

سلطنة عمان
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 الثاني - الدور الأول

للعام الدراسي ١٤٤٧/١٤٤٦ هـ - ٢٠٢٤ / ٢٠٢٥ 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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Instructions

1. The 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.

Answer all the following questions.

1) (Shade in the bubble ⬭ next to the row number in Pascal's triangle which gives the coefficient in the expansion of $(a + b)^7$)

⬭ 6 ⬭ 7

⬭ 8 ⬭ 9

[1]

2) Given that $(10\,x^2\,y^3)$ is a term in the expansion of $(x + y)^k$

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

⬭ 6 ⬭ 5

⬭ 3 ⬭ 2

[1]

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3) Given the two rows of Pascal`s triangle below

1	a	21	35	35	21	a	1	
1	8	28	56	$60+b$	56	28	8	1

Find the value of a, b

[3]

4) (Shade in the bubble ○ next to the first 4 terms of the sequence $u_n = 3 + 5n$)

○ 8, 13, 18, 23 ○ 3, 8, 13, 18

○ 8, 13, 15, 20 ○ 3, 8, 15, 20

[1]

5) (Shade in the bubble ○ next to the value of $\int_1^2 4x^3\,dx$)

○ 17 ○ 15

○ –15 ○ –17

[1]

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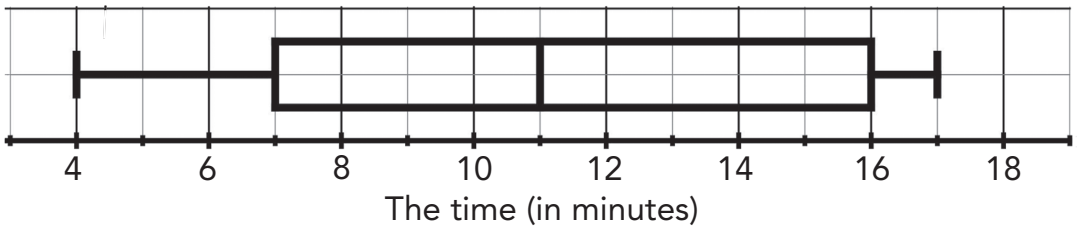
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6) Evaluate: $\int_1^3 (3x^2 + 5)\, dx$

[4]

7) The box plot below shows the distribution of the time (in minutes) spent by students in reading.



Calculate the interquartile range

[3]

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8) Find the first 3 terms in ascending power of x of the expansion $(1+x)^8$ in the simplest form.

[4]

9) (Shade in the bubble ⬭ next to the geometric sequence)

⬭ $-a, -2a, -3a, ..., -6a$

⬭ $-a, -3a, -5a, ..., -11a$

⬭ $a, 2a, 4a, ..., 64a$

⬭ $a, 3a, 5a, ..., 46a$

[1]

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10) Given $u_3 = 30$ and $u_8 = 5$ in an arithmetic sequence

Calculate u_1

[4]

11) Given that: $Q_1 = 11$, $Q_3 = 15$

A value greater than $Q_3 + 2 \times (Q_3 - Q_1)$ or less than $Q_1 - 2 \times (Q_3 - Q_1)$ is defined as an outlier

(Shade in the bubble ⬭ next to the pair of values that represent outliers)

⬭ 24, 25

⬭ 9, 24

⬭ 8, 25

⬭ 8, 9

[1]

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12) The weight, in kilograms, of 5 iron balls are 6, 8, 9, 12, 18
where the standard deviation = 4.18

Describe the skewness of the distribution by using $\dfrac{3\,(mean - median)}{standard\ deviation}$

[4]

13) The sum of the first 3 terms of an arithmetic sequence is 33
Evaluate u_2

[4]

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14) The ages of participants in two different groups are recorded as follows:

- Group A: 17, 24, 25, 36, 40
- Group B: 18, 26, 26, 37, 41

Draw a back to back stem and leaf diagram to represent this data.

[3]

15) Given that: $\frac{8 \times 15!}{14!} = k!$

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

⬭ 2 ⬭ 4

⬭ 5 ⬭ 8

[1]

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16) The coefficient of x^2 in the expansion of $(x + a)^3$ equals 6

Compute the value of a

[4]

17) Given that the first term of the geometric series is 1 , and the fourth term is 8

Find the sum of the first 10 terms of the series.

[4]

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18) A convergent geometric series has first term 4 and second term 3

Evaluate S_∞ of the series.

[4]

19) The stem and leaf diagram below shows the test scores of a group of students.

Stem	Leaf			
6	2	4	8	
7	0	3	5	9
8	1	3	6	
9	2	4		

Key: 6 | 2 = 62

(Shade in the bubble ⬭ next to the interquartile range of the test scores)

⬭ 8

⬭ 15.5

⬭ 20.5

⬭ 32

[1]

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20) Given that the number of terms in the arithmetic series $(m + 9 + \ldots + 77 + n)$ is 20 terms.

(Shade in the bubble ○ next to the sum of its terms)

○ 86 ○ 660

○ 860 ○ 1720

[1]

21) Given that $(8, x, 16)$ is a geometric sequence.

(Shade in the bubble ○ next to the value of x^2)

○ 8 ○ 16

○ 64 ○ 128

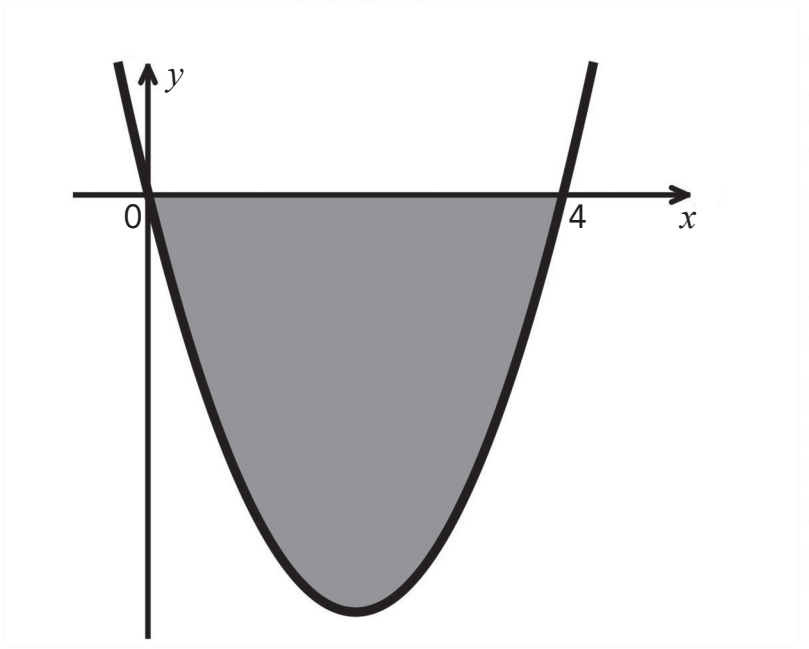
[1]

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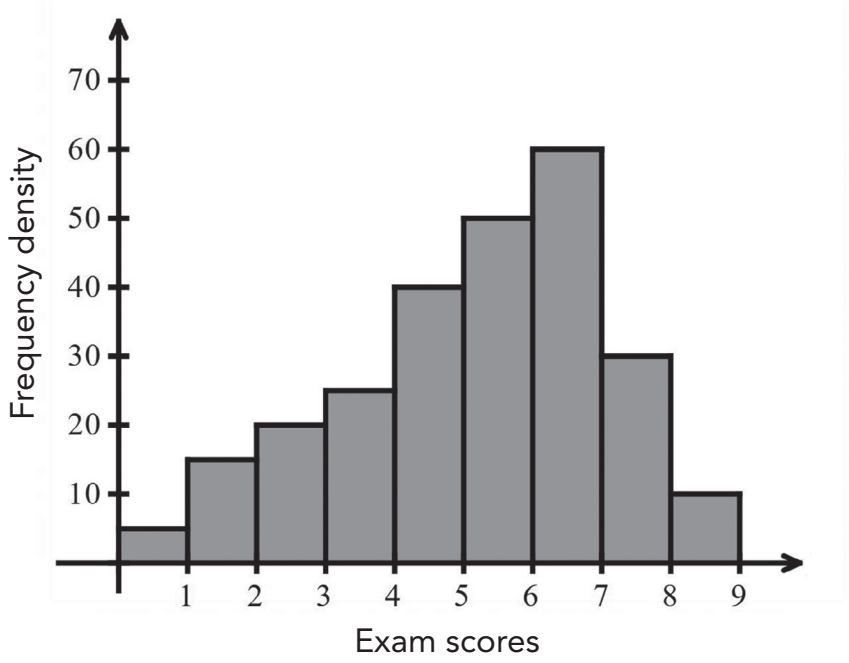
22) Find the area of the shaded region bounded by the curve $y = x^2 - 4x$ and the x-axis.



[6]

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23) The histogram below shows the distribution of exam scores in a mathematics test.



(Shade in the bubble ○ next to the correct statement of skewness)

○ $Q_3 - Q_2 = Q_2 - Q_1$

○ $Q_2 - Q_1 > Q_3 - Q_2$

○ $Q_2 - Q_1 < Q_3 - Q_2$

○ $Q_3 - Q_2 = 2(Q_2 - Q_1)$

[1]

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24) The members (x) of 19 families in a village are recorded, the data is summarized as follows:

$3 \leq x \leq 10$ $\sum x = 95$ $\sum x^2 = 567$

An outlier is an observation which lies ±2 standard deviations from the mean.

Identify the outlier for this data.

[5]

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25) Given that: $5\begin{pmatrix} 2p \\ 1 \end{pmatrix} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$

Find the values for p

[3]

26) (Shade in the bubble ⬭ next to the value of $\int_{-1}^{1} \frac{1}{x^2}(1 - x^2)\, dx$)

⬭ 2 ⬭ 0

⬭ −2 ⬭ −4

[1]

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27) Given that $\int_{q}^{8} \left(\frac{1}{4}x - 1\right) dx = 0$, where q is a constant.

Find the values of q

[3]

[End of Examination]

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Formulas sheet

The Binomial Expansion

- **Pascal's triangle:**

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

- Pascal's triangle is formed by adding adjacent pairs of numbers to find the number on the next row.

- The $(n+1)$th row of Pascal's triangle gives the coefficients in the expansion of $(a+b)^n$.

- $n! = n \times (n-1) \times (n-2) \ldots \times 3 \times 2 \times 1$

- ${}^nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$

- **The rth entry in the nth row of Pascal's triangle is given by**

$$^{n-1}C_{r-1} = \binom{n-1}{r-1}$$

- **The binomial expansion:**

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{r}a^{n-r}b^r + \cdots + b^n$$

where $(n \in N)$

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Sequences and Series

- If u_n is an arithmetic sequence, then

$$u_n = a + (n-1)d$$

$$S_n = \frac{n}{2}(2a + (n-1)d) \quad \text{or} \quad S_n = \frac{n}{2}(a + l)$$

- If u_n is a geometric sequence, then:

$$u_n = a\, r^{n-1}$$

$$\text{For } r \neq 1 \Rightarrow S_n = \frac{a\,(r^n - 1)}{r-1} \quad \text{or} \quad S_n = \frac{a\,(1-r^n)}{1-r}$$

- A geometric series is convergent if and only if $|r| < 1$, where r is the common ratio.

- The sum to infinity of a convergent geometric series is given by

$$S_\infty = \frac{a}{1-r}$$

Integration

- If $\mathrm{f}'(x)$ is the derivative of $\mathrm{f}(x)$ for all values of x in the interval $[a, b]$, then the definite integral is defined as

$$\int_a^b \mathrm{f}'(x)\ \mathrm{d}x = [\,\mathrm{f}(x)]_a^b = \mathrm{f}(b) - \mathrm{f}(a)$$

- The area between a positive curve, the x-axis and the lines $x = a$ and $x = b$ is given by

$$\text{Area} = \int_a^b y\ \mathrm{d}x$$

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Representation of Data

- $\bar{x} = \frac{\sum x}{n}$
- $Q_1 = \frac{n}{4}$ th data value $\quad Q_2 = \frac{n}{2}$ th data value $\quad Q_3 = \frac{3n}{4}$ th data value
- **Interquartile range** $= Q_3 - Q_1$
- **Variance:**

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

- **The standard deviation:** $\sigma = \sqrt{\sigma^2}$
- **Skewed:** $\frac{3\,(\text{mean} - \text{median})}{\text{standard deviation}}$

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Answer scheme

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	The Binomial Expansion	63	▭ 6 ▭ 7 ■ 8 ▭ 9	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
2	AO1 L	The Binomial Expansion	67	☐ 6 ■ 5 ☐ 3 ☐ 2	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
3	AO1 L	The Binomial Expansion	63	$1 + a = 8$		
				$a = 7$	1	(1 mark) for finding $a = 7$ correctly
				$35 + 35 = 60 + b$ $70 - 60 = b$	1	(1 mark) for writing the equation correctly
				$b = 10$	1	(1 mark) for the exact final answer $b = 10$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
4	AO1 L	Sequence and Series	81	■ 8, 13, 18, 23 □ 3, 8, 13, 18 □ 8, 13, 15, 20 □ 3, 8, 15, 20	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
5	AO1 L	Integration	153	☐ 17 ■ 15 ☐ −15 ☐ −17	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
6	AO1 L	Integration	154	$= \left[\frac{3}{3}\ x^3\ +\ 5x\right]_1^3$	1	(1 mark) for the correct integration
				$= [\ (3)^3\ +\ 5(3)] - [\ (1)^3\ +\ 5(1)]$ $= [\ 27\ +\ 15] - [\ 1\ +\ 5\ ]$	1	(1 mark) for substituting correctly
				$= 42 - 6$	1	(1 mark) for the correct calculation
				$= 36$	1	- (1 mark) for the correct answer (36) - If the student doesn't write (42-6) and writes the answer (36) he awards (2 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
7	AO1 L	Representation of Data	39	$Q_3 = 16$	1	(1 mark) for finding Q_3 correctly
				$Q_1 = 7$	1	(1 mark) for finding Q_1 correctly
				Interquartile range $= 16 - 7$		
				$= 9$	1	- (1 mark) for finding the interquartile range correctly - If a student writes (16-7= 9) directly award (3 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
8	AO1 M	The Binomial Expansion	67	$(1+x)^8 = \binom{8}{0}(1)^8 x^0 + \binom{8}{1}(1)^7 x^1 + \binom{8}{2}(1)^6 x^2 + \ldots$	1 + 1+ 1	(1 mark) for each corrected term
				$(1+x)^8 = 1 + 8x + 28x^2 + \cdots$	1	- (1 mark) for the corrected simplest form - If the student only writes the last step correctly award (4 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	AO1 M	Sequence and Series	90	☐ $-a, -2a, -3a, \ldots, -6a$ ☐ $-a, -3a, -5a, \ldots, -11a$ ■ $a, 2a, 4a, \ldots, 64a$ ☐ $a, 3a, 5a, \ldots, 46a$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Sequence and Series	108	$a + 2d = 30$	1	(1 mark) for the corrected equation for u_1
				$a + 7d = 5$	1	(1 mark) for the corrected equation for u_2
				$-5d = 25$		
				$d = -5$	1	(1 mark) for the corrected value of d
				$a + 2(-5) = 30$ $a = 30 + 10$		
				$a = 40 \quad or \quad u_1 = 40$	1	(1 mark) for the corrected value of a or u_1

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Representation of Data	35	■ 24, 25 □ 9, 24 □ 8, 25 □ 8, 9	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
12	AO1 M	Representation of Data	45	$mean = \frac{53}{5} = 10.6$	1	If the student correctly calculates the mean = 10.6 award (1 mark)
				$median = 9$	1	If the student correctly identifies the median as 9 award (1 mark)
				$\frac{3\,(mean \;-\; median)}{standard\ \ deviation} = \frac{3\,(10.6 \;-\; 9)}{4.18}$		
				≈ 1.1483	1	If the student correctly applies the skewness formula and gets (≈ 1.1483) award (1 mark)
				$Since\ the\ result\ is\ (1.1483)$ so, the distribution is positively skewed	1	If the student correctly interprets the skewness result and states that the distribution is positively skewed award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
13	AO1 H	Sequence and Series	68	$u_1 = a$ $u_2 = a + d$ $u_3 = a + 2d$	1 + 1	- If students write the correct expression of the 3 terms award (2 marks) - And if the student writes a correct expression of two only award (1 mark)
				$a + a + d + a + 2d = 33$	1	Writing the equation correctly award (1 mark)
				$3a + 3d = 33$		
				(By dividing both sides of the equation by 3) $a + d = 11$		
				$so, \quad u_2 = 11$	1	The student is awarded (1 mark) if he shows the last step correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
14	AO1 H	Representation of Data	43	Group A | Group B 7 | 1 | 8 5 4 | 2 | 6 6 6 | 3 | 7 0 | 4 | 1 Key: 7 | 1 | 8 17 for Group A 18 for Group B	1 + 1 1	• If the student correctly constructs the stem-and-leaf diagram for Group A, award (1 mark) • If the student correctly constructs the stem-and-leaf diagram for Group B, award (1 mark) • If the student correctly provides the key interpretation, award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
15	AO2 L	The Binomial Expansion	66	☐ 2 ☐ 4 ■ 5 ☐ 8	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
16	AO2 L	The Binomial Expansion	64	The coefficient is: 1, 3, 3, 1	1	(1 mark) for writing the coefficient correctly
				The term in x^2 is $3 \times a\, x^2$	1	- Award (1mark) if written the term $3 \times a\, x^2$ correctly - (2 marks) for writing this step directly
				So, $3 \times a\, x^2 = 6\, x^2$	1	- (1 mark) for writing the equation correctly - (3 marks) for writing this step directly
				$3\, a = 6$		
				$a = 2$	1	(1 mark) for writing the final answer correctly

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Sequence and Series	94	$a\,r^3 = 8$ $r^3 = 8$	1	(1 mark) if the students get the correct equation
				$r = 2$	1	(1 mark) if the students get the value of r correctly
				$S_{10} = \frac{1((2)^{10} - 1)}{2 - 1}$	1	(1 mark) if the students substitute the value of a, r and n correctly in the sum role
				$= \frac{1023}{1}$ $= 1023$	1	Award 1 mark for the correct answer (1023)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
18	AO2 L	Sequence and Series	96	$4r = 3$	1	(1 mark) for substituting the value of a and u_2 correctly
				$r = \frac{3}{4}$	1	Award the students (1 mark) for the correct value of r
				$S_\infty = \frac{4}{1-\frac{3}{4}}$	1	(1 mark) for substituting the value of a and r correctly in the role S_∞
				$= 16$	1	- Award the students (1 mark) for the correct final answer (16) - If the student gets the final answer directly (16) award (2 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Representation of Data	44	☐ 8 ■ 15.5 ☐ 20.5 ☐ 32	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
20	AO2 M	Sequence and Series	87	☐ 86 ☐ 660 ■ 860 ☐ 1720	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
21	AO2 M	Sequence and Series	87	☐ 8 ☐ 16 ☐ 64 ☒ 128	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
22	AO2 M	Integration	156	$\int_0^4 x^2 - 4x \quad dx$	1	If the student correctly sets up the definite integral, award (1 mark)
				$= \left[\frac{1}{3}x^3 - \ 2\ x^2\right]_0^4$	1+ 1	(1 mark) for each correct term of integration
				$= \left[\ \frac{1}{3}(4)^3 - \ 2\ (4)^2\ \right] - \left[\ \frac{1}{3}(0)^3 - \ 2\ (0)^2\ \right]$	1	(1mark) for substituting correctly
				$= \left[\frac{64}{3} - \ 32\ \right] - \left[\ \frac{0}{3} - \ 0\ \right]$		
				$= -\frac{32}{3} = \ -10.6666$	1	If the student correctly simplifies to obtain $= -10.6666$, award (1 mark)
				so the area is $\frac{32}{3}$ or 10.6666	1	If the student correctly interprets the negative result and states that the area is $323332\ or\ 10.6666$, award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Representation of Data	46	☐ $Q_3 - Q_2 = Q_2 - Q_1$ ■ $Q_2 - Q_1 > Q_3 - Q_2$ ☐ $Q_2 - Q_1 < Q_3 - Q_2$ ☐ $Q_3 - Q_2 = 2(Q_2 - Q_1)$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	The Binomial Expansion	37	$= \frac{\sum x}{n} = \frac{95}{19}$		
				$Mean = 5$	1	If the student writes the mean correctly award (1 mark)
				$\sigma^2 = \frac{567}{19} - \left(\frac{95}{19}\right)^2$		
				$\sigma^2 = 29.8 - 25$		
				$= 4.84$	1	If the student writes $\sigma^2 = 4.84$ correctly award (1 mark)
				$Standard\ deviation\ (\sigma) = 2.2$	1	If the student writes $\sigma = 2.2$ correctly award (1 mark)
				$Mean$ – standard deviation $= 5 - (2 \times 2.2) = 0.6$ $Mean$ + standard deviation $= 5 + (2 \times 2.2) = 9.4$	1	If the student gets the value of the rule of an outlier correctly award (1 mark)
				Therefore 10 is the only outlier	1	If the student writes the final answer (outlier) correctly award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
25	AO2 H	The Binomial Expansion	65 - 66	$5 \times 2p = 20$	$1 + 1$	(1 mark) for each side of the equation
				$10\,p = 20$		
				$p = 2$	1	- If a student writes the final answer ($p = 2$) correctly award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Integration	157	☐ 2 ☐ 0 ☐ −2 ■ −4	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Integration	153	$\left[\frac{1}{8}x^2 - x\right]_q^8 = 0$	1	If the student correctly integrates, award (1 mark)
				$\left[\left(\frac{64}{8} - 8\right) - \left(\frac{q^2}{8} - q\right)\right] = 0$	1	(1 mark) for the corrected substitution
				$\left[\left(0\right) - \left(\frac{q^2}{8} - q\right)\right] = 0$ $\frac{q^2}{8} - q = 0 \longrightarrow q^2 - 8q = 0$		
				$q\left(q - 8\right) = 0$		
				$q = 8$ or $q = 0$	1	(1 mark) for the final answer





امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

الفصل الدراسي الثاني- الدور الثاني

للعام الدراسي ١٤٤٧/١٤٤٦ هـ - ٢٠٢٥/٢٠٢٤ 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** ▭ ◉ ◔ ✗ ✓

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مُسَوَّدَة، لا يتم تصحيحها

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Instructions

1. The 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.

Answer all the following questions.

1) Given that the first seven rows of Pascal's triangle are:

$$
\begin{array}{ccccccccccc}
 & & & & & 1 & & & & & \\
 & & & & 1 & & 1 & & & & \\
 & & & 1 & & 2 & & 1 & & & \\
 & & 1 & & 3 & & 3 & & 1 & & \\
 & 1 & & 4 & & 6 & & 4 & & 1 & \\
1 & & 5 & & 10 & & 10 & & 5 & & 1 \\
1 & & 6 & & 15 & & C & & 15 & 6 & 1
\end{array}
$$

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

⬭ 10 ⬭ 20

⬭ 25 ⬭ 30

[1]

2) (Shade in the bubble ⬭ next to the expansion whose coefficient is given by the ninth row of Pascal's triangle)

⬭ $(a+b)^6$ ⬭ $(a+b)^7$

⬭ $(a+b)^8$ ⬭ $(a+b)^9$

[1]

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3) Given that: $\binom{15}{13} = \frac{15!}{13!\ \ a!}$

Evaluate the value of a

[3]

4) (Shade in the bubble ⬭ next to the nth term of the sequence 5, 9, 13, 17, …)

⬭ $u_n = 5 - 4n$ ⬭ $u_n = 1 - 4n$

⬭ $u_n = 5 + 4n$ ⬭ $u_n = 1 + 4n$

[1]

5) (Shade in the bubble ⬭ next to the value of $\int_1^2 9x^2\,dx$)

⬭ 7 ⬭ 9

⬭ 21 ⬭ 27

[1]

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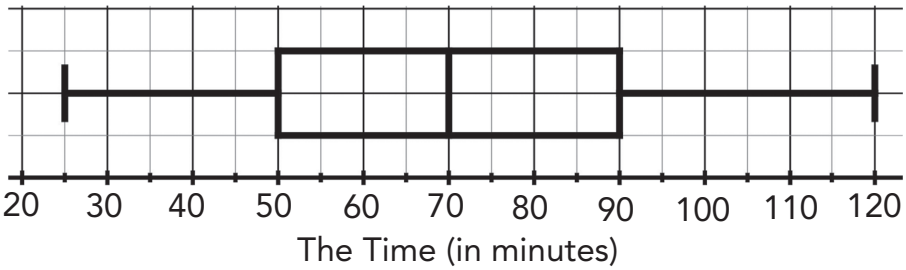
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6) Evaluate: $\int_2^4 \left(\frac{4}{x^2} + 2 \right) dx$

[4]

7) The box plot below shows the distribution of the time (in minutes) spent by students in reading.



Calculate the value of the interquartile range.

[3]

8) Find the expansion of $\left(x + \frac{1}{x} \right)^3$ by using the binomial theorem.

[4]

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9) (Shade in the bubble ⬭ next to the value of p in the arithmetic sequence 8, $6p$, ..., $10p$, 24)

⬭ 1 ⬭ 2

⬭ 8 ⬭ 12

[1]

10) The first term of an arithmetic sequence is (5). The common difference is (3). The last term is (38).

Find the number of terms

[4]

11) Given that $Q_1 = 40$, $Q_3 = 45$

A value less than $Q_1 - 3 \times (Q_3 - Q_1)$ or greater than $Q_3 + 3 \times (Q_3 - Q_1)$ is defined as an outlier

(Shade in the bubble ⬭ next to the pair of values that represent outliers)

⬭ 58, 59 ⬭ 22, 58

⬭ 23, 59 ⬭ 22, 23

[1]

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12) The table represents summary data of the heights of buildings in (meters).

Lower quartile	median	upper quartile
10	20	25

Work out in detail to describe the skewness of the distribution.

[4]

13) Given the fourth term of a geometric sequence is (8). The seventh term is (64).

Compute the first term.

[4]

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14) The following temperatures (in °C) were recorded in 10 different regions:

25, 30, 25, 25, 33, 26, 25, 32, 20, 25

Draw a stem and leaf diagram to represent these data.

[3]

15) Given that $\binom{6}{k} = \frac{5!}{(6-k)!}$

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

⬭ 1 ⬭ 3

⬭ 5 ⬭ 6

[1]

16) If the coefficient of x^4 in expansion $(2x + k)^5$ equals 240

Find the value of k.

[4]

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17) Given that the arithmetic series (1 + 3 + 5 + …)

Find the number of terms required for the sum of the series to be 400

[4]

18) A convergent geometric series with $r = \frac{1}{2}$, and $S_3 = 28$

Find S_∞ of the series.

[4]

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19) The diagram below shows a back to back stem and leaf diagram of the test scores of two student groups:

Group A				Group B		
	6	5	**4**	0	1	3
3	2	1	**5**	0	0	
	4	2	**6**	3		
	0	0	**7**	0	1	2

Key: **5 | 4 | 0** means 45 in group A and 40 in group B

(Shade in the bubble ⬭ next to the median in group A)

⬭ 53 ⬭ 52

⬭ 51 ⬭ 50

[1]

20) Given that (2, p, 18) are the first three terms of a geometric sequence where $p > 0$

(Shade in the bubble ⬭ next to the **common ratio** of the geometric sequence)

⬭ $\frac{1}{6}$ ⬭ $\frac{1}{3}$

⬭ 3 ⬭ 6

[1]

21) Given that: $\int_0^a 2x \ dx = \int_a^8 2x \ dx$, $a > 0$

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

⬭ 2 ⬭ $2\sqrt{2}$

⬭ 4 ⬭ $4\sqrt{2}$

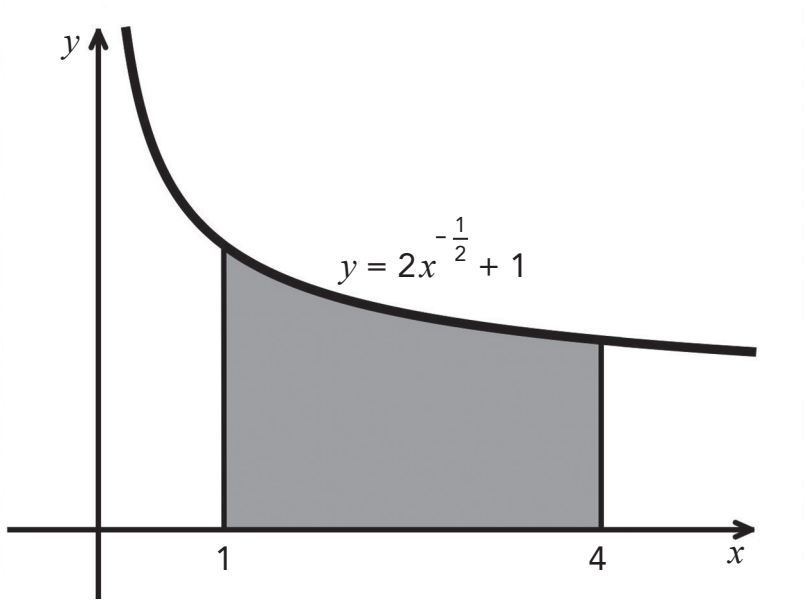
[1]

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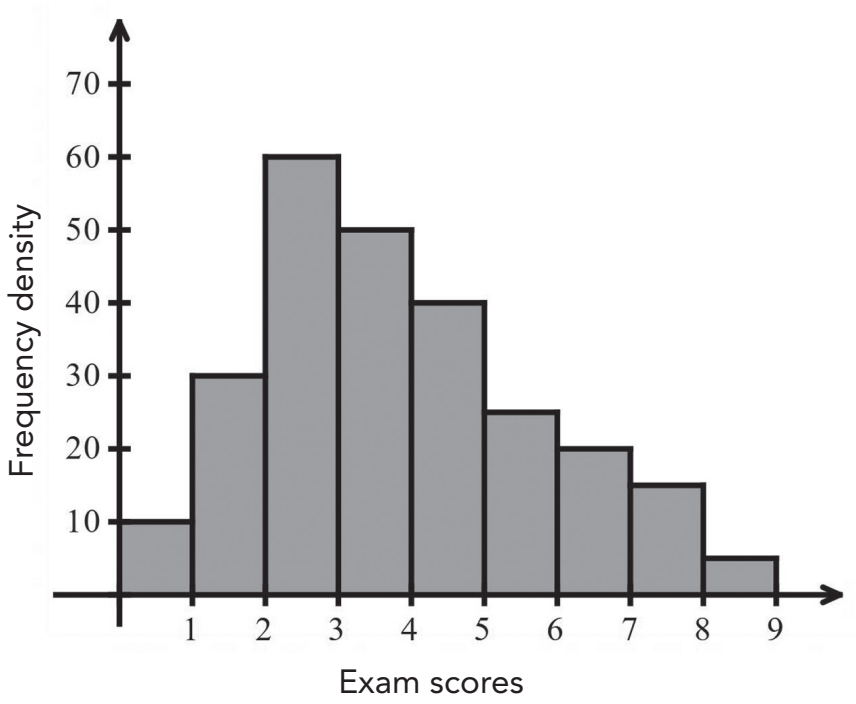
22) Find the area of the finite region bounded by the curve $y = 2x^{-\frac{1}{2}} + 1$, the x-axis where the lines $x = 1$, $x = 4$



[6]

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23) The diagram below shows the distribution of exam scores in a mathematics test.



(Shade in the bubble ⬭ next to the correct statement of skewness)

⬭ $Q_2 - Q_1 = Q_3 - Q_2$

⬭ $Q_2 - Q_1 < Q_3 - Q_2$

⬭ $Q_2 - Q_1 > Q_3 - Q_2$

⬭ $Q_2 - Q_1 = 2(Q_3 - Q_2)$

[1]

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24) The following wights were recorded (in Kg) for 12 people.

82	72	91	75	80	79
79	80	78	82	63	73

An outlier is an observation that falls either $1.5\,(Q_3 - Q_1)$ above the upper quartile or $1.5\,(Q_3 - Q_1)$ below the lower quartile.

Determine any outliers.

[5]

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25) Given that $(m\, a^{k}\, b^{k-6})$ is a term in the expansion $(a + b)^{10}$.

Find the value of m

[3]

26) Given that the multiplication of the first three terms in a geometric sequence is equal to 8

(Shade in the bubble ⬭ next to the 2nd term of the sequence)

⬭ 2 ⬭ 3

⬭ 6 ⬭ 8

[1]

27) Given that b is a constant and $\int_{0}^{4} (3x + b)\, dx = 32$

Find the value of b

[3]

[End of Examination]

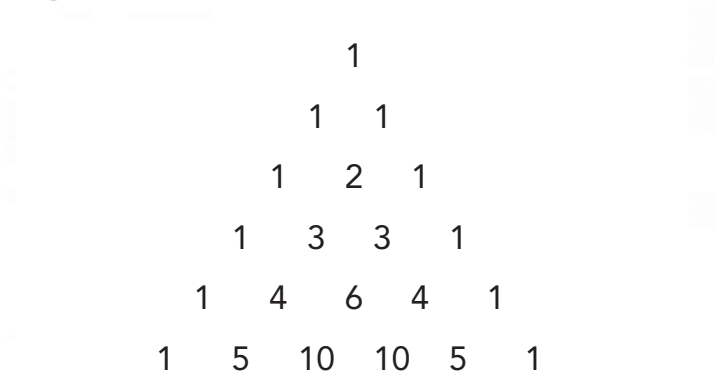
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Formulas sheet

The Binomial Expansion

- **Pascal's triangle:**



- Pascal's triangle is formed by adding adjacent pairs of numbers to find the number on the next row.

- The $(n+1)$th row of Pascal's triangle gives the coefficients in the expansion of $(a+b)^n$.

- $n! = n \times (n-1) \times (n-2) \ldots \times 3 \times 2 \times 1$

- ${}^nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$

- **The rth entry in the nth row of Pascal's triangle is given by**

$$^{n-1}C_{r-1} = \binom{n-1}{r-1}$$

- **The binomial expansion:**

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{r}a^{n-r}b^r + \cdots + b^n$$

where $(n \in N)$

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Sequences and Series

- If u_n is an arithmetic sequence, then

$$u_n = a + (n-1)d$$

$$S_n = \frac{n}{2}(2a + (n-1)d) \quad \text{or} \quad S_n = \frac{n}{2}(a + l)$$

- If u_n is a geometric sequence, then:

$$u_n = a\, r^{n-1}$$

$$\text{For } r \neq 1 \Rightarrow S_n = \frac{a\,(r^n - 1)}{r-1} \quad \text{or} \quad S_n = \frac{a\,(1-r^n)}{1-r}$$

- A geometric series is convergent if and only if $|r| < 1$, where r is the common ratio.

- The sum to infinity of a convergent geometric series is given by

$$S_\infty = \frac{a}{1-r}$$

Integration

- If $\mathrm{f}'(x)$ is the derivative of $\mathrm{f}(x)$ for all values of x in the interval $[a, b]$, then the definite integral is defined as

$$\int_a^b \mathrm{f}'(x)\ \mathrm{d}x = [\,\mathrm{f}(x)]_a^b = \mathrm{f}(b) - \mathrm{f}(a)$$

- The area between a positive curve, the x-axis and the lines $x = a$ and $x = b$ is given by

$$\text{Area} = \int_a^b y\ \mathrm{d}x$$

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Representation of Data

- $\bar{x} = \frac{\sum x}{n}$
- $Q_1 = \frac{n}{4}$ th data value $\quad Q_2 = \frac{n}{2}$ th data value $\quad Q_3 = \frac{3n}{4}$ th data value
- **Interquartile range** $= Q_3 - Q_1$
- **Variance:**

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

- **The standard deviation:** $\sigma = \sqrt{\sigma^2}$
- **Skewed:** $\frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$

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Answer scheme

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
1	AO1 L	The Binomial Expansion	63	☐ 10 ■ 20 ☐ 25 ☐ 30	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
2	AO1 L	The Binomial Expansion	63	☐ $(a+b)^6$ ☐ $(a+b)^7$ ■ $(a+b)^8$ ☐ $(a+b)^9$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
3	AO1 L	The Binomial Expansion	73	$a! = (15 - 13)!$	1	(1 mark) for writing $a! = (15 - 13)!$
				$a! = 2!$	1	(1 mark) for writing $a! = 2!$
				$a = 2$	1	- (1 mark) for the final answer - If the student writes directly $a = (15 - 13) = 2$ award (3 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
4	AO1 L	Sequence and Series	83	☐ $u_n = 5 - 4n$ ☐ $u_n = 1 - 4\,n$ ☐ $u_n = 5 + 4\,n$ ■ $u_n = 1 + 4\,n$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
5	AO1 L	Integration	153	▭ 7 ▭ 9 ■ 21 ▭ 27	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
6	AO1 L	Integration	154	$\int_2^4 4\,x^{-2} + 2 \;\; dx$	1	
				$= \left[-4\,x^{-1} + \; 2x \right]_2^4$	1	- (1 mark) for the correct integration - Award the student (2 marks) if the student writes this step directly
				$= [\,-1 \; + \; 8\,] - [\,-2 \; + \; 4\,]$	1	(1 mark) for the correct substitution
				$= [\;7\;] - [\;2\;]$		
				$= 5$	1	(1 mark) for the correct answer ($= \; 5$)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
7	AO1 L	Representation of Data	39	$Q_3 = 90$	1	(1 mark) for finding Q_3 correctly
				$Q_1 = 50$	1	(1 mark) for finding Q_1 correctly
				Interquartile range $= 90 - 50 = 40$	1	- (1 mark) for finding interquartile range correctly - If student writes the final step directly award (3 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
8	AO1 M	The Binomial Expansion	67	$(x+\frac{1}{x})^3 = x^3 + \binom{3}{1} x^2 (\frac{1}{x}) + \binom{3}{2} x (\frac{1}{x})^2 + (\frac{1}{x})^3$	1 + 1	(1 mark) for each 2 corrected terms
				$(x+\frac{1}{x})^3 = x^3 + 3x + 3\left(\frac{1}{x}\right) + \frac{1}{x^3}$	1 + 1	- (1 mark) for each 2 corrected terms in simplest form - If a student only writes the last step correctly award (4 marks)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
9	AO1 M	Sequence and Series	83	☐ 1 ■ 2 ☐ 8 ☐ 12	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
10	AO1 M	Sequence and Series	86	$a = 5 \quad d = 3 \quad l = 38$		
				$38 = 5 + 3(n - 1)$	$1 + 1 + 1$	Award the student (1 mark) for substituting by $a = 5 \quad d = 3 \quad l = 38$ in the nth term law
				$38 - 5 = 3(n - 1)$ $33 = 3(n - 1)$ $11 = (n - 1)$		
				$n = 12$	1	(1 mark) award for the correct value of n

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
11	AO1 M	Representation of Data	35	☐ 58, 59 ☐ 22, 58 ☐ 23, 59 ■ 22, 23	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
12	AO1 M	Representation of Data	45	$Q_2 = 20$ $Q_3 = 25$		
				$Q_2 - Q_1 = 20 - 10 = 10$	1	(1 mark) for the correct $Q_2 - Q_1 = 10$
				$Q_3 - Q_2 = 25 - 20 = 5$	1	(1 mark) for the correct $Q_3 - Q_2 = 5$
				Since, $Q_2 - Q_1 > Q_3 - Q_2$	1	(1 mark) for the correct inequality
				So, the distribution is negatively skewed	1	If the student correctly interprets the skewness result and states that the distribution is negatively skewed award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
13	AO1 H	Sequence and Series	90	$a\,r^3 = 8 \quad \rightarrow 1$	1	(1 mark) for writing the correct equation of u_4
				$u_7 = 64$		
				$a\,r^6 = 64 \quad \rightarrow 2$	1	(1 mark) for writing the correct equation of u_7
				$\frac{a\,r^6}{a\,r^3} = \frac{64}{8}$ $r^3 = 8$		
				$r = 2$ (the common ratio)	1	(1 mark) for finding r correctly
				$a\,(2^3) = 8$		
				$a = 1$	1	Find the value of a award (1 mark) by substitution in any equation

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
14	AO1 H	Representation of Data	43	Stem | Leaf 2 | 0 5 5 5 5 5 6 3 | 0 2 3 Key: 2 | 0 20 ℃	1 + 1 + 1	• If the student correctly constructs the stem diagram, award (1 mark) • If the student correctly constructs the leaf diagram, award (1 mark) • If the student correctly provides the key interpretation, award (1 mark)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
15	AO2 L	The Binomial Expansion	65	☐ 1 ☐ 3 ☐ 5 ☐ 6	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
16	AO2 L	The Binomial Expansion	63	$(2x + k)^5 = 32x^5 + 5 \times 16x^4k + \cdots + k^5$	1	(1 mark) for the expansion correctly
				The term x^4 is $5 \times 16x^4k$	1	- (1 mark) for writing the term x^4 is $5 \times 16x^4k$ correctly - Award the student (2 marks) it the student writes this step directly
				so, $5 \times 16k = 240$	1	(1 mark) for the equation
				$k = \frac{240}{80}$		
				$k = 3$	1	(1 mark) for the final answer

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
17	AO2 L	Sequence and Series	85	$S_n = \frac{n}{2}\left((2 \times 1) + (n-1)\,2\right)$	1	If the student substitutes the values of S_n, a and d in the role of Arithmetic Series sum correctly award (1 mark)
				$400 = \frac{n}{2}\left(2 + 2n - 2\right)$	1	(1 mark) for $S_n = 400$
				$400 = n^2$	1	(1 mark) for the equation
				$n = 20$ (number of terms is positive)	1	Award the student (1 mark) for finding the correct value of n

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [4]	More information
18	AO2 L	Sequence and Series	96	$28 = \frac{a(1-\left(\frac{1}{2}\right)^3)}{1-\frac{1}{2}}$	1	If the student substitutes the value of S_3, and r correctly in the sum role award (1mark).
				$a = 16$	1	Award the student (1mark) for the correct value of a
				$S_\infty = \frac{16}{1-\frac{1}{2}}$	1	If the student substitutes the value of a, and r correctly in the sum role (S_∞) award 1 mark
				$= 32$	1	Award students (1mark) for correct value of (S_∞)

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
19	AO2 L	Representation of Data	44	■ 53 ▭ 52 ▭ 51 ▭ 50	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
20	AO2 M	Sequence and Series	90	☐ $\frac{1}{6}$ ☐ $\frac{1}{3}$ ■ **3** ☐ **6**	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
21	AO2 M	Integration	157	☐ 2 ☐ $2\sqrt{2}$ ☐ 4 ■ $4\sqrt{2}$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [6]	More information
22	AO2 M	Integration	156	$\int_1^4 2\,x^{-\frac{1}{2}} + 1 \;\; dx$	1	If the student correctly sets up the definite integral, award (1 mark)
				$= \left[\frac{2}{\frac{1}{2}}x^{\frac{1}{2}} + \; x\right]_1^4$	1	(1 mark) for the integration
				$= \left[4\,x^{\frac{1}{2}} + \; x\right]_1^4$	1	- (1 mark) for the simplification - If the student writes this step directly award (2 marks)
				$= \left[\; 4\,(4)^{\frac{1}{2}} + \; (4)\;\right] - \left[\; 4\,(1)^{\frac{1}{2}} + \; (1)\;\right]$	1 + 1	(1 mark) for $\left[\; 4\,(4)^{\frac{1}{2}} + \; (4)\;\right]$ (1 mark) for $\left[\; 4\,(1)^{\frac{1}{2}} + \; (1)\;\right]$
				$= 12 \; - \; 5$		
				$= 7$	1	(1 mark) for the final answer

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
23	AO2 M	Representation of Data	46	☐ $Q_2 - Q_1 = Q_3 - Q_2$ ■ $Q_2 - Q_1 < Q_3 - Q_2$ ☐ $Q_2 - Q_1 > Q_3 - Q_2$ ☐ $Q_2 - Q_1 = 2\,(Q_3 - Q_2)$	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [5]	More information
24	AO2 M	Representation of Data	35	Arrange the values either ascending or descending 63 72 73 75 78 79 79 80 80 82 82 91		
				$Q_1 = \frac{75+73}{2} = 74$	1	(1 mark) for writing $Q_1 = 74$
				$Q_3 = \frac{80+82}{2} = 81$	1	(1 mark) for writing $Q_3 = 81$
				$Q_3 - Q_1 = 81 - 74 = 7$		
				Outliers are a value less than $74 - (1.5 \times 7) = 63.5$	1	(1 mark) for writing outlier less than $= 63.5$
				Outliers are a value greater than $81 + (1.5 \times 7) = 91.5$	1	(1 mark) for writing outlier greater than $= 91.5$
				Therefore 63 is the only outlier	1	(1 mark) for the final answer

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
25	AO2 H	The Binomial Expansion	67	$k + k - 6 = 10$	1	(1 mark) for writing the equation correctly
				$2k = 16$		
				$k = 8$	1	(1 mark) for $k = 8$
				$m = \binom{10}{2}$		
				$m = 45$	1	(1 mark) for $m = 45$

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [1]	More information
26	AO2 H	Sequence and Series	87 + 88	■ 2 ☐ 3 ☐ 6 ☐ 8	1	—

Item #	Assessment Object / Level of Demand	Unit	Page	Answer	Marks [3]	More information
27	AO2 H	Integration	153	$\left[\frac{3}{2}x^2 + bx\right]_0^4 = 32$	1	(1 mark) for the integration
				$\left[\frac{3}{2}(4)^2 + b(4)\right] - \left[\frac{3}{2}(0)^2 + b(0)\right] = 32$	1	(1 mark) for the substitution
				$24 + 4b = 32$ $4b = 8$		
				$b = \frac{8}{4}$		
				$b = 2$	1	(1 mark) for $b = 2$