2016 HSC Mathematics General 2 Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 26 (a)

Criteria	Marks
• Provides correct answer or correct numerical expression	1

Sample answer:

Surface area = $4\pi r^2$

$$= 4 \times \pi \times 5^2$$
$$= 314.1592$$
$$= 314 \text{ cm}^2$$

Question 26 (b)

Criteria	Marks
• Provides correctly simplified algebraic expression	2
• Provides one correctly simplified variable	1

Sample answer:

$$\frac{8x^4 y}{24x^3 y^5} = \frac{x}{3y^4}$$

Question 26 (c)

Criteria	Marks
• Provides correct solution	2
• Makes progress towards the solution	1

Sample answer:

Country driving: $\dfrac{170}{100} \times 5.9 = 10.03$ L

City driving: $\dfrac{25}{100} \times 7.3 = 1.825$ L

Total fuel used $= 10.03 + 1.825$

$\qquad\qquad\quad = 11.855$ L

Question 26 (d)

Criteria	Marks
• Provides correct answer	2
• Attempts to use Pythagoras' Theorem	1

Sample answer:

$$AB = \sqrt{32^2 + 33^2}$$
$$= 45.9673\ldots$$
$$\doteqdot 46 \text{ m}$$

Question 26 (e)

Criteria	Marks
• Provides correct answer	3
• Makes significant progress towards the answer	2
• Provides correct weekly pay, or equivalent merit	1

Sample answer:

Holiday loading $= 0.175 \times (\$63\,752 \div 52) \times 4$
$$= \$858.20$$

Holiday pay $= (\$63\,752 \div 52) \times 4 + 858.20$
$$= \$4904 + \$858.20$$
$$= \$5762.20$$

Question 26 (f) (i)

Criteria	Marks
• Provides correct answer or correct numerical expression	1

Sample answer:

Taxable income = $82 521 + $10 920 – $13 420

                        = $80 021

Question 26 (f) (ii)

Criteria	Marks
• Provides correct answer	2
• Attempts to use correct tax bracket, or equivalent merit	1

Sample answer:

Tax payable = $17 547 + 0.37(80 021 – 80 000)

                  = $17 547 + 0.37 × 21

                  = $17 547 + $7.77

                  = $17 554.77

Question 26 (f) (iii)

Criteria	Marks
• Provides correct solution with conclusion	2
• Calculates the tax payable including Medicare levy, or equivalent merit	1

Sample answer:

Total tax payable = $1600.42 + $17 554.77

                          = $19 155.19

Tax refund   = $20 525 – $19 155.19

                          = $1369.81

∴ Theo will receive a tax refund of $1369.81

Question 27 (a)

Criteria	Marks
• Provides correct solution	2
• Provides one correct description, or equivalent merit	1

Sample answer:

If Alice is responsible for a car accident, then Compulsory Third Party Insurance covers injury to people, while Third Party Property Insurance covers damage to other people's property.

Question 27 (b)

Criteria	Marks
• Provides correct answer with justification	2
• Identifies that there are 7 samples, or equivalent merit	1

Sample answer:

$$\text{Mean of mean heights} = \frac{153 + 168 + 174}{3}$$
$$= 165 \text{ cm}$$

The mean of all possible sample means is equal to the population mean.

Question 27 (c)

Criteria	Marks
• Provides correct answer	2
• Provides one correct quartile, or equivalent merit	1

Sample answer:

$$Q_3 = 172 \text{ cm}$$
$$Q_1 = 136 \text{ cm}$$
$$IQR = 172 - 136$$
$$= 36 \text{ cm}$$

Question 27 (d) (i)

Criteria	Marks
• Provides correct values for *A* and *B*	2
• Provides one correct value	1

Sample answer:

A = \$19 000

B = 17 915.67 + 71.66 – 436

   = \$17 551.33

Question 27 (d) (ii)

Criteria	Marks
• Provides correct answer	2
• Makes progress towards correct answer	1

Sample answer:

X = *Prn*

   = 18 640 × 0.004 × 1

   = \$74.56

OR

X = 18 278.56 + 436 – 18 640

   = \$74.56

Question 27 (d) (iii)

Criteria	Marks
• Provides correct answer or correct numerical expression	1

Sample answer:

Total amount = \$436 × 48

            = \$20 928

Question 27 (e) (i)

Criteria	Marks
• Provides correct answer or correct numerical expression	1

Sample answer:

Difference   = 145° – 55°

              = 90°

Question 27 (e) (ii)

Criteria	Marks
• Provides correct solution	1

Sample answer:

Time difference $= \dfrac{90}{15}$

              = 6 hours

Question 27 (e) (iii)

Criteria	Marks
• Provides correct answer	2
• Makes progress towards the solution	1

Sample answer:

Time of departure in Melbourne   = 11:30 pm Friday

                                      = 23:30

Time of arrival (Melbourne time) = 23:30 + 15 h

                                      = 14:30 Saturday

Time of arrival in Dubai   = 14:30 – 6 h

                                      = 8 h 30 min

                                      = 8:30 am on Saturday

Question 28 (a) (i)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$P(\text{gold coin}) = \frac{4}{37}$$

Question 28 (a) (ii)

Criteria	Marks
• Provides correct answer	2
• Makes progress towards the solution	1

Sample answer:

$$\frac{4}{37} \times \text{Total} = 20$$

$$\text{Total} = 20 \times \frac{37}{4}$$

$$= 185$$

OR

$$\frac{x}{33} = \frac{20}{4}$$

$$x = 33 \times 5$$

$$= 165 \text{ silver coins}$$

165 silver coins and 20 gold coins = 185

∴ Total number of coins is 185.

Question 28 (b)

Criteria	Marks
• Provides correct answer	2
• Makes progress towards the answer	1

Sample answer:

Total cost: $990 + 505 \times \$0.35 \times 5$

$990 + \$883.75$

1873.75

Question 28 (c) (i)

Criteria	Marks
• Provides correct answer	2
• Provides a correct probability	1

Sample answer:

P(Win and Draw in any order) $= P$(WD) $+ P$(DW)

$$= 0.7 \times 0.2 + 0.2 \times 0.7$$
$$= 0.28$$

Question 28 (c) (ii)

Criteria	Marks
• Provides a correct explanation	1

Sample answer:

Paul is not correct because the probability of an event occurring cannot be greater than 1.

Question 28 (d)

Criteria	Marks
• Provides correct answer or correct numerical expression	2
• Provides correct value from the table or multiplies $75 000 with a value from the correct row or column in the table	1

Sample answer:

$r = 3\%$ pa $= 0.75\%$ pq

$n = 6$ years $= 24$ quarters

$\therefore$ payment $= 0.0382 \times \$75\,000$

$$= \$2865$$

Question 28 (e) (i)

Criteria	Marks
• Provides correct volume	2
• Makes progress towards the volume	1

Sample answer:

$$\text{Volume} = \pi r^2 h$$
$$= \pi(2.5)^2 \times 3$$
$$= 58.904\ldots$$
$$\doteq 58.9 \text{ cm}^3$$

Question 28 (e) (ii)

Criteria	Marks
• Correct solution	3
• Makes significant progress towards the solution	2
• Makes some progress towards the solution	1

Sample answer:

$$\text{Volume of chocolate} = (15 \times 10 \times 6) - (6 \times 2 \times 58.904\ldots)$$
$$= 193.1416\ldots$$
$$= 193 \text{ cm}^3 \text{ (nearest cm}^3)$$
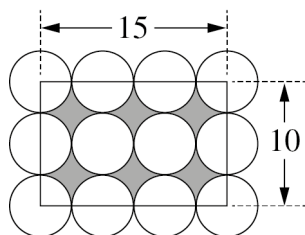
Question 29 (a) (i)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$P(\text{heads and tails}) = \dfrac{1}{2}$

Question 29 (a) (ii)

Criteria	Marks
• Provides correct solution or correct numerical expression	2
• Makes progress towards the solution	1

Sample answer:

Outcome	*P*	$	Exp
2 heads	$\dfrac{1}{4}$	+$40	+$10
2 tails	$\dfrac{1}{4}$	+$20	+$5
			$0
Heads and tails	$\dfrac{1}{2}$	–$30	–$15

∴ Financial expectation is $0.

Question 29 (b) (i)

Criteria	Marks
• Provides correct answer	1

Sample answer:

A = 1.5

Question 29 (b) (ii)

Criteria	Marks
• Provides correct answer	1

Sample answer:

10%

Question 29 (c)

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards the solution	2
• Provides one correct median, or equivalent merit	1

Sample answer:

Women	Men
Median = 55	Median = 45
Negatively skewed	Positively skewed

Pat is correct since the women's median age (55) is higher than the men's median age (45) and there are more women in the older age group (negatively skewed).

Question 29 (d) (i)

Criteria	Marks
• Correct answer	1

Sample answer:

From calculator $r = 0.90680755$

$\doteqdot 0.907$ (3 decimal places)

Question 29 (d) (ii)

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards the solution	2
• Provides correct gradient or correct numerical expression for gradient, or equivalent merit	1

Sample answer:

$$\text{gradient} = r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}}$$

$$\text{Gradient} = 0.9 \times \frac{13.73}{9.05}$$

$$= 1.365414\ldots$$

$$y\text{-intercept} = \bar{y} - \left(\text{gradient} \times \bar{x}\right)$$

$$y\text{-int} = 66 - (1.365414\ldots \times 69.4)$$

$$= 66 - 94.75973\ldots$$

$$= -28.75973\ldots$$

$$\therefore y = 1.37x - 28.76$$

Note: If $r = 0.907$ is used   then $m = 1.3760\ldots$

$$y = 1.38x - 29.5$$

Question 29 (e) (i)

Criteria	Marks
• Provides correct answer	1

Sample answer:

68 years

Question 29 (e) (ii)

Criteria	Marks
• Provides correct explanation with reference to the value of *m*	2
• Makes progress towards the correct explanation	1

Sample answer:

Gradient = 0.25 (using two points on the graph).

Life expectancy increases by 0.25 years (3 months) for each year later that a person is born.

Question 30 (a)

Criteria	Marks
• Provides correct solution	2
• Correctly converts one measurement, or equivalent merit	1

Sample answer:

V = Ah

= 30 × 0.02

Volume = 0.6 m^3

Volume = 600 L

Note: 1 m^3 = 1000 L

Question 30 (b) (i)

Criteria	Marks
• Provides correct solution	1

Sample answer:

(6.44 – 3.44) × 1024 = 3072 MB

Question 30 (b) (ii)

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards the solution	2
• Provides a correct conversion, or equivalent merit	1

Sample answer:

$$\text{Speed} = \frac{3072 \times 1024 \times 1024 \times 8}{1\,000\,000} \div (7 \times 60)$$
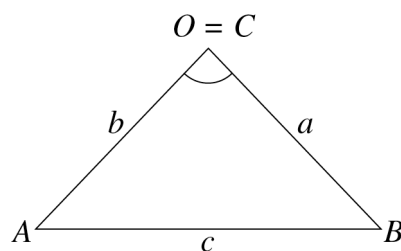
$$= 61.3566$$

$$\doteqdot 61 \text{ Mbps}$$

Question 30 (c)

Criteria	Marks
• Provides correct solution	5
• Makes significant progress towards the solution	4
• Correctly calculates area of rectangle AND attempts to calculate another area, or equivalent merit	3
• Correctly finds the length of *AB*, or equivalent merit	2
• Attempts to find *AB*, or equivalent merit	1

Sample answer:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$(AB)^2 = 45^2 + 45^2 - 2(45)(45)\cos 100°$$
$$= 4753.275\ldots$$
$$AB = 68.9439$$

$$A = \frac{1}{2}\,ab\sin C$$
$$\text{Area of rectangle} = AB \times 20$$
$$= 1378.879\ldots$$

$$A = \frac{1}{2}\,ab\sin C$$
$$\text{Area of } \triangle AOB = \frac{1}{2} \times 45 \times 45 \times \sin 100°$$
$$= 997.11784\ldots$$

$$A = \frac{\theta}{360}\pi r^2$$
$$\text{Area of major sector} = \frac{260}{360} \times \pi \times 45^2$$
$$= 4594.5792\ldots$$

$$\therefore \text{Total area} = 1378.879\ldots + 997.11784\ldots + 4594.5792\ldots$$
$$= 6970.5760\ldots$$
$$= 6971 \text{ m}^2$$

Question 30 (d) (i)

Criteria	Marks
• Substitutes correctly	1

Sample answer:

$\overline{x} = 88 - 2.4s$

Question 30 (d) (ii)

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards the solution	2
• Provides a pair of equations and attempts to solve them, or equivalent merit	1

Sample answer:

$\overline{x} = 88 - 2.4s$ ①

$\overline{x} = 52 + 1.2s$ ②

① – ② $0 = 36 - 3.6s$

$3.6s = 36$

$s = \dfrac{36}{3.6} = 10$

$\overline{x} = 52 + 1.2 \times 10$

$= 64$

∴ The value of $\overline{x}$ is 64 and s is 10.

2016 HSC Mathematics General 2
Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	MM1 (*2) Units of measurement – p40	MGP-5
2	1	AM1 (*6) Algebraic manipulation – p52	MGP-3
3	1	FSHe1 (*7) Body measurements – p108	MG2H-7
4	1	AM4 (*13) Modelling linear relationships – p102	MG2H-6, MG2H-10
5	1	AM1 (*3) Algebraic manipulation – p52	MGP-3
6	1	PB2 (*1) Multistage events – p96	MGH-8
7	1	DS1 (*4) Statistics and society, data collection and sampling – p32	MGP-10
8	1	FM2 (*6) Investing money – p26	MGP-2, MGP-6
9	1	FSRe1 (*3) Water availability and usage – p116	MG2H-10, MG2H-1
10	1	FSDr3 (*4) Safety – p68	MGP-5
11	1	FSHe2 (*3) Medication – p110	MG2H-5
12	1	MM2 (*5) Applications of perimeter, area and volume – p42	MGP-5
13	1	DS5 (*5) The normal distribution – p82	MG2H-2, MG2H-7
14	1	AM2 (*3, *4) Interpreting linear relationships – p54	MGP-3
15	1	FSCo1 (*3) Mobile phone plans – p58	MGP-6
16	1	MM3 (*3) Similarity of two-dimensional figures – p44	MGP-4, MGP-5
17	1	FM4 (*1) Credit and borrowing – p74	MG2H-6
18	1	AM5 (*6) Modelling non-linear relationships – p104	MG2H-3
19	1	DS2 (*8) Displaying and interpreting single data sets – p34	MG2H-7
20	1	FM1 (*2) Earning and managing money – p24	MGP-6
21	1	DS4 (*4) Interpreting sets of data – p80	MG2H-7
22	1	DS4 (*14) Interpreting sets of data – p80	MG2H-2
23	1	DS4 (*18) Interpreting sets of data – p80	MG2H-2
24	1	AM3 (*8) Further algebraic skills and techniques – p100	MG2H-3
25	1	MM5 (*6, 7) Applications of trigonometry – p90	MG2H-4, MG2H-5

Section II

Question	Marks	Content	Syllabus outcomes
26 (a)	1	MM4 (*7) Further applications of area and volume – p88	MG2H-4
26 (b)	2	AM1 (*2) Algebraic manipulations – p52	MGP-3
26 (c)	2	FSDr2 (*2) Fuel consumption – p66	MGP-1
26 (d)	2	MM2 (*3) Applications of perimeter, area and volume – p42	MGP-4
26 (e)	3	FM1 (*5) Earning and managing money – p24	MGP-6
26 (f) (i)	1	FM3 (*2) Taxation – p28	MGP-6
26 (f) (ii)	2	FM3 (*4) Taxation – p28	MGP-6
26 (f) (iii)	2	FM3 (*4) Taxation – p28	MGP-6
27 (a)	2	FSDr1 (*2) – p64	MGP-6
27 (b)	2	DS6 (*2) Sampling and populations – p84	MG2H-2, MG2H-8
27 (c)	2	DS4 (*3, *5) Interpreting sets of data – p80	MG2H-2
27 (d) (i)	2	FM4 (*3) Credit and borrowing – p74	MG2H-6
27 (d) (ii)	2	FM4 (*3) Credit and borrowing – p74	MG2H-6
27 (d) (iii)	1	FM4 (*3) Credit and borrowing – p74	MG2H-1, MG2H-6
27 (e) (i)	1	MM6 (*4) Spherical geometry – p92	MG2H-4, MG2H-5
27 (e) (ii)	1	MM6 (*7) Spherical geometry – p92	MG2H-4, MG2H-5
27 (e) (iii)	2	MM6 (*8) Spherical geometry – p92	MG2H-4, MG2H-5
28 (a) (i)	1	PB1 (*8) Relative frequency and probability – p48	MGP-2, MGP-8
28 (a) (ii)	2	DS6 (*4) Sampling and populations – p84	MG2H-1, MG2H-2, MG2H-9
28 (b)	2	FSRe3 (*6) Energy and sustainability – p120	MG2H-9
28 (c) (i)	2	PB2 (*3, *7) Multistage events and applications of probability – p96	MG2H-8
28 (c) (ii)	1	PB2 (*7) Multistage events and applications of probability – p96	MG2H-8, MG2H-10
28 (d)	2	FM5 (*2) Annuities and loan repayments – p76	MG2H-1, MG2H-6
28 (e) (i)	2	MM4 (*9) Further applications of perimeter, area and volume – p88	MGP-4
28 (e) (ii)	3	MM2 (*5) Further applications of area and volume – p42	MG2H-4

Question	Marks	Content	Syllabus outcomes
29 (a) (i)	1	PB2 (*3) Multistage events and applications of probability – p96	MG2H-8
29 (a) (ii)	2	PB2 (*10) Multistage events and applications of probability – p96	MG2H-8
29 (b) (i)	1	AM5 (*3) Modelling non-linear relationship – p104	MG2H-3
29 (b) (ii)	1	AM5 (*3) Modelling non-linear relationship – p104	MG2H-3
29 (c)	3	DS4 (*10, *17) Interpreting sets of data – p80	MG2H-1, MG2H-2, MG2H-10
29 (d) (i)	1	FSHe1 (*5) Body measurements – p108	MG2H-2, MG2H-7
29 (d) (ii)	3	FSHe1 (*9) Body measurements – p108	MG2H-2, MG2H-7
29 (e) (i)	1	FSHe3 (*1) Life expectancy – p112	MG2H-2
29 (e) (ii)	2	AM4 (*4, *6) Modelling linear relationships – p102	MG2H-3
30 (a)	2	FSRe2 (*6) Dams, land and catchment areas – p118	MG2H-5
30 (b) (i)	1	FSCo2 (*2) Digital download and file storage – p60	MGP-2, MGP-5, MGP-9
30 (b) (ii)	3	FSCo2 (*4) Digital download and file storage – p60	MGP-2, MGP-5, MGP-9
30 (c)	5	MM4 (*2, *3) Further application of area and volume – p88 MM5 (*7, *8) Applications of trigonometry – p90	MG2H-4, MG2H-5
30 (d) (i)	1	AM1 (*5) Algebraic manipulation – p52	MGP-2
30 (d) (ii)	3	AM3 (*9) Further algebraic skills and techniques –p100	MG2H-2, MG2H-7, MG2H-9, MG2H-10