FIRST SEMESTER

Basic Mathematics

(الرياضيات الاساسية)

(Questions)



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)

للعام الدراسي ١٤٤٥/١٤٤٦ هـ - ٢٠٢٣ / ٢٠٢٤ م

الدور الأول - الفصل الدراسي الأول

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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Instructions:

1. Non-programmable calculators are allowed.
2. List of formulas is given on the last page.

Part 1: Multiple Choice Items (14 marks)

For items from 1 to 14, shade in the bubble (⬭) corresponding to the **correct** answer. (Each item carries one mark):

1) The fraction $\frac{(x+7)^2}{(x+7)}$ can be simplified into

⬭ 1 ⬭ $x+7$

⬭ $x-7$ ⬭ 2

2) The simplest form of $\frac{x^2-25}{(x-5)}$ is

⬭ $x-10$ ⬭ $x-5$

⬭ $x+5$ ⬭ $x+10$

3) If $(x-3)$ is a factor of $x^3-4x^2+x+\boldsymbol{k}$, then the value of $\boldsymbol{k}$ is

⬭ 66 ⬭ 6

⬭ -6 ⬭ -66

4) Given that: $f(x)=5x^3-9x^2+\boldsymbol{p}\,x+2$ and $g(x)=x^3+6x^2+5x-6\boldsymbol{p}$

If $f(x)$ and $g(x)$ give the same remainder when divided by $(x-1)$, then the value of $\boldsymbol{p}$ equals

⬭ $-\frac{12}{5}$ ⬭ -2

⬭ 2 ⬭ $\frac{12}{5}$

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Part 1 continued

5) The statement $(2^3 = 8)$ as a logarithm is

- ☐ $\log_3 2 = 8$
- ☐ $\log_2 3 = 8$
- ☐ $\log_3 8 = 2$
- ☐ $\log_2 8 = 3$

6) $\log_b 6 + \log_b 2 =$

- ☐ $\log_b 3$
- ☐ $\log_b 4$
- ☐ $\log_b 8$
- ☐ $\log_b 12$

7) If $4^x = 60$, then the value of x (to 2 decimal places) is

- ☐ 2.95
- ☐ 1.18
- ☐ 0.44
- ☐ 0.34

8) $\log_4 x$ in terms of $\log_2 x$ equals

- ☐ $2 \log_2 x$
- ☐ $2 \log_2 x^2$
- ☐ $\frac{1}{2} \log_2 x$
- ☐ $\frac{1}{2} \log_2 x^2$

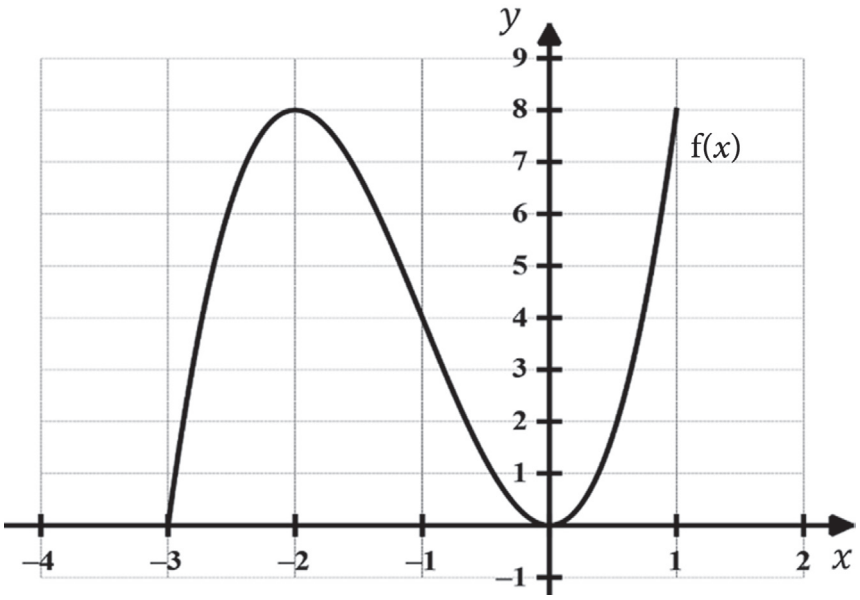
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Part 1 continued

9) The below figure shows the curve of $f(x)$ on the interval $[-3, 1]$,



then $f(x)$ is decreasing on the interval

- ☐ $[-2, 0]$
- ☐ $[-2, 1]$
- ☐ $[-3, -2]$
- ☐ $[0, 1]$

10) The function $f(x) = x^2 - 2x - 3$ has a stationary point at x equals

- ☐ 3
- ☐ 1
- ☐ -1
- ☐ -3

11) The frequency table below shows the number of coffee cups that some company workers had in one week,

Number of coffee cups	2	3	4	5	7
Frequency	10	13	15	18	12

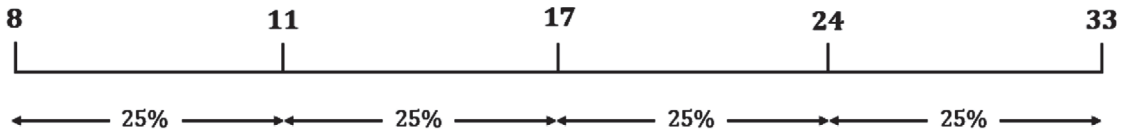
then the mode equals

- ☐ 5
- ☐ 7
- ☐ 12
- ☐ 18

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Part 1 continued

12) From the following data set



the interquartile range (IQR) is

- ☐ 13
- ☐ 16
- ☐ 22
- ☐ 25

13) If the lifetime of 50 batteries is shown in the table below,

Lifetime (minutes)	6–10	11–15	16–20	21–25	26–30
Frequency	4	10	8	13	15

then the median class is

- ☐ 6–10
- ☐ 16–20
- ☐ 21–25
- ☐ 26–30

14) If the summary data for a variable x are $\sum x = 216$, $\sigma^2 = 9$ and $n = 18$, then $\sum x^2$ equals

- ☐ 2430
- ☐ 2592
- ☐ 2646
- ☐ 2754

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Part 2: Extended Response Items (56 marks)

Write all answer in the space provided for items 15 – 28. Show all your work.

15) Simplify the fraction $\dfrac{x^2 + 10x + 24}{x^2 + x - 12}$ (4 marks)

16) Given that $g(x) = 4x^4 - 3x^2 + 3x - 1$

$g(x)$ is divided by $(2x - 1)$

Find the remainder using the remainder theorem. (5 marks)

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Part 2 continued

17) $f(x) = x^3 + 5x^2 + 3x - 1$

Divide $f(x)$ by $(x + 1)$

giving your answer in the form $f(x) = (x + 1)(ax^2 + bx + c)$ (4 marks)

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Part 2 continued

18) Show that $(x + 3)$ is **not** a factor of $f(x) = x^3 - x^2 - 9x + 11$ (3 marks)

19) $\log_3 (x + 1) = 2$

Find the value of x without using a calculator. (3 marks)

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Part 2 continued

20) Solve the equation: $\log_2 x - \log_2 8 = 1$ (3 marks)

21) $f(x) = 5^{2x} - 6\,(5^x) + 5$

Find the solution to the equation $f(x) = 0$ (4 marks)

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Part 2 continued

22) Given that $\log_a x = n$

Show that $\log_a (a^2 x) = 2 + n$ (4 marks)

23) Given that $f(x) = x^2 - 10x$

Find the values of x for which $f(x)$ is an increasing function. (3 marks)

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Part 2 continued

24) The curve with the equation $y = 2x^3 + 6x^2$ has $(0, 0)$ and $(-2, 8)$ as stationary points.

Determine the nature of the stationary points using the second derivative.

(5 marks)

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Part 2 continued

25) Show that the function $f(x) = 7 - 11x - x^3$ is decreasing for all real values of x (2 marks)

26) The frequency table below shows the amount of money (in OMR) spent by a group of women at the weekend

Money (OMR)	1	2	4	20	30
Frequency	11	16	9	1	3

Find the mean. (5 marks)

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Part 2 continued

27) a. The time, in minutes, spent by 45 people to solve a puzzle is shown in the table below:

Time (minutes)	1–3	4–6	7–9	10–12
Frequency	8	22	6	9

Use interpolation to estimate the lower quartile Q_1 (4 marks)

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Part 2 continued

27) b. The marks gained by six randomly selected students in a mathematics short test are shown below

6 7 5 3 10 8

Find the standard deviation σ (4 marks)

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Part 2 continued

28) If the mean of the following frequency table is 1.7

x	1	2	3
Frequency	p	5	1

Find the value of p (3 marks)

[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 reminder is $f\left(\frac{b}{a}\right)$

Exponential & Logarithms

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

Differentiation

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

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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:**

$\mathrm{Q}_1 = \frac{n}{4}$ th data value $\quad \mathrm{Q}_2 = \frac{n}{2}$ th data value $\quad \mathrm{Q}_3 = \frac{3n}{4}$ th data value

- **Interquartile range:** $\mathrm{IQR} = \mathrm{Q}_3 - \mathrm{Q}_1$
- **Variance:**

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

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

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

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

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

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The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٤٦/١٤٤٥ هـ - ٢٠٢٤/٢٠٢٣ م

الدور الثاني - الفصل الدراسي الأول

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- الأسئلة في (١٤) صفحة.
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س - عاصمة سلطنة عمان هي:

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● 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. Non-programmable calculators are allowed.
2. List of formulas is given on the last page.

Part 1: Multiple Choice Items (14 marks)

For items 1 to 14, shade the bubble (○) corresponding to the **correct** answer.
(Each item carries one mark)

1) The fraction $\frac{x^3 - 8x}{x}$ can be simplified into

○ $x^3 - 8x$ ○ $x^3 - 8$

○ $x^2 - 8x$ ○ $x^2 - 8$

2) The simplest form of $\frac{x^2 + 2x - 15}{(x - 3)}$ is

○ $x - 12$ ○ $x - 5$

○ $x + 5$ ○ $x + 12$

3) If $(x - 1)$ is a factor of $x^3 + 3x^2 - 4x$, then one of the other factors is

○ $x + 4$ ○ $x + 3$

○ $x - 3$ ○ $x - 4$

4) Given $f(x) = x^3 + \boldsymbol{p}x^2 + \boldsymbol{q}x + 3$ where $\boldsymbol{p}, \boldsymbol{q}$ are constants.
If $f(x)$ is divided by $(x + 2)$ with reminder 7 , then the value of $2\boldsymbol{p} - \boldsymbol{q}$ is

○ 1 ○ 2

○ 6 ○ 9

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Part 1 continued

5) The statement $(\log_4 16 = 2)$ using a power is

- ☐ $2^4 = 16$
- ☐ $4^2 = 16$
- ☐ $16^{\frac{1}{2}} = 4$
- ☐ $16^{\frac{1}{4}} = 2$

6) $\log_7 9$ can be written as

- ☐ $\dfrac{9}{\log_{10} 7}$
- ☐ $\dfrac{\log_{10} 7}{\log_{10} 9}$
- ☐ $\dfrac{\log_{10} 9}{\log_{10} 7}$
- ☐ $\dfrac{\log_{10} 9}{7}$

7) If $5^x = 100$, then the value of x (to 2 decimal places) is

- ☐ 2.86
- ☐ 1.30
- ☐ 0.40
- ☐ 0.35

8) $2\log_5 6 - \log_5 4 =$

- ☐ $\log_5 3$
- ☐ $\log_5 9$
- ☐ $\log_5 24$
- ☐ $\log_5 32$

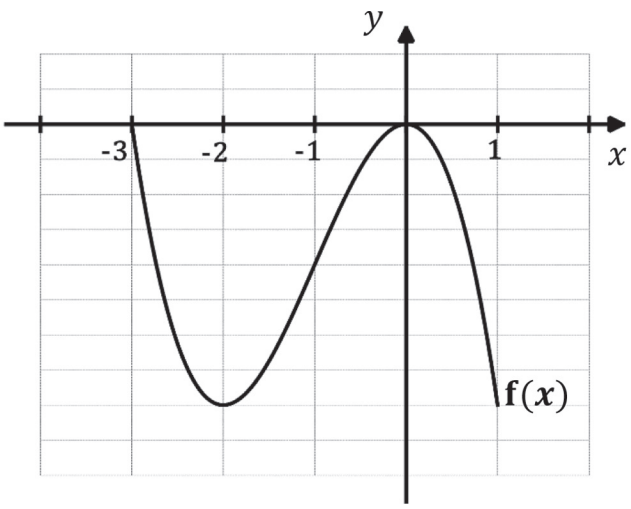
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Part 1 continued

9) The below figure shows the curve of f(x) on the interval [–3, 1] ,



then f(x) is increasing on the interval

- ☐ [–3, –2]
- ☐ [–2, 1]
- ☐ [–2, 0]
- ☐ [0, 1]

10) The curve with the equation $y = 9 - x^2$ has a gradient zero at the point

- ☐ (–3, 0)
- ☐ (0, 9)
- ☐ (3, 0)
- ☐ (0, –9)

11) The frequency table below shows the time, in minutes, spent by a group of adults to solve a puzzle,

Time (minutes)	0 – 10	10 – 20	20 – 30	30 – 40
Frequency	16	15	24	11

then the modal class is

- ☐ 20 – 30
- ☐ 11
- ☐ 30 – 40
- ☐ 24

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Part 1 continued

12) The table below shows the age (in years) of a random sample of 30 students at a college,

Age (years)	18	19	20	21
Frequency	14	7	4	5

then the mean equals

- ☐ 2.6
- ☐ 7.5
- ☐ 18
- ☐ 19

13) The weights (kilograms) of some employees in a company are shown in the table below,

Weights (kg)	60	65	70	75	80
Frequency	3	2	4	7	5

then the median is

- ☐ 75
- ☐ 70
- ☐ 7
- ☐ 4

14) If the summary data for a variable x are $\sum x^2 = 720$, $\sigma^2 = 11$ and $n = 20$, then $(\bar{x})^2$ equals

- ☐ 16
- ☐ 25
- ☐ 36
- ☐ 47

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Part 2: Extended Response Items (56 marks)

Write all answer in the space provided for items 15 – 28. Show all your work.

15) Simplify the fraction $\frac{x^2 + 9x + 20}{(x + 5)^2}$ (4 marks)

16) $f(x) = x^3 + 5x^2 - 9x - 12$

Divide $f(x)$ by $(x - 2)$ (4 marks)

Do not write in this space

Part 2 continued

17) $g(x) = \boldsymbol{k}x^4 - 2x^3 + 6x^2 - 2$

Given that $g(x)$ is divided by $(x + 1)$ with a remainder of 9

Find the value of $\boldsymbol{k}$ (5 marks)

18) Show that $(x + p)$ is a factor of $(x + p + 1)^5 - (x^5 + p^5 + 1)$ (3 marks)

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Part 2 continued

19) $\log_3 (x - 7) = 2$

Find the value of x without using a calculator. (3 marks)

20) Solve the equation: $\log_{10} 5 + \log_{10} (4x) = 2$ (3 marks)

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Part 2 continued

21) The equation $4^{x} = 3^{x+1}$

Find the solution of the equation, giving your answer to three decimal places.

(4 marks)

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Part 2 continued

22) Given that $y = \frac{a^6}{8}$

Show that $\log_a y + 3 \log_a 2 = 6$ (4 marks)

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Part 2 continued

23) Given that $f(x) = x^2 - 6x$

Find the values of x for which $f(x)$ is a decreasing function. (3 marks)

24) The equation of the curve is $y = 4x - x^2$

Determine the nature of the stationary point(s). (5 marks)

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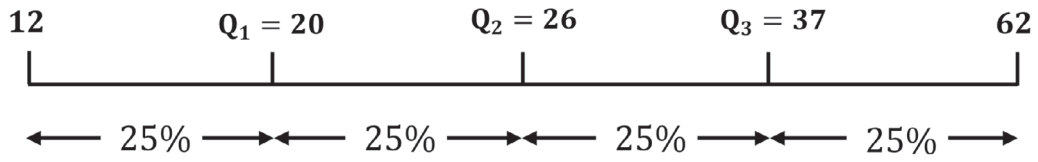
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Part 2 continued

25) The curve with the equation $y = x^3 - 12x$ has $\frac{d^2y}{dx^2} = 12$ at $x = b$

Find the value of b for which $(b, -16)$ is a local minimum point. (2 marks)

26) From the following data set



Find:

The lower quartile _____

The median _____

The upper quartile _____

The Range _____ (5 marks)

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Part 2 continued

27) a. The frequency table below shows the number of books borrowed by 26 visitors to the library in a month

Number of books	1	2	5	8
Frequency	4	7	3	12

Find the interquartile range (IQR). (4 marks)

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Part 2 continued

27) b. By completing the following table:

Class interval	Frequency f	Midpoint x	fx	fx^2
1 – 3	8	_____	16	32
4 – 6	22	5	_____	550
7 – 9	6	8	48	384
10 – 12	9	11	99	_____
Total	_____		274	_____

Find the variance σ^2 (4 marks)

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Part 2 continued

28) The mean of a sample of 15 observations is 4.2

The mean of a sample of 20 observations is $\bar{x}_2$

The mean of all 35 observations is 7.6

Show that $\bar{x}_2 = 10.15$ (3 marks)

[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 reminder is $f\left(\frac{b}{a}\right)$

Exponential & Logarithms

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

Differentiation

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

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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:** $\text{IQR} = Q_3 - Q_1$
- **Variance:**

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

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

- **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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امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م

الدور الأول - الفصل الدراسي الأول

تنبيه:
- المادة: الرياضيات التطبيقية.
- الأسئلة في (١٥) صفحات.
- 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. Non-programmable calculators are allowed.
2. List of formulas is given on the last page.

Part 1: Multiple Choice Items (14 marks)

For items 1 to 14, shade the bubble (○) corresponding to the **correct** answer. (Each item carries one marks):

1) The second term of the sequence $\{3n + 1\}$ is:

○ 9 ○ 7

○ 4 ○ 2

2) For the geometric sequence 9, 27, 81, 243, ….. the common ratio r equals:

○ 3 ○ 9

○ 18 ○ 36

3) If u_n is an arithmetic series with $u_2 = 21$ and $S_2 = 46$, then the common difference d equals:

○ -25 ○ -4

○ 4 ○ 25

4) A bank exchanges UK pounds for a commission of 1.3% . If Ali wants to convert 800 UK pounds, then the amount of commission charged equals (in UK pounds):

○ 10.40 ○ 9.10

○ 2.40 ○ 1.30

5) The simple interest on a loan of \$6500 at a rate of 9% p.a. over 12 months is (in \$):

○ 7020 ○ 5850

○ 585 ○ 488

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Part 1 continued

6) The final balance of a \$43100 investment at 4% p.a. where interest is compounded quarterly for 5 years approximately equals (in \$):

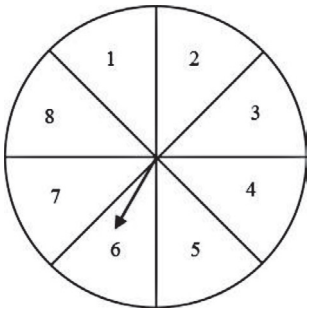
- ☐ 52590.19
- ☐ 52437.74
- ☐ 45298.53
- ☐ 94437.41

7) If a car is bought for \$15000 and sold 2 years later for \$10000, then the annual rate of depreciation (approximately) equals:

- ☐ 16.67 %
- ☐ 18.35 %
- ☐ 22.47 %
- ☐ 33.33 %

8) If an octagonal spinner is twirled once, then the probability of getting a result of 6 is:

- ☐ $\frac{5}{8}$
- ☐ $\frac{3}{4}$
- ☐ $\frac{1}{4}$
- ☐ $\frac{1}{8}$



9) If A is an event where $P(A) = 0.07$, then $P(A')$=

- ☐ 0
- ☐ 0.03
- ☐ 0.93
- ☐ 1

10) If a 6-sided die is rolled once, then the probability of getting a number more than 2 is:

- ☐ $\frac{5}{6}$
- ☐ $\frac{2}{3}$
- ☐ $\frac{1}{3}$
- ☐ $\frac{1}{6}$

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Part 1 continued

11) Let A and B are two events where $P(B') = 0.4$ and $P(A \cap B) = 0.2$

If $P(B \mid A) = 0.5$, then $P(A \cup B) =$

- ☐ 0.2
- ☐ 0.4
- ☐ 0.6
- ☐ 0.8

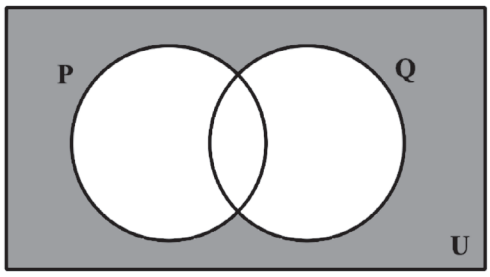
12) The negation of $x > -2$ where $x \in \mathbb{R}$ is:

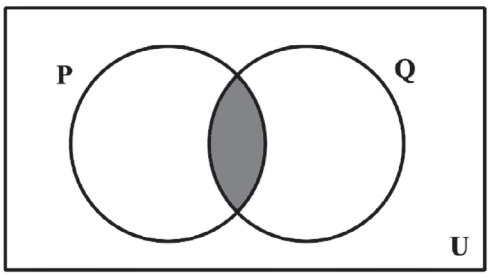
- ☐ $x \geq 2$
- ☐ $x > 2$
- ☐ $x \leq -2$
- ☐ $x < -2$

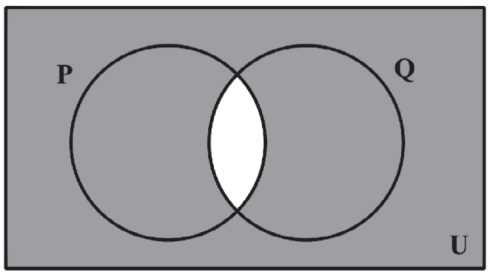
13) If p : Ahmed had rice for lunch, and q : Ahmed had fish for lunch, then the symbolic form for (Ahmed had either rice or fish for lunch, but not both) is:

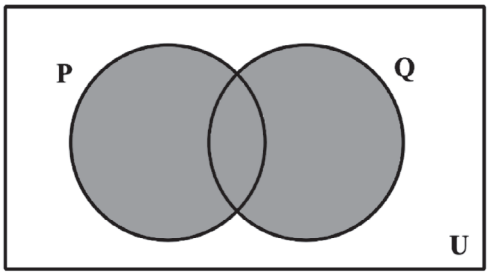
- ☐ $p \vee q$
- ☐ $p \vee \neg q$
- ☐ $p \underline{\vee} q$
- ☐ $p \underline{\vee} \neg q$

14) If ($\mathbf{P}$ is the truth set of p and $\mathbf{Q}$ is the truth set of q), then the Venn diagram that represents the statement $\neg (p \wedge q)$ is:

☐ 

☐ 

☐ 

☐ 

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Part 2: Extended Response Questions (56 marks)

Write all answer in the space provided for items 15 – 28. Show all your work.

15) Let 5, 8, 11, 14, ….. be an arithmetic sequence.

Find u_1 and d. (2 marks)

16) The amount of \$9000 was invested for 3 years at 8% p.a.

Calculate the compound interest at the end of this period. (6 marks)

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Part 2 continued

17) Let u_n be a geometric series with $u_1 = -1$ and $S_2 = 2$

Show that $r = -3$ (3 marks)

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Part 2 continued

18) The table below shows the interest paid on a deposit of \$7000 at r % p.a. compounded annually for 4 years.

Year	Principal (1)	Interest (= $C \times r \times n$) (2)	Balance (1) + (2)
1	\$7000.00	\$7000.00 × 0.07 × 1 = \$490.00	\$7490.00
2	\$7490.00	\$7490.00× 0.07 × 1 = \$524.30	\$8014.30
3	\$8014.30	\$8014.30 × 0.07 × 1 = \$561.00	\$8575.30
4	\$8575.30	Y	\$9175.57

Find: (5 marks)

a. The interest rate per compound period (r).

b. The number of periods (n).

c. The value of (Y).

d. The total interest earned.

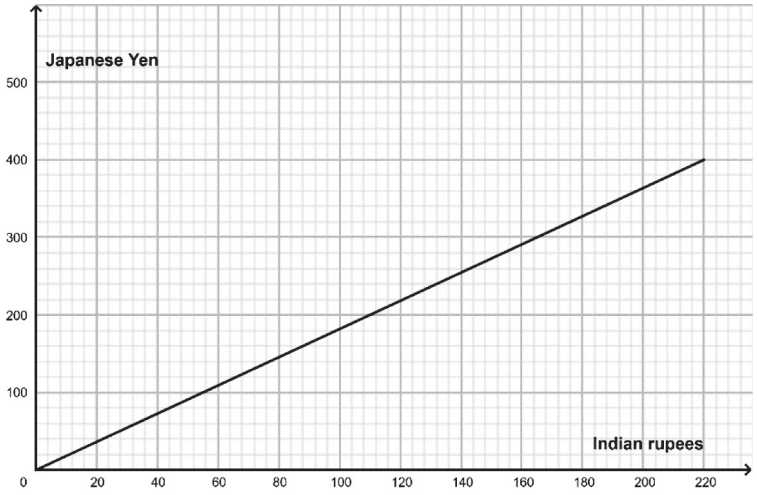
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Part 2 continued

19) The graph below shows the relationship between Indian rupees and Japanese yen on a particular day.



Find the number of Indian rupees in 45 Japanese yen. (5 marks)

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Part 2 continued

20) You buy 4500 UK pounds worth of travellers cheques and it costs you 7894.39 Australian dollars.

Find the selling exchange rate. (5 marks)

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Part 2 continued

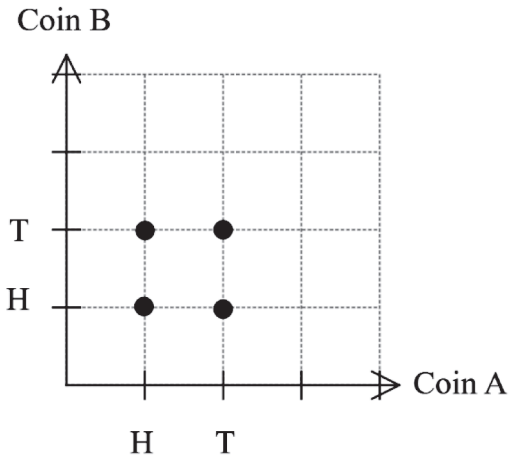
21) The effective rate of interest on an investment is 8.6% p.a. compounded half-yearly.

Find the rate per compound interest period (i). (3 marks)

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Part 2 continued

22) The below 2-dimensional grid illustrates the possible outcomes of tossing two coins A and B.



List the sample space. (4 marks)

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Part 2 continued

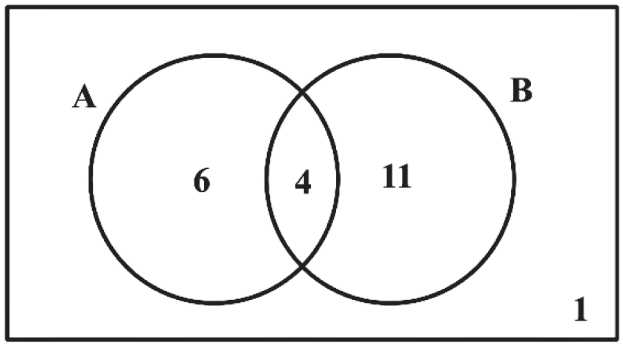
23) A bag contains 3 green marbles and 7 white marbles. Two marbles are drawn simultaneously from the bag.

Determine the probability that at least one marble is white. (5 marks)

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Part 2 continued

24) The Venn diagram below illustrates the number of students in a class who like ice-cream (A) and popcorn (B).



One student is randomly selected from the class.

Find the probability that the student likes ice-cream given that he/she likes popcorn.

(5 marks)

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Part 2 continued

25) Let A and B be two independent events such that $P(B) = 0.4$ and $P(A \cup B) = 0.6$

Show that $P(A) = \frac{1}{3}$ (3 marks)

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Part 2 continued

26) Complete the following truth table using (T: True / F: False) (3 marks)

p	q	$\neg q$	$p \wedge \neg q$
T	T	_____	F
T	F	T	_____
F	T	F	F
F	F	_____	F

27) Use deMorgan property to find the negation of $2 < x < 8$ (4 marks)

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Part 2 continued

28) Prove that $p \vee (\neg p \wedge q) = p \vee q$. (3 marks)

[End of Examination]

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Formulas sheet

Sequence and series

- If u_n is an arithmetic sequence, then

$$u_n = u_1 + (n-1)d$$

$$S_n = \frac{n}{2}(2u_1 + (n-1)d) \quad \text{or} \quad S_n = \frac{n}{2}(u_1 + u_n)$$

- If u_n is a geometric sequence, then:

$$u_n = u_1 r^{n-1}$$

$$\text{For } r \neq 1 \Rightarrow S_n = \frac{u_1(r^n-1)}{r-1} \quad \text{or} \quad S_n = \frac{u_1(1-r^n)}{1-r}$$

- Compound growth: $u_{n+1} = u_1 \times r^n$

Financial mathematics

Foreign exchange:

- Cost in currency $= \frac{\text{foreign currency bought}}{\text{selling exchange rate}}$
- Currency bought $= \frac{\text{foreign currency sold}}{\text{buying exchange rate}}$

Travellers cheques:

- Cost of travellers cheques $= \frac{\text{amount of foreign currency}}{\text{selling exchange rate}} \times 101\ \%$

Simple interest:

- Simple interest: $I = C \times r \times n$

Calculating Repayments:

- Periodic repayment $= \frac{\text{principal + interest}}{\text{number of repayments}}$ i.e., $R_P = \frac{C+I}{N}$

Compound interest:

- Compound Interest: $I = C \times \left(1 + \frac{r}{100}\right)^n - C$
- Total interest earned = final balance – principal

The effective interest rate on an investment:

- Conversion of Nominal (compound) Rates to an effective rate: $r = (1+i)^c - 1$

Depreciation:

- Depreciation formula: $A = \mathrm{C} \times \left(1 + \frac{\mathrm{r}}{100}\right)^{\mathrm{n}}$

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Probability

- $P(E) = \frac{\text{the number of members of the event E}}{\text{the total number of possible outcomes}}$
- $P(E) + P(E') = 1$
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- If A and B are mutually exclusive events then $P(A \cap B) = 0$
- Conditional Probability: $P\left(A \mid B\right) = \frac{P(A \cap B)}{P(B)}$
- Independent Rule:
  A and B are independent events $\Leftrightarrow$ $P(A \cap B) = P(A) \times P(B)$

Logic

- deMorgan properties:

$$\neg(p \wedge q) = \neg p \vee \neg q$$
$$\neg(p \vee q) = \neg p \wedge \neg q$$

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امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م

الدور الأول - الفصل الدراسي الأول

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- الأسئلة في (١١) صفحة.
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- الإجابة في الورقة نفسها.

تعليمات مهمة:

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- 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.
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- 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. Non-programmable calculators are allowed.
2. List of formulas is given on the last page.

Part 1: Multiple Choice Items (14 marks)

For items 1 to 14, shade the bubble (○) corresponding to the **correct** answer. (Each item carries one marks):

1) The general term of the sequence 4, 9, 14, 19, …. is:

○ n + 3 ○ 3n+1

○ 5n – 1 ○ 2n+2

2) The amount of an investment of \$10000 at 8% p.a. compound interest after 4 years (approximately) is:

○ \$12597.12 ○ \$13604.89

○ \$13685.69 ○ \$14693.28

3) The sum of the arithmetic series 100 + 93 + 86 + 79 + … to 10 terms is:

○ 720 ○ 685

○ 650 ○ 615

4) A geometric series with $u_1 = 2$ and $r = 2$. If $S_n = 62$, then n equals:

○ 4 ○ 5

○ 6 ○ 7

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Part 1 continued

5) A bank exchanges UK pounds for a commission of 1.8%. If a person wants to convert 600 UK pounds, then the amount of commission charged equals (in UK pounds):

- ☐ 1.08
- ☐ 1.80
- ☐ 4.80
- ☐ 10.80

6) A device is bought for $13000. If it depreciates at 25% p.a. for 3 years, then the future value equals:

- ☐ $203.125
- ☐ $3250
- ☐ $5484.38
- ☐ $97507

7) The number of years (n) that take to earn simple interest of $4320 on a loan of $18000 at a rate of 6% p.a. is:

- ☐ 2
- ☐ 4
- ☐ 6
- ☐ 8

8) If you want to buy Singapore dollars worth of travellers cheques which cost in US dollars 2960.49 where $1 US =$1.7058 Singapore, then the amount of foreign currency (approximately) equals:

- ☐ $2900
- ☐ $2990
- ☐ $5000
- ☐ $5050

9) A vending machine bought for $20 000 is sold 2 years later for $16 000. The annual rate of depreciation is:

- ☐ 10.6%
- ☐ 11.8%
- ☐ 20%
- ☐ 36%

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Part 1 continued

10) An ordinary 6-sided die is rolled once. The probability of getting a 3 is:

- ☐ $\frac{1}{6}$
- ☐ $\frac{1}{4}$
- ☐ $\frac{1}{3}$
- ☐ $\frac{1}{2}$

11) If A and B are mutually exclusive events where $P(A) = 0.6$ and $P(B) = 0.2$, then $P(A \cup B) =$

- ☐ 0.12
- ☐ 0.33
- ☐ 0.4
- ☐ 0.8

12) A bag contains 3 purple, 1 blue and 2 red pens. Three pens are randomly selected with replacement, then the probability that all pens are purple is:

- ☐ $\frac{1}{36}$
- ☐ $\frac{1}{20}$
- ☐ $\frac{1}{8}$
- ☐ $\frac{1}{2}$

13) If X and Y are two events where $P(Y) = 0.2$ and $P(X \mid Y) = 0.7$, then $P(X \cap Y) =$

- ☐ 0.90
- ☐ 0.50
- ☐ 0.29
- ☐ 0.14

14) A coin is tossed 5 times, then the probability of getting at least one tail is:

- ☐ $\frac{31}{32}$
- ☐ $\frac{4}{5}$
- ☐ $\frac{1}{5}$
- ☐ $\frac{1}{32}$

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Part 2: Extended Response Questions (56 marks)

Write all answer in the space provided for items 15 - 26. Show all your work.

15) List the first two terms of the sequence $\{20 - (-3)^n\}$ (5 marks)

16) In 1998, there were 3000 koalas on Koala Island. Since then, the population of koalas on the island has increased by 5% each year.

How many koalas were there on the island by the end of 2006? (5 marks)

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Part 2 continued

17) consider the series of odd numbers 1 + 3 + 5 + 7 + ……..

Prove that "the sum of the first n odd numbers is n^2". (3 marks)

18) The table below shows the interest paid on a deposit of \$8000 at r % p.a. compound annually for 5 years. (6 marks)

Year	Principal	Interest	Balance
1	8000	\$8000 × 0.06 × 1= \$480	8480
2	8480	\$8480 × 0.06 × 1= \$508.8	8988.8
3	8988.8	\$8988.8 × 0.06 × 1= \$539.33	9528.13
4	9528.13	\$89528.13 × 0.06 × 1= \$571.69	10099.82
5	x	\$10099.82 × 0.06 ×1= \$605.99	A

Find:

a. The interest rate per compound period (r).

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Part 2 continued

b. The number of periods (n).

c. The value of (x).

d. The final balance (A).

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Part 2 continued

19) A person takes out a personal loan for $18000 to buy a bus. He negotiates a term of 3 years at 10% p.a. interest. Calculate the: (6 marks)

a. Monthly repayments.

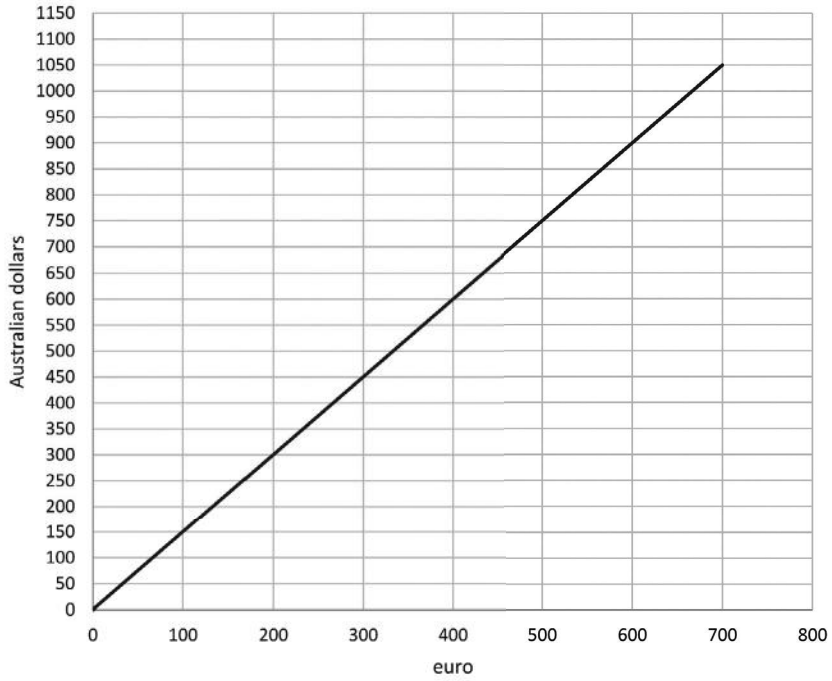
b. Total repayments.

c. Interest charged.

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Part 2 continued

20) The graph below shows the relationship between euro and Australian dollars on a particular day. (6 marks)



a. Find the number of Australian dollars in 1 euro.

b. Determine whether a person with 500 euro could afford to buy an item valued 850 Australian dollars.

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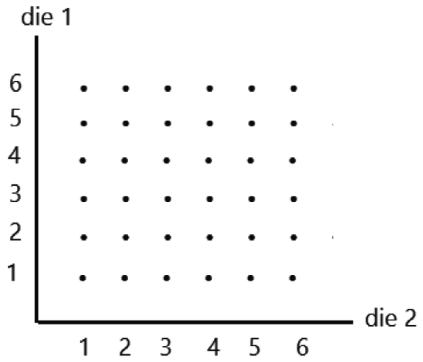
Part 2 continued

21) Which is the better rate offered :

6.8% p.a. compound monthly or 6.9% p.a. compound quarterly? (4 marks)

22) A pair of dice is rolled. The results of 36 different possible (pair of die) are illustrated below on a 2-dimensional grid.

Use the grid below to determine the probability of getting: (2 marks)



a. a sum of 5

b. a 3 and a 1

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Part 2 continued

23) List the sample space of possible outcomes for tossing two coins. (4 marks)

24) A box contains 4 white and 6 black marbles. Two marbles are randomly selected from the box without replacement. (7 marks)

a. Draw a tree diagram to illustrate this sampling process.

b. find the probability that both marbles are white.

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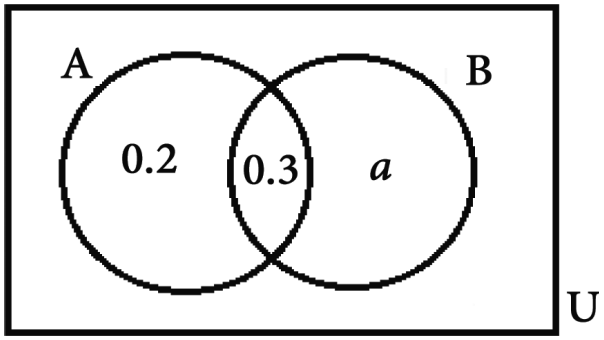
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Part 2 continued

25) In a class of 100 students, 60 students like tea, 50 students like coffee and 80 students like tea or coffee. One student is randomly selected from the school. find the probability that the student likes tea given that he/she likes coffee. (4 marks)

26) Using the Venn diagram, If $P(A \cup B) = 0.6$, then find a. (4 marks)



[End of Examination]

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List of formulas

Financial mathematics

Sequence and series

- If u_n is an arithmetic sequence, then:

  $u_n = u_1 + (n-1)d$

  $S_n = \frac{n}{2}(2u_1 + (n-1)d)$ or $S_n = \frac{n}{2}(u_1 + u_n)$

- If u_n is a geometric sequence, then:

  $u_n = u_1 r^{n-1}$

  For $r \neq 1. S_n = \frac{u_1(r^n-1)}{r-1}$ or $S_n = \frac{u_1(1-r^n)}{1-r}$

- Compound growth:
  $u_{n+1} = u_1 \times r^n$

Financial mathematics

- Cost in currency = $\frac{foreign\ currency\ bought}{selling\ exchange\ rate}$
- Currency bought = $\frac{\text{foreign currency sold}}{\text{buying exchange rate}}$
- Cost of travelers cheques = $\frac{\text{amount of foreign currency}}{\text{selling exchange rate}} \times 101\ \%$
- Simple interest I = C × r × n
- Compound Interest $I = C \times \left(1 + \frac{r}{100}\right)^n - C$
- Depreciation formula: $A = C \times \left(1 + \frac{r}{100}\right)^n$
- Periodic repayment = $\frac{\text{principal+interest}}{\text{number of repayments}}$
- Total interest earned = final balance – principal
- Conversion of Nominal (compound) Rates to an effective rate: $r = (1+i)^c - 1$
- Closing balance (outstanding balance)= previous balance + interest − monthly repayment

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Probability

- $P(E) = \frac{\text{the number of members of the event}}{\text{the total number of possible outcomes}}$
- $P(E) + P(E') = 1$
- Addition Rule:
  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- If A and B are mutually exclusive events then, $P(A \cap B) = 0$ and so the addition law becomes $P(A \cup B) = P(A) + P(B)$.

- Conditional Probability:
  $P(A\ given\ B) = P\left(A \mid B\right) = \frac{P(A \cap B)}{P(B)}$

- Multiplication Rule:
  $P(A \cap B) = P\left(A \mid B\right) \times P(B)$
  $P(A \cap B) = P\left(B \mid A\right) \times P(A)$

- Independent Rule:
  A and B are independent events if:
  $P\left(A \mid B\right) = P(A)$
  $P\left(B \mid A\right) = P(B)$ or $P(A \cap B) = P(A) \times P(B)$

Table of monthly repayments per $1000

Loan term (months)	Table of monthly repayments per $1000 Annual interest rate						
	10.0%	10.5%	11.0%	11.5%	12.0%	12.5%	13.0%
12	87.9159	88.1486	88.6151	88.8488	89.0829	89.3173	89.3173
18	60.0571	60.2876	60.5185	60.7500	60.9820	61.2146	61.4476
24	46.1449	46.3760	46.6078	46.8403	47.0735	47.3073	47.5418
30	37.8114	38.0443	38.2781	38.5127	38.7481	38.9844	39.2215
36	32.2672	32.5024	32.7387	32.9760	33.2143	33.4536	33.6940
42	28.3168	28.5547	28.7939	29.0342	29.2756	29.5183	29.7621
48	25.3626	25.6034	25.8455	26.0890	26.3338	26.5800	26.8275
54	23.0724	23.0727	23.5615	23.8083	24.0566	24.3064	24.5577
60	21.2470	21.4939	21.7424	21.9926	22.2444	22.4979	22.7531

End of List of formulae

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امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م

الدور الثاني - الفصل الدراسي الأول

تنبيه:
- المادة: الرياضيات التطبيقية.
- 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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Instructions:

1. Non-Programmable calculators are allowed.
2. List of formulae is given on the last page.

Part 1: Multiple Choice Items (12 marks)

For items 1 to 14, shade the bubble (○) corresponding to the **correct** answer. (Each item carries 1 mark):

1) The first term of the sequence {3n – 1} is:

○ 1 ○ 2

○ 3 ○ 4

2) For the arithmetic sequence 17, 28, 39, 50, …. , the general term u_n=

○ $6 + 11n$ ○ $17 + 11n$

○ $28 - 11n$ ○ $17 - 11n$

3) A population of rodents was initially 400 but increased by 54% per month. The expected population size after one year is:

○ 46216 ○ 53360

○ 71172 ○ 76920

4) For the geometric series 2 + 6 + 18 + 54+…… , if S_n= 728, then n equals:

○ 6 ○ 7

○ 8 ○ 9

5) If you have 500 English pound and 1 baht = 0.01318 English pound, then the cost of purchasing travelers cheques in Thailand baht approximately equals:

○ 3793.63 ○ 3815.27

○ 37936.27 ○ 38315.63

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Part 1 continued

6) The final value of a \$35000 investment at 5% p.a. where interest is compounded half yearly for 4 years approximately equals:

- ☐ \$42542.72
- ☐ \$38633.4
- ☐ \$40516.88
- ☐ \$42644.10

7) The monthly repayments on a loan of \$15000 at 7% p.a. simple interest over 5 years approximately is:

- ☐ \$87,5
- ☐ \$337.5
- ☐ \$4050
- ☐ \$5250

8) If \$100 invested, then the effective interest rate for a simple interest rate of 10.5% p.a. applied for two years' approximately equals:

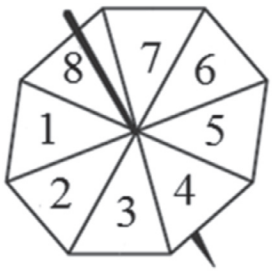
- ☐ 9
- ☐ 9.5
- ☐ 10
- ☐ 10.5

9) A person takes out a personal loan for \$17500 over (n) years at 11%. If a monthly repayments is \$420, then (n)=

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4

10) An octagonal spinner is spinned one time, the probability of getting a result of 7 is:

- ☐ $\frac{7}{8}$
- ☐ $\frac{3}{4}$
- ☐ $\frac{1}{4}$
- ☐ $\frac{1}{8}$



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Part 1 continued

11) An ordinary 6-sided die is rolled once. The probability of not getting a 2 is:

- ☐ $\frac{1}{6}$
- ☐ $\frac{1}{4}$
- ☐ $\frac{3}{4}$
- ☐ $\frac{5}{6}$

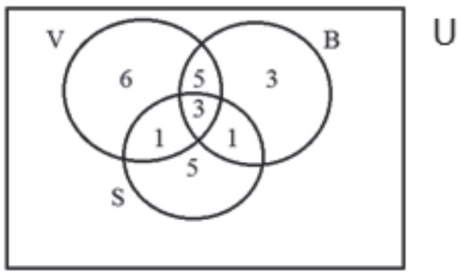
12) If a ball is randomly selected from the box containing 3 blue, 5 red and 7 green balls, then the probability of getting a red or a green ball is:

- ☐ $\frac{2}{15}$
- ☐ $\frac{8}{15}$
- ☐ $\frac{2}{5}$
- ☐ $\frac{4}{5}$

13) If X and Y are two events where $P(Y) = 0.3$ and $P(X|Y) = 0.6$, then $P(X \cap Y)$=

- ☐ 0.12
- ☐ 0.18
- ☐ 0.3
- ☐ 0.9

14) The Venn diagram below illustrates the number of girls in a sporting club who play in a volleyball team (V), a swimming team (S) and a basketball team (B).



If a girl is randomly selected from the club, then the probability that she is in the swimming team given that she is on the volleyball team is :

- ☐ $\frac{4}{10}$
- ☐ $\frac{4}{15}$
- ☐ $\frac{1}{10}$
- ☐ $\frac{1}{15}$

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Part 2: Extended Response Questions (48 marks)

Write all answer in the space provided for items 13 - 26. Show all your work.

15) List the first two terms of the sequence $u_n = 2n - 3$. (5 marks)

16) Consider the geometric sequence x , – 6 , 3 , y . Find the values of the terms x and y. (5 marks)

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Part 2 continued

17) Show that $1 + 2 + 3 + 4 + \cdots + n = \frac{n(n+1)}{2}$ (3 marks)

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Part 2 continued

18) The table below shows how a device costing \$20500 depreciates over (n) years at (r%) each year. (6 marks)

Age (year)	Depreciation	Depreciated value
0		\$20500
1	\$20500*0.2 = \$4100	\$16400
2	\$16400*0.2 = \$3280	\$13120
3	\$13120*0.2 = \$2624	\$10496
4	x	A

Find:

a. The depreciation rate per period (r).

b. The number of periods (n).

c. The depreciation (x).

d. The future value after n time periods (A).

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Part 2 continued

19) A currency exchange service exchanges 1 Canadian dollars for USA dollar using: 'buy at 1,28, sell at 1.23'. A person wants to exchange 500 Canadian dollars for USA dollar. (6 marks)

a. How many USA dollars will he received?

b. If he immediately converts the USA dollars back to Canadian dollars, how many Canadian dollars are bought?

c. What is the resultant commission on the double transaction?

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Part 2 continued

20) How much interest is earned if $7500 is placed in an account that pays 5% p.a. compound half yearly for 4 years. (4 marks)

21) $20000 is deposited in a fixed term account for two years. The investment is worth $21836.22 after two years. Inflation over the period averages 2% p.a. compound monthly. Prove that the real increase in value of the investment is $1028.22. (4 marks)

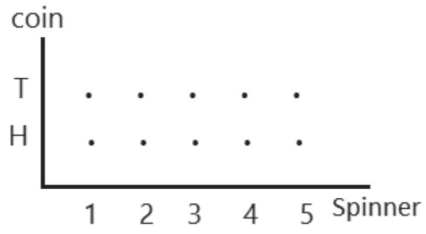
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Part 2 continued

22) A pentagonal spinner with sectors 1, 2, 3, 4 and 5 and a coin are rolled and spun respectively. The 10 different possible results are illustrated below on a 2- dimensional grid. (3 marks)



Use the grid below to determine the probability of getting:

a. A tail and a 4

b. An even number

c. A head and an odd number

23) List the sample space of possible outcomes for rolling a die. (3 marks)

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Part 2 continued

24) A jar contains 4 yellow and 5 green tickets. Two tickets are drawn from the jar without replacement. (7 marks)

a. Draw a tree diagram to illustrate this sampling process.

b. What is the probability that at least one ticket is green.

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Part 2 continued

25) If A and B are independent events where $P(A) = 0.4$ and $P(B) = 0.3$.
Find $P(A \cup B)$. (4 marks)

26) Ahmed travels to school either on foot or by bicycle. The chance he cycles to school is 0.75. If he walks, the chance that he is late is 0.35 but if he cycles, it is 0.20.
Find the probability that Ahmed is late for school. (4 marks)

[End of Examination]

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List of formulas

Financial mathematics

Sequence and series

- If u_n is an arithmetic sequence, then:

  $u_n = u_1 + (n-1)d$

  $S_n = \frac{n}{2}(2u_1 + (n-1)d)$ or $S_n = \frac{n}{2}(u_1 + u_n)$

- If u_n is a geometric sequence, then:

  $u_n = u_1 r^{n-1}$

  For $r \neq 1. S_n = \frac{u_1(r^n-1)}{r-1}$ or $S_n = \frac{u_1(1-r^n)}{1-r}$

- Compound growth:
  $u_{n+1} = u_1 \times r^n$

Financial mathematics

- Cost in currency = $\frac{foreign\ currency\ bought}{selling\ exchange\ rate}$
- Currency bought = $\frac{\text{foreign currency sold}}{\text{buying exchange rate}}$
- Cost of travelers cheques = $\frac{\text{amount of foreign currency}}{\text{selling exchange rate}} \times 101\ \%$
- Simple interest I = C × r × n
- Compound Interest $I = C \times \left(1 + \frac{r}{100}\right)^n - c$
- Depreciation formula: $A = C \times \left(1 + \frac{r}{100}\right)^n$
- Periodic repayment = $\frac{\text{principal+interest}}{\text{number of repayments}}$
- Total interest earned = final balance – principal
- Conversion of Nominal (compound) Rates to an effective rate: $r = (1+i)^c - 1$
- Closing balance (outstanding balance)= previous balance + interest − monthly repayment

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Probability

- $P(E) = \frac{\text{the number of members of the event}}{\text{the total number of possible outcomes}}$
- $P(E) + P(E') = 1$
- Addition Rule:
  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- If A and B are mutually exclusive events then, $P(A \cap B) = 0$ and so the addition law becomes $P(A \cup B) = P(A) + P(B)$.

- Conditional Probability:

$$P(A \text{ given } B) = P\left(A \mid B\right) = \frac{P(A \cap B)}{P(B)}$$

- Multiplication Rule:

$$P(A \cap B) = P\left(A \mid B\right) \times P(B)$$

$$P(A \cap B) = P\left(B \mid A\right) \times P(A)$$

- Independent Rule:
  A and B are independent events if:

$$P\left(A \mid B\right) = P(A)$$

$$P\left(B \mid A\right) = P(B) \text{ or } P(A \cap B) = P(A) \times P(B)$$

Table of monthly repayments per \$1000

	Table of monthly repayments per \$1000						
Loan term (months)	Annual interest rate						
	10.0%	10.5%	11.0%	11.5%	12.0%	12.5%	13.0%
12	87.9159	88.1486	88.6151	88.8488	89.0829	89.3173	89.3173
18	60.0571	60.2876	60.5185	60.7500	60.9820	61.2146	61.4476
24	46.1449	46.3760	46.6078	46.8403	47.0735	47.3073	47.5418
30	37.8114	38.0443	38.2781	38.5127	38.7481	38.9844	39.2215
36	32.2672	32.5024	32.7387	32.9760	33.2143	33.4536	33.6940
42	28.3168	28.5547	28.7939	29.0342	29.2756	29.5183	29.7621
48	25.3626	25.6034	25.8455	26.0890	26.3338	26.5800	26.8275
54	23.0724	23.0727	23.5615	23.8083	24.0566	24.3064	24.5577
60	21.2470	21.4939	21.7424	21.9926	22.2444	22.4979	22.7531

End of List of formulae

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