

**BOARD OF STUDIES**  
NEW SOUTH WALES

## **2013 HSC General Mathematics Marking Guidelines**

### **Section I**

#### **Multiple-choice Answer Key**

<b>Question</b>	<b>Answer</b>
1	C
2	A
3	D
4	B
5	A
6	D
7	B
8	C
9	A
10	A
11	D
12	B
13	B
14	C
15	C
16	B
17	C
18	D
19	B
20	A
21	A
22	D
23	A
24	C
25	D

## Section II

### Question 26 (a)

Criteria	Marks
• Correct answer	2
• Demonstrates some understanding, eg – correct substitution into formula OR – correct application of formula to find incorrect angle (ie finding $\angle P$ or $\angle R$ )	1

*Sample answer:*

$$\begin{aligned}\cos Q &= \frac{53^2 + 66^2 - 98^2}{2 \times 53 \times 66} \\ &= -0.348\ 627\ 787 \\ \angle Q &= 110.403\ 407\ 4 \\ &= 110^\circ \text{ (nearest degree)}\end{aligned}$$

### Question 26 (b)

Criteria	Marks
• A correct set of six data values	2
• Demonstrates some understanding, eg – appropriate number of 12s for it to be the mode OR – maximum value of 24 and a minimum value of 12	1

*Sample answer:*

12 12 12 15 18 24

**Question 26 (c) (i)**

Criteria	Marks
• Correct reason	1

**Sample answers:**

No.

The commentator is not correct because less than 100 is not the complement of more than 100.

OR

The commentator has forgotten scoring 100 points exactly.

**Question 26 (c) (ii)**

Criteria	Marks
• Correct numerical expression	1

**Sample answer:**

$$\frac{31}{40} \times \frac{31}{40} = \frac{961}{1600}$$

**Question 26 (d) (i)**

Criteria	Marks
• Correct numerical expression	1

**Sample answer:**

$$560.9 + 523.5 = 1084.4$$

**Question 26 (d) (ii)**

Criteria	Marks
• Correct answer with units in either cents or dollars and cents	2
• Demonstrates some understanding	1

**Sample answer:**

$$\begin{aligned} 47.77 \times 154 - 9.6 \times 154 &= 5878.18\text{c} \\ &= \$58.78 \end{aligned}$$

**Question 26 (e)**

Criteria	Marks
• Correct numerical expression	2
• Demonstrates some understanding, eg multiplying 3500 by: – correct number of periods with incorrect interest rate OR – correct interest rate with incorrect number of periods	1

*Sample answer:*

$$1.172 \times 3500 = \$4102$$

**Question 26 (f) (i)**

Criteria	Marks
• Correct answer	1

*Sample answer:*

52 minutes

**Question 26 (f) (ii)**

Criteria	Marks
• Correct answer	1

*Sample answer:*

$$\frac{50 + 51}{2} = 50.5 \text{ minutes}$$

**Question 26 (f) (iii)**

Criteria	Marks
• Describes how the sets differ in terms of both features	2
• Demonstrates some understanding, eg – with tolls data is more spread out OR – with tolls data is positively skewed	1

*Sample answer:*

Without tolls data shows no skewness whereas with tolls data is positively skewed.

AND

Without tolls data is clustered in the 40s and 50s and with tolls data is more spread out.

**Question 27 (a) (i)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$35 + 35 = 70 \text{ km}$$

**Question 27 (a) (ii)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$2 + \frac{1}{2} + 1 + 2 + 1 = 6\frac{1}{2} \text{ hours}$$

**Question 27 (b)**

Criteria	Marks
• Correct answer justified with calculations	4
• Significant progress towards solution	3
• Progress towards solution eg calculating tax payable OR Medicare levy	2
• Demonstrates some understanding, eg calculating taxable income	1

*Sample answer:*

$$\begin{aligned} \text{Taxable income} &= \$84\,000 - 1000 - 500 \\ &= \$82\,500 \end{aligned}$$

$$\begin{aligned} \text{Tax payable} &= 17\,547 + 0.37(\$82\,500 - \$80\,000) \\ &= \$18\,472 \end{aligned}$$

$$\begin{aligned} \text{Medicare levy} &= 0.015 \times \$82\,500 \\ &= \$1237.50 \end{aligned}$$

$$\begin{aligned} \text{Total tax} &= \$1237.50 + \$18\,472 \\ &= \$19\,709.50 \end{aligned}$$

$$\begin{aligned} \text{Tax owed} &= \$19\,709.50 - \$18\,500 \\ &= \$1209.50 \end{aligned}$$

$\therefore$  Peta will owe \$1209.50

**Question 27 (c) (i)**

Criteria	Marks
• Correct numerical expression	2
• Demonstrates some understanding, eg finding $Q_1$ or $Q_3$	1

*Sample answer:*

$$\begin{aligned}Q_3 - Q_1 \\ &= 470 - 190 \\ &= 280\end{aligned}$$

**Question 27 (c) (ii)**

Criteria	Marks
• Correct explanation	1

*Sample answer:*

No. Oscar is incorrect.  
As this is grouped data the graph does not show individual weekly television sales.

**Question 27 (d) (i)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$\frac{0.5}{25} \times 100 = 2\%$$

**Question 27 (d) (ii)**

Criteria	Marks
• Correct numerical expressions	2
• Correct calculation of one limit	1

*Sample answer:*

$$16.5 \times 24.5 = 404.25 \text{ cm}^2$$

$$17.5 \times 25.5 = 446.25 \text{ cm}^2$$

$\therefore$  The area will lie between  $404.25 \text{ cm}^2$  and  $446.25 \text{ cm}^2$ .

**Question 27 (e) (i)**

Criteria	Marks
• Correct answer	1

*Sample answer:*

$$\text{Time difference} = 2 + 5$$

$$= 7 \text{ hours}$$

7 hours before 10 pm Tuesday is 3 pm Tuesday

**Question 27 (e) (ii)**

Criteria	Marks
• Correct answer	2
• Demonstrates some understanding	1

*Sample answer:*

$$9 \text{ am} + 11 \text{ hours} = 8 \text{ pm New York time}$$

Athens is 7 hours ahead

$$\therefore 8 \text{ pm} + 7 \text{ hours} = 3 \text{ am Thursday}$$

**Question 28 (a)**

Criteria	Marks
• Correct numerical expression	2
• Demonstrates some understanding, eg correct value for $\angle AOB$	1

*Sample answer:*

$$\begin{aligned}A &= \frac{1}{2}ab \sin C \\&= \frac{1}{2} \times 75 \times 60 \sin 71^\circ \\&= 2127.416\ 795 \\&= 2127 \text{ m}^2 \text{ (nearest m}^2\text{)}\end{aligned}$$

**Question 28 (b) (i)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$\begin{aligned}\text{gradient} &= \frac{30}{5} \text{ (or similar)} \\&= 6\end{aligned}$$

**Question 28 (b) (ii)**

Criteria	Marks
• Correct explanation	1

*Sample answer:*

For each year of age, a typical 11–16-year-old grows 6 centimetres.



**Question 28 (b) (iii)**

Criteria	Marks
• Correct answer	2
• Demonstrates some understanding	1

**Sample answer:**

Substitute  $a = 15$ ,  $h = 170$

$$h = ma + b$$

$$170 = 6 \times 15 + b$$

$$b = 80$$

$$h = 6a + 80$$

**Question 28 (b) (iv)**

Criteria	Marks
• Correct answer	1

**Sample answer:**

$$h = 6a + 80$$

when  $a = 17$

$$h = 6 \times 17 + 80$$

$$= 182$$

$$\therefore 182 \text{ cm}$$

(OR from extrapolating graph.)

**Question 28 (b) (v)**

Criteria	Marks
• Correct explanation	1

**Sample answer:**

People do not continue to grow at the same rate over a lifetime.

OR when  $a = 45$

$$h = 6 \times 45 + 80$$

$$= 350$$

No man grows to a height of 350 cm.

**Question 28 (c)**

Criteria	Marks
• Correct numerical expression	2
• Demonstrates some understanding eg calculates correct angle	1

*Sample answer:*

$$\theta = 47^\circ - 13^\circ = 34^\circ$$

$$l = \frac{\theta}{360^\circ} \times 2\pi r$$

$$l = \frac{34^\circ}{360^\circ} \times 2 \times \pi \times 6400$$

$$= 3797.836\ 452$$

$$= 3798 \text{ km (nearest km)}$$

**Question 28 (d) (i)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$2000 \times \$1.50 = \$3000$$

**Question 28 (d) (ii)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$\frac{30}{150} \times 100 = 20\%$$

**Question 28 (e)**

Criteria	Marks
• Correct answer justified with suitable calculations	3
• Significant progress towards solution eg – correct salvage value, depreciation or numerical expression for Method 1 AND – correct salvage value, depreciation or numerical expression for Method 2	2
• Demonstrates some understanding, eg – correct salvage value for one method OR – correct depreciation for one method OR – correct numerical expression for one method	1

**Sample answer:**

$$\text{Method 1: Depreciation} = 2 \times 1250 = \$2500$$

$$\text{Method 2: Depreciation} = 5000 - 5000(1 - 0.35)^2 = \$2887.50$$

∴ The declining balance method gives the greatest depreciation.

**Question 29 (a)**

Criteria	Marks
• Correct method of solution	2
• Demonstrates some understanding of equation solving	1

**Sample answer:**

$$\frac{W + 4}{3} - \frac{2W - 1}{5} = 1$$

$$5W + 20 - 6W + 3 = 15$$

$$23 - W = 15$$

$$W = 8$$

**Question 29 (b) (i)**

Criteria	Marks
• Correct answer	1

**Sample answer:**

Standard deviation = 5.220 153 25  
= 5.2 (to 1 decimal place)

**Question 29 (b) (ii)**

Criteria	Marks
• Correct solution	3
• Significant progress towards solution eg correct $z$ -score for first test AND correct equation for the second test	2
• Demonstrates some understanding, eg – correct $z$ -score for first test OR – correct equation for the second $z$ -score with incorrect $z$ -score for the first test	1

**Sample answer:**

$$z = \frac{x - \bar{x}}{s}$$

$$z_{first} = \frac{62 - 68.5}{5.2}$$

$$= -1.25$$

$$\text{want } z_{second} = -1.25$$

$$\therefore -1.25 = \frac{x - 74.4}{12.4}$$

$$-1.25 \times 12.4 = x - 74.4$$

$$-15.5 = x - 74.4$$

$$x = 58.9$$

$\therefore$  She needs a mark of 59 to maintain her performance.

**Question 29 (c)**

Criteria	Marks
• Correct answer justified with suitable calculations	2
• Demonstrates some understanding, eg – calculation of 676 OR – correct numerical expression for number of combination of letters	1

**Sample answer:**

Two letters (repetition allowed) =  $26 \times 26 = 676$   
with 1 numeral =  $676 \times 10 = 6\,760$   
with 2 numerals =  $676 \times 10 \times 10 = 67\,600$   
with 3 numerals =  $676 \times 10 \times 10 \times 10 = 676\,000$   
with 4 numerals =  $676 \times 10 \times 10 \times 10 \times 10 = 6\,760\,000$

∴ She needs four numerals.

**Question 29 (d)**

Criteria	Marks
• Correct conclusion justified with suitable calculations	3
• Significant progress towards solution eg 1.5	2
• Demonstrates some understanding	1

**Sample answer:**

$$\frac{1}{4} \times 6 + \frac{1}{2} \times 1 + \frac{1}{4} \times 2 = 2.5$$

$$2.5 - 4 = -1.5$$

Jane will lose \$1.50

**Question 29 (e)**

Criteria	Marks
• Correct answer justified with suitable calculations	4
• Significant progress towards solution eg correct expression for $N$	3
• Progress towards solution eg correct number of periods AND correct interest rate AND correct payment	2
• Demonstrates some understanding, eg any TWO correct of: correct number of periods, correct interest rate, correct payment	1

*Sample answer:*

$$N = 2048.65 \left( \frac{(1.005)^{240} - 1}{0.005(1.005)^{240}} \right) = \$285\,952.15$$

No, this is less than \$300 000, therefore he will not be able to pay off the loan in 20 years. He would have only been able to pay off a loan of \$285 952.15 in full in 20 years.

**Question 30 (a) (i)**

Criteria	Marks
• Correct numerical expression	1

*Sample answer:*

$$20\,000 \times (7.3)^3 = 7\,780\,340 \text{ watts}$$

**Question 30 (a) (ii)**

Criteria	Marks
• Correct equation	1

*Sample answer:*

$$A = 0.4 \times 20\,000w^3$$

OR

$$A = 8000w^3$$

**Question 30 (a) (iii)**

Criteria	Marks
• Correct answer OR correct numerical expression	1

**Sample answer:**

$$14\,600\,000 - 5\,800\,000$$

$$= 8\,800\,000 \text{ watts}$$

$$\text{(OR } T = 20\,000 \times 9^3$$

$$= 14\,580\,000$$

$$A = 0.4 \times 14\,580\,000$$

$$= 5\,832\,000$$

$$T - A = 14\,580\,000 - 5\,832\,000$$

$$= 8\,740\,000)$$

**Question 30 (a) (iv)**

Criteria	Marks
• Correct answer, using equation or graph	1

**Sample answer:**

$$8.2 \text{ m/s}$$

**Question 30 (a) (v)**

Criteria	Marks
• Correct numerical expression	3
• Significant progress towards solution	2
• Demonstrates some understanding	1

**Sample answer:**

For wind speed of 8 m/s

$$\begin{aligned}P &= 0.61 \times \pi \times 43^2 \times 8^3 \\ &= 1\,814\,205.92\end{aligned}$$

New wind speed 8.8 m/s

$$\begin{aligned}P &= 0.61 \times \pi \times 43^2 \times 8.8^3 \\ &= 2\,414\,708.08\end{aligned}$$

$$\begin{aligned}\text{Increase} &= 2\,414\,708.08 - 1\,814\,205.92 \\ &= 600\,502.16\end{aligned}$$

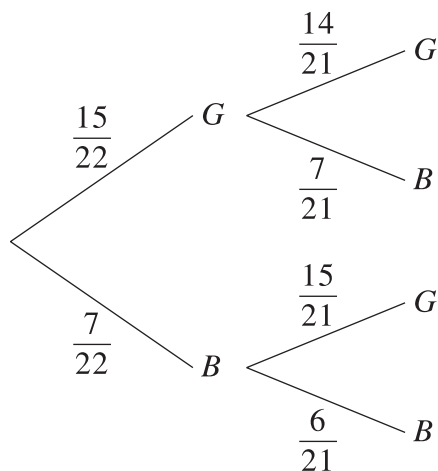
$$\begin{aligned}\% \text{ increase} &= \frac{600\,502}{1\,814\,205.92} \times 100\% \\ &= 33.1\%\end{aligned}$$



**Question 30 (b) (i)**

Criteria	Marks
• Correct completion of tree diagram	2
• Demonstrates some understanding	1

*Sample answer:*


**Question 30 (b) (ii)**

Criteria	Marks
• Correct numerical expression or correct from previous answer	2
• Demonstrates some understanding	1

*Sample answer:*

$$P(\text{same gender}) = P(GG) + (BB)$$

$$= \left( \frac{15}{22} \times \frac{14}{21} \right) + \left( \frac{7}{22} \times \frac{6}{21} \right)$$

$$= \frac{6}{11}$$

$$0.54$$

$$\text{or } 54.54\%$$

**Question 30 (c) (i)**

Criteria	Marks
• Correct numerical expression	1

**Sample answer:**

Petrol : oil

40 : 1

5 : ?

$$\text{oil} = \frac{5}{40} \times 1$$

$$= 0.125 \text{ L (125 mL)}$$

**Question 30 (c) (ii)**

Criteria	Marks
• Correct method of solution	3
• Significant progress towards solution	2
• Demonstrates some understanding, eg – calculation of remaining petrol/oil in container	1

**Sample answer:**

Remaining in container 4.1 L

Petrol : oil

40 : 1

4 : 0.1

For new ratio of 25 : 1

Petrol : oil

25 : 1

4 : ?

$$\text{oil needed in total} = \frac{4}{25} \times 1$$

$$= 0.16 \text{ L}$$

$$\text{oil to be added} = 0.16 - 0.1$$

$$= 0.06 \text{ L}$$

$$(60 \text{ mL})$$

# General Mathematics

## 2013 HSC Examination Mapping Grid

### Section I

Question	Marks	Content	Syllabus outcomes
1	1	PB1 The Language of Chance	P10, P11
2	1	DA7 Correlation	H4, H5
3	1	FM1 Earning Money	P2
4	1	M4 Right-angled Triangles	P6
5	1	AM3 Algebraic Skills and Techniques	H2
6	1	DA3 Displaying Single Data Sets	P4, P9
7	1	PB2 Relative Frequency and Probability	P4, P10
8	1	DA2 Data Collection and Sampling	P9
9	1	FM2 Investing Money	P8
10	1	DA5 Interpreting Sets of Data, PB4 Applications of Probability	H2
11	1	FM1 Earning Money	P2
12	1	M5 Further Applications of Area and Volume	H6
13	1	FM4 Credit and Borrowing	H5
14	1	DA5 Interpreting Sets of Data	H4, H5, H9
15	1	DA4 Summary Statistics, DA5 Interpreting Sets of Data	P4, H2, H4
16	1	M5 Further Applications of Area and Volume	H6
17	1	M3 Similarity of Two-Dimensional Figures	P2, P6
18	1	PB3 Multi-Stage Events	H4, H10
19	1	M5 Further Applications of Area and Volume	H6
20	1	DA6 The Normal Distribution	H4, H5
21	1	AM3 Algebraic Skills and Techniques	H3
22	1	AM4 Modelling Linear and Non-Linear Relationships	H5
23	1	FM5 Annuities and Loan Repayments	H5
24	1	M6 Applications of Trigonometry	H6
25	1	M2 Applications of Area and Volume	P6

**Section II**

Question	Marks	Content	Syllabus outcomes
26 (a)	2	M6 Applications of Trigonometry	H6
26 (b)	2	DA3 Displaying Single Data Sets DA4 Summary Statistics	P2, P9
26 (c) (i)	1	PB2 Relative Frequency and Probability	P11
26 (c) (ii)	1	PB3 Multi-stage events	H10
26 (d) (i)	1	FM1 Earning Money	P2
26 (d) (ii)	2	FM1 Earning Money	P8
26 (e)	2	FM2 Investing Money	P2, P8
26 (f) (i)	1	DA4 Summary Statistics DA5 Interpreting Sets of Data	P2, H9
26 (f) (ii)	1	DA5 Interpreting Sets of Data	H9
26 (f) (iii)	2	DA5 Interpreting Sets of Data	H4, H9, H11
27 (a) (i)	1	AM2 Modelling Linear Relationships	P5
27 (a) (ii)	1	AM2 Modelling Linear Relationships	P2, P5
27 (b)	4	FM3 Taxation	P2, P11
27 (c) (i)	2	DA3 Displaying Single Data Sets	P4
27 (c) (ii)	1	DA3 Displaying Single Data Sets	P11
27 (d) (i)	1	M1 Units of Measurement	P7
27 (d) (ii)	2	M1 Units of Measurement M5 Further Applications of Area and Volume	P7, H2, H7
27 (e) (i)	1	M7 Spherical Geometry	H2, H6, H7
27 (e) (ii)	2	M7 Spherical Geometry	H2, H6, H7
28 (a)	2	M6 Applications of Trigonometry	H2, H6
28 (b) (i)	1	DA7 Correlation	H2, H4
28 (b) (ii)	1	AM2 Modelling Linear Relationships, DA7 Correlation	P5, H2, H4
28 (b) (iii)	2	DA7 Correlation	H2, H4
28 (b) (iv)	1	DA7 Correlation	H5
28 (b) (v)	1	DA7 Correlation	H5, H11
28 (c)	2	M7 Spherical Geometry	H2, H6
28 (d) (i)	1	FM2 Investing Money	P2
28 (d) (ii)	1	FM2 Investing Money	P2
28 (e)	3	FM6 Depreciation	H5, H8, H11
29 (a)	2	AM1 Basic Algebraic Skills AM3 Modelling Linear Relationships	P2, H2

<b>Question</b>	<b>Marks</b>	<b>Content</b>	<b>Syllabus outcomes</b>
29 (b) (i)	1	DA4 Summary Statistics	P2
29 (b) (ii)	3	DA6 The Normal Distribution	H5, H9
29 (c)	2	PB3 The Language of Chance	H4, H11
29 (d)	3	PB4 Applications of Probability	H4, H10
29 (e)	4	FM5 Annuities and loan repayments	H5, H8, H11
30 (a) (i)	1	AM4 Modelling Linear and Non-linear Relationships	H5
30 (a) (ii)	1	AM4 Modelling Linear and Non-linear Relationships	H3
30 (a) (iii)	1	AM4 Modelling Linear and Non-linear Relationships	H3, H5
30 (a) (iv)	1	AM4 Modelling Linear and Non-linear Relationships	H5
30 (a) (v)	3	AM4 Modelling Linear and Non-linear Relationships	H3, H5
30 (b) (i)	2	PB3 Multi-stage Events	H10
30 (b) (ii)	2	PB3 Multi-stage Events	H10
30 (c) (i)	1	M1 Units of Measurement	P2
30 (c) (ii)	3	M1 Units of Measurement	P2, P5