5	Reasoning	Function e^x and $\ln x$	
18	$y = x^4 \cot x - \sin x + \ln 3x - 9$ $\frac{dy}{dx} = 4x^3 \cot x - x^4 cosec\, x - \cos x + \frac{1}{x} + 0$	***5marks*** 1+1+1+1+1	Knowledge	Differentiation	134
19	$f(x) = (x^2 - 1)(\sqrt{5x+2})$ $f'(x) = 2x(\sqrt{5x+2}) + \frac{5}{2}\frac{(x^2-1)}{(\sqrt{5x+2})}$ $f'(0) = 0 + \frac{5(-1)}{2\sqrt{2}}$ $= \frac{-5}{2\sqrt{2}}$	***4 marks*** 1+1 0.5 + 0.5 1	Application	Differentiation	123

20	$\frac{dy}{dx} = \left(\frac{1}{2}(4)sin^3 x \cos x\right) = 2\ sin^3 x \cos x$ At point $\left(\frac{\pi}{4}, \frac{1}{8}\right)$: $\frac{dy}{dx} = 2sin^3\left(\frac{\pi}{4}\right)\cos\left(\frac{\pi}{4}\right)$ $= \frac{1}{2}$ Equation of the tangent $y - y_1 = m(x - x_1)$ $y - \frac{1}{8} = \frac{1}{2}\left(x - \frac{\pi}{4}\right)$ $y = \frac{1}{2}x + \frac{1+\pi}{8}$	***4 marks*** 1 1 0.5 1 0.5 + 0.5 + 0.5	Application	Differentiation	138
21	$f(x) = e^{(ax+1)^2}$, $f(0) = e$ and $f'(x) - 4f(x) = 0$ $f'(x) = 2a(ax+1)e^{(ax+1)^2}$ $f'(x) - 4f(x) = 0$ $2a(ax+1)e^{(ax+1)^2} - 4e^{(ax+1)^2} = 0$ $e^{(ax+1)^2}(2a(ax+1) - 4) = 0$ $e^{(ax+1)^2} \neq 0$ $2a(ax+1) - 4 = 0$ Since $f(0) = e$, then $x = 0$ $2a = 4$ $a = 2$	***4 marks*** 1 0.5 0.5 0.5 0.5 0.5 0.5	Reasoning	Differentiation	111

22	$y = x - xy$ $y' = 1 - y - xy'$ $y' = 1 - y - 2y(x+1)$	***4 marks*** 1+1+1 1	Knowledge	Further Differentiation	209
23	$V = r^3$ $\frac{dV}{dt} = 3r^2 \frac{dr}{dt}$ $\frac{dV}{dt} = 0.3$ cm^{3}s^{-1} and $r = 2\ cm$ $0.3 = 3(2)^2 \frac{dr}{dt}$ $\frac{dr}{dt} = 0.025$ cm s^{-1} The surface area: $S = 6r^2$ $\frac{dS}{dt} = 12\, r \frac{dr}{dt}$ $\frac{dS}{dt} = 12\,(2)(0.025) = 0.6$ cm s^{-1}	***5 marks*** 1 1 1 1 1 1	Application	Further Differentiation	213

24	$by^2 + xy = 3$ $2byy' + y + xy' = 0$ $y' = \frac{-y}{2by + x}$ The equation of the tangent is $y = -x + 3$ at (1,2) $y' = -1$ $-1 = \frac{-2}{4b + 1}$ $b = \frac{1}{4}$	***2 marks*** 1 0.5 0.5	Reasoning	Further Differentiation	213
25	$= \int e^{8x-3x+1}\, dx =$ $= \int e^{5x+1}\, dx$ $= \frac{e^{5x+1}}{5} + c$	***4 marks*** 1 1+1+1	Knowledge	Integration	268
26	$A = \int_0^1 \sqrt{x}\, dx + \int_1^2 \sqrt{2 - x}\, dx$ $A = \frac{2x^{\frac{3}{2}}}{3}\Big\|_0^1 + \frac{-2(2-x)^{\frac{3}{2}}}{3}\Big\|_1^2$ $A = \frac{2}{3} + \frac{(-2(0) - (-2)(1))}{3}$ $A = \frac{2}{3} + \frac{2}{3} = \frac{4}{3}$ square units	***5 marks*** 1 1+1 1 1	Application	Integration	269

27		***6 marks***	Application	Integration	253
	$2x^2 = x^3$	0.5			
	$x^3 - 2x^2 = 0$	0.5			
	$x^2(x-2) = 0$	0.5			
	$x = 0, x = 2$	1			
	$V = \int_0^2 \pi((x^3)^2 - (x^2)^2)dx$	1			
	$V = \pi \int_0^2 (x^4 - x^6)dx$	1			
	$V = \pi \left(\frac{x^7}{7} - \frac{x^5}{5}\right)\Big\vert_0^2$	0.5			
	$V = \pi\left(\frac{128}{7} - \frac{32}{5}\right)$	1			
	$V = \frac{416}{35}\ \pi$ cubic units				
28		***2 marks***	Reasoning	Integration	267
	$\frac{a}{6}\int_0^1 6xe^{-3x^2}dx = e^3 - 1$	0.5			
	$\frac{a}{6}(e^{3x^2}\vert_0^1) = e^3 - 1$	0.5			
	$\frac{a}{6}(e^3 - 1) = e^3 - 1$	0.5			
	$a = 6$	0.5			

"End of the Answer scheme"

SULTANATE OF OMAN

MINISTRY OF EDUCATION

GENERAL EDUCATION DIPLOMA

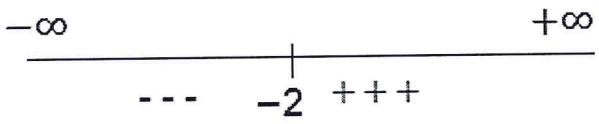
BILINGUAL PRIVATE SCHOOLS

End of Year Exam –**First Session- Pure Mathematics – 2020/2021**

Marking Guide

Part One: (Multiple choice): 12 × 1 = 12 marks

Item #	Answer	marks	Cognitive level	Topic	page
1	(1, -9)	1	Application	Differentian2	236
2	$2x + 1$	1	Knowledge	Differentian3	122
3	24	1	Application	Differentian3	106
4	-6	1	Reasoning	Differentian3	101
5	$\frac{x^{10}}{10} + c$	1	Knowledge	Integration1	167
6	$x^5 + 2$	1	Application	Integration1	172
7	$\frac{2}{3}$	1	Application	Integration3	246
8	$2\int_{-1}^{0} \pi y^2 dx$	1	Reasoning	Integration3	255
9	$\frac{1}{10}$	1	Knowledge	Probability	81
10	$\frac{1}{6}$	1	Knowledge	Probability	78
11	0.5	1	Application	Probability	87
12	0.07	1	Application	Probability	85

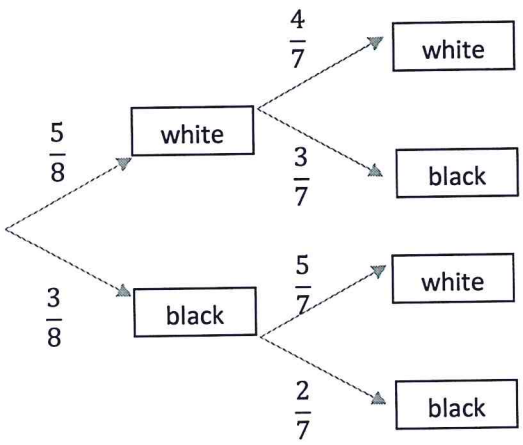
Item #	Answer	Marks	Cognitive level	Topic	Page(s)
13	a) $y = x^2 + 4x + 5$ $y' = 2x + 4$ $2x + 4 = 0$ $2x = -4$ $x = -2$  y is a decreasing function of x for $x < -2$	3 marks $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$	Application	Differentian2	237
14	$f(x) = (1 + 2x)^2$ $f'(x) = 4(1 + 2x)$ $f'(1) = 4(1 + 2(1))$ $f'(1) = 4(3) = 12$	4 marks 1+1 1 1	knowledge	Differentian3	106
15	$y = x^2(x - 4)^7$ $\frac{dy}{dx} = 2x(x - 4)^7 + (x^2)[7(x - 4)^6]$ $\frac{dy}{dx} = 2x(x - 4)^7 + 7x^2(x - 4)^6$	4 marks 1 + 1 + 1 1	Application	Differentian3	117

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
16	$y = \sqrt{2x^2 + x}$ $\frac{dy}{dx} = \frac{1}{2}(2x^2 + x)^{-\frac{1}{2}}(4x + 1)$ $\frac{dy}{dx} = \frac{4x + 1}{2\sqrt{2x^2 + x}}$ $\frac{dy}{dx} = \frac{4x + 1}{2y}$ $\frac{dy}{dx} = \frac{4x}{2y} + \frac{1}{2y}$ $\frac{dy}{dx} = \frac{2x}{y} + \frac{1}{2y}$	4 marks $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$ 1 1 $\frac{1}{2}$	Reasoning	Differentian3	100
17	$\int (3x^2 + 7)dx$ $= \frac{3x^3}{3} + 7x + c$ $= 3x^3 + 7x + c$	3 marks 1 + 1 + 1	knowledge	Integration1	173

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
18	$\frac{dy}{dx} = 2x + 3$ $y = \int (2x + 3)dx$ $y = \frac{2x^2}{2} + 3x + c$ $y = x^2 + 3x + c$ Substitute (1,-2) in equation $y = x^2 + 3x + c$ $-2 = 1 + 3 + c$ $c = -6$ $y = x^2 + 3x - 6$	3 marks $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	Application	Integration1	173
19	$V = \pi \int_0^1 (6x - x^2)^2 dx$ $V = \pi \int_0^1 (36x^2 - 12x^3 + x^4)dx$ $V = \pi \left(12x^3 - 3x^4 + \frac{x^5}{5}\right)\Big\|_0^1$ $V = \pi(12 - 3 + \frac{1}{5})$ $V = \frac{46}{5}\pi$ cubic units	4 marks 1 1 1 $\frac{1}{2}$ $\frac{1}{2}$	Application	Integration3	256

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
20	$y = \frac{1}{3}x$ At $y = 2, x = 6$ $V = \pi \int_0^6 \left(\frac{1}{3}x\right)^2 dx$ $V = \pi \int_0^6 (\frac{1}{9}x^2)dx$ $V = \pi (\frac{1}{27}x^3)\Big\|_0^6$ $V = \pi \frac{216}{27} = 8\pi$ cubic units.	4 marks $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $1+\frac{1}{2}$	Reasoning	Integration3	250
21	a) $P(A') = 1 - 0.4 = 0.6$ b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $= 0.4 + 0.7 - 0.3 = 0.8$	*(4 Marks)* $1 + 1$ $1+1$	knowledge	Probability	85
22	The probability of a head and a tail $= \frac{2}{4} = \frac{1}{2}$ Or P (HT, TH)$= \frac{2}{4} = \frac{1}{2}$	*(3 Marks)* 1+1+1	knowledge	Probability	79+90

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
23	a)	*(5 Marks)*	Application	Probability	100



$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$

$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$

b) The probability of 2 white = $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$

$\frac{1}{2}+\frac{1}{2}+1$

Note: there no marks for probability value in the tree diagram.

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
24	***A*** a person is a Male ***B*** a person has a car $P((A\|B) = \frac{P(A \cap B)}{P(B)}$ $P(A \cap B) = \frac{150}{500}$ $P(B) = \frac{190}{500}$ $P(A\|B) = \frac{\frac{150}{500}}{\frac{190}{500}} = \frac{150}{190} \approx 0.789$ Note: if the student write $\frac{150}{190} \approx 0.789$ directly , he/she will get full marks.	*(5 Marks)* 1 1 1+1+1	Application	Probability	95
25	$P(B) = 0.3$ $P(C) = 0.2$ $P(B \cap C) = P(B) . P(C)$ $P(B \cap C) = 0.3\ (0.2) = 0.06$ So , events B and C are independent .	*(2 Marks)* $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	Reasoning	Probability	102

(End of the Marking Guide)

SULTANATE OF OMAN

MINISTRY OF EDUCATION

GENERAL EDUCATION DIPLOMA

BILINGUAL PRIVATE SCHOOLS

End Of Year Exam –**Second Session- Pure Mathematics – 2020/2021**

Marking Guide

Part One: (Multiple choice): 12 × 1 = 12 marks

Item #	Answer	marks	Cognitive level	Topic	page
1	$0\ ,2$	1	Application	Differentian2	234
2	$2x+2$	1	Knowledge	Differentian3	123
3	$24(2x+1)$	1	Application	Differentian3	107
4	4	1	Application	Differentian3	105
5	$\frac{t^9}{9}+c$	1	Knowledge	Integration1	169
6	x^6+15	1	Application	Integration1	172
7	$\frac{+8}{3}$	1	Application	Integration3	245
8	$\frac{1}{6}\pi$	1	Reasoning	Integration3	255
9	0.74	1	Knowledge	Probability	85
10	$\frac{1}{2}$	1	Knowledge	Probability	79+90
11	$\frac{7}{9}$	1	Application	Probability	81
12	$\frac{1}{5}$	1	Application	Probability	87

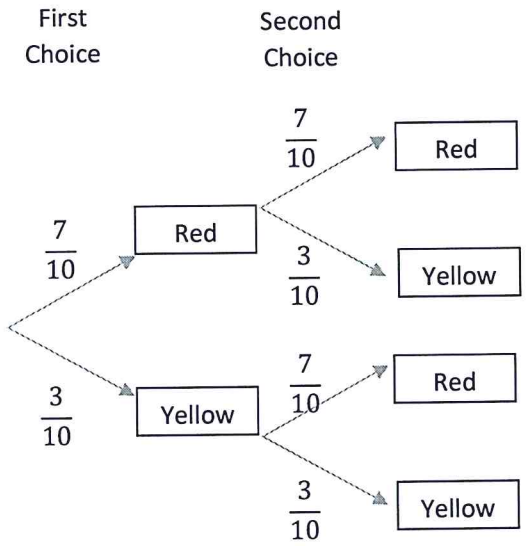
Item #	Answer	Marks	Cognitive level	Topic	Page(s)
13	$y = x^2 + 6x - 3$ $\frac{dy}{dx} = 2x + 6$ $2x + 6 = 0$ $2x = -6$ $x = -3$ $-\infty$ --- -3 +++ $+\infty$ y is an increasing function of x for $x > -3$	3 marks $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$	Application	Differentian2	231
14	$f(x) = \frac{x}{x+1}$ $f'(x) = \frac{x+1-x}{(x+1)^2}$ $f'(x) = \frac{1}{(x+1)^2}$	4 marks $1+1+1$ 1	knowledge	Differentian3	123

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
15	$y = (3x-1)^2$ $\frac{dy}{dx} = 6(3x-1)$ When $x = 1$ $\frac{dy}{dx} = 6(3(1)-1) = 12$ Equation of the tangent at $(1\ ,8)$ $y - 8 = 12(x-1)$ $y - 8 = 12x - 12$ $y - 12x + 12 - 8 = 0$ $y - 12x + 4 = 0$ $-12x + y + 4 = 0$	4 marks 1 $\frac{1}{2} + \frac{1}{2}$ 1 1	Application	Differentian3	105

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
16	$y = (5-2x)^3$ $\frac{dy}{dx} = -6\,(5-2x)^2$ $\frac{d^2y}{dx^2} = -6 \times 2 \times -2\,(5-2x)$ $\frac{d^2y}{dx^2} = 24\,(5-2x)$ $\left(\frac{d^2y}{dx^2}\right)^3 = (24)^3(5-2x)^3$ $\left(\frac{d^2y}{dx^2}\right)^3 = 13824\,y$	4 marks 1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1	Reasoning	Differentian3	123
17	$\frac{3x^3}{3} - \frac{12x^2}{2} + c$ $x^3 - 6x^2 + c$	3 marks 1 + 1 + 1	knowledge	Integration1	173

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
18		3 marks	Application	Integration1	171
	$y = \int (3x^2 + 4x - 2)dx$	$\frac{1}{2}$			
	$y = \frac{3x^3}{3} + \frac{4x^2}{2} - 2x + c$	$\frac{1}{2}$			
	$y = x^3 + 2x^2 - 2x + c$	$\frac{1}{2}$			
	$6 = 0 + 0 + c$	$\frac{1}{2}$			
	$c = 6$	$\frac{1}{2}$			
	$y = x^3 + 2x^2 - 2x + 6$	$\frac{1}{2}$			
19		4 marks	Application	Integration3	256
	$V = \pi \int_0^3 (x^2 - 3x)^2 dx$	1			
	$V = \pi \int_0^3 (x^4 - 6x^3 + 9x^2)dx$	$\frac{1}{2}$			
	$V = \pi \left(\frac{x^5}{5} - \frac{6}{4}x^4 + \frac{9x^3}{3}\right)\Big\|_0^3$	1			
	$V = \pi \left(\frac{243}{5} - \frac{243}{2} + 81\right)$	1			
	$V = \frac{81}{10}\pi$ cubic units	$\frac{1}{2}$			

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
20	$x^2 - 1 = 0$ $x = \pm 1$ $V = \pi \int_{-1}^{1} (x^2 - 1)^2 dx$ $V = \pi \int_{-1}^{1} (x^4 - 2x^2 + 1) dx$ $V = \pi \left(\frac{x^5}{5} - \frac{2}{3}x^3 + x\right)\Big\|_{-1}^{1}$ $V = \pi \left(\frac{1}{5} - \frac{2}{3} + 1\right) - \left(-\frac{1}{5} + \frac{2}{3} - 1\right)$ $V = \left(\frac{2}{5} - \frac{4}{3} + 2\right)\pi = \frac{16}{15}\pi$ cubic units	4 marks $\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	Reasoning	Integration3	256
21	a) $\frac{3}{16}$ b) $\frac{1}{16}$	(4 Marks) 1 + 1 1+1	knowledge	Probability	78
22	The probability of throwing an even number is $\frac{3}{6}$	*(3 Marks)* 1+1+1	knowledge	Probability	78

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
23	a)  b) The probability of 2 Yellow= $\frac{3}{10} \times \frac{3}{10} = \frac{9}{100}$ Note: there no marks for probability value in the tree diagram.	*(5 Marks)* $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}+1$	Application	Probability	100
24	***A*** a student is a Female ***B*** a student plays the Piano $P((A\|B) = \frac{P(A \cap B)}{P(B)}$ $P(A \cap B) = \frac{10}{100}$ $P(B) = \frac{45}{100}$ $P(A\|B) = \frac{\frac{10}{100}}{\frac{45}{100}} = \frac{10}{45} \approx 0.222$	*(5 Marks)* 1 1 1+1+1	Application	Probability	95

Item #	Answer	Marks	Cognitive level	Topic	Page(s)
25	If A and B are two independent events , then $P(A\|B) = P(A)$ $P(A) = \frac{1}{3}$ $P(A \cup B) = P(A) + P(B) - P(A).P(B)$ $P(A \cup B) = \frac{1}{3} + \frac{1}{4} - \frac{1}{3}.\frac{1}{4}$ $P(A \cup B) = \frac{1}{2}$	*(2 Marks)* $\frac{1}{2}$ 1 $\frac{1}{2}$	Reasoning	Probability	96

(End of the Marking Guide)