

## **2017 HSC Mathematics General 2**

### **Marking Guidelines**

#### **Section I**

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

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

## Section II

### Question 26 (a)

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

$$\begin{aligned} & \$0.27 \times 20 \\ & = \$5.40 \end{aligned}$$

### Question 26 (b)

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

*Sample answer:*

$$\begin{aligned} \text{Cost} &= \$20 + \$0.50 \times 3 + \$0.70 + \$1.40 + \$3.50 \\ &= \$27.10 \end{aligned}$$

### Question 26 (c)

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

*Sample answer:*

Let  $N$  be the number of goats.

$$\begin{aligned} \frac{16}{45} &= \frac{80}{N} \\ N &= \frac{80 \times 45}{16} \\ &= 225 \end{aligned}$$

$\therefore$  The estimated number of goats the farmer has on his property is 225.

### Question 26 (d)

Criteria	Marks
• Provides correct solution	2
• Uses correct trig equation or equivalent merit	1

**Sample answer:**

Let  $x$  be the required depth.

$$\begin{aligned}
 \sin 2^\circ &= \frac{x}{15000} \\
 &= 15000 \sin 2^\circ \\
 &= 523.4\dots \\
 &= 523 \text{ mm (to the nearest mm)}
 \end{aligned}$$

### Question 26 (e)

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

**Sample answer:**

$$\begin{aligned}
 \text{Share cost} &= 500 \times 3.20 \\
 &= \$1600 \\
 \text{Brokerage} &= 1.5\% \times 1600 \\
 &= \$24 \\
 \text{Total cost} &= \$1624 \\
 \text{Share selling price} &= 500 \times 4.80 \\
 &= \$2400 \\
 \text{Dividend} &= 0.26 \times 500 \\
 &= \$130 \\
 \text{Total proceeds} &= 2400 + 130 \\
 &= \$2530 \\
 \text{Total profit} &= 2530 - 1624 \\
 &= \$906
 \end{aligned}$$

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

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

4 goals

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

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

Round 3

**Question 26 (g)**

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards the correct solution	2
• Uses the simple interest formula correctly, or equivalent merit	1

*Sample answer:*

$$\begin{aligned}
 \text{Amount borrowed} &= 7990 - 500 \\
 &= \$7490 \\
 \text{Interest} &= 7490 \times 0.07 \times 2 \\
 &= \$1048.60 \\
 \text{Repayment} &= \frac{7490 + 1048.60}{2 \times 52} \\
 &= \$82.10 \text{ per week}
 \end{aligned}$$

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

Criteria	Marks
• Provides correct answer or CNE	1

*Sample answer:*

Mean = 200.875 kL

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

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

Standard deviation = 127.35...  
= 127.4 kL (1 decimal place)

**Question 27 (b)**

Criteria	Marks
• Provides correct solution	2
• Calculates a correct conversion of units	1

*Sample answer:*

3 terabytes =  $3 \times 2^{40}$  bytes  
 20 megabytes =  $20 \times 2^{20}$  bytes  
 Number of files =  $\frac{3 \times 2^{40}}{20 \times 2^{20}}$   
 = 157 286.4

∴ 157 286 files can fit.

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

Criteria	Marks
• Provides correct answer or CNE	1

*Sample answer:*

$$\begin{aligned}\text{Future value} &= 12\,000 \times 5.4163 \\ &= \$64\,995.60\end{aligned}$$

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

Criteria	Marks
• Provides correct answer or CNE	1

*Sample answer:*

$$\begin{aligned}\text{Interest earned} &= 64\,995.60 - (5 \times 12\,000) \\ &= \$4\,995.60\end{aligned}$$

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

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

25°W

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

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

$$\begin{aligned}\text{Time difference} &= \frac{30}{15} \\ &= 2 \text{ hours} \\ \therefore \text{Time on island } B &= 10 \text{ am} - 2 \text{ hours} \\ &= 8 \text{ am}\end{aligned}$$

**Question 27 (d) (iii)**

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

**Sample answer:**

$$\begin{aligned}
 \text{Distance} &= \frac{30}{360} \times 2\pi \times 6400 \\
 &= 3351.0... \text{ km} \\
 \text{Time} &= \frac{3351.0...}{40} \text{ hours} \\
 &= 83.7... \text{ hours} \\
 &= \frac{83.7...}{24} \text{ days} \\
 &= 3.490658504 \text{ days} \\
 &= 3 \text{ days} + (0.490658504 \times 24) \text{ hours} \\
 &= 3 \text{ days} + 11.7... \text{ hours} \\
 &= 3 \text{ days } 12 \text{ hours (nearest hour)}
 \end{aligned}$$

**Question 27 (e)**

Criteria	Marks
• Provides correct solution	4
• Attempts to determine the maximum number of bottles based on the number of standard drinks ( $N$ )	3
• Solves for $N$ , or equivalent merit	2
• Substitutes into correct formula, or equivalent merit	1

**Sample answer:**

$$\begin{aligned}
 BAC_{\text{male}} &= \frac{10N - 7.5H}{6.8M}, & BAC_{\text{male}} = 0.05, H = 5, M = 90 \\
 0.05 &= \frac{10N - 7.5 \times 5}{6.8 \times 90} \\
 6.8 \times 90 \times 0.05 &= 10N - 7.5 \times 5 \\
 10N &= 7.5 \times 5 + 6.8 \times 90 \times 0.05 \\
 N &= 6.81 \quad \text{ie } 6.81 \text{ standard drinks} \\
 \text{Number of bottles} &= \frac{6.81}{0.8} \\
 &= 8.5125
 \end{aligned}$$

$\therefore$  Rhys can drink a maximum of 8 complete bottles.

**Question 28 (a) (i)**

Criteria	Marks
• Provides correct answer, or CNE	1

*Sample answer:*

$$F = \frac{9C}{5} + 32, C = -20$$

$$F = \frac{9 \times (-20)}{5} + 32$$

Temperature =  $-4$  degrees Fahrenheit

**Question 28 (a) (ii)**

Criteria	Marks
• Provides correct solution for $C$ or $F$	2
• Makes progress towards correct solution	1

*Sample answer:*

$$C = \frac{9C}{5} + 32$$

$$5C = 9C + 160$$

$$-160 = 4C$$

$$C = -40$$

$$F = -40$$

**Question 28 (a) (iii)**

Criteria	Marks
• Provides correct explanation	1

*Sample answer:*

The two lines intersect at  $(-40, -40)$ .



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

Criteria	Marks
• Provides correct answer or CNE	1

*Sample answer:*

$$\frac{5 \times 4}{2} = 10 \text{ groups of two}$$

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

Criteria	Marks
• Provides correct answer or CNE	1

*Sample answer:*

Four of the ten possible groups include Mary (ie a group including Mary and one of the other 4 team members).

$$\begin{aligned} \text{The probability} &= \frac{4}{10} \\ &= 0.4 \end{aligned}$$

**Question 28 (c)**

Criteria	Marks
• Provides correct solution	3
• Provides balance after one month, or equivalent merit	2
• Calculates interest, or equivalent merit	1

*Sample answer:*

$$\begin{aligned} \text{Amount owing after first month, } A_1 &= 100\,000 \times \left(1 + \frac{0.12}{12}\right) - 1029 \\ &= \$99\,971 \end{aligned}$$

$$\begin{aligned} \text{Amount owing after second month, } A_2 &= 99\,971 \times \left(1 + \frac{0.12}{12}\right) - 1029 \\ &= \$99\,941.71 \end{aligned}$$

**Question 28 (d)**

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

**Sample answer:**

$$x^2 = yp - 1$$

$$x^2 + 1 = yp$$

$$y = \frac{x^2 + 1}{p}$$

**Question 28 (e) (i)**

Criteria	Marks
• Provides correct answer	1

**Sample answer:**

From the graph, the income is maximised when the increase in ticket price is \$6.

$\therefore$  the ticket price should be  $\$8 + \$6 = \$14$

**Question 28 (e) (ii)**

Criteria	Marks
• Provides correct answer	1

**Sample answer:**

$$200 - 10 \times 6 = 140 \text{ tickets}$$

**Question 28 (e) (iii)**

Criteria	Marks
• Provides correct solution	2
• Calculates cost or income, or equivalent merit	1

***Sample answer:***

$$\begin{aligned}\text{Income} &= 140 \times \$14 \\ &= \$1960\end{aligned}$$

$$\begin{aligned}\text{Cost} &= 140 \times \$2 + \$500 \\ &= \$780\end{aligned}$$

$$\begin{aligned}\text{Profit} &= \$1960 - \$780 \\ &= \$1180\end{aligned}$$

**Question 29 (a) (i)**

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

*Sample answer:*

$$\begin{aligned}
 h &= \frac{200}{4} \\
 &= 50 \\
 V &\approx \frac{50}{3}(0 + 4 \times 140 + 270) + \frac{50}{3}(270 + 4 \times 300 + 360) \\
 &= 44\,333\frac{1}{3} \text{ m}^3 \\
 &= 44\,333 \text{ m}^3 \text{ (nearest m}^3\text{)}
 \end{aligned}$$

**Question 29 (a) (ii)**

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

*Sample answer:*

$$\begin{aligned}
 2 \text{ km}^2 &= 2 \times 1000 \times 1000 \\
 &= 2\,000\,000 \text{ m}^2 \\
 V &= Ah \\
 44\,333 &= 2\,000\,000 \times h \\
 h &= \frac{44\,333}{2\,000\,000} \\
 &= 0.0221\ldots \text{ m} \\
 &= 22 \text{ mm (nearest mm)}
 \end{aligned}$$

**Question 29 (b)**

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards correct solution	2
• Makes progress towards correct solution	1

**Sample answer:**

$$\begin{aligned}
 \text{Tax payable} &= 3572 + 0.325(86\,725 - 37\,000) \\
 &= \$19\,732.63 \\
 \text{Medicare levy} &= 2\% \times 86\,725 \\
 &= \$1734.50 \\
 \text{Total payable} &= 19\,732.63 + 1734.50 \\
 &= \$21\,467.13 \\
 \therefore \text{Net income} &= 86\,725 - 21\,467.13 \\
 &= \$65\,257.87
 \end{aligned}$$

**Question 29 (c) (i)**

Criteria	Marks
• Provides correct solution	2
• Provides correct numerator or denominator, or equivalent merit	1

**Sample answer:**

$$\begin{aligned}
 \text{Number of students surveyed} &= 3520 \\
 \text{Probability} &= \frac{2500}{3520} \\
 &= \frac{125}{176}
 \end{aligned}$$

**Question 29 (c) (ii)**

Criteria	Marks
• Provides correct justification with calculations	2
• Identifies correct numbers from table, or equivalent merit	1

**Sample answer:**

$$\begin{aligned}
 \text{Country students who have water skied: } &\frac{70}{870} \times 100 = 8.04\ldots\% \\
 \text{City students who have water skied: } &\frac{150}{2650} \times 100 = 5.66\ldots\% \\
 \therefore \text{The claim in the newspaper article is true.}
 \end{aligned}$$

**Question 29 (d) (i)**

Criteria	Marks
• Provides correct answer	1

*Sample answer:*

15th mark is 4.

16th mark is 8.

$$\begin{aligned}\text{Median} &= \frac{4 + 8}{2} \\ &= 6\end{aligned}$$

**Question 29 (d) (ii)**

Criteria	Marks
• Provides correct solution	2
• Calculates correct boundaries, or equivalent merit	1

*Sample answer:*

$$\begin{aligned}\text{Mean minus standard deviation} &= 5.4 - 4.22 \\ &= 1.18\end{aligned}$$

$$\begin{aligned}\text{Mean plus standard deviation} &= 5.4 + 4.22 \\ &= 9.62\end{aligned}$$

$$\begin{aligned}\text{Percentage of marks between 1.18 and 9.62} &= \frac{2 + 2 + 2 + 1 + 6}{30} \\ &= \frac{13}{30} \\ &= 43.3\% \text{ (1 decimal place)}\end{aligned}$$

**Question 29 (d) (iii)**

Criteria	Marks
• Provides correct explanation	1

*Sample answer:*

The dot plot does not show a normally distributed data set, so the statement is not relevant.

**Question 30 (a)**

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

*Sample answer:*

$$\begin{aligned}
 \text{Interquartile range (IQR)} &= Q_U - Q_L \\
 &= 16 - 10 \\
 &= 6 \\
 \text{Lower bound} &= Q_L - 1.5 \times \text{IQR} \\
 &= 10 - 1.5 \times 6 \\
 &= 1 \\
 \text{Upper bound} &= Q_U + 1.5 \times \text{IQR} \\
 &= 16 + 1.5 \times 6 \\
 &= 25 \\
 \therefore \text{Range} &= 25 - 1 \\
 &= 24
 \end{aligned}$$

**Question 30 (b)**

Criteria	Marks
• Provides correct solution	2
• Writes a correct equation, or equivalent merit	1

*Sample answer:*

Let  $C$  be the cost of the jewellery box.

Let  $h$  be the height of the jewellery box.

$$C = kh^3 \text{ where } k \text{ is a constant.}$$

$$50 = k \times 10^3$$

$$\therefore k = 0.05$$

When  $h=12$

$$\begin{aligned}
 \text{cost, } C &= 0.05 \times 12^3 \\
 &= \$86.40
 \end{aligned}$$

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

Criteria	Marks
• Provides correct solution	2
• Substitutes correctly into cosine rule, or equivalent merit	1

*Sample answer:*

$$AC^2 = 13^2 + 5^2 - 2 \times 5 \times 13 \times \cos 135^\circ$$

$$= 285.92\dots$$

$$AC = \sqrt{285.92\dots}$$

$$= 16.9\dots$$

$$= 17 \text{ km (nearest kilometre)}$$

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

Criteria	Marks
• Provides correct solution	3
• Calculates an angle in the triangle, or equivalent merit	2
• Substitutes correctly into sine rule or cosine rule, or equivalent merit	1

*Sample answer:*

$$\frac{\sin A}{13} = \frac{\sin 135^\circ}{17}$$

$$\sin A = \frac{13 \sin 135^\circ}{17}$$

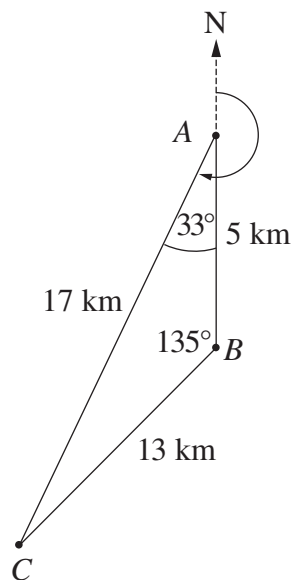
$$= 0.5407$$

$$A = 32.7\dots^\circ$$

$$= 33^\circ \text{ (nearest degree)}$$

The bearing of school C from school A is

$$180^\circ + 33^\circ = 213^\circ.$$





**Question 30 (d) (i)**

Criteria	Marks
• Provides correct answer, or CNE	1

*Sample answer:*

$$\begin{aligned}\text{Speed (y)} &= 2.125 \times 5 + 2.0375 \\ &= 12.6625 \text{ km/h}\end{aligned}$$

**Question 30 (d) (ii)**

Criteria	Marks
• Provides correct solution	2
• Identifies correct formula, or equivalent merit	1

*Sample answer:*

$$\begin{aligned}\text{gradient} &= r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}} \\ 2.125 &= r \times \frac{2}{0.8} \\ \therefore r &= 0.85\end{aligned}$$

**Question 30 (e)**

Criteria	Marks
• Provides correct solution	3
• Makes significant progress towards correct solution	2
• Calculates the height of the cone, or equivalent merit	1

*Sample answer:*

$$\begin{aligned}\text{Radius of cone, } r &= \sqrt{4^2 - 2^2} \\ &= \sqrt{12} \text{ cm} \\ \text{Height of cone, } h &= 15 - (4 + 2) \\ &= 9 \text{ cm} \\ \text{Volume of cone, } V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (\sqrt{12})^2 \times 9 \\ &= 113.09... \\ &= 113 \text{ cm}^3 \text{ (to nearest cm}^3\text{)}\end{aligned}$$

# 2017 HSC Mathematics General 2

## Mapping Grid

### Section I

Question	Marks	Content	Syllabus outcomes
1	1	DS4 (•5) Find median from a box-and-whisker plot p80	MG2H-2
2	1	FSDr3 (•1) Calculate distance, given speed and time p68	MGP-5
3	1	FSHe3 (•1) Life expectancy from a graph p112	MG2H-2
4	1	DS1 (•5) Distinguish between different sample types p32	MGP-10
5	1	DS6 (•6) Expected number p84	MG2H-2
6	1	FM1 (•2) Calculating fortnightly wage p24	MGP-6
7	1	AM1 (•4) Substitution into a formula to find the subject p52	MGP-3
8	1	MM5 (•2) Trigonometric ratios to find an angle with rounding p90	MG2H-5
9	1	AM3 (•6) Solving linear equations p100	MG2H-3
10	1	FM2 (•5) Using the compound interest formula p26	MGP-6
11	1	FSDr1 (•1) Percentage decrease in car value p64	MGP-6
12	1	FSHe1 (•7) Interpret the size of correlation coefficient from a graph p108	MG2H-2
13	1	DS5 (•2) Calculate z-score p82	MG2H-7
14	1	FSDr2 (•3) Compare fuel consumption of various vehicles p66	MGP-5
15	1	PB1 (•8) Determine theoretical probability p48	MGP-8
16	1	FSRe3 (•9) Reducing energy use p120	MG2H-2
17	1	AM4 (•9) Identifying point of intersection of graphs p102	MG2H-3
18	1	MM2 (•5) Volume of a prism p42	MGP-4
19	1	FSHe2 (•5) Calculate required child dosage p110	MG2H-5
20	1	AM2 (•13) Generalisation of linear number patterns p54	MGP-3
21	1	MM1 (•2) Degree of accuracy of a measurement p40	MGP-5
22	1	MM4 (•10) Volume of an annular cylinder p88	MG2H-4
23	1	FSCo2 (•2) Convert units of data storage p60	MGP-5
24	1	PB2 (•7) Calculate multi-stage probability p96	MG2H-8
25	1	MM6 (•1) Calculate arc length p92	MG2H-4

## Section II

Question	Marks	Content	Syllabus outcomes
26 (a)	1	FSRe3 (•4) Electricity cost p120	MG2H-5
26 (b)	2	FSCo1 (•3) Cost of a phone bill p58	MGP-6
26 (c)	2	DS6 (•4) Capture–recapture p84	MG2H-3
26 (d)	2	MM3 (•6) Angle of depression p44	MGP-4
26 (e)	3	FM2 (•10) Shares p26	MGP-6
26 (f) (i)	1	DS4 (•15) Area chart p80	MG2H-7
26 (f) (ii)	1	DS4 (•15) Area chart p80	MG2H-7
26 (g)	3	FM4 (•2) Flat-rate loan p74	MG2H-6
27 (a) (i)	1	FSRe1 (•2) Mean of water use p116	MGP-1
27 (a) (ii)	1	FSRe1 (•2) Standard deviation of water use p116	MG2H-7
27 (b)	2	FSCo2 (•3) Number of files on a disc p60	MGP-5
27 (c) (i)	1	FM5 (•2) FV annuity p76	MG2H-6
27 (c) (ii)	1	FM5 (•6) Interest on an annuity p76	MG2H-6
27 (d) (i)	1	MM6 (•4) Longitude value p92	MG2H-4
27 (d) (ii)	1	MM6 (•7) Time calculation p92	MG2H-4
27 (d) (iii)	3	MM6 (•5) Using speed to calculate time	MG2H-5
27 (e)	4	FSDr3 (•4) Male BAC, number of drinks in given time p68	MGP-3
28 (a) (i)	1	AM1 (•4) Substitution to convert from $C$ to $F$ p52	MGP-3
28 (a) (ii)	2	AM4 (•10) Solving simultaneous equations p102	MG2H-3
28 (a) (iii)	1	AM4 (•9) Interpreting a solution p102	MG2H-3
28 (b) (i)	1	PB2 (•5) Combinations p96	MG2H-8
28 (b) (ii)	1	PB2 (•7) Probability p96	MG2H-8
28 (c)	3	FM4 (•3) Reducible loan without repayment table p74	MG2H-6
28 (d)	2	AM3 (•8) Change the subject of equation p100	MG2H-3
28 (e) (i)	1	AM5 (•1) Location of maximum value from quadratic graph p104	MG2H-3
28 (e) (ii)	1	AM5 (•1) Interpreting written information p104	MG2H-3
28 (e) (iii)	2	AM5 (•1) Calculating profit p104	MG2H-3
29 (a) (i)	2	FSRe2 (•7) Simpson’s rule (volume) p118	MG2H-4
29 (a) (ii)	2	FSRe2 (•6) Catchment area p118	MG2H-4

Question	Marks	Content	Syllabus outcomes
29 (b)	3	FM3 (•4) Tax table calculation p28	MG2H-6
29 (c) (i)	2	DS4 (•18) Probability with two-way table p80	MG2H-2
29 (c) (ii)	2	DS4 (•18) Justifying opinion with calculations p80	MG2H-2
29 (d) (i)	1	DS3 (•1) Median p36	MGP-7
29 (d) (ii)	2	DS5 (•2) Using mean and standard deviation p82	MG2H-7
29 (d) (iii)	1	DS5 (•4) Normal distribution explanation p82	MG2H-7
30 (a)	2	DS4 (•5) Outliers p80	MG2H-7
30 (b)	2	AM5 (•6) Variation p104	MG2H-3
30 (c) (i)	2	MM5 (•7) Cosine rule p90	MG2H-4
30 (c) (ii)	3	MM5 (•11) Calculate bearing p90	MG2H-4
30 (d) (i)	1	AM1 (•4) Substitution p52	MGP-3
30 (d) (ii)	2	FSHe1 (•5) Correlation from least-squares equation p108	MG2H-7
30 (e)	3	MM4 (•8) Volume of a cone p88	MG2H-4