

وزارة التربية والتعليم



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

امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
الفصل الدراسي الأول - الدور الأول - العام الدراسي ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الرياضيات.
- الأسئلة في (١٥) 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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1. List of formulae is given in the last page.
2. Write all answers in the space provided in this question paper show all your work.
3. Non-programmable calculators are allowed.

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

$(4x^3 + 6x - 7) + (3x^3 - 5x + 9)$)

⬭ $7x^3 - x - 16$ ⬭ $7x^3 + x - 16$

⬭ $7x^3 + x - 2$ ⬭ $7x^3 + x + 2$ [1]

2) (Shade in the bubble ⬭ next to sin 160°)

⬭ – sin 20° ⬭ – cos 20°

⬭ cos 20° ⬭ sin 20° [1]

3) Solve the equation $\cos\theta = \frac{1}{2}$ for $\theta \in \mathbb{R}$, where θ is in degrees.

[3]

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4) (Shade in the bubble ⬭ next to the angle 330° in radians)

⬭ $\frac{11\pi}{6}$ ⬭ $\frac{6\pi}{11}$

⬭ $\frac{\pi}{11}$ ⬭ $\frac{\pi}{6}$ [1]

5) Find the magnitude of the vector $-7\mathbf{i} + 2\mathbf{j} - 2\mathbf{k}$

(Round the answer to one decimal place)

[4]

6) $B = \begin{pmatrix} 3 & -1 \\ -5 & 3 \end{pmatrix}$

(Shade in the bubble ⬭ next to the determinant of B)

⬭ – 14 ⬭ – 4

⬭ 4 ⬭ 14 [1]

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7) For the complex number $z = 9 - 12i$

Find $|z|$

[3]

8) Multiply $(x - 6)$ by $(5x^2 + 2x + 2)$

[3]

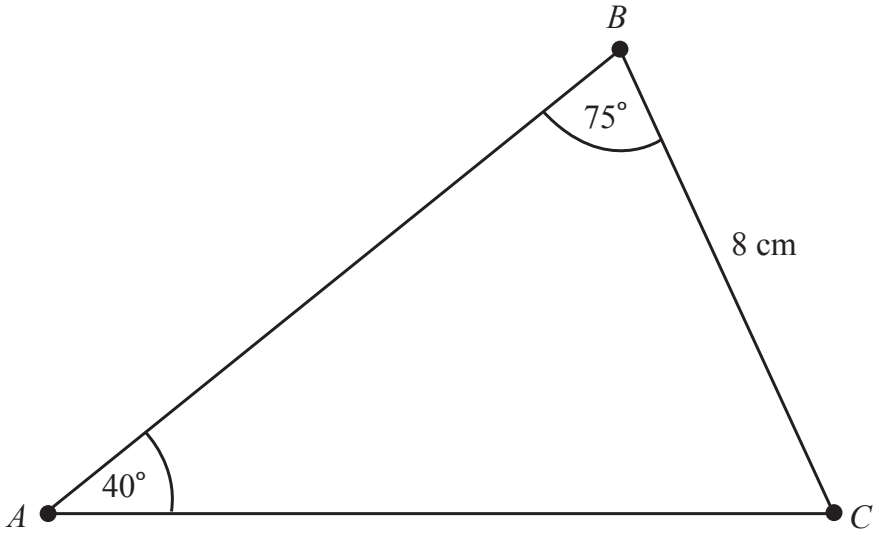
9) $\log x = C$

Write $\log 10\, x^2$ in term of C

[4]

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10) In triangle ABC, $|\angle BAC| = 40°$, $|\angle ABC| = 75°$ and $|BC| = 8cm$



Find $|AC|$ (Round the answer to 2 decimal places)

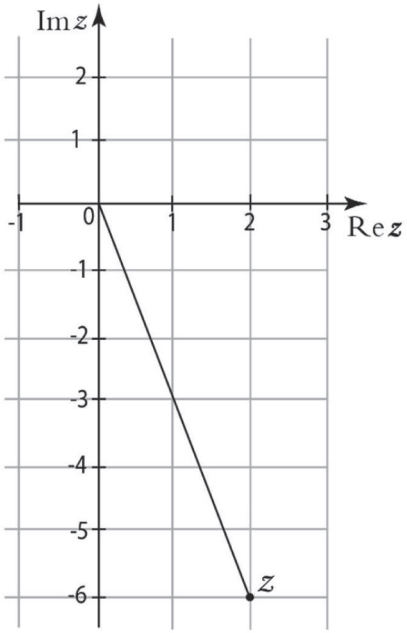
[3]

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11) The Argand diagram shows the complex number z



(Shade in the bubble ⬭ next to the complex number $\frac{1}{2}z$)

⬭ $-6 + 2i$

⬭ $2 - 6i$

⬭ $-3 + i$

⬭ $1 - 3i$

[1]

12) $3(a + bi) = 15 - 6i$

Find the value of a and b

[3]

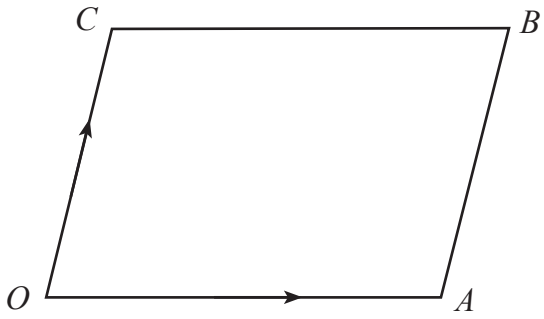
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13) Solve the equation $\sec x = \frac{-5}{4}$ for $0° \leq x \leq 360°$

[3]

14) The diagram shows a parallelogram $OABC$, $\overrightarrow{OA} = 5\boldsymbol{a}$ and $\overrightarrow{OC} = 5\boldsymbol{c}$



(Shade in the bubble ⬭ next to the vector $\overrightarrow{AC}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{c}$)

⬭ $5(\boldsymbol{a} + \boldsymbol{c})$ ⬭ $5(\boldsymbol{a} - \boldsymbol{c})$

⬭ $-5(\boldsymbol{a} - \boldsymbol{c})$ ⬭ $-5(\boldsymbol{a} + \boldsymbol{c})$ [1]

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15) $A = \begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$, $B = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$

Find $\frac{1}{2}(A \cdot B)$

[3]

16) Find the remainder when $x^3 - 5x^2 + 2x - 3$ is divided by $x^2 - 2x + 1$

[4]

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17) Simplify $\sin\left(B + \frac{\pi}{6}\right) - \sin\left(B - \frac{\pi}{6}\right)$

[5]

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18) Use determinants to solve the simultaneous equations

$8x - 6y = 36$

$2x + 4y = -2$

[4]

19) $z_1 = 6 - 5i$ and $z_2 = 8 - 2i$

(Shade in the bubble ⬭ next to $z_2 - z_1^*$)

⬭ $-2 - 7i$ ⬭ $2 - 7i$

⬭ $2 + 3i$ ⬭ $-2 - 3i$ [1]

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20) $e^{8-3x} = 10$

(Shade in the bubble ⬭ next to the value of x , rounded to one decimal place)

⬭ – 3.4 ⬭ – 1.9

⬭ 1.9 ⬭ 3.4 [1]

21) Solve the equation $\sin 2x - \sqrt{3}\cos x = 0$ for $0° \leq x \leq 180°$

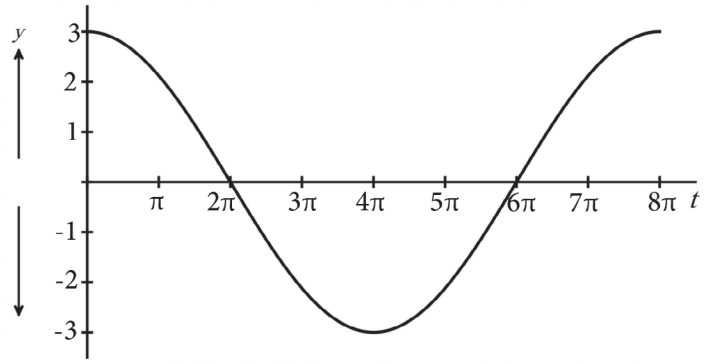
[5]

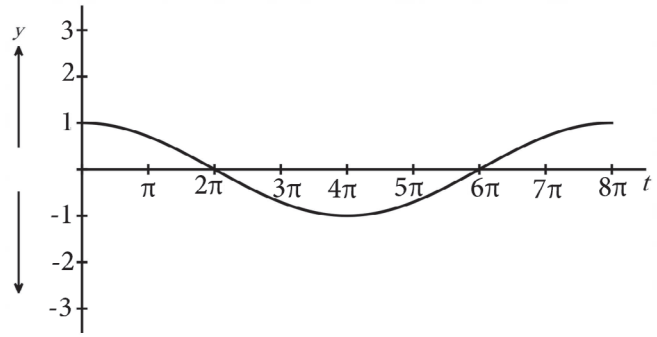
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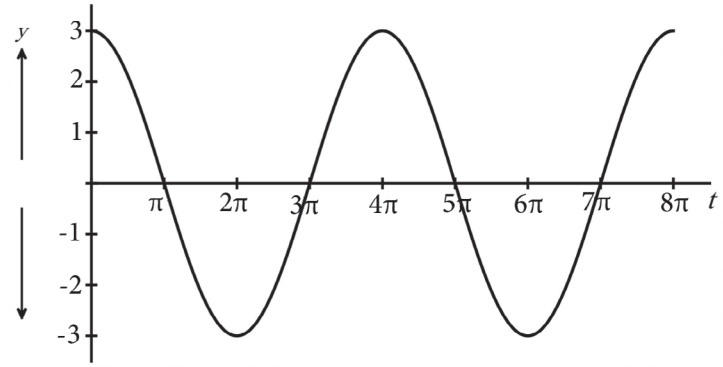
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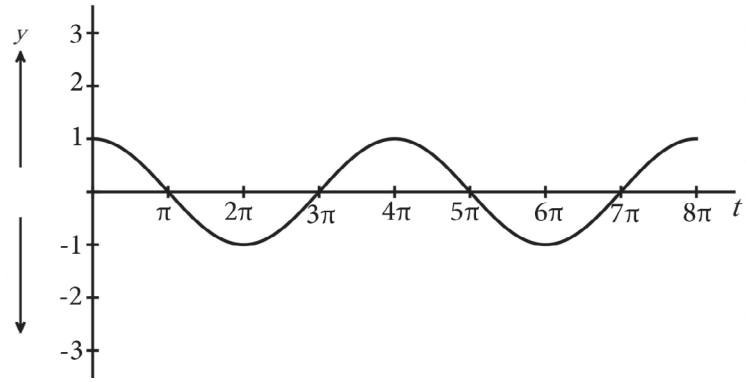
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22) (Shade in the bubble ⬭ next to the graph of $y = 3\cos\frac{1}{2}t$)

⬭ 

⬭ 

⬭ 

⬭ 

[1]

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23) $y_1 = 5 \sin \omega t$ and $y_2 = 2 \sin (\omega t - \frac{\pi}{5})$

(Shade in the bubble ⬭ next to the value of the resultant y_R in units, rounded to two decimal places)

⬭ 9.16 ⬭ 6.72

⬭ 5.39 ⬭ 4.81 [1]

24) For points A, B with position vectors $\boldsymbol{a} = \begin{pmatrix} x \\ y \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} x + 2 \\ 3y \end{pmatrix}$

The mid-point of AB is $\begin{pmatrix} 5 \\ 7 \end{pmatrix}$

Find the value of x and y

[4]

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25) $A = \begin{pmatrix} 4 & 5 \\ 5 & 6 \end{pmatrix}$

(Shade in the bubble ⬭ next to A^{-1})

⬭ $\begin{pmatrix} -6 & 5 \\ 5 & -4 \end{pmatrix}$ ⬭ $\begin{pmatrix} -6 & -5 \\ -5 & -4 \end{pmatrix}$

⬭ $\begin{pmatrix} 6 & -5 \\ -5 & 4 \end{pmatrix}$ ⬭ $\begin{pmatrix} -4 & -5 \\ -5 & -6 \end{pmatrix}$ [1]

26) $z_1 = 8\left(\cos\frac{5\pi}{12} + i\sin\frac{5\pi}{12}\right)$

$z_2 = 4\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$

(Shade in the bubble ⬭ next to $\frac{z_1}{z_2}$)

⬭ $4\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$ ⬭ $2\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$

⬭ $4\left(\cos\frac{7\pi}{12} + i\sin\frac{7\pi}{12}\right)$ ⬭ $2\left(\cos\frac{7\pi}{12} + i\sin\frac{7\pi}{12}\right)$ [1]

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27) $a^x = (a-1)^{x+1}$ where $a > 1$

Show that $x = \dfrac{\ln(a-1)}{\ln(\dfrac{a}{a-1})}$

[3]

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28) The quadratic equation $z^2 - 6z + 34 = 0$ has a root $(a + 5i)$
Find the value of a

[4]

(End of Examination]

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Formulae

1. $\log_a xy = \log_a x + \log_a y$
2. $\log_a \frac{x}{y} = \log_a x - \log_a y$
3. $\log_a x^k = k \log_a x$
4. $|a_1\mathbf{i} + a_2\mathbf{j}| = \sqrt{a_1^2 + a_2^2}$
5. Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
6. Sine Rule: $\frac{a}{\sin A} = \frac{b}{\text{Sin } B} = \frac{c}{\text{Sin } C}$
7. Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$
8. General Sinusoidal expression: $y = A\sin(\omega t \pm \alpha)$ Where A = amplitude, ω = angular velocity in radians per second, t = time in seconds, α = angle of lead or lag Periodic Time $= \frac{1}{f} = \frac{2\pi}{\omega}$ s
9. $\sin^2 A + \cos^2 A = 1$

   $\sec^2 A \equiv 1 + \tan^2 A$

   $\text{cosec}^2 A \equiv 1 + \cot^2 A$

10. Compound Angles:

$$\sin(A \pm B) \equiv \sin A\cos B \pm \cos A\sin B$$

$$\cos(A \pm B) \equiv \cos A\cos B \mp \sin A\sin B$$

$$\tan(A \pm B) \equiv \frac{\tan A \pm \tan B}{1 \mp \tan A\tan B}$$

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11. Double Angles:

$$\sin 2A \equiv 2\sin A\cos A$$

$$\cos 2A \equiv \cos^2 A - \sin^2 A$$

$$\cos 2A \equiv 1 - 2\sin^2 A$$

$$\cos 2A \equiv 2\cos^2 A - 1$$

$$\tan 2A \equiv \frac{2\tan A}{1 - \tan^2 A}$$

12. Reciprocal Functions:

$$\sec A \equiv \frac{1}{\cos A}$$

$$\operatorname{cosec} A \equiv \frac{1}{\sin A}$$

$$\cot A \equiv \frac{1}{\tan A} \equiv \frac{\cos A}{\sin A}$$

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Royal Guard of Oman Technical College, Mathematics
First Semester -First Session
Academic Year 2025/2026

Answer scheme

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
1	AO1 L	1-1	Booklet 2	☐ $7x^3 - x - 16$ ☐ $7x^3 + x - 16$ ☐ $7x^3 + x - 2$ ■ $7x^3 + x + 2$		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
2	AO1 L	3-2	Booklet 12	☐ $-\sin 20°$ ☐ $-\cos 20°$ ☐ $\cos 20°$ ■ $\sin 20°$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
3	AO1 L	3-3	Booklet 14	$\cos\theta = \frac{1}{2}$		1 mark for $\theta = 300°$ If the student writes one of the general solutions, he gets 1 mark.
				$\theta = \cos^{-1}\left(\frac{1}{2}\right)$ (Reference angle)		
				$= 60°$	1	
				cos positive in Q1 and Q4 Thus, $\theta = 60°\ or\ 300°$	1	
				General solution $60° + n(360°)\ or\ 300° + n(360°)$, for $n \in \mathbb{Z}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
4	AO1 L	3-1	Booklet 5	■ $\frac{11\pi}{6}$ ☐ $\frac{6\pi}{11}$ ☐ $\frac{\pi}{11}$ ☐ $\frac{\pi}{6}$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
5	AO1 L	4-4	192	Magnitude $= \sqrt{(-7)^2 + (2)^2 + (-2)^2}$	1+1+1	1mark for the square root symbol
				$= \sqrt{57}$		
				$\simeq 7.5$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
6	AO1 L	5-3	Booklet 59	☐ -14 ■ 4 ☐ -4 ☐ 14		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
7	AO1 L	6-1	246	$z = 9 - 12\mathrm{i}$		1mark for the square root symbol
				$\lvert z\rvert = \sqrt{(9)^2 + (-12)^2}$	1+1	
				$\lvert z\rvert = \sqrt{225}$		
				$\lvert z\rvert = 15$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
8	AO1 M	1-2	Booklet 4	$x(5x^2+2x+2)-6(5x^2+2x+2)$		1mark for each 3 correct terms.
				$5x^3+2x^2+2x-30x^2-12x-12$	1+1	
				$5x^3-28x^2-10x-12$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
9	AO1 M	2-1	38	$= \log 10 + \log x^2$	1	
				$=1 + 2 \log x$	1+1	
				$= 1 + 2C$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
10	AO1 M	3-4	Booklet 20	Using the sine rule: $\frac{\sin 40°}{8} = \frac{\sin 75°}{\|AC\|}$	1	
				$b = \frac{8 \sin 75°}{\sin 40°}$	1	
				$\|AC\| = 12.02cm$ (correct to two decimal place)	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
11	AO1 M	6-2	245	☐ $-6+2i$ ☐ $2-6i$ ☐ $-3+i$ ■ $1-3i$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
12	AO1 M	6-1	251	$3(a + bi) = 15-6i$		
				$3a + 3bi = 15-6i$	1	
				$3a = 15$		
				$a = 5$	1	
				$3b = -6$		
				$b = -2$	1	
				Another solution $3(a + bi) = 3(5 + 2i)$		
				$(a + bi) = (5 + 2i)$	1	
				$a = 5$	1	
				$b = -2$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
13	AO1 H	3-11	78	$\frac{1}{\cos x} = \frac{-5}{4}$		
				$\cos x = \frac{-4}{5}$	1	
				$x = 36.87°(reference\ angle)$		
				$\cos x\ \ negative\ in\ Q2, Q3$		
				$x = 180 - 36.87°$		
				$x = 143.13°$	1	
				$x = 180 + 36.87°$		
				$x = 216.87°$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
14	AO1 H	4-2	186 or 184	☐ $5(a+c)$ ☐ $5(a-c)$ ■ $-5(a-c)$ ☐ $-5(a+c)$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
15	AO1 H	5-1	booklet 57	$\begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix} \times \begin{pmatrix} -5 \\ 4 \end{pmatrix}$		
				$\begin{pmatrix} 2 \times -5 + -1 \times 4 \\ 3 \times -5 \ + \ 1 \times 4 \end{pmatrix}$	1	
				$\begin{pmatrix} -14 \\ -11 \end{pmatrix}$	1	
				$\frac{1}{2}\begin{pmatrix} -14 \\ -11 \end{pmatrix} = \begin{pmatrix} -7 \\ -5.5 \end{pmatrix}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
16	AO2 L	1-3	13	$x-3$ $x^2-2x+1 \overline{)\, x^3-5x^2+2x-3}$ x^3-2x^2+x $-3x^2+x-3$ $-3x^2+6x-3$ $-5x$	1+1 1 1	1 mark for each correct term

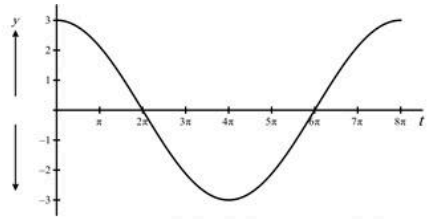
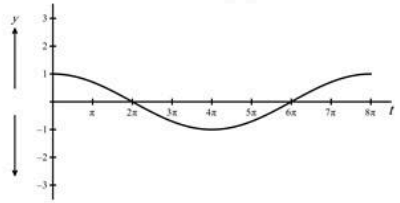
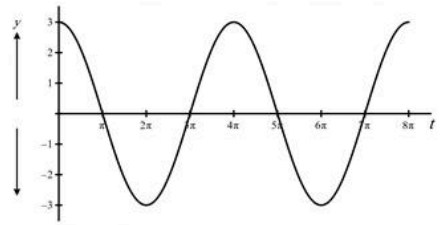
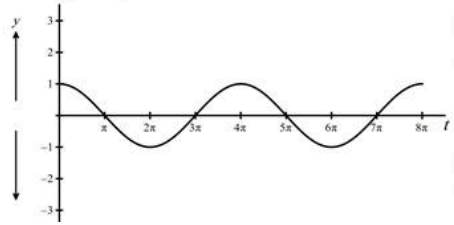
Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [5]	More information
17	AO2 L	3-8	69	$\sin\left(B+\frac{\pi}{6}\right)-\sin\left(B-\frac{\pi}{6}\right)$		1 mark for each correct formula for $\sin\left(B+\frac{\pi}{6}\right)$ and $\sin\left(B-\frac{\pi}{6}\right)$
				$\sin B\ \cos\frac{\pi}{6}+\cos B\sin\frac{\pi}{6}$ $-\left(\sin B\ \cos\frac{\pi}{6}-\cos B\sin\frac{\pi}{6}\right)$	1+1	
				$=2\cos B\sin\frac{\pi}{6}$	1	
				$=2\cos B\times\frac{1}{2}$	1	
				$=\cos B$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
18	AO2 L	5.5	booklet 65	$8x - 6y = 36$ $2x + 4y = -2$		If the student finds the correct values of x and y using a different method, he will get 1 mark for x and 1 mark for y only.
				$\frac{x}{\begin{vmatrix} -6 & -36 \\ 4 & 2 \end{vmatrix}} = \frac{-y}{\begin{vmatrix} 8 & -36 \\ 2 & 2 \end{vmatrix}} = \frac{1}{\begin{vmatrix} 8 & -6 \\ 2 & 4 \end{vmatrix}}$	1	
				$\frac{x}{132} = \frac{-y}{88} = \frac{1}{44}$	1	
				$\frac{-y}{88} = \frac{1}{44}$		
				$y = -2$	1	
				$\frac{x}{132} = \frac{1}{44}$		
				$x = 3$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
19	AO2 L	6-3	250	☐ $-2-7i$ ■ $2-7i$ ☐ $2+3i$ ☐ $-2-3i$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
20	AO2 M	2.2	50	☐ -3.4 ☐ -1.9 ■ 1.9 ☐ 3.4		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [5]	More information
21	AO2 M	3-9	72	$\sin 2x - \sqrt{3}\cos x = 0$		
				$(2\sin x \cos x) - \sqrt{3}\cos x = 0$	1	
				$\cos x(2\sin x - \sqrt{3}) = 0$		
				If $\cos x = 0$	1	
				then $x = 90°$	1	
				If $2\sin x - \sqrt{3} = 0$	1	
				$\sin x = \frac{\sqrt{3}}{2}$		
				then $x = 60°, 120°$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
22	AO2 M	3-6	Booklet 26	☐  ☐  ■  ☐ 		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
23	AO2 M	3-7	Booklet 46	☐ 9.16 ☐ 5.39 ■ 6.72 ☐ 4.81		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [4]	More information
24	AO2 M	4-3	197	$\frac{1}{2}\begin{pmatrix} x+x+2 \\ y+3y \end{pmatrix} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$		
				$\frac{x+x+2}{2} = 5$	1	
				$2x + 2 = 10$		
				$x = 4$	1	
				$\frac{y+3y}{2} = 7$	1	
				$4y = 14$		
				$y = 3.5$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
25	AO2 M	5.3	Booklet 68	■ $\begin{pmatrix} -6 & 5 \\ 5 & -4 \end{pmatrix}$ ☐ $\begin{pmatrix} -6 & -5 \\ -5 & -4 \end{pmatrix}$ ☐ $\begin{pmatrix} 6 & -5 \\ -5 & 4 \end{pmatrix}$ ☐ $\begin{pmatrix} -4 & -5 \\ -5 & -6 \end{pmatrix}$		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
26	AO2 M	6-6	261	☐ $4\left(\cos\frac{\pi}{4}+\mathrm{i}\sin\frac{\pi}{4}\right)$ ■ $2\left(\cos\frac{\pi}{4}+\mathrm{i}\sin\frac{\pi}{4}\right)$ ☐ $4\left(\cos\frac{7\pi}{12}+\mathrm{i}\sin\frac{7\pi}{12}\right)$ ☐ $2\left(\cos\frac{7\pi}{12}+\mathrm{i}\sin\frac{7\pi}{12}\right)$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
27	AO2 H	2-3	54	$\ln a^x = \ln(a-1)^{x+1}$	1	
				$x \ln a = (x+1)\ln(a-1)$ $x \ln a = x \ln(a-1) + \ln(a-1)$	1	
				$x \ln a - x \ln(a-1) = \ln(a-1)$		
				$x\,(\ln a - \ln(a-1)) = \ln\,(a-1)$		
				$x(\ln(\frac{a}{a-1})) = \ln\,(a-1)$	1	
				$x = \frac{\ln(a-1)}{\ln(\frac{a}{a-1})}$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
28	AO2 H	6-5	257	Another root is $a - 5\mathrm{i}$		If a student writes $z = a + 5\mathrm{i}$ only he will not take this mark.
				Start with $z = a \pm 5\mathrm{i}$	1	
				$z - a = \pm 5\mathrm{i}$		
				$(z - a)^2 = -25$	1	
				$z^2 - 2az + a^2 = -25$		
				$z^2 - 2az + a^2 - 25 = 0$	1	
				$-2az = -6z$		
				$-2a = -6$		
				$a = 3$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
28	AO2 H	6-5		**Another Solution:**		
				Another root is $a - 5\mathrm{i}$		
			257	Write the equation as: $(z-(a-5\mathrm{i}))(z-(\mathrm{a}+5\mathrm{i}))=0$	1	
				$((z-a)+5i)((\mathrm{z}-\mathrm{a})-5\mathrm{i})=0$		
				$(z-a)^2-(5i)^2=0$	1	
				$z^2-2az+a^2-25i^2=0$		
				$z^2-2az+a^2+25=0$	1	
				$-2az=-6z$		
				$-2a=-6$		
				$a=3$	1	

وزارة التعليم

امتحان دبلوم التعليم العام

لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)

الفصل الدراسي الأول - الدور الثاني - للعام الدراسي ١٤٤٨/١٤٤٧ هـ - ٢٠٢٥ / ٢٠٢٦ م

تنبيه:
- المادة: الرياضيات.
- 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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1. List of formulae is given in the last page.
2. Write all answers in the space provided in this question paper show all your work.
3. Non-programmable calculators are allowed.

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

$(3x^2 + 7x + 4) - (5x + 4)$)

⬭ $3x^2 + 2x$ ⬭ $3x^2 + 2x + 8$

⬭ $3x^2 + 12x$ ⬭ $3x^2 + 12x + 8$ [1]

2) (Shade in the bubble ⬭ next to the angle $\frac{\pi}{5}$ in degrees)

⬭ 18° ⬭ 36°

⬭ 54° ⬭ 72° [1]

3) Solve the equation $\sin\theta = \frac{1}{2}$ for $\theta \in \mathbb{R}$, where θ is in degrees.

[3]

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4) (Shade in the bubble ⬭ next to cos 240°)

⬭ – sin 60° ⬭ cos 60°

⬭ – cos 60° ⬭ sin 60° [1]

5) The vectors $\boldsymbol{a}$ and $\boldsymbol{b}$ are given by $\boldsymbol{a} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$ and $\boldsymbol{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

Find $2\boldsymbol{a} + 3\boldsymbol{b}$

[4]

6) $A = \begin{pmatrix} 1 & 4 \\ 3 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 0 & 6 \end{pmatrix}$

(Shade in the bubble ⬭ next to $A - B$)

⬭ $\begin{pmatrix} -1 & -3 \\ -3 & -4 \end{pmatrix}$ ⬭ $\begin{pmatrix} 1 & 3 \\ 3 & 4 \end{pmatrix}$

⬭ $\begin{pmatrix} 1 & -3 \\ -3 & 4 \end{pmatrix}$ ⬭ $\begin{pmatrix} -1 & 3 \\ 3 & -4 \end{pmatrix}$ [1]

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7) $z_1 = 8 - 19\text{i}$ and $z_2 = 3 + 7\text{i}$

Find $z_1^* + z_2$

[3]

8) $\text{f}(x) = x^3 + 3x^2 - 4x$

Show that $(x - 1)$ is a factor.

[3]

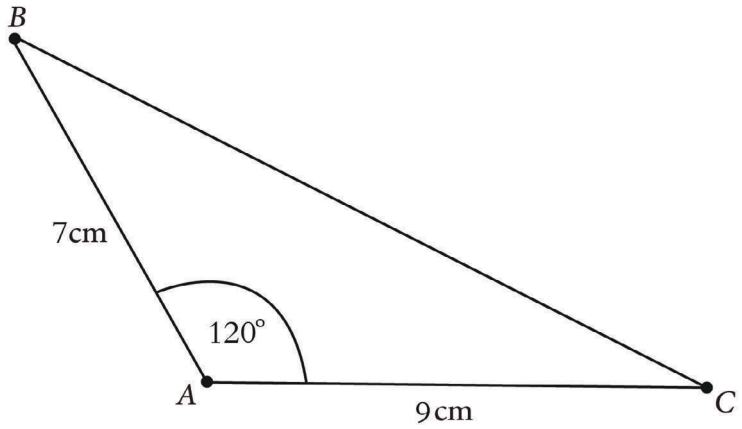
9) $\log_a 2 = C$

Find the value of $\log_a 24 - \log_a 6$ in terms of C

[4]

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10) In the triangle ABC, $|AB| = 7\text{cm}$, $|\angle CAB| = 120°$ and $|AC| = 9cm$



Calculate the length of $\overline{BC}$

(Round the answer to two decimal places)

[3]

11) $z = 7 + 2i$

(Shade in the bubble ⬭ next to arg z)

⬭ 0.142 ⬭ 0.278

⬭ 1.292 ⬭ 1.429 [1]

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12) $z_1 = 3e^{\frac{\pi}{5}i}$ and $z_2 = 4e^{\frac{2\pi}{5}i}$

Find $z_1 z_2$

[3]

13) Solve the equation $\cot\theta = -\frac{4}{3}$ for $0° < \theta < 360°$

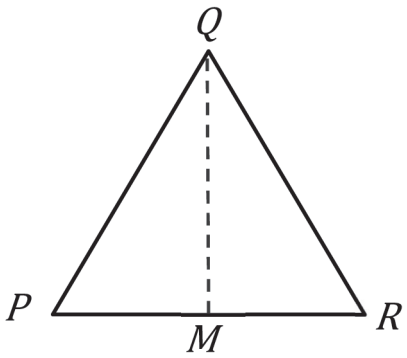
[3]

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14) The diagram shows a triangle PQR

M is the midpoint of $\overrightarrow{PR}$

$\overrightarrow{QR} = 4\boldsymbol{b}$ and $\overrightarrow{PQ} = 6\boldsymbol{a}$



(Shade in the bubble ⬭ next to the vector $\overrightarrow{PM}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$)

⬭ $3\boldsymbol{a} + 2\boldsymbol{b}$ ⬭ $3\boldsymbol{a} + 4\boldsymbol{b}$

⬭ $6\boldsymbol{a} + 2\boldsymbol{b}$ ⬭ $6\boldsymbol{a} + 4\boldsymbol{b}$ [1]

15) $A = \begin{pmatrix} 4 & 0 \\ -2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

Find $-\frac{1}{2}(A \cdot B)$

[3]

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16) Divide $x^3 + 4x^2 - x - 4$ by $x + 4$

[4]

17) Simplify $\sin\left(\frac{\pi}{6} - A\right) + \cos\left(\frac{\pi}{3} - A\right)$

[5]

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18) Use matrices to solve the simultaneous equations

$2x + 6y = 22$

$2x + 4y = 16$

[4]

19) (Shade in the bubble ⬭ next to the roots of the equation $z^2 + 81 = 0$)

⬭ $\pm 9i$ ⬭ ± 9

⬭ $\pm 81i$ ⬭ ± 81 [1]

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20) $0.9^{x-2} > 0.5$

(Shade in the bubble ⬭ next to the value of x, rounded to one decimal place)

⬭ $x > 2.6$ ⬭ $x > 4.6$

⬭ $x > 6.6$ ⬭ $x > 8.6$ [1]

21) Solve the equation $\cos 2x + \sin x = 1$ for $0 < x \leq \pi$, x in radians.

[5]

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22) For the sinusoidal function $y = -5 \sin\left(\frac{1}{2}x + \pi\right)$

(Shade in the bubble ⬭ next to the period of the graph of y)

⬭ -4π ⬭ -2π

⬭ 2π ⬭ 4π [1]

23) $y_R = A \sin\left(\omega t + \frac{\pi}{4}\right)$, $y_1 = 10 \sin(\omega t)$, $y_2 = 10 \sin\left(\omega t + \frac{\pi}{2}\right)$

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

⬭ $20\sqrt{2}$ ⬭ 20

⬭ $10\sqrt{2}$ ⬭ 10 [1]

24) For points A, B with position vectors $\boldsymbol{a} = \begin{pmatrix} 5 \\ y \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} x \\ -2 \end{pmatrix}$

The mid-point of AB is $\begin{pmatrix} 8 \\ 3 \end{pmatrix}$

Find the value of x and y

[4]

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25) $-2\begin{pmatrix} 2 & a \\ 0 & x-1 \end{pmatrix} = \begin{pmatrix} -4 & -6 \\ 0 & 2a \end{pmatrix}$

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

⬭ -12 ⬭ -11

⬭ -3 ⬭ -2 [1]

26) (Shade in the bubble ⬭ next to $(3 + 7i) \div (1 + i)$)

⬭ $10 + 4i$ ⬭ $5 + 2i$

⬭ $10 - 4i$ ⬭ $5 - 2i$ [1]

27) Solve the inequality $3^x < e^{7-4x}$
(Round your answer to two decimal places)

[3]

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28) z is a complex number.
Find all the roots of the equation $2z^2 - 10z + 17 = 0$

[4]

[End of Examination]

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Formulae

1. $\log_a xy = \log_a x + \log_a y$
2. $\log_a \frac{x}{y} = \log_a x - \log_a y$
3. $\log_a x^k = k \log_a x$
4. $|a_1\mathbf{i} + a_2\mathbf{j}| = \sqrt{a_1^2 + a_2^2}$
5. Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
6. Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
7. Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$
8. General Sinusoidal expression: $y = A\sin(\omega t \pm \alpha)$ Where A = amplitude, ω = angular velocity in radians per second, t = time in seconds, α = angle of lead or lag Periodic Time $= \frac{1}{f} = \frac{2\pi}{\omega}$ s
9. $\sin^2 A + \cos^2 A = 1$

   $\sec^2 A \equiv 1 + \tan^2 A$

   $\operatorname{cosec}^2 A \equiv 1 + \cot^2 A$

10. Compound Angles:

$$\sin(A \pm B) \equiv \sin A\cos B \pm \cos A\sin B$$

$$\cos(A \pm B) \equiv \cos A\cos B \mp \sin A\sin B$$

$$\tan(A \pm B) \equiv \frac{\tan A \pm \tan B}{1 \mp \tan A\tan B}$$

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11. Double Angles:

$$\sin 2A \equiv 2\sin A\cos A$$

$$\cos 2A \equiv \cos^2 A - \sin^2 A$$

$$\cos 2A \equiv 1 - 2\sin^2 A$$

$$\cos 2A \equiv 2\cos^2 A - 1$$

$$\tan 2A \equiv \frac{2\tan A}{1 - \tan^2 A}$$

12. Reciprocal Functions:

$$\sec A \equiv \frac{1}{\cos A}$$

$$\operatorname{cosec} A \equiv \frac{1}{\sin A}$$

$$\cot A \equiv \frac{1}{\tan A} \equiv \frac{\cos A}{\sin A}$$

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Marking Guide of
General Education Diploma
The Royal Guard of Oman Technical College
First Semester – Second Session
Academic Year 2025/2026

The marking guide is in (29) pages **Subject: Mathematics** **Full marks: (70)**

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
1	AO1 L	1-1	Booklet 2	■ $3x^2 + 2x$ ☐ $3x^2 + 2x + 8$ ☐ $3x^2 + 12x$ ☐ $3x^2 + 12x + 8$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
2	AO1 L	3-1	Booklet 5	☐ 18° ■ 36° ☐ 54° ☐ 72°		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
3	AO1 L	3-3	Booklet 14	$\sin\theta = \frac{1}{2}$		
				$\theta = sin^{-1}\left(\frac{1}{2}\right)$ $= 30°$ (Reference angle)	1	
				sin positive in Q1 and Q2 Thus, $\theta = 30°$ or $150°$	1	1 mark for $\theta = 150°$
				General solution $30° + n(360°)$or $150° + n(360°)$ for $n \in \mathbb{Z}$	1	If the student writes one of the general solutions, he gets 1 mark.

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
4	AO1 L	3-2	Booklet 12	☐ $-\sin 60°$ ☐ $\cos 60°$ ■ $-\cos 60°$ ☐ $\sin 60°$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
5	AO1 L	4-2	180	$2\begin{pmatrix}1\\5\end{pmatrix}+3\begin{pmatrix}3\\2\end{pmatrix}$		1 mark for each correct vector.
				$=\begin{pmatrix}2\\10\end{pmatrix}+\begin{pmatrix}9\\6\end{pmatrix}$	1+1	
				$=\begin{pmatrix}11\\16\end{pmatrix}$	1+1	1 mark for each correct element. If the student did not write the second step but he completed the solution correctly, he will receive full marks.

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
6	AO1 L	5-1	Booklet 53	☐ $\begin{pmatrix}-1 & -3\\ -3 & -4\end{pmatrix}$ ☐ $\begin{pmatrix}1 & -3\\ -3 & 4\end{pmatrix}$ ☐ $\begin{pmatrix}1 & 3\\ 3 & 4\end{pmatrix}$ ■ $\begin{pmatrix}-1 & 3\\ 3 & -4\end{pmatrix}$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
7	AO1 L	6-1	250	$z_1^* = 8 + 19\text{i}$	1	1 mark for each correct term
				$z_1^* + z_2 = 8 + 19\text{i} + 3 + 7\text{i}$		
				$= 11 + 26\text{i}$	1+1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
8	AO1 M	14	14	Substitute $x = 1$ into $f(x)$		If the student used long division and found the remainder to be zero, he gets full marks.
				$f(1) = (1)^3 + 3(1)^2 - 4(1)$	1	
				$f(1) = 1 + 3 - 4$	1	
				$f(1) = 0$	1	
				So $(x - 1)$ is a factor		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
9	AO1 M	2-1	42	$\log_a 24 - \log_a 6 = \log_a(\frac{24}{6})$	1	
				$= \log_a(4)$	1	
				$= \log_a(2)^2$		
				$= 2\log_a 2$	1	
				$= 2C$	1	
				Another solution		
				$\log_a 24 - \log_a 6 = \log_a(3 \times 8) - \log_a(3 \times 2)$	1	
				$= \log_a 3 + \log_a 8 - \log_a 3 - \log_a 2$	1	
				$= \log_a 2^3 - \log_a 2$	1	
				$= 3\log_a 2 - \log_a 2$ $= 2\log_a 2 = 2C$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
10	AO1 M	3-4	Booklet 17	Using the cosine rule: $\lvert BC\rvert^2 = b^2 + c^2 - 2bc\ \cos A$		
				$\lvert BC\rvert^2 = 9^2 + 7^2 - 2 \times 9 \times 7\ \cos 120°$	1	
				$\lvert BC\rvert^2 = 81 + 49 + 63$		
				$\lvert BC\rvert^2 = 193$	1	
				$\lvert BC\rvert = \sqrt{193}$		
				$\lvert BC\rvert = 13.89$ cm (correct to two decimal places)	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
11	AO1 M	6-1	246	☐ 0.142 ☐ 1.292 ■ 0.278 ☐ 1.429		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
12	AO1 M	6-6	262	$z = 3e^{\frac{\pi}{5}\mathrm{i}} \times 4e^{\frac{2\pi}{5}\mathrm{i}}$		
				$\lvert z\rvert = 3 \times 4$ $= 12$	1	
				$\arg z = \frac{\pi}{5} + \frac{2\pi}{5}$		
				$\arg z = \frac{3\pi}{5}$ in the domain $-\pi \leq \theta \leq \pi$	1	
				$z = 12e^{\frac{3\pi}{5}\mathrm{i}}$ $= 12\left(\cos\frac{3\pi}{5} + i\,sin\frac{3\pi}{5}\right)$	1	If the student found the answer directly, he will get full marks.

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
13	AO1 H	3-11	78	$\frac{1}{\tan\theta} = -\frac{4}{3}$		
				$\tan\theta = -\frac{3}{4}$	1	
				$\theta = 36.87°$(reference angle)		
				$\tan\theta$ negative in $Q2, Q4$		
				$\theta = 180° - 36.87°$		
				$\theta = 143.13°$	1	
				$\theta = 360° - 36.87°$		
				$\theta = 323.13°$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
14	AO1 H	4-2	186	■ $3a + 2b$ ☐ $3a + 4b$ ☐ $6a + 2b$ ☐ $6a + 4b$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
15	AO1 H	5-1	booklet 57	$A \cdot B = \begin{pmatrix} 4 & 0 \\ -2 & 3 \end{pmatrix} \times \begin{pmatrix} 1 \\ 5 \end{pmatrix}$		
				$= \begin{pmatrix} 4 \times 1 + 0 \times 5 \\ -2 \times 1 + 3 \times 5 \end{pmatrix}$	1	
				$= \begin{pmatrix} 4 \\ 13 \end{pmatrix}$	1	
				$-\frac{1}{2}(A \cdot B) = -\frac{1}{2}\begin{pmatrix} 4 \\ 13 \end{pmatrix} = \begin{pmatrix} -2 \\ -6.5 \end{pmatrix}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
16	AO2 L	1-4	13	$x^2 - 1$ $x + 4 \overline{)\, x^3 + 4x^2 - x - 4}$ $x^3 + 4x^2$ $-x - 4$ $-x - 4$ 0	1+1 1 1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [5]	More information
17	AO2 L	3-8	68	$\sin\left(\frac{\pi}{6}-A\right)+\cos\left(\frac{\pi}{3}-A\right)$		1 mark for each correct formula for $\sin\left(\frac{\pi}{6}-A\right)$ and $\cos\left(\frac{\pi}{3}-A\right)$
				$=(\sin\frac{\pi}{6}\cos A-\cos\frac{\pi}{6}\sin A)+(\cos\frac{\pi}{3}\cos A+\sin\frac{\pi}{3}\sin A)$	1+1	
				$=\frac{1}{2}\cos A-\frac{\sqrt{3}}{2}\sin A+\frac{1}{2}\cos A+\frac{\sqrt{3}}{2}\sin A$	1+1	
				$=\cos A$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [4]	More information
18	AO2 L	5-4	booklet 72	$\begin{pmatrix} 2 & 6 \\ 2 & 4 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 22 \\ 16 \end{pmatrix}$	1	 If the student found the values of x and y correctly by another method, he will get only 1 mark.
				The inverse matrix of $\begin{pmatrix} 2 & 6 \\ 2 & 4 \end{pmatrix}$ is $-\frac{1}{4}\begin{pmatrix} 4 & -6 \\ -2 & 2 \end{pmatrix}$		
				$= \begin{pmatrix} -1 & \frac{3}{2} \\ \frac{1}{2} & -\frac{1}{2} \end{pmatrix}$	1	
				$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 & \frac{3}{2} \\ \frac{1}{2} & -\frac{1}{2} \end{pmatrix}\begin{pmatrix} 22 \\ 16 \end{pmatrix}$	1	
				$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -22+24 \\ 11-8 \end{pmatrix}$		
				$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
19	AO2 L	6-4	258	■ $\pm 9i$ ☐ ± 9 ☐ $\pm 81i$ ☐ ± 81		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
20	AO2 M	2.3	53	☐ $x > 2.6$ ☐ $x > 6.6$ ☐ $x > 4.6$ ■ $x > 8.6$		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [5]	More information
21	AO2 M	3-9	71	$\cos 2x + \sin x = 1$		
				$1 - 2\sin^2 x + \sin x = 1$	1	
				$-2\sin^2 x + \sin x = 0$		
				$2\sin^2 x - \sin x = 0$		
				$\sin x(2\sin x - 1) = 0$	1	
				If $\sin x = 0$		
				$x = \pi$	1	
				If $2\sin x - 1 = 0$		
				$\sin x = \frac{1}{2}$	1	
				$x = \frac{\pi}{6}, \frac{5\pi}{6}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [5]	More information
21	AO2 M	3-9	71	**Another solution** $\cos 2x + \sin x = 1$		
				$2\cos^2 x - 1 + \sin x = 1$	1	
				$2\cos^2 x + \sin x = 2$		
				$\sin x = 2 - 2\cos^2 x$		
				$\sin x = 2(1 - \cos^2 x)$		
				$\sin x = 2\sin^2 x$		
				$-2\sin^2 x + \sin x = 0$		
				$2\sin^2 x - \sin x = 0$		
				$\sin x(2\sin x - 1) = 0$	1	
				If $\sin x = 0$		
				$x = \pi$	1	
				If $2\sin x - 1 = 0$		
				$\sin x = \frac{1}{2}$	1	
				$x = \frac{\pi}{6}, \frac{5\pi}{6}$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
22	AO2 M	3-6	Booklet 27	☐ -4π ☐ -2π ☐ 2π ■ 4π		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
23	AO2 M	3-7	Booklet 46	☐ $20\sqrt{2}$ ☐ 20 ■ $10\sqrt{2}$ ☐ 10		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
24	AO2 M	4-3	197	$\frac{1}{2}\begin{pmatrix}5+x\\y+2\end{pmatrix}=\begin{pmatrix}8\\3\end{pmatrix}$		
				$\frac{1}{2}(5+x)=8$	1	
				$5+x=16$		
				$x=11$	1	
				$\frac{1}{2}(y+-2)=3$	1	
				$y+-2=6$		
				$y=8$	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [1]	More information
25	AO2 M	5-1	Booklet 54	☐ -12 ☐ -3 ☐ -11 ■ -2		

Item #	Assessment Object/ Level of demand	Learning Aims	Page	Answer	Marks [1]	More information
26	AO2 M	6-3	252	☐ 10+4i ■ 5+2i ☐ 10-4i ☐ 5-2i		

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [3]	More information
27	AO2 H	2-3	54	$\ln 3^x < \ln e^{7-4x}$	1	
				$x \ln 3 < (7-4x) \ln e$	1	
				$x \ln 3 + 4x < 7$		
				$x(\ln 3 + 4) < 7$		
				$x < \dfrac{7}{(\ln 3 + 4)}$		
				$x < 1.37$ (Round to two decimal places)	1	

Item #	Assessment Object/ Level of demand	Learning Aims	page	Answer	Marks [4]	More information
28	AO2 H	6-4	258	$2z^2 - 10z + 17 = 0$	1	
				Solve by completing the square: $2(z^2 - 5z) + 17 = 0$		
				$2\left(z^2 - 5z + \frac{25}{4} - \frac{25}{4}\right) + 17 = 0$		
				$2\left((z - \frac{5}{2})^2 - \frac{25}{4}\right) + 17 = 0$		
				$2(z - \frac{5}{2})^2 = -\frac{9}{2}$	1	
				$(z - \frac{5}{2})^2 = -\frac{9}{4}$		
				$z - \frac{5}{2} = \pm\frac{3}{2}\mathrm{i}$	1	
				$z = \frac{5}{2} \pm \frac{3}{2}\mathrm{i}$	1	