

وزارة التربية والتعليم



مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الأول - الدور الأول

للعام الدراسي ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الرياضيات المتقدمة.
- الأسئلة في (١٤) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

○ القاهرة ○ الدوحة

● مسقط ○ أبوظبي

ملاحظة: يتم تظليل الشكل (●) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ● **غير صحيح** ▭ ◉ ◒ ☒ ☑

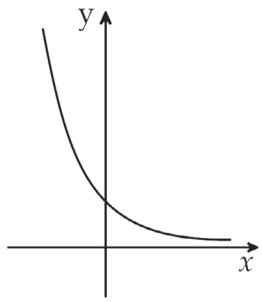
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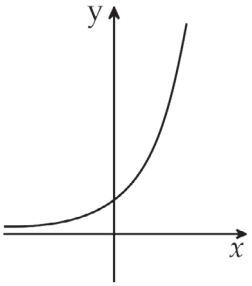
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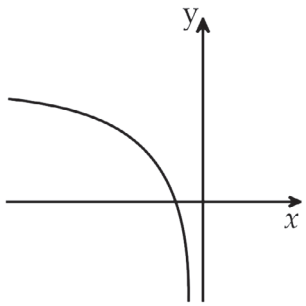
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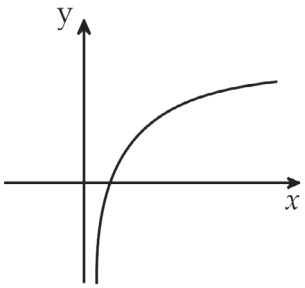
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1) (Shade in the bubble ⬭ next to the graph that represents the function of $f(x) = e^x$)

⬭ 

⬭ 

⬭ 

⬭ 

[1]

2) Compute the value of $\log_3 81 - \log_3 9$

[4]

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3) Given that $\cot\theta = \sqrt{3}$, where $0 < \theta < \frac{\pi}{2}$

(Shade in the bubble ⬭ next to the exact value of θ)

⬭ $\frac{\pi}{2}$ ⬭ $\frac{\pi}{3}$

⬭ $\frac{\pi}{4}$ ⬭ $\frac{\pi}{6}$ **[1]**

4) Solve the equation $2\cos(x - 30°) = 1$, where $0 \leq x \leq 90°$

[3]

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5) Given that $f(x) = e^{-2x}$

(Shade in the bubble ⬭ next to $f'(x)$)

⬭ $2e^{-2x}$ ⬭ $2e^{-x}$

⬭ $-2e^{-2x}$ ⬭ $-2e^{-x}$ **[1]**

6) $y = 2\ln(x^5)$

Find $\frac{dy}{dx}$

[3]

7) The random variable C has the probability distribution shown below:

C	0	1	2
$P(C = c)$	0.2	0.5	0.3

(Shade in the bubble ⬭ next to the expected value $E(C)$)

⬭ 1.0 ⬭ 1.1

⬭ 1.3 ⬭ 1.7 **[1]**

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8) Given that $\ln a = 3$ and $\ln b = 2$

Find the value of $\ln a^2 b$

[3]

9) $f(x) = 2 + \sec x$

(Shade in the bubble ⬭ next to the range of $f(x)$)

⬭ $f(x) \geq 3$ and $f(x) \leq 1$

⬭ $f(x) \geq 2$ and $f(x) \leq -2$

⬭ $f(x) \geq 2$ and $f(x) \leq 1$

⬭ $f(x) \geq 3$ and $f(x) \leq -2$

[1]

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10) Without using a calculator, $\tan A = \frac{3}{4}$ where $0 < A \leq \frac{\pi}{2}$

evaluate $\operatorname{cosec} A$

[4]

11) Given that $f(x) = -3\cos(3x+2) + 1$

and $f'(x) = b\sin(3x+2)$, where b is a constant integer.

(Shade in the bubble ⬭ next to the value of b)

⬭ -9 ⬭ -3

⬭ 3 ⬭ 9 **[1]**

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12) The probability distribution of the random variable W is given by

w	2	4
$\mathbf{P(W = w)}$	0.75	0.25

Where $E(\mathrm{W}) = 2.5$

Find the var (W)

[5]

13) Write $\sin\theta - \sqrt{3}\cos\theta$ in the form of $r\sin(\theta - \alpha)$, where α is in degrees.

[3]

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14) $f(x) = x \tan x$

Find the value of $f'(\pi)$

[4]

15) Solve the equation $\ln(2x - 4) = 5$

[4]

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16) Given that $A = \cos\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right) + \sin\left(\frac{\alpha+\beta}{2}\right)\sin\left(\frac{\alpha-\beta}{2}\right)$

(Shade in the bubble ⬭ next to the simplest form of A)

⬭ $\cos\frac{\beta}{2}$ ⬭ $\cos\frac{\alpha}{2}$

⬭ $\cos\beta$ ⬭ $\cos\alpha$ **[1]**

17) A curve is defined by $x^2 + y = 10$

Find the coordinate (x, y), where the gradient of the curve at this point equals 2

[5]

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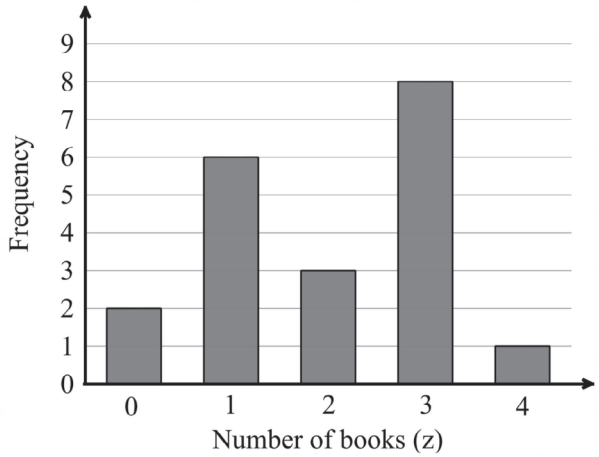
18) The random variable Y has the distribution shown below:

y	1	2	3
$\mathbf{P}(Y = y)$	$3b$	0.4	b

Find the mode.

[3]

19) The graph shows the number of books read (z) by 20 students in a month.



(Shade in the bubble ⬭ next to the value of $\mathrm{P}(0 \leq Z \leq 2)$)

⬭ 0.45 ⬭ 0.55

⬭ 0.85 ⬭ 0.90 **[1]**

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20) Solve the inequality $6^{2x+1} < 35$

[3]

Given that $e^{2x} + e^{x} - 12 = 0$ (**21**

(Shade in the bubble ⬭ next to the value of x)

⬭ $\ln 3$ ⬭ $\ln 4$

⬭ 3 ⬭ 4 **[1]**

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22) Solve the equation $\sin 2x = \dfrac{1}{\sec x}$, where $0 \leq x \leq \pi$

[6]

23) Given that $b = \text{cosec}\,\theta\ (1 - \cos\theta)\ (1 + \cos\theta)$

(Shade in the bubble ⬭ next to the simplest form of b)

⬭ $-\sin\theta$ ⬭ $-\text{cosec}\,\theta$

⬭ $\text{cosec}\,\theta$ ⬭ $\sin\theta$ **[1]**

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24) The equation of the curve is $y = \dfrac{1}{x^2 + 1}$

(Shade in the bubble ⬭ next to the equation of the tangent line at the point $(1 , \frac{1}{2})$)

⬭ $y = -\frac{1}{2}x - 1$

⬭ $y = \frac{1}{2}x - 1$

⬭ $y = -\frac{1}{2}x + 1$

⬭ $y = \frac{1}{2}x + 1$

[1]

25) The discrete random variable X has the probability distribution given by:

$$\mathrm{P}(X=x) = \begin{cases} \frac{1}{3} & , \text{ for } x = a \\ \frac{2}{3} & , \text{ for } x = 4 \\ 0 & , \text{ otherwise} \end{cases}$$

where $\mathrm{E}(X) = 3$

Find the value of a

[2]

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26) Given that $x = 10^m$ and $y = 100^n$

(Shade in the bubble ⬭ next to $\log (xy^3)$)

⬭ $m + 6n$ ⬭ $m + 3n$

⬭ $10^{m + 3n}$ ⬭ $10^{m + 6n}$ **[1]**

27) Given that $y = \tan^{-1} (\sqrt{x})$

Show that $\frac{dy}{dx} = \frac{1}{2\sqrt{x}(1 + x)}$

[3]

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28) Prove that $\dfrac{\cos^4\alpha - \sin^4\alpha}{\sin^2\alpha} \equiv \cot^2\alpha - 1$

[3]

[End of Examination]

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Formulae Sheet

Log. & Exponential Functions

- $\log xy = \log x + \log y$
- $\log \frac{x}{y} = \log x - \log y$
- $\log x^k = k \log x$
- $y = a^x \rightarrow \log_a y = x$
- $\log_a xy = \log_a x + \log_a y$
- $\log_a \frac{x}{y} = \log_a x - \log_a y$
- $\log_a x^k = k \log_a x$
- $\log_a a = 1 \quad , \quad \log_a 1 = 0$
- $y = e^x \Longrightarrow \frac{dy}{dx} = e^x = y$
- $y = e^{ax} \Longrightarrow \frac{dy}{dx} = ae^{ax} \Longrightarrow \frac{dy}{dx} = ay$
- $e^x = y \Leftrightarrow \ln y = x$

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Trigonometry

Pythagorean Formulas

- $\sin^2 A + \cos^2 A = 1$
- $\sec^2 A = 1 + \tan^2 A$
- $\text{cosec}^2 A = 1 + \cot^2 A$

Addition and subtraction Formulas

- $\sin(A + B) \equiv \sin A \cos B + \cos A \sin B$
- $\sin(A - B) \equiv \sin A \cos B - \cos A \sin B$
- $\cos(A + B) \equiv \cos A \cos B - \sin A \sin B$
- $\cos(A - B) \equiv \cos A \cos B + \sin A \sin B$
- $\tan(A + B) \equiv \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$
- $\tan(A - B) \equiv \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

Double Angle Formulas:

- $\sin 2A \equiv 2 \sin A \cos A$
- $\cos 2A \equiv \cos^2 A - \sin^2 A$
- $\cos 2A \equiv 2\cos^2 A - 1$
- $\cos 2A \equiv 1 - 2\sin^2 A$
- $\tan 2A \equiv \dfrac{2\tan A}{1 - \tan^2 A}$

The Reciprocal Functions:

- $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$
- $\sec\theta = \dfrac{1}{\cos\theta}$
- $\text{cosec}\,\theta = \dfrac{1}{\sin\theta}$
- $\cot\theta = \dfrac{1}{\tan\theta}$
- $\tan\theta = \cot(90^\circ - \theta)$
- $\cos\theta = \sin(90^\circ - \theta)$

- **The form** $a\cos\theta + b\sin\theta$ **can be expressed as** $r\sin(\theta \pm \alpha)$ **or** $r\cos(\theta \pm \alpha)$, where $r = \sqrt{a^2 + b^2}$

and $\tan\alpha = \pm\dfrac{b}{a}$ or $\tan\alpha = \pm\dfrac{a}{b}$

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Differentiation

- $y = x^n \Rightarrow \frac{dy}{dx} = n\,x^{n-1}$
- $f(x) = e^x \Rightarrow f'(x) = e^x$
- $f(x) = e^{kx} \Rightarrow f'(x) = ke^{kx}$
- $f(x) = \ln x \Rightarrow f'(x) = \frac{1}{x}$
- $f(x) = \ln(g(x)) \Rightarrow f'(x) = \frac{1}{g(x)}g'(x)$
- $f(x) = u\,v \Rightarrow f'(x) = u\,v' + v\,u'$
- $f(x) = \frac{u}{v} \Rightarrow f'(x) = \frac{v\,u' - u\,v'}{v^2}$
- $f(x) = \sin x \Rightarrow f'(x) = \cos x$
- $f(x) = \cos x \Rightarrow f'(x) = -\sin x$
- $f(x) = \tan x \Rightarrow f'(x) = \sec^2 x$
- $f(x) = \tan^{-1} x \Rightarrow f'(x) = \frac{1}{1+x^2}$
- If y is a function of u and u is a function of x, then : $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

Discrete random variable

- $P(x) = \frac{\text{Frequency}}{\text{Total Frequency}}$
- $E(X) = \sum xp$
- $E(Y^2) = \sum y^2 p$
- $\text{Var}(X) = E(X^2) - \big(E(X)\big)^2$ or $\text{Var}(X) = \sum x^2 p - \big(E(X)\big)^2$

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سلطنة عُمان
وزارة التربية والتعليم

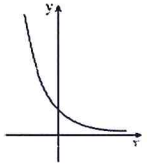
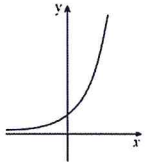
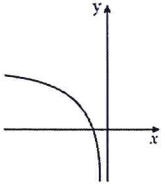
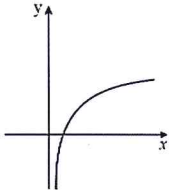
Answer scheme

Diploma, Bilingual Private Schools, Advanced Mathematics

First Semester-First Session
Academic Year: 2025/2026

Answer Scheme

Diploma, Bilingual Private, Advanced Mathematics | First Semester-First Session | Academic Year: 2025/2026

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Log. & Exponential Functions	39	☐  ■  ☐  ☐ 	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Log. & Exponential Functions	42	$\log_3 81 - \log_3 9$		
				$= \log_3 \frac{81}{9}$	1	
				$= \log_3 9$	1	
				$= \log_3 3^2$	1	
				$= 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Log. & Exponential Functions	42	Alternative solution		
				$= \log_3 3^4 - \log_3 3^2$	1 + 1	
				$= 4 - 2$	1	
				$= 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Log. & Exponential Functions	42	Alternative solution $\log_3 81 - \log_3 9 = \log_3(9 \times 9) - \log_3 9$	1	
				$= \log_3 9 + \log_3 9 - \log_3 9$	1	
				$= \log_3 9 = \log_3 3^2$	1	
				$= 2$	1	

Answer Scheme

Diploma, Bilingual Private, Advanced Mathematics | First Semester-First Session | Academic Year: 2025/2026

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Trigonometry	78	☐ $\frac{\pi}{2}$ ☐ $\frac{\pi}{3}$ ☐ $\frac{\pi}{4}$ ■ $\frac{\pi}{6}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
4	AO2 M	Trigonometry	78+79	$\cos(x - 30^\circ) = \frac{1}{2}$	1	
				$x - 30^\circ = 60^\circ$	1	
				$x = 90^\circ$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
5	AO1 L	Differentiation	86	☐ $2\,e^{-2x}$ ☐ $2\,e^{-x}$ ■ $-2e^{-2x}$ ☐ $-2e^{-x}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 L	Differentiation	90	$= (2) \times \frac{5x^4}{x^5}$	1 + 1	Award (1 mark) for correctly applying the derivative rule of $\ln(x)$
				$= \frac{2\times5}{x}$		
				$= \frac{10}{x}$	1	Award (1 mark) for correctly simplifying

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 L	Differentiation	90	Alternative solution		
				$y = \ln (x^5)^2$		
				$= \ln x^{10}$	1	Award (1 mark) for correctly applying the rule of n ln (x) = ln x^n
				$= \frac{10x^9}{x^{10}}$	1	Award (1 mark) for correctly applying the derivative rule of ln (x)
				$= \frac{10}{x}$	1	Award (1 mark) for correctly simplifying

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 L	Differentiation	90	Alternative solution		
				$y = 2\times 5\ln x$	1	
				$y = 10\ln x$	1	
				$\frac{dy}{dx} = 10\times\frac{1}{x}$	1	
				$\frac{dy}{dx} = \frac{10}{x}$		

Answer Scheme

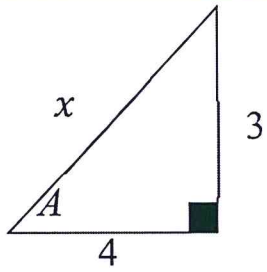
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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
7	AO1 L	Discrete Random Variables	91	☐ 1.0 ■ 1.1 ☐ 1.3 ☐ 1.7	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	A01 M	Log. & Exponential Functions	50	$= \ln a^2 + \ln b$		
				$= 2 \ln a + \ln b$	1	
				$= 2\,(3) + 2$	1	
				$= 6 + 2$		
				$= 8$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	A01 M	Log. & Exponential Functions	50	Alternative solution		
				$a = e^3$ $b = e^2$	1	Award (1 mark) for getting the a and b correct
				$= \ln (e^6)(e^2)$	1	
				$= \ln (e^8)$		
				$= 8$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	AO2 M	Trigonometry	77+78	■ $f(x) \geq 3$ *and* $f(x) \leq 1$ ☐ $f(x) \geq 2$ *and* $f(x) \leq -2$ ☐ $f(x) \geq 2$ *and* $f(x) \leq 1$ ☐ $f(x) \geq 3$ *and* $f(x) \leq -2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Trigonometry	80			
				$x^2 = 9 + 16 = 25$ $x = 5$	1 + 1	Award (2 marks) if they get the value of $x = 5$ directly
				$\sin A = \frac{3}{5}$	1	
				$\operatorname{cosec} A = \frac{5}{3}$	1	Award (2 marks) if the find this step directly in a correct way

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Trigonometry	80	Alternative solution		
				$\text{cosec}^2 A = 1 + \cot^2 A$		
				$\text{cosec}^2 A = 1 + (\frac{4}{3})^2$	1 + 1	Award (2 marks) if the get cot A and substitute correctly
				$\text{cosec}^2 A = \frac{25}{9}$	1	
				$\text{cosec}\, A = \frac{5}{3}$	1	Since the domain of angle $0 \leq A \leq \frac{\pi}{2}$ at the first quarter, Award (1 mark) if the student writes the positive angle only

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Differentiation	92	☐ -9 ☐ -3 ☐ 3 ■ 9	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
12	AO1 M	Discrete Random Variables	95	$\sum w^2P = (4 \times 0.75) + (16 \times 0.25)$	1 + 1	
				$\sum w^2P = 7$	1	- Award (1 mark) for correctly calculating $\sum w^2P = 7$ - Award (2 marks) if they write this step directly in a correct way
				$Var(W) = \sum w^2P - (E(W))^2$ $= 7 - (2.5)^2$	1	
				$= 7 - 6.25$		
				$= 0.75$	1	Award (1 mark) for obtaining the correct result

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
13	AO1 H	Trigonometry	73+74	$r\cos\alpha = 1$ and $r\sin\alpha = \sqrt{3}$		
				$\tan\alpha = \sqrt{3}$		
				$\alpha = 60^\circ$	1	Award (1 mark) for α
				$r = 2$	1	Award (1 mark) for r
				$\sin\theta - \sqrt{3}\cos\theta \equiv 2\ \sin(\theta - 60^\circ)$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
14	AO1 H	Differentiation	100	$f'(x) = \tan x + x \sec^2 x$	1	Award (1 mark) for applying the chain rule correctly and differentiating the outer function
				$f'(\pi) = \tan \pi + \pi \sec^2 \pi$	1	Award (1 mark) for substituting correctly
				$f'(\pi) = 0 + \pi \frac{1}{\cos^2 \pi}$		
				$f'(\pi) = \pi \frac{1}{(-1)^2}$	1	
				$= \pi$	1	Award (1 mark) for finding $f'(\pi) = \pi$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
15	AO2 L	Log. & Exponential Functions	52	$e^{\ln(2x-4)} = e^5$	1	
				$2x - 4 = e^5$	1	Award (2 marks) if they write this step directly in a correct way
				$2x = e^5 + 4$		
				$x = \frac{e^5 + 4}{2}$	1	
				$x = 76.20657955$	1	Award (1 mark) for finding $x \approx$ (76.20 - 76.21)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
16	AO2 L	Trigonometry	68	☐ $\cos\frac{\beta}{2}$ ☐ $\cos\frac{\alpha}{2}$ ■ $\cos\beta$ ☐ $\cos\alpha$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
17	AO2 L	Differentiation	113+115	$2x + y' = 0$	1	Award (1 mark) for differentiating correctly
				$y' = -2x$		Award (1 mark) for rearranging the equation
				Since, gradient $= 2$ $2 = -2x$	1	
				$x = -1$	1	Award (1 mark) for finding $x = -1$
				Substitute $x = -1$ $(-1)^2 + y = 10$ $1 + y = 10$		
				$y = 9$	1	Award (1 mark) for finding $y = 9$
				the coordinate is $(-1, 9)$	1	

سلطنة عمان
وزارة التربية والتعليم
وزارة التعليم العالي والبحث العلمي والابتكار
الهيئة العامة للتعليم التقني والتدريب المهني

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
18	AO2 L	Discrete Random Variables	87	$3b + 0.4 + b = 1$ $4b = 1 - 0.4$ $4b = 0.6$	1	
				$b = 0.15$	1	Award (1 mark) for correctly finding $b = 0.15$
				y | 1 | 2 | 3 $P(Y = y)$ | 0.45 | 0.4 | 0.15		
				The highest probability is 0.45, so the mode is 1	1	Award (1 mark) for correctly finding the mode

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Discrete Random Variables	87	☐ 0.45 ■ 0.55 ☐ 0.85 ☐ 0.90	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
20	AO2 M	Log. & Exponential Functions	53	$\log 6^{2x+1} < \log 35$	1	- Award (1 mark) for writing the log on both sides - Award (3 marks) if they use ln as another solution and get the same result
				$(2x+1)\log 6 < \log 35$	1	
				$2x+1 < \dfrac{\log 35}{\log 6}$		
				$2x+1 < 1.984278$ $2x < 1.984278 - 1$		
				$x < 0.49213$	1	Award (1 mark) for finding $x <$ 0.40 *or* $x < 0.50$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
21	AO2 M	Log. & Exponential Functions	51	■ ln 3 ☐ ln 4 ☐ 3 ☐ 4	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
22	AO2 M	Trigonometry	71	$2 \sin x \cos x = \cos x$	1	
				$2 \sin x \cos x - \cos x = 0$		
				$\cos x \,(2 \sin x - 1) = 0$	1	
				$\cos x = 0$ or $(2 \sin x - 1) = 0$		
				$x = \frac{\pi}{2}$	1	Award (1 mark) for value of x
				$2 \sin x - 1 = 0$		
				$\sin x = \frac{1}{2}$	1	
				$x = \frac{\pi}{6}$ or $x = \frac{5\pi}{6}$	1+1	Award (1 mark) for each value of x

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Trigonometry	80	☐ $-\sin\theta$ ☐ $-\operatorname{cosec}\theta$ ☐ $\operatorname{cosec}\theta$ ■ $\sin\theta$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
24	AO2 M	Differentiation	107	☐ $y = -\frac{1}{2}x - 1$ ☐ $y = \frac{1}{2}x - 1$ ■ $y = -\frac{1}{2}x + 1$ ☐ $y = \frac{1}{2}x + 1$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [2]	More information
25	AO2 M	Discrete Random Variables	94	$E(X) = \left(a \times \frac{1}{3}\right) + \left(4 \times \frac{2}{3}\right)$		
				$3 = \frac{a}{3} + \frac{8}{3}$	1	Award (1 mark) for correctly substituting probabilities into the expectation(mean) formula
				$3 = \frac{a+8}{3}$		
				$9 = a + 8 \longrightarrow a = 1$	1	Award (1 mark) for obtaining the correct value of $a = 1$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Log. & Exponential Functions	40	■ $m + 6n$ ☐ $m + 3n$ ☐ 10^{m+3n} ☐ 10^{m+6n}	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Differentiation	102+ 104	$\frac{dy}{dx} = \frac{1}{1+(\sqrt{x})^2} \cdot \frac{1}{2\sqrt{x}}$	1 + 1	Award (2 marks) for differentiating correctly
				rearrange the function $= \frac{1}{2\sqrt{x}(1+x)}$	1	Award (1 mark) for rearranging correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	$L.H.S = \frac{(\cos^2\alpha - \sin^2\alpha)(\cos^2\alpha + \sin^2\alpha)}{\sin^2\alpha}$	1	
				$= \frac{\cos^2\alpha - \sin^2\alpha}{sin^2\alpha}$	1	
				$= \frac{\cos^2\alpha}{sin^2\alpha} - \frac{\sin^2\alpha}{sin^2\alpha}$	1	
				$= \cot^2\alpha - 1 = R.H.S$		

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	Alternative solution $L.H.S = \frac{\cos^4 \alpha}{\sin^2 \alpha} - \frac{\sin^4 \alpha}{\sin^2 \alpha}$		
				$= \cos^2 \alpha \cot^2 \alpha - \sin^2 \alpha$	1	
				$= \cos^2 \alpha \cot^2 \alpha - (1 - \cos^2 \alpha)$	1	
				$= \cos^2 \alpha(\cot^2 \alpha + 1) - 1$		
				$= \cos^2 \alpha \operatorname{cosec}^2 \alpha - 1$		
				$= \frac{\cos^2 \alpha}{\sin^2 \alpha} - 1$	1	
				$= \cot^2 \alpha - 1 = R.H.S$		

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	Alternative solution $R.H.S = \frac{\cos^2\alpha}{\sin^2\alpha} - 1$		
				$= \frac{\cos^2\alpha - \sin^2\alpha}{\sin^2\alpha}$	1	
				$= \frac{\cos^2\alpha - \sin^2\alpha}{\sin^2\alpha} \times \frac{\cos^2\alpha + \sin^2\alpha}{1}$	1	
				$= \frac{\cos^4\alpha - \sin^4\alpha}{\sin^2\alpha} = L.H.S$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	Alternative solution $L.H.S = \frac{\cos^4\alpha}{\sin^2\alpha} - \frac{\sin^4\alpha}{\sin^2\alpha}$		
				$= \frac{(1-\sin^2\alpha)(1-\sin^2\alpha)}{\sin^2\alpha} - \sin^2\alpha$	1	
				$= \frac{1-2\sin^2\alpha+\sin^4\alpha}{\sin^2\alpha} - \sin^2\alpha$		
				$= \frac{1}{\sin^2\alpha} - 2 + \sin^2\alpha - \sin^2\alpha$		
				$= \text{cosec}^2\alpha - 2$	1	
				$= \cot^2\alpha + 1 - 2$	1	
				$= \cot^2\alpha - 1 = R.H.S$		

وزارة التعليم

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الأول - الدور الثاني

للعام الدراسي ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الرياضيات المتقدمة.
- الأسئلة في (١٢) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

▬ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (▬) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ▬ **غير صحيح** ▭ ◉ ◒ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Instructions:

1. List of formulae is given at the end.
2. Write all answers in the space provided in this question paper and show all your work.
3. Non-programmable calculators are allowed.

1) (Shade in the bubble ⬭ next to the value of $\log 0.000001$)

⬭ -6 ⬭ -5

⬭ 5 ⬭ 6

[1]

2) Without using a calculator, find $\log_2 24 - \log_2 3$

[4]

3) Given that $b = \sin 50° \cos 30° + \cos 50° \sin 30°$

(Shade in the bubble ⬭ next the exact expression of b)

⬭ $\cos 80°$ ⬭ $\sin 80°$

⬭ $\sin 20°$ ⬭ $\cos 20°$

[1]

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4) Given that $\tan\theta = \frac{1}{2}$

Without using a calculator, find the exact value of $\tan 2\theta$

[3]

5) Given that $f(x) = \ln(-5x)$, Where $x < 0$

(Shade in the bubble ▭ next to $f'(x)$)

▭ $-\frac{1}{x}$ ▭ $\frac{1}{x}$

▭ $\frac{1}{5x}$ ▭ $-\frac{1}{5x}$ [1]

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6) $y = e^{x^4 - 4x}$

Find $\frac{dy}{dx}$

[3]

7) The random variable Z has the probability distribution shown below

Z	0	5
$P(Z = z)$	0.2	0.8

(Shade in the bubble ⬭ next to the expected value of $E(Z)$)

⬭ 5.1 ⬭ 5

⬭ 4.1 ⬭ 4 [1]

8) Given that $\ln a = 5$ and $\ln b = 3$

Find the value of $\ln\left(\frac{a^2}{b}\right)$

[3]

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9) Given that $2 \sin \alpha = 1$, where $0^\circ \leq \alpha \leq 360^\circ$

(Shade in the bubble ⬭ next to one value of α)

⬭ 30° ⬭ 60°

⬭ 120° ⬭ 210° [1]

10) Given that $\cot B = \frac{3}{4}$, where $0 < B < \frac{\pi}{2}$

Find the value of $\sec B$

[4]

11) Given that $f(x) = 2x + 6 \tan (7x - 5)$

and $f'(x) = 2 + n \sec^2 (7x - 5)$, where n is a constant integer.

(Shade in the bubble ⬭ next to the value of n)

⬭ -42 ⬭ -6

⬭ 6 ⬭ 42 [1]

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12) The random variable R has the distribution shown below:

r	-1	0	1	2	3	4	5
$\mathbf{P}(R = r)$	0.05	0.10	0.15	0.20	0.20	0.15	0.15

Find $\mathrm{P}(R > 1)$

[5]

13) Simplify $\sin(\beta - \alpha) + \sin(\beta + \alpha)$

[3]

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14) Given that $f(x) = \tan^{-1} e^{2x}$

Find $f'(0)$

[4]

15) Solve the equation $e^{2x-1} = 6$

[4]

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16) Given that $c = 2\sin^2\theta + 6\cos^2\theta$

(Shade in the bubble ⬭ next to the simplest form of c in terms of $a + b\cos^2\theta$)

⬭ $2 - 4\cos^2\theta$ ⬭ $2 + 8\cos^2\theta$

⬭ $2 - 8\cos^2\theta$ ⬭ $2 + 4\cos^2\theta$ [1]

17) Given that $y = \dfrac{x^2}{x-2}$, Where $x \neq 2$

Find the x – coordinate of the stationary points.

[5]

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18) The random variable Y has the probability distribution shown below

y	1	2	3	4	5
$\mathbf{P}(Y = y)$	0.2	q	$q + 0.4$	0.1	0.2

Find the value of q

[3]

19) The random variable X has the probability distribution shown below

x	1	2	3	4
x^2	1	4	9	16
$\mathbf{P}(X = x)$	0.2	0.3	0.1	0.4

(Shade in the bubble ⬭ next to the value of Var (X))

⬭ 1.19 ⬭ 1.41

⬭ 2.45 ⬭ 6.00 [1]

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20) Solve the inequality $4^{x+1} < 8$

[3]

21) Given that $(\frac{1}{2})^{2y+1} = \frac{1}{32}$

(Shade in the bubble ⬭ next to the value of y)

⬭ 5 ⬭ 4

⬭ 3 ⬭ 2 [1]

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22) Solve the equation $\sqrt{2}\cos(\theta - 15°) = 1$ for $0° \leq \theta < 360°$

[6]

23) $a = (1 - \sin^2 x)(1 + \tan^2 x)\cos x$

(Shade in the bubble ⬭ next to the simplest form of a)

⬭ $-\operatorname{cosec} x$ ⬭ $\cos x$

⬭ $-\cos x$ ⬭ $\operatorname{cosec} x$ [1]

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24) The equation of the curve is $2e^{y} + 4x = 6$

(Shade in the bubble ⬭ next to the equation of the tangent line at the point (1, 0))

⬭ $y = -2x - 2$ ⬭ $y = -2x + 2$

⬭ $y = -\frac{2x}{e} - \frac{2}{e}$ ⬭ $y = -\frac{2x}{e} + \frac{2}{e}$

[1]

25) The random variable X has the probability distribution shown below

x	2	4
$\mathbf{P}(X = x)$	$\frac{1}{2}$	$\frac{1}{2}$

Find $E(2X)$

[2]

26) Given that $\log_2 x = a$

(Shade in the bubble ⬭ next to the value of $\log_4 x$)

⬭ $\frac{2}{a}$ ⬭ $a + 2$

⬭ $\frac{a}{2}$ ⬭ $a - 2$

[1]

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27) Given that $y = 5 \sin x \tan x$

Show that: $\frac{dy}{dx} = 5 \sin x (1 + \sec^2 x)$

[3]

28) Prove that $\cos x + \tan^2 x \cos x \equiv \sec x$

[3]

[End of Examination]

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Formulae Sheet

Log. & Exponential Functions

- $\log xy = \log x + \log y$
- $\log \frac{x}{y} = \log x - \log y$
- $\log x^k = k \log x$
- $y = a^x \rightarrow \log_a y = x$
- $\log_a xy = \log_a x + \log_a y$
- $\log_a \frac{x}{y} = \log_a x - \log_a y$
- $\log_a x^k = k \log_a x$
- $\log_a a = 1 \quad , \quad \log_a 1 = 0$
- $y = e^x \Longrightarrow \frac{dy}{dx} = e^x = y$
- $y = e^{ax} \Longrightarrow \frac{dy}{dx} = ae^{ax} \Longrightarrow \frac{dy}{dx} = ay$
- $e^x = y \Leftrightarrow \ln y = x$

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Trigonometry

Pythagorean Formulas

- $\sin^2 A + \cos^2 A = 1$
- $\sec^2 A = 1 + \tan^2 A$
- $\operatorname{cosec}^2 A = 1 + \cot^2 A$

Addition and subtraction Formulas

- $\sin(A + B) \equiv \sin A \cos B + \cos A \sin B$
- $\sin(A - B) \equiv \sin A \cos B - \cos A \sin B$
- $\cos(A + B) \equiv \cos A \cos B - \sin A \sin B$
- $\cos(A - B) \equiv \cos A \cos B + \sin A \sin B$
- $\tan(A + B) \equiv \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$
- $\tan(A - B) \equiv \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

Double Angle Formulas:

- $\sin 2A \equiv 2 \sin A \cos A$
- $\cos 2A \equiv \cos^2 A - \sin^2 A$
- $\cos 2A \equiv 2\cos^2 A - 1$
- $\cos 2A \equiv 1 - 2\sin^2 A$
- $\tan 2A \equiv \dfrac{2\tan A}{1 - \tan^2 A}$

The Reciprocal Functions:

- $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$
- $\sec\theta = \dfrac{1}{\cos\theta}$
- $\operatorname{cosec}\theta = \dfrac{1}{\sin\theta}$
- $\cot\theta = \dfrac{1}{\tan\theta}$
- $\tan\theta = \cot(90^\circ - \theta)$
- $\cos\theta = \sin(90^\circ - \theta)$

- **The form** $a\cos\theta + b\sin\theta$ **can be expressed as** $r\sin(\theta \pm \alpha)$ **or** $r\cos(\theta \pm \alpha)$, where $r = \sqrt{a^2 + b^2}$

and $\tan\alpha = \pm\dfrac{b}{a}$ or $\tan\alpha = \pm\dfrac{a}{b}$

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Differentiation

- $y = x^n \Rightarrow \frac{dy}{dx} = n\,x^{n-1}$
- $f(x) = e^x \Rightarrow f'(x) = e^x$
- $f(x) = e^{kx} \Rightarrow f'(x) = ke^{kx}$
- $f(x) = \ln x \Rightarrow f'(x) = \frac{1}{x}$
- $f(x) = \ln(g(x)) \Rightarrow f'(x) = \frac{1}{g(x)}\,g'(x)$
- $f(x) = u\,v \Rightarrow f'(x) = u\,v' + v\,u'$
- $f(x) = \frac{u}{v} \Rightarrow f'(x) = \frac{v\,u' - u\,v'}{v^2}$
- $f(x) = \sin x \Rightarrow f'(x) = \cos x$
- $f(x) = \cos x \Rightarrow f'(x) = -\sin x$
- $f(x) = \tan x \Rightarrow f'(x) = \sec^2 x$
- $f(x) = \tan^{-1} x \Rightarrow f'(x) = \frac{1}{1+x^2}$
- If y is a function of u and u is a function of x, then : $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

Discrete random variable

- $P(x) = \frac{\text{Frequency}}{\text{Total Frequency}}$
- $E(X) = \sum xp$
- $E(Y^2) = \sum y^2 p$
- $\text{Var}(X) = E(X^2) - \big(E(X)\big)^2$ or $\text{Var}(X) = \sum x^2 p - \big(E(X)\big)^2$

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Marking Guide of
General Education Diploma
Bilingual Private
First Semester – Second Session
2025/2026

وزارة التعليم

The marking guide is in (32) pages | Subject: Advanced Mathematics | Full marks: (70)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Log. & Exponential Functions	39	■ – 6 ▭ – 5 ▭ 5 ▭ 6	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Log. & Exponential Functions	38+42	$\log_2 24 - \log_2 3$		
				$= \log_2(\frac{24}{3})$	1	
				$= \log_2(8)$	1	
				$= \log_2 (2)^3$	1	
				$= 3 \log_2 2$		
				$= 3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Log. & Exponential Functions	38+42	Alternative solution $\log_2 24 - \log_2 3$		
				$= \log_2 8 \times 3 - \log_2 3$	1	
				$= \log_2 (8) + \log_2 3 - \log_2 3$		
				$= \log_2 (8)$	1	
				$= \log_2 (2)^3$	1	
				$= 3 \log_2 2$		
				$= 3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Trigonometry	68	☐ $\cos 80^\circ$ ■ $\sin 80^\circ$ ☐ $\sin 20^\circ$ ☐ $\cos 20^\circ$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
4	AO1 L	Trigonometry	70	$\tan 2\theta = \frac{2 \times \frac{1}{2}}{1-\frac{1}{4}}$	1	
				$= \frac{1}{\frac{3}{4}}$	1	
				$= \frac{4}{3}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
5	AO1 L	Differentiation	90	☐ $-\frac{1}{x}$ ■ $\frac{1}{x}$ ☐ $\frac{1}{5x}$ ☐ $-\frac{1}{5x}$	1	—

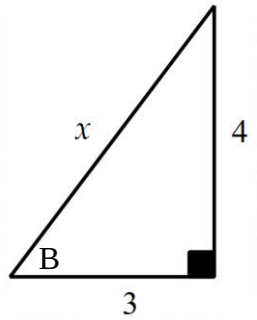
Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 L	Differentiation	86	$\frac{dy}{dx} = (4\,x^3 - 4)\,\mathrm{e}^{x^4 - 4\,x}$	1 + 1+1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
7	AO1 L	Discrete Random Variables	93	☐ 5.1 ☐ 5 ☐ 4.1 ■ 4	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	AO1 M	Log. & Exponential Functions	38+42	$\ln\left(\frac{a^2}{b}\right) = \ln a^2 - \ln b$	1	
				$= 2\ln a - \ln b$	1	
				$= 2\,(5) - 3$		
				$= 10 - 3$		
				$= 7$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	AO1 M	Log. & Exponential Functions	38+42	Alternative solution		
				$a = e^5$ and $b = e^3$	1	
				$\ln\left(\frac{a^2}{b}\right) = \ln\left(\frac{\left(e^5\right)^2}{e^3}\right)$		
				$= \ln\frac{e^{10}}{e^3}$	1	
				$= \ln e^7$		
				$= 7$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	AO1 M	Trigonometry	78+79	■ 30° ☐ 60° ☐ 120° ☐ 210°	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Differentiation	80			Award (3 marks) for any correct method
				$x^2 = 9 + 16 = 25$ $x = 5$	1 + 1	Award (2 marks) if they get the value of $x = 5$ directly
				$\cos B = \frac{3}{5}$	1	
				$\sec B = \frac{5}{3}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Differentiation	104	☐ -42 ☐ -6 ☐ 6 ■ 42	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
12	AO1 M	Discrete Random Variables	87	$P(R > 1) = P(r = 2) + P(r = 3) + P(r = 4) + P(r = 5)$ $P(R > 1) = 0.20 + 0.20 + 0.15 + 0.15$	1+1+1+1	Award (1 mark) for each value of probabilities - Award (1 mark) for the correct final probability value
				$= 0.70$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
12	AO1 M	Discrete Random Variables	87	Alternative solution		
				$P(R > 1) = 1 - (P \leq 1)$	1	Award (1 mark) for each value of probabilities
				$P(R > 1) = 1 - P(r = -1) + P(r = 0) + P(r = 1)$ $= 1 - [0.05 + 0.10 + 0.15]$	1 + 1 + 1	
				$= 1 - 0.3$		Award (1 mark) for the correct final probability value
				$= 0.70$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
13	AO1 H	Trigonometry	69	$(sin\ \beta\ \cos\alpha - cos\ \beta\ sin\ \alpha) + (\sin\beta\ \cos\alpha + \cos\ \beta\ \sin\alpha)$	1	
				$= \sin\beta\cos\alpha + \sin\ \beta\cos\ \alpha$	1	
				$= 2\sin\beta\cos\alpha$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
14	AO1 H	**Differentiation**	104	$f'(x) = \frac{(e^{2x})'}{1+(e^{2x})^2}$		
				$f'(x) = \frac{2e^{2x}}{1+e^{4x}}$	1 + 1	
				$f'(0) = \frac{2e^{0}}{1+e^{0}}$	1	
				$= \frac{2}{1+1}$		
				$= 1$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
15	AO2 L	Log. & Exponential Functions	52	$\ln e^{2x-1} = \ln 6$	1	
				$2x - 1 = \ln 6$	1	
				$2x = \ln 6 + 1$	1	
				$x = \frac{\ln 6 + 1}{2}$		
				$x = 1.39587$	1	Award (1 mark) for finding $1.39 \leq x \leq 1.4$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
16	AO2 L	Trigonometry	75	☐ $2 - 4\cos^2\theta$ ☐ $2 + 8\cos^2\theta$ ☐ $2 - 8\cos^2\theta$ ■ $2 + 4\cos^2\theta$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
17	AO2 L	Differentiation	100	$y' = \frac{2x(x-2) - x^2}{(x-2)^2}$	1	Award (1 mark) for correctly applying the quotient rule setup
				$y' = \frac{2x^2 - 4x - x^2}{(x-2)^2} = 0$	1	Award (1 mark) for substituting each derivative correctly and simplifying.
				$2x^2 - 4x - x^2 = 0$	1	
				$x^2 - 4x = 0$ $x(x - 4) = 0$		Award (1 mark) for solving the equation
				$x = 0$ and $x = 4$	1 + 1	Award (2 marks) for the correct two values of the x – coordinate

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
18	AO2 L	Discrete Random Variables	87	$1 = 0.2 + q + q + 0.4 + 0.1 + 0.2$ $1 = 0.9 + 2q$	1	
				$1 - 0.9 = 2q$ $0.1 = 2q$	1	
				$q = 0.05$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Discrete Random Variables	94	☐ 1.19 ■ 1.41 ☐ 2.45 ☐ 6.00	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
20	AO2 M	Log. & Exponential Functions	53	$4^{x+1} < 8$		
				$\log 4^{x+1} < \log 8$	1	If the student solves the question using In for any base with the correct steps, the student will get (3 marks)
				$(x + 1)\log 4 < \log 8$	1	
				$x + 1 < \frac{\log 8}{\log 4}$		
				$x + 1 < 1.5$		
				$x < 0.5$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
21	AO2 M	Log. & Exponential Functions	52+53	☐ 5 ☐ 4 ☐ 3 ■ 2		-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
22	AO2 M	3	79	$\cos(\theta - 15^\circ) = \frac{1}{\sqrt{2}}$	1	
				$\theta - 15^\circ = \cos^{-1}(\frac{1}{\sqrt{2}})$ $\theta - 15^\circ = 45^\circ or\ \theta - 15° = 315°$	1	
				$\theta = 45^\circ + 15^\circ$	1	
				$\theta = 60^\circ$	1	
				$\theta = 315^\circ + 15^\circ$	1	
				$\theta = 330^\circ$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Trigonometry	79	☐ $-\operatorname{cosec} x$ ■ $\cos x$ ☐ $-\cos x$ ☐ $\operatorname{cosec} x$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
24	AO2 M	Differentiation	115	☐ $y = -2x - 2$ ■ $y = -2x + 2$ ☐ $y = -\frac{2x}{e} - \frac{2}{e}$ ☐ $y = -\frac{2x}{e} + \frac{2}{e}$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [2]	More information
25	AO2 M	Discrete Random Variables	94	$E(2X) = \left(2 \times 2 \times \frac{1}{2}\right) + \left(2 \times 4 \times \frac{1}{2}\right)$	1	Award (1 mark) for correctly substituting probabilities into the expectation (mean) formula
				$= 2 + 4$ $= 6$	1	Award (1 mark**)** for obtaining the correct value of $a = 6$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Log. & Exponential Functions	43	☐ $\frac{2}{a}$ ☐ $a+2$ ■ $\frac{a}{2}$ ☐ $a-2$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Differentiation	92	$\frac{dy}{dx} = 5\cos x \tan x + 5\sin x \sec^2 x$	1	Award (1 mark) for applying the product rule correctly and writing the expression
				$\frac{dy}{dx} = 5\cancel{\cos x}\frac{\sin x}{\cancel{\cos x}} + 5\sin x \sec^2 x$	1	Award (1 mark) for simplifying the expression
				$\frac{dy}{dx} = 5\sin x + 5\sin x \sec^2 x$		
				$\frac{dy}{dx} = 5\sin x (1+\sec^2 x)$	1	Award (1 mark) for factoring and presenting the final simplified expression

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	$L.H.s = cos\ x\ + \frac{sin^2 x}{cos^2 x}\ cos\ x$		
				$cos\ x\ + \frac{sin^2 x}{\cancel{cos^2 x}}\ \cancel{cos\ x}$	1	
				$cos\ x\ + \frac{sin^2 x}{cos\ x}$		
				$= \frac{cos^2 x\ + sin^2 x}{cos\ x}$ $= \frac{1}{cos\ x}$	1	
				$= sec\ x$=R.H. S	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
28	AO2 H	Trigonometry	80	Alternative solution $L.H.S = \cos x + \tan^2 x \cos x$		
				$= \cos x (1 + \tan^2 x)$	1	
				$= \cos x \sec^2 x$	1	
				$= \cancel{\cos x} \dfrac{1}{\cos^{\cancel{2}} x}$	1	
				$= \dfrac{1}{\cos x}$		
				$= \sec x = R.H.S$		