

2024 HSC Mathematics Standard 2 Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	D
2	C
3	A
4	B
5	A
6	A
7	D
8	C
9	B
10	D
11	B
12	C
13	A
14	B
15	D

Section II

Question 16 (a)

Criteria	Marks
• Provides the correct path	2
• Provides a continuous path from T to H	1

Sample answer:

$TYWH$

Question 16 (b)

Criteria	Marks
• Provides correct solution	2
• Provides a continuous path from Y to G , without C to G	1

Sample answer:

$YWHMG$ is 89 km

Question 17

Criteria	Marks
• Provides correct answer	2
• Performs an appropriate conversion, or equivalent merit	1

Sample answer:

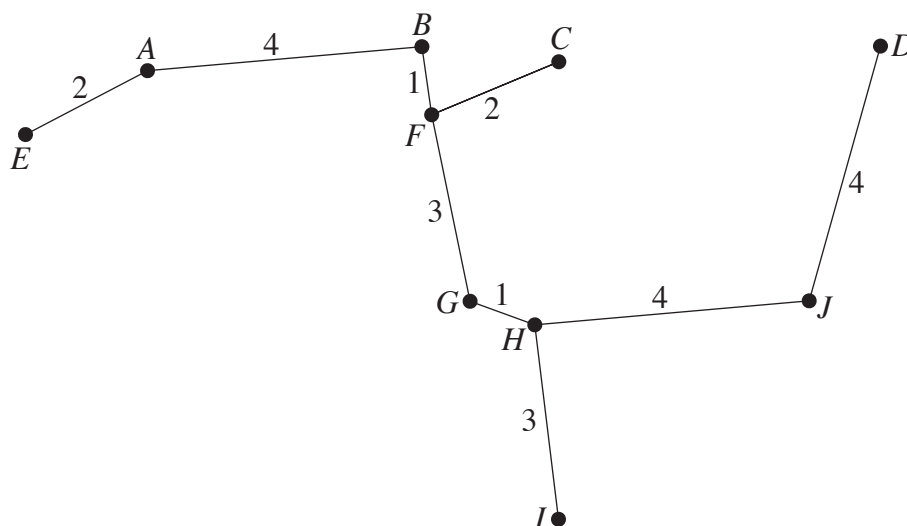
$$\frac{650}{1000} \times 6 \times \$0.3013$$

$$= \$1.18$$

Question 18 (a)

Criteria	Marks
• Provides correct solution	2
• Draws a spanning tree, or equivalent merit	1

Sample answer:



Weight = 24

Question 18 (b)

Criteria	Marks
• Provides a correct reason for why it is possible to find another spanning tree with the same weight	1

Sample answer:

Yes, use BC instead of FC as the weight of BC is the same as the weight of FC .

Question 19 (a)

Criteria	Marks
• Provides correct solution	2
• Finds the y-intercept or gradient, or equivalent merit	1

Sample answer:

$$m = \frac{14}{10}$$

$$= 1.4$$

$$y = 1.4x + 6$$

Question 19 (b)

Criteria	Marks
• Provides correct reason	1

Sample answer:

Worse as the predicted test mark was 13 instead of 12.

Question 20 (a)

Criteria	Marks
<ul style="list-style-type: none"> Provides correct answer 	1

Sample answer:

$$\$200 \times 10.0266$$

$$= \$2005.32$$

Question 20 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides correct solution 	2
<ul style="list-style-type: none"> Finds the correct rate, or equivalent merit 	1

Sample answer:

$$r = \frac{4}{2}\%$$

$$= 2\%$$

$$n = 3 \times 2$$

$$= 6$$

$$\begin{aligned} \text{Investment per 6 months} &= \frac{4500}{6.4343} \\ &= 699.37... \end{aligned}$$

$$= \$700 \quad \text{rounded to nearest \$10}$$

Question 21 (a)

Criteria	Marks
• Provides correct solution	2
• Provides one correct entry in the table	1

Sample answer:

	A	B	C	D	E
1	Month	Principal	Interest charged	Amount repaid	Balance owing
2	1	\$5590.00	\$111.80	\$110.00	\$5591.80
3	2	\$5591.80	\$111.84	\$110.00	\$5593.64

\therefore Balance owing = \$5593.64

Question 21 (b)

Criteria	Marks
• Provides a correct reason	1

Sample answer:

Loan will never be repaid as the interest charged per month is more than the monthly repayment of \$110.

Answers could include:

The balance owing on the loan is increasing.

Question 22

Criteria	Marks
• Completes the table correctly	3
• Provides two correct entries	2
• Provides one correct entry	1

Sample answer:

	<i>Population W</i>	<i>Population K</i>
Population in 1985	$A = 34$	$B = 280$
Percentage yearly change in the population	5.5%	-3%
Population when $x = 50$	494	61

$$\begin{aligned}
 & \uparrow \\
 & 34(1.055)^{50} \\
 & = 494.426... \\
 & = 494
 \end{aligned}$$

Question 23

Criteria	Marks
• Provides correct solution	3
• Finds Zazu's normal time earnings and overtime hourly rate, or equivalent merit	2
• Finds Zazu's normal time earnings, or equivalent merit	1

Sample answer:

$$\begin{aligned}
 \text{Normal time earnings} &= 38 \times 45 \\
 &= 1710
 \end{aligned}$$

$$\begin{aligned}
 \text{Overtime paid} &= 2790 - 1710 \\
 &= 1080
 \end{aligned}$$

$$\begin{aligned}
 \text{Overtime hours} &= \frac{\$1080}{(45 \times 1.5)} \\
 &= 16 \text{ hours}
 \end{aligned}$$

Therefore 16 hours overtime.

Question 24 (a)

Criteria	Marks
• Provides correct answer	2
• Attempts to use the <i>BAC</i> formula	1

Sample answer:

$$\begin{aligned}
 BAC &= \frac{10(1.2 \times 3) - 7.5 \times 2.5}{5.5 \times 60} \\
 &= 0.0522... \\
 &= 0.052 \quad (\text{to 3 decimal places})
 \end{aligned}$$

Question 24 (b)

Criteria	Marks
• Provides correct answer in hours and minutes	2
• Correct substitution of previous answer, or equivalent merit	1

Sample answer:

$$\begin{aligned}
 \text{Time} &= \frac{0.052}{0.015} \\
 &= 3 \text{ hours } 28 \text{ minutes}
 \end{aligned}$$

Question 25

Criteria	Marks
• Provides correct solution	3
• Calculates Jun's interest, or equivalent merit	2
• Calculates Alex's interest, or equivalent merit	1

Sample answer:

$$\begin{aligned}\text{Alex's interest after 5 years} &= 1800 \times 7.5\% \times 5 \\ &= \$675\end{aligned}$$

$$\begin{aligned}\text{Jun's investment at 5 years} &= 1800 \times \left(1 + \frac{6}{4}\%\right)^{4 \times 5} \\ &= 2424.339\dots\end{aligned}$$

$$\begin{aligned}\text{Interest} &= 2424.34 - 1800 \\ &= \$624.34\end{aligned}$$

\therefore Alex earns more interest.

Question 26

Criteria	Marks
• Provides correct solution	3
• Finds correct maximum area, or equivalent merit	2
• Finds the width corresponding to maximum area, or equivalent merit	1

Sample answer:

$$A = -0.5w^2 + 20w$$

Maximum area when width = 20

$$\begin{aligned}A &= -0.5(20)^2 + 20(20) \\ &= 200 \text{ cm}^2\end{aligned}$$

$$A = h \times w$$

$$200 = h \times 20$$

$$h = 10$$

\therefore width = 20 cm, height = 10 cm

Question 27

Criteria	Marks
• Provides correct answer	3
• Finds two of the repayments required, or equivalent merit	2
• Finds a relevant repayment amount, or equivalent merit	1

Sample answer:

$$\begin{aligned}\text{Repayments for 5 years at 280} &= 280 \times 12 \times 5 \\ &= 16\,800\end{aligned}$$

$$\text{Repayments for 7 years at 250} = 21\,000$$

$$\begin{aligned}\text{Total repayment} &= 16\,800 + 21\,000 \\ &= 37\,800\end{aligned}$$

$$\text{Repayment for 10 years at 280} = 33\,600$$

$$\begin{aligned}\therefore \text{Difference} &= \$37\,800 - \$33\,600 \\ &= \$4\,200\end{aligned}$$

Question 28

Criteria	Marks
• Compares the two datasets on skewness, central tendency and spread	3
• Compares two of the measures of centre and spread and skewness for the two gardens, or equivalent merit	2
• Compares skewness, measures of centre or spread for the two gardens, or equivalent merit	1

Sample answer:

The dataset for Garden A is negatively skewed while the dataset for Garden B is positively skewed.

The median for Garden A is higher than the median for Garden B.

The *IQR* of Garden A is larger than the *IQR* of Garden B.

Answers could include:

The range of Garden A is larger than the range of Garden B.

Question 29

Criteria	Marks
• Provides correct solution	4
• Uses the declining-balance method with correct values for r , n and V_0 , or equivalent merit	3
• Attempts to use the declining-balance method with an initial value from the straight-line method, or equivalent merit	2
• Attempts to use straight-line method, or equivalent merit	1

Sample answer:

Value after 4 years:

$$\begin{aligned}\text{Using straight-line method} &= 50\,000 - 1500 \times 4 \\ &= 44\,000\end{aligned}$$

Value after the next 6 years:

$$\begin{aligned}\text{Using declining-balance method} &= 44\,000(1 - 35\%)^6 \\ &= 3318.43\dots\end{aligned}$$

$$\begin{aligned}\text{Total depreciation} &= 50\,000 - 3318.43 \\ &= \$46\,681.57\end{aligned}$$

Question 30

Criteria	Marks
• Provides three correct observations	3
• Provides two correct observations	2
• Provides one correct observation	1

Sample answer:

- Female anacondas grow at a faster rate than males.
- Both females and males continue to grow after 4 years.
- Females are longer than males.

Question 31 (a)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$\frac{2}{3}$$

Question 31 (b)

Criteria	Marks
• Provides correct solution	2
• Finds probability of no heads, or equivalent merit	1

Sample answer:

$$\begin{aligned}P(\text{no heads}) &= \frac{1}{3} \times \frac{1}{3} \\&= \frac{1}{9}\end{aligned}$$

$$\begin{aligned}\therefore P(\text{at least 1 head}) &= 1 - \frac{1}{9} \\&= \frac{8}{9}\end{aligned}$$

Question 32

Criteria	Marks
• Provides correct solution to 2 significant figures	4
• Finds the shaded area, or equivalent merit	3
• Finds the area of both the circle and a triangle, or equivalent merit	2
• Finds the area of the circle or a triangle, or equivalent merit	1

Sample answer:

$$\begin{aligned}
 A_{\text{circle}} &= \pi r^2 \\
 &= \pi \times 30^2 \\
 &= 2827.433\dots
 \end{aligned}$$

$$\begin{aligned}
 A_{\Delta} &= \frac{1}{2}ab \sin C \\
 &= \frac{1}{2} \times 30 \times 30 \sin 72^\circ \\
 &= 427.975\dots
 \end{aligned}$$

$$\begin{aligned}
 A_{\text{pentagon}} &= 5 \times 427.975\dots \\
 &= 2139.877\dots
 \end{aligned}$$

$$\begin{aligned}
 \text{Shaded area} &= 2827.433 - 2139.877 \\
 &= 687.5\dots \\
 &= 690 \text{ cm}^2 \quad (2 \text{ significant figures})
 \end{aligned}$$

Question 33

Criteria	Marks
• Provides correct solution	3
• Provides correct calculations in hours, or equivalent merit	2
• Provides correct distance conversion, or equivalent merit	1

Sample answer:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$40 \text{ km/h} = \frac{0.15 \text{ km}}{T}$$

$$T = \frac{0.15}{40}$$

$$T = 0.00375 \text{ hours}$$

$$T = 0.00375 \times 3600 \text{ seconds}$$

$$= 13.5 \text{ seconds}$$

Question 34

Criteria	Marks
• Provides correct solution in square metres	4
• Finds the total surface area, or equivalent merit	3
• Finds the surface area of the cylinder or sphere	2
• Attempts to find surface area of sphere, or equivalent merit	1

Sample answer:

$$\text{Surface area of sphere} = 4 \times \pi \times \left(\frac{23}{2}\right)^2$$

$$\text{Surface area curved cylindrical body} = 2 \times \pi \times \frac{23}{2} \times (23 \times 2)$$

$$\begin{aligned} \therefore \text{Total surface area} &= \left(4 \times \pi \times \left(\frac{23}{2}\right)^2\right) + \left(2 \times \pi \times \frac{23}{2} \times 46\right) \\ &= 4985.707... \\ &= 4985.7 \text{ cm}^2 \\ &= 0.5 \text{ m}^2 \quad (\text{correct to 1 decimal place}) \end{aligned}$$

Question 35 (a)

Criteria	Marks
• Provides correct solution, including a correct z-score	2
• Finds z-score corresponding to 70, or equivalent merit	1

Sample answer:

$$z = \frac{70 - 58}{15}$$

$$= 0.8$$

 P from table = 0.7881 P required = $0.7881 - 0.5 = 0.2881$ $\therefore 28.81\%$ **Question 35 (b)**

Criteria	Marks
• Provides correct answer	1

Sample answer:The z -score for 46 is -0.8 .

By symmetry the area between 46 and 58 is equal to the area between 58 and 70.

So, the percentage of scores between 46 and 70 is twice 28.81%.

Question 35 (c)

Criteria	Marks
• Provides correct solution, with evidence of using the table	2
• Finds the z-score corresponding to 90th percentile, or equivalent merit	1

Sample answer:

$$1.3 = \frac{x - 58}{15}$$

$$x = 77.5$$

 \therefore Approximate minimum score = 77**Answers could include:**

78

Question 36 (a)

Criteria	Marks
• Provides correct answer	2
• Attempts to use sine rule, or equivalent merit	1

Sample answer:

$$\frac{BE}{\sin 27^\circ} = \frac{53.8}{\sin 106^\circ}$$

$$BE = \frac{53.8}{\sin 106^\circ} \times \sin 27^\circ$$

$$= 25.408\dots$$

$$= 25.4 \text{ m}$$

Question 36 (b)

Criteria	Marks
• Provides correct solution	2
• Finds the length of BX , or equivalent merit	1

Sample answer:

$$\angle EBC = 180^\circ - 106^\circ$$

$$= 74^\circ$$

$$\tan 74^\circ = \frac{20}{BX}$$

$$BX = \frac{20}{\tan 74^\circ}$$

$$= 5.73\dots$$

$$\therefore CD = 25.4 - 5.73$$

$$= 19.7 \text{ m} \quad (1 \text{ decimal place})$$

Question 37

Criteria	Marks
• Provides correct solution	2
• Provides 7 pm Tuesday or 4 am Thursday, or equivalent merit	1

Sample answer:

Rio – flight time
 = 3 pm – 20 hours
 = 7 pm Tuesday 19th July
 + time difference 13 hours
 = 8 am Wednesday 20th July

Alternative:

Rio + time difference
 = 3 pm + 13 hours
 = 4 am Thursday 21st July
 – flight time
 = 8 am Wednesday 20th July

Question 38

Criteria	Marks
• Provides correct solution	3
• Calculates the volume of the cake, or equivalent merit	2
• Calculates the volume of the cylinder, or equivalent merit	1

Sample answer:

Volume of cylinder : volume of top = 5 : 1

$$\begin{aligned}
 \text{Volume of cylinder} &= \pi \times 15^2 \times 6 \\
 &= 4241.150... \\
 &= 5 \text{ parts}
 \end{aligned}$$

$$\begin{aligned}
 \text{Volume of cake} &= 6 \text{ parts} \\
 &= \frac{6}{5} \times 4241.150 \\
 &= 5089.38...
 \end{aligned}$$

Volume of each slice is 212 cm^3

$$\begin{aligned}
 \therefore \text{Number of slices} &= \frac{5089.38}{212} \\
 &= 24.0065... \\
 &= 24 \text{ slices} \quad (\text{to the nearest whole slice})
 \end{aligned}$$

Question 39 (a)

Criteria	Marks
• Provides correct answer	1

Sample answer:

As there are float-times for A and C , the critical path is $BEGI$.

Question 39 (b)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$19 - 12 = 7 \text{ hours}$$

Question 39 (c)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$12 - 3 = 9 \text{ hours}$$

$$9 - 1 = 8 \text{ hours}$$

Question 40

Criteria	Marks
• Provides correct solution	3
• Attempts to find bearing of C from O , or equivalent merit	2
• Uses cosine rule in $\triangle ODA$ to find an angle, or equivalent merit	1

Sample answer:

In $\triangle ODA$:

$$\begin{aligned}\cos \angle AOD &= \frac{38^2 + 42^2 - 67.5^2}{2 \times 38 \times 42} \\ &= -0.42238... \\ \angle AOD &= 114.985... \\ &\approx 115^\circ\end{aligned}$$

Bearing of D from O is 285°

$$\therefore \angle DON = 75^\circ$$

$$\angle AOD = \angle DON + \angle AON$$

$$\text{ie } 115^\circ = 75^\circ + \angle AON$$

$$\therefore \angle AON = 40^\circ$$

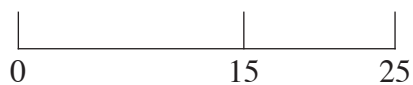
$$\begin{aligned}\text{Bearing of } C \text{ from } O &= 40^\circ + 180^\circ \quad (\text{as } AC \text{ is a straight line}) \\ &= 220^\circ \quad (\text{nearest degree})\end{aligned}$$

Question 41

Criteria	Marks
• Provides correct solution	4
• Makes substantial progress towards a solution	3
• Demonstrates in calculations understanding of importance of 15 years and 25 years	2
• Identifies the required interest rate, or equivalent merit	1

Sample answer:

$$r = \frac{2.4\%}{12} = 0.002$$



For 25 years need $1200 \times 225.430 = 270\,516$

For 15 years need extra $800 \times 151.036 = 120\,828.80$

Total = \$391 344.80

2024 HSC Mathematics Standard 2 Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	MS-M1 Application of Measurement	MS11-3
2	1	MS-A2 Linear Relationships	MS11-9
3	1	MS-S1 Data Analysis	MS11-10
4	1	MS-N2 Network Concepts	MS2-12-8
5	1	MS-S5 The Normal Distribution	MS2-12-7
6	1	MS-M6 Non-right-angled Trigonometry	MS2-12-3
7	1	MS-F1 Money Matters	MS11-6
8	1	MS-F1 Money Matters	MS11-5
9	1	MS-A4 Types of Relationships	MS2-12-6
10	1	MS-A1 Formulae and Equations	MS11-10
11	1	MS-M7 Rates and Ratios	MS2-12-3
12	1	MS-S2 Relative Frequency and Probability	MS11-10
13	1	MS-F1 Money Matters	MS11-6
14	1	MS-A4 Types of Relationships	MS2-12-6
15	1	MS-S1 Data Analysis	MS11-10

Section II

Question	Marks	Content	Syllabus outcomes
16 (a)	2	MS-N2 Network Concepts	MS2-12-8
16 (b)	2	MS-N2 Network Concepts	MS2-12-8
17	2	MS-M7 Rates and Ratios	MS2-12-3
18 (a)	2	MS-N2 Network Concepts	MS2-12-8
18 (b)	1	MS-N2 Network Concepts	MS2-12-10
19 (a)	2	MS-S4 Bivariate Data Analysis	MS2-12-7
19 (b)	1	MS-S4 Bivariate Data Analysis	MS2-12-2
20 (a)	1	MS-F5 Annuities	MS2-12-5
20 (b)	2	MS-F5 Annuities	MS2-12-5
21 (a)	2	MS-F4 Investments and Loans	MS2-12-5
21 (b)	1	MS-F4 Investments and Loans	MS2-12-10
22	3	MS-A4 Types of Relationships	MS2-12-6
23	3	MS-F1 Money Matters	MS11-6
24 (a)	2	MS-A1 Formulae and Equations	MS11-6
24 (b)	2	MS-A1 Formulae and Equations	MS11-10
25	3	MS-F4 Investments and Loans	MS2-12-10
26	3	MS-A4 Types of Relationships	MS2-12-6
27	3	MS-F4 Investments and Loans	MS2-12-10

Question	Marks	Content	Syllabus outcomes
28	3	MS-S1 Data Analysis	MS11-10
29	4	MS-F1 Money Matters MS-F4 Investments and Loans	MS11-10, MS2-12-10
30	3	MS-S4 Bivariate Data Analysis	MS2-12-10
31 (a)	1	MS-S2 Relative Frequency and Probability	MS11-10
31 (b)	2	MS-S2 Relative Frequency and Probability	MS11-10
32	4	MS-M6 Non-right-angled Trigonometry	MS2-12-9
33	3	MS-M7 Rates and Ratios	MS2-12-3
34	4	MS-M1 Applications of Measurement	MS11-10
35 (a)	2	MS-S5 The Normal Distribution	MS2-12-7
35 (b)	1	MS-S5 The Normal Distribution	MS2-12-7
35 (c)	2	MS-S5 The Normal Distribution	MS2-12-7
36 (a)	2	MS-M6 Non-right-angled Trigonometry	MS2-12-9
36 (b)	2	MS-M6 Non-right-angled Trigonometry	MS2-12-9
37	2	MS-M2 Working with Time	MS11-3
38	3	MS-M1 Applications of Measurement	MS11-4
39 (a)	1	MS-N3 Critical Path Analysis	MS2-12-10
39 (b)	1	MS-N3 Critical Path Analysis	MS2-12-10
39 (c)	1	MS-N3 Critical Path Analysis	MS2-12-10
40	3	MS-M6 Non-right-angled Trigonometry	MS2-12-4
41	4	MS-F5 Annuities	MS2-12-9