

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 الأساسية.
- 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 $\frac{(x-4)(x+4)}{(x+4)}$)

⬭ $\frac{1}{x-4}$ ⬭ $\frac{1}{x+4}$

⬭ $x-4$ ⬭ $x+4$

[1]

2) Given that $f(x) = x^3 - 2x^2 + 9x - 18$

Divide $f(x)$ by $(x-2)$

[4]

3) (Shade in the bubble ⬭ next to the represented statement of $a^3 = 18$ as a logarithm)

⬭ $\log_a 18 = 3$ ⬭ $\log_a 3 = 18$

⬭ $\log_3 18 = a$ ⬭ $\log_3 a = 18$ [1]

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4) The frequency table illustrates the distribution of marks that grade twelve students achieved in a mathematics quiz

Marks	0	1	2	3	4	5
Number of students	1	6	3	10	8	2

Find the mean of the marks.

[4]

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

$n = 15$, $\sum x = 90$, $\sum x^2 = 1500$

Find the standard deviation (σ).

[4]

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6) Simplify $\dfrac{2x^2 - 8}{x^2 - 5x + 6}$

[4]

7) (Shade in the bubble ⬭ next to the represented statement of $\log_b 7$)

⬭ $\dfrac{\log_{10} b}{\log_{10} 7}$ ⬭ $\dfrac{\log_{10} 7}{\log_{10} b}$

⬭ $\log_{10} b - \log_{10} 7$ ⬭ $\log_{10} 7 - \log_{10} b$ [1]

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8) Find the value of $\log_{15} 25 + \log_{15} 9$ without using a calculator.

[3]

9) Given that $g(x) = x^5 + 4x^3 + 3x - 6$

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

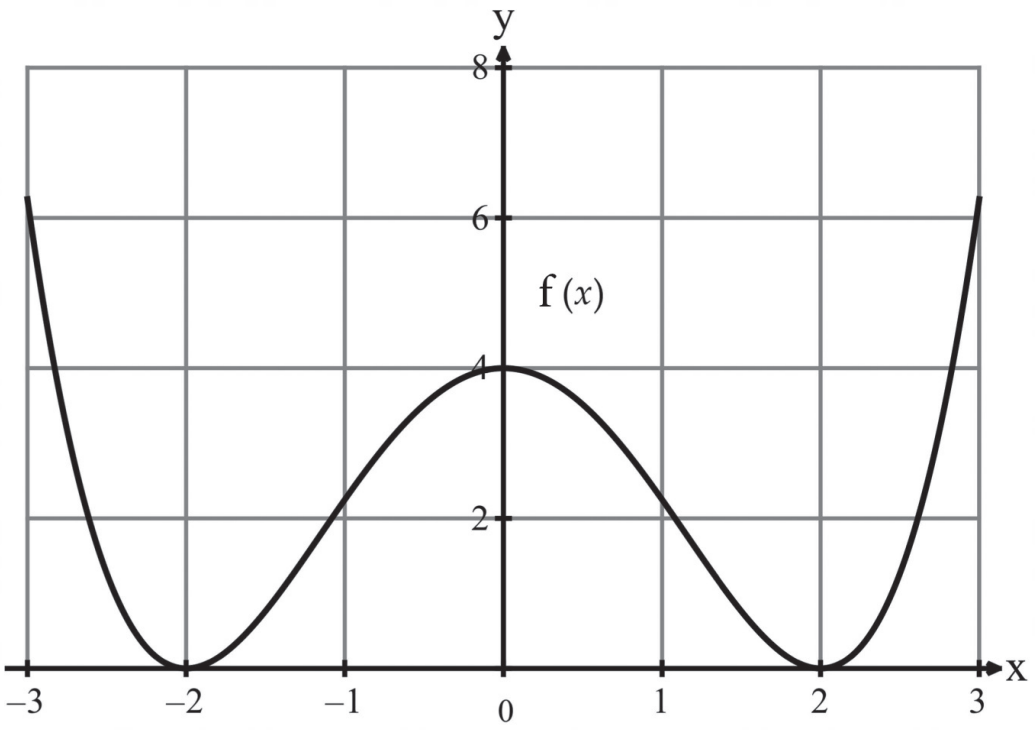
[5]

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



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

⬭ $[-2, 0]$ ⬭ $[-1, 0]$

⬭ $[0, 2]$ ⬭ $[2, 3]$ [1]

11) (Shade in the bubble ⬭ next to the simplest form of $\dfrac{9x^3 - 6x - 3}{3x}$)

⬭ $3x^2 - 2 - \dfrac{1}{x}$ ⬭ $3x^2 - 2x - \dfrac{1}{x}$

⬭ $3x^2 - 2$ ⬭ $3x^2 - x - 2$

[1]

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12) Simplify $\log_6\left(\frac{\sqrt{6x}}{36}\right)$ in terms of $\log_6 x$

[4]

13) Ten students were asked how many hours they studied per day

Their responses (in hours) are as follows:

1	5	3	2	6
6	7	6	5	4

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

⬭ 4.5 ⬭ 5

⬭ 5.5 ⬭ 6 [1]

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14) The table below shows the length measurements of randomly selected flowers

Length (In cm)	11 – 15	16 – 20	21 – 25	26 – 30
Frequency	3	10	13	6

(Shade in the bubble ⬭ next to the class boundaries of the second column)

⬭ 15 – 21 ⬭ 15.5 – 20.5

⬭ 16 – 20 ⬭ 16.5 – 19.5 [1]

15) Given that $f(x) = x^3 - 5x^2 + a$ and $f(-1) = 0$

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

⬭ – 6 ⬭ – 3

⬭ 3 ⬭ 6 [1]

16) Given that $f(x) = x^3 + bx^2 - bx - 11$
when $f(x)$ is divided by $(x - 3)$ with a remainder of 10

Find the value of b

[3]

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17) $\log_2 y = \log_2 y^2 + 1$

Find the value of y

[4]

18) Given that $f(x) = x^2 - 6x + 4$ has a stationary point at $x = a$

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

⬭ 0 ⬭ 1

⬭ 2 ⬭ 3 [1]

19) The heights of seven students were measured as follows:

152 156 160 161 165 167 169

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

⬭ 6 ⬭ 7

⬭ 11 ⬭ 17 [1]

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20) The data below show the number of palm trees owned by 10 families:

5	2	3	3	1
6	7	4	4	5

Find the variance σ^2 of the number of palm trees.

[4]

21) Given that $\mathrm{f}(x) = 2x^3 + 3x^2 - 12x + m$

$(2x - 1)$ is a factor of $\mathrm{f}(x)$

Find the value of m

[3]

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22) Given the equation $\log_2\left(\frac{42-5x}{x}\right) = 4$

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

⬭ 2 ⬭ 4

⬭ 6 ⬭ 8 [1]

23) Solve the equation by giving your answer to 3 significant figures:

$3^{2x} - 9\,(3^x) + 20 = 0$

[4]

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24) Given the curve $y = x^4 + 4x - 1$

Determine the nature of the stationary point by using the second derivative

[5]

25) The following frequency distribution shows children's ages in a school bus

Age (In years)	10	11	12	13
Frequency	4	12	6	8

(Shade in the bubble ⬭ next to lower quartile (Q_1))

⬭ 10 ⬭ 11

⬭ 12 ⬭ 13 [1]

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26) $g(x) = x^3 + x + 10$

$(x + 2)$ is a factor of $g(x)$

Write $g(x)$ in the form $g(x) = (x + 2)(ax^2 + bx + c)$

[3]

27) If the mean salaries of 5 workers in a company is 500 (in OMR), and the salary of a sixth worker is 800 (in OMR).

Find the mean salary of all the workers.

[4]

[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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Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Algebraic methods	2	☐ $\frac{1}{x-4}$ ■ $x-4$ ☐ $\frac{1}{x+4}$ ☐ $x+4$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Algebraic methods	3	$x-2\overline{)x^3-2x^2+9x-18}$ x^2+9 x^3-2x^2 0	1+1 1	The student gets (2 marks) for writing all terms of the quotient correctly.
				$9x-18$ $9x-18$ 0	1	
				The result x^2+9		

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Exponentials and Logarithms	**52**	■ $\log_a 18 = 3$ ☐ $\log_a 3 = 18$ ☐ $\log_3 18 = a$ ☐ $\log_3 a = 18$	1	-

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
4	AO1 L	Measures of Location and Spread	10	$\sum xf = 0\times1+1\times6+2\times3+3\times10+4\times8+5\times2$ $= 84$	1	
				$\sum f = 1+6+3+10+8+2$ $= 30$	1	
				$\bar{x} = \frac{84}{30}$	1	
				$= 2.8$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
5	AO1 L	Measures of Location and Spread	**20**	$\sigma = \sqrt{\frac{1500}{15} - \left(\frac{90}{15}\right)^2}$	1 + 1	(1 mark) for the substitution of each term
				$= \sqrt{100 - 36}$	1	
				$\sigma = \sqrt{64} = 8$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
5	AO1 L	Measures of Location and Spread	**20**	Alternative Solution		
				$\sigma^2 = \frac{1500}{15} - \left(\frac{90}{15}\right)^2$	1+1	(1 mark) for the substitution of each term
				$= 100 - 36$ $= 64$	1	
				$\sigma = \sqrt{64} = 8$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
6	AO1 M	Algebraic methods	2	$=\frac{2(x^2-4)}{x^2-5x+6}$	1	The student gets (1 mark) for factorizing the numerator
				$=\frac{2(x-2)(x+2)}{(x-2)(x-3)}$	1 1	The student gets (2 marks) for factorizing the numerator and denominator
				$=\frac{2(x+2)}{(x-3)}$	1	The student gets (1 mark) for either one quotient or both of them
				$=\frac{2x+4}{(x-3)}$		

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
7	AO1 M	Exponentials and Logarithms	58	☐ $\frac{\log_{10} b}{\log_{10} 7}$ ■ $\frac{\log_{10} 7}{\log_{10} b}$ ☐ $\log_{10} b - \log_{10} 7$ ☐ $\log_{10} 7 - \log_{10} b$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	AO1 M	Exponentials and Logarithms	**54**	$= \log_{15}(25 \times 9)$	1	
				$= \log_{15} 225$		If the student gets 2 from this step, award (2 marks)
				$= \log_{15} 15^2$	1	
				$= 2\log_{15} 15$		
				$= 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	AO1 M	Exponentials and Logarithms	**54**	Alternative Solution		
				$= \log_{15} 5^2 + \log_{15} 3^2$		
				$= 2\log_{15} 5 + 2\log_{15} 3$	1	If the student gets 2 from this step, award (2 marks)
				$= 2(\log_{15} 5 + \log_{15} 3)$		
				$= 2\log_{15} 15$	1	
				$= 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
9	AO1 M	Differentiation	**138**	$g'(x) = 5x^4 + 12x^2 + 3$	1+1	Each mark for differentiating the two terms
				$g'(x) \geq 0$ $5x^4 + 12x^2 + 3 \geq 0$		
				$5x^4 \geq 0$ ، for all real values of x	1	
				$12x^2 \geq 0$ ، for all real values of x	1	
				$5x^4 + 12x^2 + 3 \geq 0$ ، for all real values of x	1	Award (3 marks) if the student writes this step without showing the previous two steps
				So g(x) is an increasing function for all real values of x		

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
10	AO1 M	Differentiation	**138**	☐ $[-2,0]$ ☐ $[-1,0]$ ■ $[0,2]$ ☐ $[2,3]$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 H	Algebraic methods	8	■ $3x^2-2-\frac{1}{x}$ ☐ $3x^2-2x-\frac{1}{x}$ ☐ $3x^2-2$ ☐ $3x^2-x-2$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
12	AO1H	Exponentials and Logarithms	56	$= \log_6 \sqrt{6x} - \log_6 36$		
				$= \log_6 \sqrt{6} + \log_6 \sqrt{x} - \log_6 36$	1	If the student writes all three terms correctly award (1mark)
				$= \log_6 6^{\frac{1}{2}} + \log_6 x^{\frac{1}{2}} - \log_6 6^2$		
				$= \frac{1}{2}\log_6 6 + \frac{1}{2}\log_6 x - 2\log_6 6$	1	If the student uses a calculator to get first and third terms correctly award (1mark)
				$= \frac{1}{2} + \frac{1}{2}\log_6 x - 2$	1	
				$= \frac{1}{2}\log_6 x - \frac{3}{2}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
12	AO1 H	Exponentials and Logarithms	56	Alternative Solution		
				$= \log_6 \frac{(6x)^{\frac{1}{2}}}{6^2}$		
				$= \log_6 (6x)^{\frac{1}{2}} - \log_6 6^2$	1	
				$= \frac{1}{2}\log_6 (6x) - 2\log_6 6$	1	
				$= \frac{1}{2}(\log_6 6 + \log_6 x) - 2\log_6 6$		
				$= \frac{1}{2}(1 + \log_6 x) - 2$	1	
				$= \frac{1}{2} + \frac{1}{2}\log_6 x - 2$		
				$= \frac{1}{2}\log_6 x - \frac{3}{2}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
13	AO1 H	Measures of Location and Spread	10	☐ 4.5 ■ 5 ☐ 5.5 ☐ 6	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
14	AO1 H	Measures of Location and Spread	7	☐ 15 – 21 ■ 15.5 – 20.5 ☐ 16 – 20 ☐ 16.5 – 19.5	1	-

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

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
16	AO2 M	Algebraic methods	**12**	$f(3)=10$	1	
				$27+9b-3b-11=10$	1	The student gets (1 mark) for the substitution for the value of x. If the student writes this step directly award (2 marks).
				$6b=-6$		
				$b=-1$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and Logarithms	**55**	$\log_2 y = 2\log_2 y + 1$	1	
				$2\log_2 y - \log_2 y = -1$	1	
				$\log_2 y = -1$	1	
				$y = 2^{-1} = \frac{1}{2}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and Logarithms	55	Alternative Solution		
				$\log_2 y - \log_2 y^2 = 1$	1	
				$\log_2 \frac{y}{y^2} = 1$	1	
				$\log_2 \frac{1}{y} = 1$		
				$\frac{1}{y} = 2$	1	
				$y = \frac{1}{2}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
18	AO2 L	Differentiation	141	☐ 0 ☐ 1 ☐ 2 ■ 3	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Measures of Location and Spread	17	☐ 6 ☐ 7 ■ 11 ☐ 17	1	-

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
20	AO2 L	Measures of Location and Spread	18	$\Sigma x = 5+2+3+3+1+6+7+4+4+5$ $= 40$	1	If the student writes $\Sigma x = 40$ immediately, award (1 mark)
				$\Sigma x^2 = 25+4+9+9+1+36+49+16+16+25$ $=190$	1	If the student writes $\Sigma x^2 = 190$ immediately, award (1 mark)
				$\sigma^2 = \frac{190}{10} - \left(\frac{40}{10}\right)^2$ $=19-16$	1	
				$\sigma^2 = 3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
21	AO2 M	Algebraic methods	**13**	$f\left(\frac{1}{2}\right)=0$	1	
				$2\left(\frac{1}{2}\right)^3+3\left(\frac{1}{2}\right)^2-12\left(\frac{1}{2}\right)+m=0$	1	The student gets (1 mark) for substituting the value of x correctly into three terms.
				$2\left(\frac{1}{8}\right)+3\left(\frac{1}{4}\right)-12\left(\frac{1}{2}\right)+m=0$		
				$\frac{1}{4}+\frac{3}{4}-6+m=0$ $-5+m=0$		
				$m=5$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
22	AO2 M	Exponentials and Logarithms	**53**	■ 2 ☐ 4 ☐ 6 ☐ 8	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
23	AO2 M	Exponentials and Logarithms	57	$(3^x - 4)(3^x - 5) = 0$	1+1	(1mark) for each correct factor
				$(3^x - 4) = 0$ $3^x = 4$ $x = \log_3 4 \quad \text{or} \quad x = \frac{\log 4}{\log 3}$		
				$x \approx 1.26$	1	
				$(3^x - 5) = 0$ $3^x = 5$ $x = \log_3 5 \quad \text{or} \quad x = \frac{\log 5}{\log 3}$		
				$x \approx 1.46$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
23	AO2 M	Exponentials and Logarithms	57	Alternative solution		
				Let's assume $3^x = k$ So $3^{2x} = k^2$ $k^2 - 9k + 20 = 0$ $(k-4)(k-5) = 0$ $k = 4$ $\quad$ $k = 5$ $3^x = 4$ $\quad$ $3^x = 5$	1+1	
				$x = \log_3 4 \approx 1.26$	1	
				$x = \log_3 5 \approx 1.46$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	Differentiation	**141**	$\frac{dy}{dx} = 4x^3 + 4$	1	(1mark) for the differentiation.
				$\frac{dy}{dx} = 4x^3 + 4 = 0$ $x^3 = -1$ then, $x = -1$	1	(1 mark) for finding the value of x.
				$\frac{d^2y}{dx^2} = 12x^2$	1	
				When $x = -1$ $\frac{d^2y}{dx^2} = 12 \times (-1)^2 = 12$	1	(1 mark) for writing $\frac{d^2y}{dx^2} = 12$
				$\frac{d^2y}{dx^2} > 0$		
				local minimum point	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
25	AO2 M	Measures of Location and Spread	**15**	☐ 10 ■ 11 ☐ 12 ☐ 13	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
26	AO2 H	Algebraic methods	5	$x+2\overline{)x^3+0x^2+x+10}$ x^2-2x+5 x^3+2x^2 $-2x^2+x$ $-2x^2-4x$ $5x+10$ $5x+10$ 0	1+1	The student gets (2 marks) for writing three terms of the quotient correctly. The student gets (1mark) for writing two terms of the quotient correctly. The student gets (0 marks) for writing almost one term of the quotient correctly.
				$g(x)=(x+2)(x^2-2x+5)$	1	The student gets (1 mark) for writing $g(x)$ in the form $g(x)=(x+2)(ax^2+bx+c)$

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
27	AO2 H	Measures of Location and Spread	11	$\Sigma x_5 = 500 \times 5 = 2500$	1	
				$\Sigma x_6 = 2500 + 800 = 3300$	1	
				$\overline{x} = \frac{3300}{6}$	1	
				$\overline{x} = 550$ (OMR)	1	

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 الأساسية.
- الأسئلة في (١١) 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 $\frac{(2x-3)(x-7)}{(2x-3)}$)

⬭ $\frac{1}{x-7}$ ⬭ $x-7$

⬭ $\frac{x-7}{2x-3}$ ⬭ $(2x-3)(x-7)$

[1]

2) Simplify the fraction $\frac{6x^4-4x^3-2x^2+12x}{2x}$

[4]

3) (Shade in the bubble (⬭) next to the represented statement of $\log_b 8 + \log_b 2$)

⬭ $\log_b 16$ ⬭ $\log_b 10$

⬭ $\log_b 6$ ⬭ $\log_b 4$

[1]

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4) The following data presents the Science grades of students in a test

5 7 10 8 5 6 10 9

Find the variance (σ^2)

[4]

5) If the summary data for a variable x for two groups A and B is as follows:

$n_A = 10$ $\bar{x}_A = 165$

$n_B = 15$ $\bar{x}_B = 170$

Calculate the mean of the two groups

[4]

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6) $f(x) = x^3 + 2x^2 - 5x - 10$

Determine if $(x - 1)$ is a factor of $f(x)$ by the factor theorem

[4]

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

⬭ –1 ⬭ $-\frac{1}{2}$

⬭ $\frac{1}{2}$ ⬭ 1

[1]

8) Simplify $\log_5 \left(\frac{xy}{5}\right)$ in terms of $\log_5 x$ and $\log_5 y$

[3]

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9) Given that $f(x) = x^3 - 4 - 12x$

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

[5]

10) (Shade in the bubble (⬭) next to the function of $f(x)$ which is an increasing function for all $x \in \mathbb{R}$)

⬭ $-x^3$ ⬭ $-x^2$

⬭ x^2 ⬭ x^3

[1]

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11) (Shade in the bubble (⬭) next to the remainder of dividing

$g(x) = \frac{x^3}{9} + x^2 - 1$ by $(x + 3)$

⬭ −13 ⬭ −9

⬭ 5 ⬭ 11

[1]

12) Find the value of $\log_9 12 + \log_9 16 - 3 \log_9 4$ without using a calculator

[4]

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13) The table below show the temperatures in Jebel Shams for 31 days in January

Temperature (°C)	$-3 \le t < 3$	$3 \le t < 9$	$9 \le t < 15$	$15 \le t < 21$
Frequency	2	6	8	15

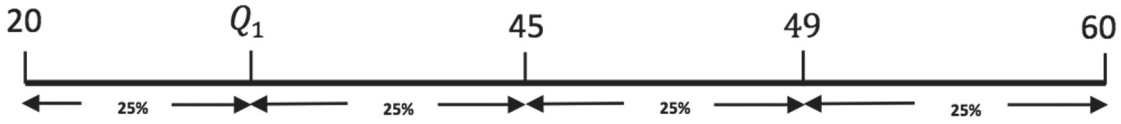
(Shade in the bubble (◯) next to the model class)

◯ $-3 \le t < 3$ ◯ $3 \le t < 9$

◯ $9 \le t < 15$ ◯ $15 \le t < 21$

[1]

14) The interquartile range (IQR) of the following data set equals **17**



(Shade in the bubble (◯) next to the lower quartile (Q_1))

◯ 25 ◯ 32

◯ 37 ◯ 40

[1]

15) $(x-2)$ is a factor of $g(x) = x^3 + 2x^2 - 5x - 6$

(Shade in the bubble (◯) next to the other factors of $g(x)$)

◯ $(x+1)$, $(x+3)$ ◯ $(x+1)$, $(x-3)$

◯ $(x-1)$, $(x-3)$ ◯ $(x-1)$, $(x+3)$

[1]

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16) Given $\mathrm{f}(x) = x^4 + nx^2 - 3x - 6$

Find the value of n if $\mathrm{f}(2) = 16$

[3]

17) Given that $\log_x (3x) = 2$

Find the value of x

[4]

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18) Given that $f(x) = 4 - x^2$

(Shade in the bubble (○) next to the coordinates of the stationary point)

○ (0, 2) ○ (2, 0)

○ (0, 4) ○ (4, 0)

[1]

19) If the summary data for a variable x are

$\sum x^2 = 5480$, $\sum x = 288$, $n = 64$

(Shade in the bubble (○) next to the standard deviation (σ) to 2 decimal places)

○ 8.09 ○ 9.01

○ 65.38 ○ 81.31

[1]

20) The frequency table illustrates the number of books that students read in a month

Number of books	3	1	P
Frequency	15	5	10

Find the value of P if the mean number of books is **4**

[4]

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21) Given $g(x) = x^3 + a\,x^2 + b\,x - 12$

$(x - 1)$ and $(x + 1)$ are factors of $g(x)$

Find the values of a and b

[3]

22) Given that $3^x = 20$

(Shade in the bubble (⬭) next to the value of x to 3 significant figures)

⬭ 0.367 ⬭ 0.824

⬭ 1.78 ⬭ 2.73

[1]

23) Solve the equation $\log_2 x + 3 \log_x 2 = 4$

[4]

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24) Given the curve $y = x^3 - 3x^2$

Determine the coordinates of the stationary points

[5]

25) Given the data:

3 5 5 6 8 10 12 13

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

○ 4 ○ 6

○ 7 ○ 10

[1]

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26) Given that $f(x) = 8kx^3 + 4(k+1)x^2 - 8$

When $f(x)$ is divided by $(2x - 1)$, the remainder is 13

Find the value of k

[3]

27) A taxi travelled from Muttrah to Qurum. The time it took for the journey were recorded over a certain period. The times are shown in the table below.

Journey time (minutes)	1 – 10	11 – 20	21 – 30	31 – 40
Frequency	2	10	12	16

Find an estimate for the 10th percentile (P_{10})

[4]

[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:**

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

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

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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Marking Guide of

General Education Diploma

Bilingual Private Schools

First Semester – Second Session

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

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	Algebraic methods	**2**	☐ $\frac{1}{x-7}$ ■ $x-7$ ☐ $\frac{x-7}{2x-3}$ ☐ $(2x-3)(x-7)$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
2	AO1 L	Algebraic methods	**3**	$= \frac{6x^4}{2x} - \frac{4x^3}{2x} - \frac{2x^2}{2x} + \frac{12x}{2x}$		
				$= 3x^3 - 2x^2 - x + 6$	1+1+1+1	The student gets (1 mark) for each term

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
3	AO1 L	Exponentials and Logarithms	**54**	■ $\log_b 16$ ☐ $\log_b 10$ ☐ $\log_b 6$ ☐ $\log_b 4$	1	-

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
4	AO1 L	Measures of Location and Spread	**18**	$\Sigma x = 5 + 7 + 10 + 8 + 5 + 6 + 10 + 9$ $= 60$	1	
				$\Sigma x^2 = 25 + 49 + 100 + 64 + 25 + 36 + 100 + 81$ $= 480$	1	
				$\sigma^2 = \frac{480}{8} - \left(\frac{60}{8}\right)^2$	1	If this step is presented correctly, the student is awarded (3marks) regardless of whether the previous two steps are written.
				$= \frac{15}{4}$ or $= 3.75$	1	

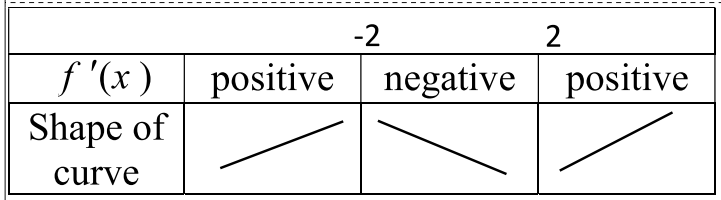
c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
5	AO1 L	Measures of Location and Spread	9	$\Sigma x_A = 10 \times 165 = 1650$	1	
				$\Sigma x_B = 15 \times 170 = 2550$	1	
				$\overline{x} = \frac{1650 + 2550}{10+15}$	1	If this step is presented correctly, the student is awarded (3marks) regardless of whether the previous two steps are written.
				$\overline{x} = 168$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
6	AO1 M	Algebraic methods	7	$f(1) = (1)^3 + 2(1)^2 - 5(1) - 10$	1+1	The student gets (2 marks) for writing $f(1)$ and substituting the value of x
				$= 1 + 2 - 5 - 10$		
				$= -12$	1	
				$f(1) \neq 0$		
				So $(x-1)$ is not a factor of $f(x)$	1	The student gets (1 mark) for determining that $(x-1)$ is not a factor of $f(x)$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
7	AO1 M	Exponentials and Logarithms	**53**	☐ -1 ☐ $-\frac{1}{2}$ ■ $\frac{1}{2}$ ☐ 1	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
8	AO1 M	Exponentials and Logarithms	**55**	$= \log_5 xy - \log_5 5$	1	
				$= \log_5 x + \log_5 y - 1$	1+1	If the student writes three terms correctly award (2 marks). If the student writes two terms correctly award (1 mark). If the student writes one term correctly award (0 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
9	AO1 M	Differentiation	**138**	$f'(x) = 3x^2 - 12$	1	
				$f'(x) \leq 0$ $3x^2 - 12 \leq 0$	1	
				$3x^2 \leq 12$	1	
				$x^2 \leq 4$	1	
				$-2 \leq x \leq 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
9	AO1 M	Differentiation	**138**	Alternative Solution		
				$f'(x) = 3x^2 - 12$	1	
				$f'(x) = 0$	1	
				$3x^2 - 12 = 0$		
				$x^2 = 4$		
				$x = \pm 2$	1	
					1	
				The values of x are: $-2 \le x \le 2$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
10	AO1 M	Differentiation	**138**	☐ $-x^3$ ☐ $-x^2$ ☐ x^2 ■ x^3	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 H	Algebraic methods	**12**	☐ -13 ☐ -9 ■ 5 ☐ 11	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
12	AO1 H	Exponentials and Logarithms	**56**	$= \log_9 12 + \log_9 16 - \log_9 4^3$ $= \log_9 12 + \log_9 16 - \log_9 64$	1	
				$= \log_9 \left(\frac{12 \times 16}{64} \right)$	1	
				$= \log_9 3$ $= \log_9 9^{\frac{1}{2}}$ or $= \frac{\log 3}{\log 9}$	1	
				$= \frac{1}{2}$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
13	AO1 H	Measures of Location and Spread	**12**	☐ $-3 \le t < 3$ ☐ $3 \le t < 9$ ☐ $9 \le t < 15$ ■ $15 \le t < 21$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
14	AO1 H	Measures of Location and Spread	**13**	☐ 25 ■ 32 ☐ 37 ☐ 40	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
15	AO2 L	Algebraic methods	7	■ $(x+1),(x+3)$ ☐ $(x+1),(x-3)$ ☐ $(x-1),(x-3)$ ☐ $(x-1),(x+3)$	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
16	AO2 L	Algebraic methods	**12**	$f(2)=16$ $(2)^4+n(2)^2-3(2)-6=16$ $16+4n-6-6=16$	1	The student gets (1 mark) for substituting by x=2
				$4n+4=16$	1	
				$n=3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and Logarithms	**53**	$\log_x 3 + \log_x x = 2$	1	
				$\log_x 3 + 1 = 2$	1	
				$\log_x 3 = 1$	1	
				$x = 3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Exponentials and Logarithms	**53**	Alternative Solution		
				$x^2 = 3x$	1	
				$x^2 - 3x = 0$ $x(x-3) = 0$	1	
				$x = 0$ or $x = 3$	1	
				The value of $x = 3$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
18	AO2 L	Differentiation	**143**	☐ (0,2) ☐ (2,0) ■ (0,4) ☐ (4,0)	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Measures of Location and Spread	**20**	■ 8.09 □ 9.01 □ 65.38 □ 81.31	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
20	AO2 L	Measures of Location and Spread	**11**	$\bar{x} = \frac{3\times15+1\times5+P\times10}{15+5+10}$	1 1	(1 mark for the nominator) (1 mark for the denominator)
				$4 = \frac{45+5+10P}{30}$	1	
				$P = 7$	1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
21	AO2 M	Algebraic methods	**10**	$g(1) = 0$		
				$1 + a + b - 12 = 0$ $a + b = 11 \longrightarrow 1$	1	
				$g(-1) = 0$		
				$-1 + a - b - 12 = 0$ $a - b = 13 \longrightarrow 2$	1	
				$a = 12 \qquad b = -1$	1	The student gets (1 mark) for the two values of a and b

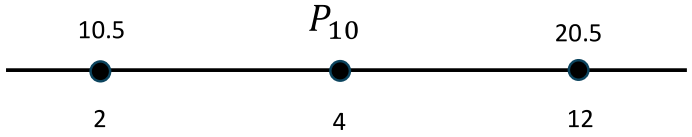
Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
22	AO2 M	Exponentials and Logarithms	**58**	☐ 0.367 ☐ 0.824 ☐ 1.78 ■ 2.73	1	-

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
23	AO2 M	Exponentials and Logarithms	**59**	$\log_2 x + \frac{3}{\log_2 x} = 4$	1	
				Let $\log_2 x = y$ $\quad y + \frac{3}{y} = 4$	1	
				$y^2 + 3 = 4y$ $\quad y^2 - 4y + 3 = 0$		
				$(y-1)(y-3) = 0$		If the student gets the correct factors by using $\log_2 x$ award (2marks) for the previous steps.
				$y = 1$ $\quad \log_2 x = 1$ $\quad x = 2$	1	
				$y = 3$ $\quad \log_2 x = 3$ $\quad x = 8$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	Differentiation	**141**	$\acute{y} = 3x^2 - 6x$	1	
				$0 = 3x^2 - 6x$		
				$0 = 3x\,(x - 2)$		
				$x = 0\ ,\quad x = 2$	1+1	
				$y = (0)^3 - 3\times(0)^2 = 0$ $y = (2)^3 - 3\times(2)^2 = -4$		
				The coordinates of the stationary points: $(0,0)$ $(2,-4)$	 1 1	

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
25	AO2 M	Measures of Location and Spread	**15**	☐ 4 ■ 6 ☐ 7 ☐ 10	1	-

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
26	AO2 H	Algebraic methods	**5**	$f\left(\frac{1}{2}\right)=13$	1	
				$8k\left(\frac{1}{2}\right)^3+4(k+1)\left(\frac{1}{2}\right)^2-8=13$	1	
				$k+k+1-8=13$		
				$2k-7=13$ $2k=20$		
				$k=10$	1	

c	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
27	AO2 H	Measures of Location and Spread	**14**	10th percentile: $\frac{10}{100} \times 40 = 4th\ value$	1	
						
				$\frac{P_{10} - 10.5}{20.5 - 10.5} = \frac{4-2}{12-2}$	1	
				$\frac{P_{10} - 10.5}{10} = \frac{2}{10}$	1	
				$P_{10} = 12.5$	1	