



امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الأول - الدور الأول

للعام الدراسي ١٤٤٧/١٤٤٦ هـ - ٢٠٢٤ / ٢٠٢٥ م

تنبيه:
- المادة: الرياضيات الأساسية.
- 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** ▭ ◉ ◒ ✗ ✓

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 $\frac{(x-2)^2}{(x-2)}$)

⬭ $x+2$ ⬭ $x-2$

⬭ $\frac{1}{(x+2)}$ ⬭ $\frac{1}{(x-2)}$

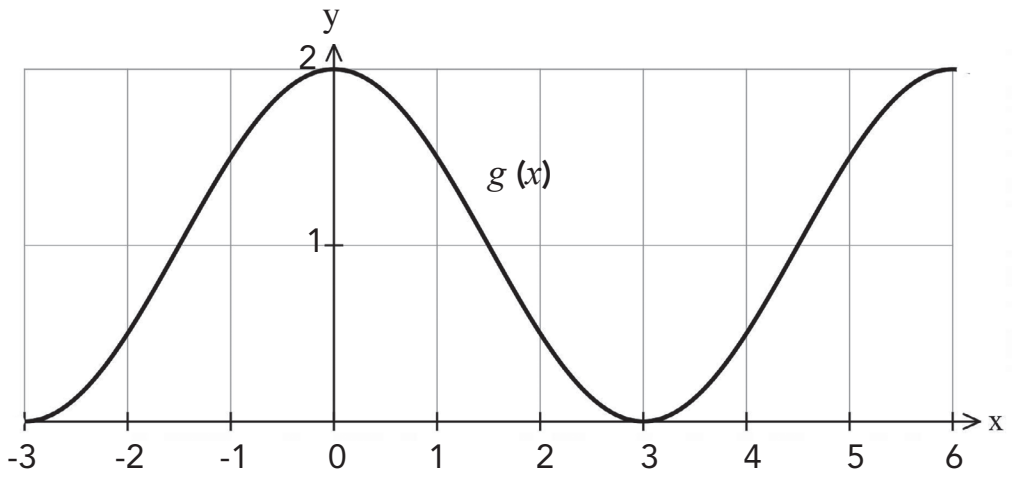
[1]

2) Find the value of $\log_7(y) + \log_7(\frac{1}{y})$

[4]

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3) The graph below shows the curve of $g(x)$ on the interval $[-3, 6]$



(Shade in the bubble ⬭ next to the decreasing interval of $g(x)$)

⬭ $[-3, 0]$ ⬭ $[-3, 3]$

⬭ $[0, 3]$ ⬭ $[3, 6]$ [1]

4) Given that $f(x) = 10 + 2x^2 - 20x$

Find the values of x for which $f(x)$ is an increasing function.

[4]

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5) If the summary data for a variable x are:

$$n = 7 \ , \ \sum x = 49 \ , \ \sum x^2 = 455$$

Find the standard deviation (σ).

[4]

6) Simplify the fraction $\dfrac{-8x^7 + 2x - 10}{2x}$

[3]

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7) Find the remainder of dividing $g(x) = x^3 - \frac{x}{2} - 4$ by $(x + 2)$

[4]

8) Given the equation $\log_4 (x + 5) = 0$

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

○ -4 ○ -1

○ 1 ○ 4 [1]

9) (Shade in the bubble ○ next to the represented statement of $\log_a \frac{x}{y^2}$)

○ $2 \log_a x - \log_a y$ ○ $\log_a x + 2 \log_a y$

○ $2 \log_a x + \log_a y$ ○ $\log_a x - 2 \log_a y$

[1]

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10) Given that $4^{(x+1)} = 40$

Find the value of x to 3 significant figures

[4]

11) The sum of the scores of 25 students in class (A) is 175, and the sum of the scores of 25 students in class (B) is 225

(Shade in the bubble ⬭ next to the mean of the scores of the students in the two schools **together**)

⬭ 6 ⬭ 7

⬭ 8 ⬭ 9 [1]

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12) $g(x) = x^3 + p\,x^2 + q\,x + 5$ is divided by $(x - 1)$, with remainder 10, where p and q are constants.

(Shade in the bubble ○ next to the value of (p + q))

○ – 6 ○ – 4

○ 4 ○ 6

[1]

13) $f(x) = x^3 + 3\,x^2 + 2\,x + 6$ is divided by $(x + 3)$

Find the **quotient**.

[3]

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14) Given that the following weights (in kilograms) of school bags packed by 10 students are:

4 5 3 6 6 5 7 4 3 7

Find the variance (σ^2) of the weight.

[3]

15) ($x - 3$) is a factor of $2x^3 - 6x^2 + kx - 6$

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

⬭ 0 ⬭ 2

⬭ 3 ⬭ 6 [1]

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16) When $(x + 1)$ is a factor of $f(x) = x (x^2 - 1) + (b x^2 + 2)$.

Using the factor theorem to find the value of b

[4]

17) Solve the equation by giving your answer to two decimal places :

$3^{2x} - 12 (3^x) + 32 = 0$

[4]

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18) The data below shows the distances (in kilometers) covered by 12 players in a football match.

5	6	7	8	8	8
9	10	10	10	10	11

(Shade in the bubble ○ next to the median (Q_2))

○ 7.5 ○ 8.5

○ 10 ○ 11 [1]

19) The summary data for a variable X are:

Set A of size n_1 = 10, and has a mean $\overline{x_1}$ = 30

Set B of size $n_2 = \frac{n_1}{2}$, and has a mean $\overline{x_2}$ =18

Find $\overline{X}$ (the mean for the combined set A and B)

[4]

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20) Given that $\log_5 x = y$

(Shade in the bubble ⬭ next to the value of $\log_x 125$ in terms of y)

⬭ $\frac{5}{y}$ ⬭ $\frac{3}{y}$

⬭ $\frac{y}{5}$ ⬭ $\frac{y}{3}$ [1]

21) Given that the curve $y = 3x^2 - x^3$.

Determine the nature of the stationary point(s).

[6]

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22) The table below shows the distribution of the waiting times for 100 customers in a certain petrol station.

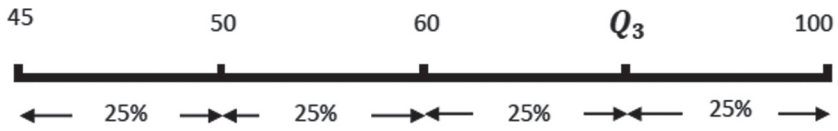
Waiting times in minutes	1 – 3	4 – 6	7 – 10	11 – 13	14 – 16
Number of customers	m	20	10	30	35

(Shade in the bubble ⬭ next to the median class)

⬭ 1 – 3 ⬭ 4 – 6

⬭ 11 – 13 ⬭ 14 – 16 [1]

23) The interquartile range (IQR) of the following data is 15



(Shade in the bubble ⬭ next to the Q_3)

⬭ 65 ⬭ 70

⬭ 75 ⬭ 85 [1]

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24) The table below shows the distribution number of points obtained by 40 players in taekwondo.

Number of points	5 – 50	51 – 100	101 – 150	151 – 200
Number of players	8	16	13	3

Find an estimate for the lower quartile (Q_1).

[5]

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25) Given that ($2x + 1$) is a factor of $f(x) = 2x^3 + 3x^2 - 3x - 2$

Factorize f (x) completly.

[3]

26) Given that $f(x) = 2x^2 + \boldsymbol{a}x + 6$ has a stationary point at $x = 1$

(Shade in the bubble ⬭ next to the value of $\boldsymbol{a}$)

⬭ 4 ⬭ 2

⬭ – 2 ⬭ – 4 [1]

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27) Given that a and b are two positive constants.

Solve the simultaneous equations:

$a = b^2$

$\log_2 a + \log_2 b = 3$

[3]

[End of Examination]

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Formulas sheet

Algebraic Methods

- **The factor theorem** states that if $f(x)$ is a polynomial, then:

  *) If $f(p) = 0$, then $(x - p)$ is a factor of $f(x)$.
  *) If $(x - p)$ is a factor of $f(x)$, then $f(p) = 0$
  *) If $f\left(\frac{b}{a}\right) = 0$, then $(ax - b)$ is a factor of $f(x)$.
  *) If $(ax - b)$ is a factor of $f(x)$, then $f\left(\frac{b}{a}\right) = 0$

- **The remainder theorem** states that if a polynomial $f(x)$ is divided by $(ax - b)$, then the remainder is $f\left(\frac{b}{a}\right)$

Exponential & Logarithms

- $\log_a n = x$ is equivalent to $a^x = n \ \ (a \neq 1)$
- $\log_a x + \log_a y = \log_a xy$
- $\log_a x - \log_a y = \log_a \frac{x}{y}$
- $\log_a x^k = k \log_a x$
- $\log_a a = 1$
- $\log_a x = \frac{\log_b x}{\log_b a}$
- $\log_a b = \frac{1}{\log_b a}$

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Differentiation

- $y = x^n \Rightarrow \frac{dy}{dx} = n\,x^{n-1}$

Measures of Location and Spread

- $\bar{x} = \frac{\sum x}{n}$
- If set ***A***, of size n_1 , has mean $\bar{x}_1$ and set ***B***, of size n_2 , has mean $\bar{x}_2$, then the mean of the combined set of ***A*** and ***B*** **is**

$$\bar{x} = \frac{n_1\,\bar{x}_1 + n_2\,\bar{x}_2}{n_1 + n_2}$$

- **For data given in a frequency table**: $\bar{x} = \frac{\sum xf}{\sum f}$
- **For grouped continuous data, or data presented in a cumulative frequency table:**

$Q_1 = \frac{n}{4}$ th data value $\quad Q_2 = \frac{n}{2}$ th data value $\quad Q_3 = \frac{3n}{4}$ th data value

- **Interquartile range:** $IQR = Q_3 - Q_1$
- **Variance:**

$$\sigma^2 = \frac{\sum(x-\bar{x})^2}{n} = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 = \frac{S_{xx}}{n}$$

$$\text{where} \quad S_{xx} = \sum(x-\bar{x})^2 = \sum x^2 - \frac{(\sum x)^2}{n}$$

- **The standard deviation:** $\sigma = \sqrt{\sigma^2}$
- **For grouped data presented in a frequency table:**

Variance $\sigma^2 = \frac{\sum f(x-\bar{x})^2}{\sum f} = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$

Standard deviation $\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$

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Answer scheme



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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Algebraic methods	3	☐ $x+2$ ■ $x-2$ ☐ $\frac{1}{x+2}$ ☐ $\frac{1}{x-2}$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Exponentials and logarithms	54	$= \log_7(y) + \log_7(\frac{1}{y})$		
				$= \log_7(y \times \frac{1}{y})$	1 + 1	If the student applies the law of multiplication and cancelation together award (2 marks)
				$= \log_7 1$	1	If the student writes the expression ($\log_7 1$) award (1 mark)
				$= 0$	1	If the student uses calculator to get the answer is 0, award (1 mark)

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Exponentials and logarithms		**.....Alternative Solution .....**		
			54	$= \log_7(y) + \log_7(\frac{1}{y})$		
				$= \log_7(y) + \log_7(1) - \log_7(y)$	1 + 1	If the student applies the law of Division and cancelation together award (2 marks)
				$= \log_7 1$	1	If the student writes the expression ($\log_7 1$) award (1 mark)
				$= 0$	1	If the student uses calculator to get the answer is 0, award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Differentiation	**138**	☐ $[-3,0]$ ☐ $[-3,3]$ ■ $[0,3]$ ☐ $[3,6]$	1	-

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
4	AO1 L	Differentiation	**138**	$f'(x) = 4x - 20$	1	If the student finds $f'(x)$ correctly award (1 mark)
				$f(x)$ *is increasing when* $f'(x) \geq 0$	1	If the student doesn't write the rule ($f(x)$ is increasing when $f'(x) \geq 0$), then award its mark to the next step
				$4x - 20 \geq 0$ $4x \geq 20$ $x \geq \frac{20}{4}$	1	
				The values of x are: $x \geq 5$	1	If the student writes final answer as $x \geq \frac{20}{4}$ award (1 mark)

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<table>
<tr><th>Item #</th><th>Assessment Object / Level of Demand</th><th>Unit</th><th>Page</th><th>Answer</th><th>Marks [4]</th><th>More information</th></tr>
<tr><td rowspan="6">4</td><td rowspan="6">AO1
L</td><td rowspan="6">Differentiation</td><td rowspan="6">138</td><td>……Alternative Solution ……</td><td></td><td></td></tr>
<tr><td>$f'(x) = 4x - 20$</td><td>1</td><td>If the student finds $f'(x)$ correctly award (1 mark)</td></tr>
<tr><td>$4x - 20 = 0$
$x = 5$</td><td>1</td><td>Student award (1 mark) if find x =5</td></tr>
<tr><td><table><tr><td colspan="3">5</td></tr><tr><td>$f'(x)$</td><td>Negative (-)</td><td>Positive (+)</td></tr><tr><td></td><td>↘</td><td>↗</td></tr></table></td><td>1</td><td>Student award (1 mark) by drawing the table correctly to describe the $f'(x)$</td></tr>
<tr><td>The values of x are: $x \geq 5$</td><td>1</td><td>If the student writes final answer as $x \geq \frac{20}{4}$ award (1 mark)</td></tr>
<tr><td></td><td></td><td></td></tr>
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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
5	AO1 L	Statistic	20	$\sigma^2 = \frac{455}{7} - \left(\frac{49}{7}\right)^2$	1	(1 mark) if the students substitute in the law
				$\sigma^2 = 65 - 49$	1	(1 mark) if the students write (65 - 49)
				$\sigma^2 = 16$	1	- (1 mark) if the students write 16 - If the student doesn't write this step, and finds the result in the next step award (1 mark)
				$\sigma = \sqrt{16} = 4$	1	(1 mark) if the students write 4

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 M	Algebraic methods	2	$= \frac{-8x^7 + 2x - 10}{2x}$		
				$= \frac{-8x^7}{2x} + \frac{2x}{2x} - \frac{10}{2x}$		
				$= -4x^6 + 1 - \frac{5}{x}$	1 + 1 + 1	If the student writes the three terms correctly award (3 marks)

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
7	AO1 M	Algebraic methods	12	$g(-2)$ is the remainder	1	If the student uses the remainder theorem to find $g(-2)$, award (1 mark)
				$g(-2) = (-2)^3 - \frac{(-2)}{2} - 4$	1	- (1 mark) for the $g(-2)$ - (1 mark) for the substitute correctly
				$g(-2) = -8 + 1 - 4$	1	If the student writes the calculation correctly without the substitution step, award (2 marks)
				$g(-2) = -11$	1	If the student finds the result correctly, award (1 mark)

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
8	AO1 M	Exponentials and logarithms	12	■ −4 □ −1 □ 1 □ 4	1	-

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	AO1 M	Exponentials and logarithms	**55**	☐ $2\log_a x - \log_a y$ ☐ $\log_a x + 2\log_a y$ ☐ $2\log_a x + \log_a y$ ■ $\log_a x - 2\log_a y$	1	-

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Exponentials and logarithms	57	$log_4 40 = x + 1$	1	If the student rewrites power function into the logarithm function award (1 mark)
				$x = log_4 40 - 1$	1	
				$x = (2.6609 \ldots.) - 1$	1	
				$x \approx 1.66$	1	If the student uses calculator to get value of x award (1 mark)

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Exponentials and logarithms	57	**Alternative Solution**		
				By taking log for both sides for base 10	1	
				$log_{10}\, 4^{x+1} = log_{10}\, 40$	1	If the student takes the logarithm of both sides award (1 mark)
				$x = \dfrac{log_{10}\, 40}{log_{10}\, 4} - 1$	1	
				$x \approx 1.66$	1	If the student uses calculator to get value of x award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Statistic	9	☐ 6 ☐ 7 ■ 8 ☐ 9	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
12	AO1 H	Algebraic methods	**12**	☐ − 6 ☐ − 4 ■ 4 ☐ 6	1	-



Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
13	AO1 H	Algebraic methods	5	$x+3\overline{)x^3+3x^2+2x+6}$ $\quad x^2+2$ x^3+3x^2 0	1	
				$2x+6$ $2x+6$ 0	1	
				The quotient is (x^2+2)	1	If the student doesn't write the quotient, then he will get the mark if indicates it in the long division as: $\overline{)}$ x^2+2

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
14	AO1 H	Statistic	**21**	$\sum x = 4 + 5 + 3 + 6 + 6 + 5 + 7 + 4 + 3 + 7$ $= 50$	1	if the student writes $\sum x = 50$ immediately, award (1 mark)
				$\sum x^2 = 16 + 25 + 9 + 36 + 36 + 25 + 49 + 16 + 9 + 49$ $= 270$	1	if the student writes $\sum x^2 = 270$ immediately, award (1 mark)
				$\sigma^2 = \frac{270}{10} - (\frac{50}{10})^2$ $\sigma^2 = 27 - 25$		
				$\sigma^2 = 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
15	AO2 L	Algebraic methods	12	☐ 0 ■ 2 ☐ 3 ☐ 6	1	-



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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
16	AO2 L	Algebraic methods	9	$f(-1) = 0$	1	If the student doesn't write the statement that says $(f(-1) = 0)$, then the student will get (1 mark) in the next step of substitution.
				$-1((-1)^2 - 1) + (b \times (-1)^2 + 2) = 0$	1	
				$-1(0) + (b + 2) = 0$ $0 + b + 2 = 0$	1	
				$b = -2$	1	If the student writes the last step, then the student will get (1 mark) for the result

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and logarithms	**58**	$3^{2x} - 12(3^x) + 32 = 0$		
				$(3^x - 4)(3^x - 8) = 0$	1 + 1	- (1 mark) for each correct factor - Student lose (2 marks) if he/she doesn't write this step
				$3^x = 4$ $log_3 4 = x$ $x \approx 1.26$	1	
				$3^x = 8$ $log_3 8 = x$ $x \approx 1.89$	1	

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and logarithms	**58**	Alternative Solution		
				$(3^x - 4)(3^x - 8) = 0$	$1 + 1$	- (1 mark) for each correct factor - Student lose (2 marks) if he/she doesn't write this step
				$3^x = 4$ $log_{10} 3^x = log_{10} 4$ $x = \frac{\log_{10} 4}{\log_{10} 3}$ $x \approx 1.26$	1	
				$3^x = 8$ $log_{10} 3^x = log_{10} 8$ $x = \frac{\log_{10} 8}{\log_{10} 3}$ $x \approx 1.89$	1	

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
18	AO2 L	Statistic	**13**	☐ 7.5 ■ 8.5 ☐ 10 ☐ 11	1	-



Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
19	AO2 L	Statistic	**9**	$n_2 = 5$	1	If the student doesn't write this step, then the student gets the mark in the next step
				$\bar{X} = \frac{10 \times 30 + 5 \times 18}{10 + 5}$	1	If the student doesn't write this step, then the student gets the mark in the next step
				$\bar{X} = \frac{300 + 90}{10 + 5}$	1	
				$\frac{390}{15} = 26$	1	If student writes the result 20 or $\frac{300}{15}$, award (1 mark)

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
20	AO2 M	Exponentials and logarithms	**59**	☐ $\frac{5}{y}$ ■ $\frac{3}{y}$ ☐ $\frac{y}{5}$ ☐ $\frac{y}{3}$	1	-

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
21	AO2 M	Differentiation	**140**	$y' = 0 \rightarrow y' = 6x - 3x^2 = 0$	1	
				$3x(2-x) = 0$, then $x = 0$	1	
				$3x(2-x) = 0$, then $x = 2$	1	
				$y'' = 6 - 6x$	1	
				$y''(0) = 6 - 6(0) = 6$ $y''(2) = 6 - 6(2) = -6$		
				the point (0,0) is a local minimum	1	
				the point (2,4) is a local maximum	1	

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<table>
<tr><th>Item #</th><th>Assessment Object / Level of Demand</th><th>Unit</th><th>Page</th><th>Answer</th><th>Marks [6]</th><th>More information</th></tr>
<tr><td rowspan="8">21</td><td rowspan="8">AO2
M</td><td rowspan="8">Differentiation</td><td rowspan="8">140</td><td>Alternative Solution</td><td></td><td></td></tr>
<tr><td>$y' = 0 \rightarrow y' = 6x - 3x^2 = 0$</td><td>1</td><td></td></tr>
<tr><td>$3x(2 - x) = 0$, then $x = 0$</td><td>1</td><td></td></tr>
<tr><td>$3x(2 - x) = 0$, then $x = 2$</td><td>1</td><td></td></tr>
<tr><td><table><tr><td>Value of x</td><td>$x = -1$</td><td>$x = 0$</td><td>$x = 1$</td><td>$x = 2$</td><td>$x = 3$</td></tr><tr><td>Gradient</td><td>- 9</td><td>0</td><td>+3</td><td>0</td><td>-9</td></tr><tr><td>Shape of curve</td><td>\</td><td>—</td><td>/</td><td>—</td><td>\</td></tr></table></td><td>1</td><td></td></tr>
<tr><td>the point (0,0) is a local minimum</td><td>1</td><td></td></tr>
<tr><td>the point (2,4) is a local maximum</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
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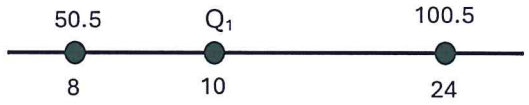
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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
22	AO2 M	Statistic	12	☐ 1 – 3 ☐ 4 – 6 ■ 11 – 13 ☐ 14 – 16	1	-

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Statistic	16	■ 65 ☐ 70 ☐ 75 ☐ 85	1	-



Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	Statistic	14	lower quartile: $\frac{40}{4} = 10^{th}$ value	1	If the student finds a lower quartile 10^{th}, then award (1 mark)
				Using the interpolation:  	1	If the student doesn't write this step, then the student will get its mark in the next step
				$\frac{Q_1 - 50.5}{100.5 - 50.5} = \frac{10-8}{24-8}$	1	If the student doesn't write this step, then the student will get its mark in the next step
				$\frac{Q_1 - 50.5}{50} = \frac{2}{16}$	1	
				$Q_1 = 6.25 + 50.5$ $Q_1 = 56.75$	1	

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
25	AO2 H	Algebraic methods	16	$$\begin{array}{r} x^2+x-2 \\ 2x+1\overline{)\,2x^3+3x^2-3x-2} \\ \underline{2x^3+x^2} \\ 2x^2-3x \\ \underline{2x^2+x} \\ -4x-2 \\ \underline{-4x-2} \\ 0 \end{array}$$	1	The student gets (1 mark) for the correct steps of division.
				$2x^3+3x^2-3x-2=(2x+1)(x^2+x-2)$	1	The student gets (1 mark) for the quotient
				$=(2x+1)(x-1)(x+2)$	1	The student gets (1 mark) for the correct factorization

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Differentiation	16	☐ 4 ☐ 2 ☐ −2 ■ −4	1	-



Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Exponentials and logarithms	56	$log_2 a + log_2 b = 3$ $log_2 ab = 3$		
				$a\ b = 2^3 = 8 \longrightarrow$ (1)	1	If the student applies the logarithm laws and gets the first equation will award (1) mark
				substitute $a = b^2$ given in equation (1) $b^2 \times b = 8$ $b^3 = 8$ $b = 2$	1	(1 mark) for the value of b
				$a = 2^2 = 4$	1	(1 mark) for the value of a

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Exponentials and logarithms	56	**Alternative Solution**		
				By taking log for base 2 in both sides for $(a = b^2)$ $\log_2 a = \log_2 b^2$	1	
				Substitute $(\log_2 a = \log_2 b^2)$ in $(\log_2 a + \log_2 b = 3)$ $\log_2 b^2 + \log_2 b = 3$ $b^2 \times b = 2^3$ $b^3 = 8 \longrightarrow b = \mathbf{2}$	1	(1 mark) for the value of b
				$a = b^2$ $a = 2^2 = 4$	1	(1 mark) for the value of a

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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Exponentials and logarithms	56	**Alternative Solution**		
				By taking log for base 2 in both sides for $(a = b^2)$ $\log_2 a = \log_2 b^2$ $\log_2 a - 2\log_2 b = 0$	1	
				$\log_2 a - 2\log_2 b = 0$ $\log_2 a + \log_2 b = 3$ } Subtract $-3\log_2 b = -3$ $\log_2 b = 1 \longrightarrow b = 2$	1	(1 mark) for the value of b
				$a = b^2$ $a = 2^2 = 4$	1	(1 mark) for the value of a

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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 الثاني

للعام الدراسي ١٤٤٧/١٤٤٦ هـ - ٢٠٢٥/٢٠٢٤ م

تنبيه:
- المادة: الرياضيات الأساسية.
- 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 $\frac{(x+5)^2}{(x+5)}$)

⬭ $x + 5$ ⬭ $x - 5$

⬭ $\frac{1}{x+5}$ ⬭ $\frac{1}{x-5}$ [1]

2) Giving that $\log_{10}(x^5) - 3\log_{10}(x)$

Write the statement as a single logarithm in terms of $\log_{10}(x)$

[4]

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3) Given that $f(x) = x^2 + px$ is increasing at $x = 1$

(Shade in the bubble ⬭ next to the possible values for p)

⬭ $p \geq 2$ ⬭ $p \leq 2$

⬭ $p \leq -2$ ⬭ $p \geq -2$ [1]

4) $f(x) = 1 + 2x - x^2$

Find the values of x for which $f(x)$ is a decreasing function.

[4]

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5) The summary data for a variable X are

$$\overline{x_1} = 20, \quad \overline{x_2} = 30, \quad n_1 = 15, \quad n_2 = 10$$

Find $\overline{X}$ (the mean combined set x_1 and x_2)

[4]

6) Simplify the fraction $\dfrac{x^2 - 9}{x^2 + 4x + 3}$

[3]

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7) Find the remainder of dividing $g(x) = 3x^3 - 5x^2 + 2x - 7$ by $(x - 2)$

[4]

8) (Shade in the bubble ⬭ next to the power expression of the statement $\log_5 7 = x$)

⬭ $5^x = 7$ ⬭ $5^7 = x$

⬭ $7^5 = x$ ⬭ $x^5 = 7$ [1]

9) Given that $2^{2x} + 1 = 2$

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

⬭ -2 ⬭ -1

⬭ 0 ⬭ 1 [1]

Do not write in this space

Do not write in this space

10) Solve the equation $\log_4 12 - \log_4 x = 1$

[4]

11) The table below shows the grouped frequency number of daily hours spent studying by students.

Number of hours	1 – 2	3 – 4	5 – 6	7 – 8
Frequency	15	17	12	10

(Shade in the bubble ○ next to the modal class)

○ 1 – 2 ○ 3 – 4

○ 5 – 6 ○ 7 – 8 [1]

Do not write in this space

12) $g(x) = x^3 + px^2 + qx - 1$ is divided by $(x - 1)$ with remainder 7, where p and q are constant.

(Shade in the bubble ⬭ next to the value of $\frac{p+q}{7}$)

⬭ -7 ⬭ -1

⬭ 1 ⬭ 7 [1]

13) Given that $(x - 5)$ is a factor of $\frac{1}{5}x^3 - k$

Find the value of k

[3]

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Do not write in this space

Do not write in this space

14) The data below shows the number of days spent by 20 Omani families travelling to Salalah.

4	4	5	6	6	8	8	8	9	10
10	10	10	11	12	12	13	14	14	15

Find the lower quartile (Q_1).

[3]

15) Giving that $(x + 4)$ is a factor of $g(x) = x^3 + 4x^2 - 7x - 28$

(Shade in the bubble ⬭ next to the other factor)

⬭ $-x^2 - 7$ ⬭ $x^2 + 7$

⬭ $x^2 - 7$ ⬭ $-x^2 + 7$ [1]

Do not write in this space

16) $f(x) = 5x^3 + x^2 - x + 3$ is divided by $(x + 1)$

Write $f(x)$ in the form $(x + 1)(ax^2 + bx + c)$

[4]

Do not write in this space

Do not write in this space

Do not write in this space

17) Solve the equation:

$$x \log_4 x = \log_2 x$$

[4]

18) The data below shows the times (to nearest minutes) covered by 50 players in a race.

Times (in minutes)	50 – 70	71 – 90	91 – 110	111 – 130
Number of players	4	20	14	12

(Shade in the bubble ⬭ next to the median class)

⬭ 50 – 70 ⬭ 71 – 90

⬭ 91 – 110 ⬭ 111 – 130 [1]

Do not write in this space

19) Salim conducted a survey among his friends, asking how many times they brush their teeth each day. The table below displays the results.

Times of brushing teeth (x)	1	2	3
Number of friends (f)	7	9	14

Calculate the variance (σ^2) of the times of brushing teeth.

[4]

20) Given that $k = \log_p 64$

(Shade in the bubble ⬭ next to the expression of $\log_p 2$ in terms of k)

⬭ $\frac{k}{4}$ ⬭ $\frac{k}{6}$

⬭ $3k$ ⬭ $6k$ [1]

Do not write in this space

Do not write in this space

Do not write in this space

21) Given that $f(x) = x^3 - 3x^2 + 5$

Determine the nature of the stationary point(s).

[6]

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22) The 25th to 50th interquartile range equals 40 and $Q_2 = 100$, $Q_3 = 150$

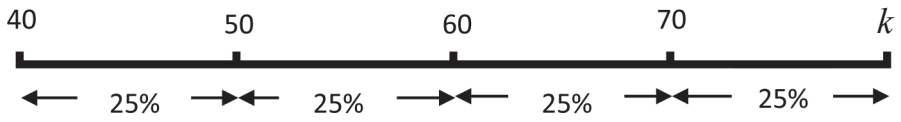
(Shade in the bubble ⬭ next to the interquartile range (IQR))

⬭ 20 ⬭ 50

⬭ 60 ⬭ 90 [1]

23) The range of the following data is 35

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



⬭ 75 ⬭ 80

⬭ 95 ⬭ 105 [1]

Do not write in this space

Do not write in this space

Do not write in this space

24) The table below shows the time spent in minutes by 80 vehicles traveling between two cities.

Time spent (in minutes)	$30 \leq t < 35$	$35 \leq t < 40$	$40 \leq t < 45$	$45 \leq t < 50$
Frequency	3	34	26	17

Find the 10^{th} percentile.

[5]

Do not write in this space

25) Given that $(x-2)$ is a factor of $h(x) = x^3 - 9x^2 + 26x - 24$

Factorize $h(x)$ completely.

[3]

Do not write in this space

Do not write in this space

Do not write in this space

26) Given that $f(x) = 6ax^2 + 12x - 1$ has a stationary point at $x = 1$

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

⬭ -2 ⬭ -1

⬭ 1 ⬭ 2 [1]

27) Given that a and b are positive constants, and $a > b$.

Solve the simultaneous equations:

$$a - b = 7$$

$$\log_2 a - \log_2 b = 3$$

[3]

[End of Examination]

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List of formulas

Algebraic Methods

- **The factor theorem** states that if $f(x)$ is a polynomial, then:

  *) If $f(p) = 0$, then $(x - p)$ is a factor of $f(x)$.
  *) If $(x - p)$ is a factor of $f(x)$, then $f(p) = 0$
  *) If $f\left(\frac{b}{a}\right) = 0$, then $(ax - b)$ is a factor of $f(x)$.
  *) If $(ax - b)$ is a factor of $f(x)$, then $f\left(\frac{b}{a}\right) = 0$

- **The remainder theorem** states that if a polynomial $f(x)$ is divided by $(ax - b)$, then the remainder is $f\left(\frac{b}{a}\right)$

Exponential & Logarithms

- $\log_a n = x$ is equivalent to $a^x = n \ \ (a \neq 1)$
- $\log_a x + \log_a y = \log_a xy$
- $\log_a x - \log_a y = \log_a \frac{x}{y}$
- $\log_a x^k = k \log_a x$
- $\log_a a = 1$
- $\log_a x = \frac{\log_b x}{\log_b a}$
- $\log_a b = \frac{1}{\log_b a}$

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Differentiation

- $y = x^n \Rightarrow \frac{dy}{dx} = n\,x^{n-1}$

Measures of Location and Spread

- $\bar{x} = \frac{\sum x}{n}$
- If set ***A***, of size n_1 , has mean $\bar{x}_1$ and set ***B***, of size n_2 , has mean $\bar{x}_2$, then the mean of the combined set of ***A*** and ***B*** **is**

$$\bar{x} = \frac{n_1\,\bar{x}_1 + n_2\,\bar{x}_2}{n_1 + n_2}$$

- **For data given in a frequency table**: $\bar{x} = \frac{\sum xf}{\sum f}$
- **For grouped continuous data, or data presented in a cumulative frequency table:**

$Q_1 = \frac{n}{4}$ th data value $\quad Q_2 = \frac{n}{2}$ th data value $\quad Q_3 = \frac{3n}{4}$ th data value

- **Interquartile range:** $IQR = Q_3 - Q_1$
- **Variance:**

$$\sigma^2 = \frac{\sum(x-\bar{x})^2}{n} = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 = \frac{S_{xx}}{n}$$

$$\text{where} \quad S_{xx} = \sum(x-\bar{x})^2 = \sum x^2 - \frac{(\sum x)^2}{n}$$

- **The standard deviation:** $\sigma = \sqrt{\sigma^2}$
- **For grouped data presented in a frequency table:**

Variance $\sigma^2 = \frac{\sum f(x-\bar{x})^2}{\sum f} = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$

Standard deviation $\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$

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Answer scheme

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Algebraic methods	**3**	■ $x+5$ ☐ $x-5$ ☐ $\frac{1}{x+5}$ ☐ $\frac{1}{x-5}$	1	-

Item #	Assessment Objective / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Exponentials and logarithms	**54**	$\log_{10}(x^5) - 3\log_{10}(x)$		
				$= \log_{10}(x^5) - \log_{10}(x^3)$	1	
				$= \log_{10}\frac{x^5}{x^3}$	1	If the student applies the logarithm law of division award 1 mark
				$= \log_{10} x^2$	1	If the student analyses and applies cancelation award 2 marks
				$= 2\log_{10} x$	1	If the student gets the simplification: $= 2\log_3 x$ award 1 mark

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Differentiation	**138**	☐ $p \geq 2$ ☐ $p \leq 2$ ☐ $p \leq -2$ ■ $p \geq -2$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
4	AO1 L	Differentiation	**138**	$f'(x) = 2 - 2x$	1	If the student finds $f'(x)$ award (1 mark)
				$f(x)\ is\ decreasing\ when\ f'(x) \leq 0$ $2 - 2x \leq 0$	1	If the student doesn't write the rule($f(x)$ is decreasing when ($f'(x) \leq 0$), and writes the next step award (2 marks)
				$-2x \leq -2$	1	If the student divides both sides by -2 and changes the inequality sign award (1 mark)
				$x \geq \frac{-2}{-2}$		
				The values of x are: $x \geq 1$	1	If the student writes the final answer correctly award 1 mark

Item #	Assessment Objective / Level of Demand	Unit	Page	Answer	Marks [4]	More information
5	AO1 L	Measures of Location and Spread	9	$\bar{x} = \frac{(15\times20+10\times30)}{(15+10)}$	1 + 1	If the student substitutes the law of $\bar{x}$ award 2 marks
				$\bar{x} = \frac{(300+300)}{(25)}$	1	If the student finds 300, 300, 25 correctly award 1 mark
				$\bar{x} = \frac{(600)}{(25)}$		
				$\bar{x} = 24$	1	if the student writes the final answer correctly award 1 mark

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
6	AO1 M	Algebraic methods	3	$= \frac{(x-3)(x+3)}{(x+1)(x+3)}$	1 + 1	(1 mark) for the denominator and (1 mark) for the numerator
				$= \frac{(x-3)\cancel{(x+3)}}{(x+1)\cancel{(x+3)}}$		
				$= \frac{x-3}{x+1}$	1	(1 mark) if the student gets the final answer $\frac{x-3}{x+1}$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
7	AO1 M	Algebraic methods	**52**	*g (2) is the remainder*	1	If the student uses the remainder theorem when g (2), award (1 mark)
				$g\ (2) = 3(2)^3 - 5(2)^2 + 2(2) - 7$	1	If the student doesn't write the first step award 2 marks for the second step
				$g\ (2) = 24 - 20 + 4 - 7$	1	If the student writes the calculation correctly without the substitution step, award (2 marks)
				g (2) = 1	1	1 mark if the student writes the final answer correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
8	AO1 M	Exponentials and logarithms	**52**	■ $5^x = 7$ ☐ $5^7 = x$ ☐ $7^5 = x$ ☐ $x^5 = 7$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	Ao1 M	Exponentials and logarithms	**57**	☐ -2 ☐ -1 ■ 0 ☐ 1	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Exponentials and logarithms	**56**	$\log_4 (\frac{12}{x}) = 1$	1	If the student applies the logarithm law of division award (1) mark
				$\frac{12}{x} = 4^1$	1	1 mark for the correct equation: $\frac{12}{x} = 4^1$
				$x = \frac{12}{4}$	1	1 mark for the correct equation: $x = \frac{12}{4}$
				$x = 3$	1	If the student gets $x = 3$ solution award (1mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Measures of Location and Spread	**12**	☐ 1 – 2 ■ 3 – 4 ☐ 5 – 6 ☐ 7 – 8	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
12	AO1 H	Algebraic methods	11	▭ -7 ▭ -1 ■ 1 ▭ 7	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
13	AO1 H	Algebraic methods	**10**	Since $(x-5)$ *is a factor of* $\frac{1}{5}x^3-k$		
				so, $\frac{1}{5}x^3-k=0$, when $x=5$	1	- If the student writes the statement that function = 0, when $x = 5$, award (1 mark) - if the student didn't write this step award 2 marks for the next step
				$\frac{1}{5}(5)^3-k=0$	1	If the student substitutes by $x = 5$, then award 1 mark
				$\frac{1}{5}(125)-k=0 \Rightarrow \frac{1}{5}(125)=k \Rightarrow$		
				$k=25$	1	1 mark if the student writes the final answer correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
14	AO1 H	Measures of Location and Spread	**14**	$\frac{20}{4} = 5$		
				$Q_1 = 5.5^{th}\ value$	1	
				$Q_1 = \frac{6+8}{2}$	1	If the student doesn't write this step, award its mark in the final corrected answer
				$Q_1 = 7$	1	1 mark if the student writes the final answer correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
15	AO2 L	Algebraic methods	8	☐ $-x^2-7$ ☐ x^2+7 ■ x^2-7 ☐ $-x^2+7$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
16	AO2 L	Algebraic methods	**5**	$x+1\overline{)\,5x^3+x^2-x+3}$ $5x^3+5x^2$ $-4x^2-x$ $-4x^2-4x$	1 1	The student loses the marks, if they don't write these steps
				$3x+3$ $3x+3$ 0	1	
				$5x^3+x^2-x+3=(x+1)(5x^2-4x+3)$	1	(1 mark) for the final answer

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and logarithms	**59**	$x\frac{\log_2 x}{\log_2 4} = \log_2 x$	1	If the student applies the change base rule award (1 mark)
				$x\frac{\cancel{\log_2 x}}{\log_2 4} = \cancel{\log_2 x}$	1	If the student cancels and simplifies award (1 mark)
				$x = \log_2 4$	1	- (1 mark) if the student writes the equation in terms of x - If the student finds the final answer by using a calculator award (2 marks)
				$x = 2$	1	(1 mark) for the $x = 2$

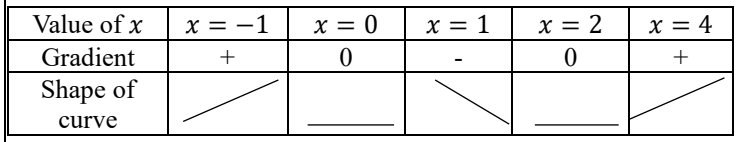
Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and logarithms	**59**	**alternative solution**		
				$x \log_4 x = \frac{\log_4 x}{\log_4 2}$	1	If the student applies the change base rule award (1 mark)
				$x \cancel{\log_4 x} = \frac{\cancel{\log_4 x}}{\log_4 2}$	1	If the student cancels and simplifies award (1 mark)
				$x = \frac{1}{\log_4 2}$	1	- (1 mark) if the student writes the equation in terms of x - If the student finds the final answer by using a calculator award (2 marks)
				$x = \frac{1}{\frac{1}{2}}$		
				$x = 2$	1	(1 mark) for the $x = 2$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
18	AO2 L	Measures of Location and Spread	**12**	☐ 50 – 70 ☐ 71 – 90 ■ 91 – 110 ☐ 111 – 130	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
19	AO2 L	Measures of Location and Spread	**9**	$\sum fx^2 = (1^2 \times 7) + (2^2 \times 9) + (3^2 \times 14)$ $\sum fx^2 = 169$	1	Award students (1 mark) for $\sum fx^2 = 169$
				$\sum fx = (1 \times 7) + (2 \times 9) + (3 \times 14)$ $\sum fx = 67$	1	Award students (1 mark) for $\sum fx = 67$
				$\sum f = 30$	1	Award students (1 mark) for $\sum f = 30$
				$\sigma^2 = \frac{169}{30} - (\frac{67}{30})^2 = 5.633 - 4.987$		
				$\sigma^2 \approx 0.646$	1	Award students (1 mark) for the final answer

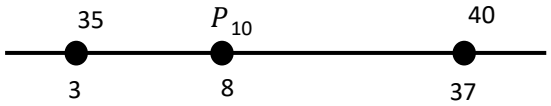
Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
20	AO2 M	Exponentials and logarithms	**60**	☐ $\frac{k}{4}$ ■ $\frac{k}{6}$ ☐ $3k$ ☐ $6k$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
21	AO2 M	Differentiation	**140**	$f'(x) = 0 \rightarrow f'(x) = 3x^2 - 6x = 0$	1	Award students (1 mark) for differentiating $f(x)$ correctly
				$3x(x-2) = 0$, then $x = 0$	1	(1 mark) for $x = 0$
				$3x(x-2) = 0$, then $x = 2$	1	(1 mark) for $x = 2$
				$f''(x) = 6x - 6$	1	Award students (1 mark) for differentiating $f'(x)$ correctly
				$f''(0) = 6(0) - 6 = -6$ $f''(2) = 6(2) - 6 = 6$		
				the point (0,5) is a local maximum	1	(1 mark) for point (0,5) and the correct decision
				the point (2,1) is a local minimum	1	(1 mark) for point (2,1) and the correct decision

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
21	AO2 M	Differentiation	**140**	**Alternative Solution**		
				$f'(x) = 0 \rightarrow \quad f'(x) = 3x^2 - 6x$	1	Award students (1 mark) for differentiating $f(x)$ correctly
				$3x(x-2) = 0$, then $x = 0$	1	(1 mark) if students find $x = 0$
				$3x(x-2) = 0$, then $x = 2$	1	(1 mark) if students find $x = 2$
					1	(1 mark) for drawing the table correctly
				the point (0,5) is a local maximum	1	(1 mark) for point (0,5) and the correct decision
				the point (2,1) is a local minimum	1	(1 mark) for point (2,1) and the correct decision

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
22	AO2 M	Measures of Location and Spread	**16**	☐ 20 ☐ 50 ☐ 60 ■ 90	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Measures of Location and Spread	**16**	■ 75 □ 80 □ 95 □ 105	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	Measures of Location and Spread	**16**	for the 10th (P_{10}) percentile = 8th data value	1	
				Using the interpolation:  	1	If the student doesn't write this step, then award the student awards its mark in the next step if correct.
				$\frac{P_{10}-35}{40-35}=\frac{8-3}{37-3}$	1	(1 mark) for both corrected sides.
				$\frac{P_{10}-35}{5}=\frac{5}{34}$	1	If the student doesn't write this step, then award the student its mark in the final correct answer
				$P_{10}-35=\frac{5\times5}{34}$		
				$P_{10}=\frac{25}{34}+35=35.74$	1	- (1 mark) for the final corrected answer or - (1 mark) for the list of acceptable answers: (36) (35.7) (35.73)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
25	AO2 H	Algebraic methods	**10**	$x-2\overline{)\,x^3-9x^2+26x-24}$ x^3-2x^2 $-7x^2+26x$ $-7x^2+14x$	1	Award the student (2 mark) for the correct steps of division.
				$12x-24$ $12x-24$ 0	1	
				$x^3-9x^2+26x-24=(x-2)\,(x^2-7x+12\,)$		
				$=(x-2)(x-4)(x-3)$	1	Award the student (1 mark) for the correct complete factorization

Item #	Assessment Objective / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Differentiation	**134**	☐ -2 ■ -1 ☐ 1 ☐ 2	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Exponentials and logarithms	**56**	$\frac{a}{b} = 2^3 = 8$ $a = 8b$	1	If the student applies the division law, and changes to the power expression award (1 mark)
				$substitute\ a = 8b\ \ in\ \ a - b = 7$ $8b - b = 7$ $b = \frac{7}{7}$		
				$b = 1$	1	(1 mark) for the value of $b = 1$
				$a = 8b = 8(1)$		
				$a = 8$	1	(1 mark) for the value of $a = 8$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Exponentials and logarithms	56	**Alternative Solution**		
				$a = b + 7$ Take log for base 2 on both sides $\log_2 a = \log_2(b + 7)$		
				Substitute $\log_2 a = \log_2(b + 7)$ in $\log_2 a - \log_2 b = 3$ $\log_2(b + 7) - \log_2 b = 3$	1	If the student substitutes correctly award (1 mark)
				$\frac{b + 7}{b} = 2^3$		
				$so \quad b = 1$	1	(1 mark) for the value of $b = 1$
				$a = 1 + 7$		
				$a = 8$	1	(1 mark) for the value of $a = 8$