BOSTES | BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

2014 HSC Mathematics General 2
Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 26 (a)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$4x\left(7x^4 - x^2\right)$

$= 28x^5 - 4x^3$

Question 26 (b)

Criteria	Marks
• Provides correct answer	2
• Provides correct expression for h involving a correct trigonometric ratio	1

Sample answer:

$$\sin 28^\circ = \frac{5}{h}$$

$$h = \frac{5}{\sin 28^\circ}$$

$$= 10.650\ 27$$

$$= 10.65 \text{ (two decimal places)}$$

Question 26 (c)

Criteria	Marks
• Provides correct solution	3
• Demonstrates more than one correct algebraic step	2
• Demonstrates a correct algebraic step	1

Sample answer:

$$\begin{aligned}
\frac{5x+1}{3} - 4 &= 5 - 7x \\
\frac{5x+1}{3} &= 9 - 7x \\
5x + 1 &= 3(9 - 7x) \\
5x + 1 &= 27 - 21x \\
26x &= 26 \\
x &= 1
\end{aligned}$$

Question 26 (d)

Criteria	Marks
• Calculates correct values of x and y	3
• Demonstrates correct method • Evaluates one value correctly from this method	2
• Shows substitution or equivalent	1

Sample answer:

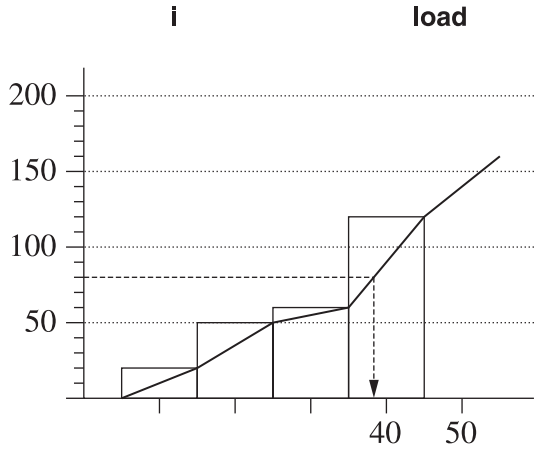
$$\begin{aligned}
y &= 2x + 1 \\
x - 2y - 4 &= 0 \\
x - 2(2x + 1) - 4 &= 0 \\
x - 4x - 2 - 4 &= 0 \\
-3x &= 6 \\
x &= -2 \\
y &= 2(-2) + 1 \\
y &= -3
\end{aligned}$$

$\therefore\ x = -2,\ \ y = -3$

Question 26 (e)

Criteria	Marks
• Draws horizontal and vertical lines on the graph to show correct position of median	2
• Draws the correct ogive or equivalent merit	1

Sample answer:



Question 26 (f)

Criteria	Marks
• Provides correct solution	2
• Attempts to set up a relevant equation or equivalent	1

Sample answer:

$$W_M = kW_E$$
$$14 = k84$$
$$\frac{1}{6} = k$$
$$W_M = kW_E$$
$$2449 = \frac{1}{6}W_E$$
$$W_E = 14694 \text{ kg}$$

Question 26 (g)

Criteria	Marks
• Provides correct answer	2
• Provides correct longitude difference OR • Finds correct time from incorrect longitude calculation	1

Sample answer:

Longitude difference $= 47°$

Time difference $= 47 \times 4$

$= 188$ minutes

$= 3$ h 8 min

Question 27 (a) (i)

Criteria	Marks
• Provides correct numerical expression	1

Sample answer:

Sale price = \$13 380

= \$13 400 (to nearest \$100)

$$\text{Stamp Duty} = \frac{13\,400}{100} \times 3$$

= \$402

Question 27 (a) (ii)

Criteria	Marks
• Provides correct monthly repayment	4
• Makes significant progress towards correct answer eg total to be repaid	3
• Makes significant progress towards total to be repaid	2
• Makes some progress eg evidence of an interest calculation	1

Sample answer:

Car price = \$13 380

Transfer of rego = \$30

Stamp duty = \$402

Total to be borrowed = \$13 812

$$\text{Interest} = 7.5\% \times 13\,812 \times 3$$

= \$3107.70

Total to be repaid = \$13 812 + \$3107.70

= \$16 919.70

$\therefore$ Monthly repayment = \$16 919.70 ÷ 36

= \$469.99

Question 27 (a) (iii)

Criteria	Marks
• Provides correct total amount or numerical expression	3
• Makes progress towards total amount eg correct calculation of stamp duty or GST	2
• Provides correct calculation of FSL OR • Provides correct numerical expression for stamp duty or GST using an incorrect FSL	1

Sample answer:

$$\begin{aligned}
\text{Base rate} &= \$845 \\
\text{FSL} &= 1\% \times \$845 \\
\text{FSL} &= \$8.45 \\
\text{Stamp Duty} &= 5.5\% \times (845 + 8.45) \\
&= \$46.94 \\
\text{GST} &= 10\% \times (845 + 8.45) \\
&= \$85.35 \\
\therefore \text{Total cost} &= 845 + 8.45 + 46.94 + 85.35 \\
&= \$985.74
\end{aligned}$$

Question 27 (a) (iv)

Criteria	Marks
• Provides correct answer	1

Sample answer:

Comprehensive car insurance covers damage to Alex's car but non-compulsory third party only covers other people's property.

Question 27 (b)

Criteria	Marks
• Provides correct conclusion from correct calculations	2
• Provides correct calculation for motorcycle trip	1

Sample answer:

Cost for 10 bus trips = \$36.40

$\therefore$ cost for 1 bus trip = $\dfrac{\$36.40}{10}$ = \$3.64

Cost for 1 motorcycle trip to travel 34 km

$= 2 \times \$1.67$

$= \$3.34$

$\therefore$ the motorcycle is cheaper.

Question 27 (c)

Criteria	Marks
• Provides correct solution (ignore rounding) in litres	4
• Makes progress towards calculation of volume	3
• Makes progress towards calculation of base area	2
• Provides evidence of radius and correct length of rectangle or equivalent merit	1

Sample answer:

Radius $= \dfrac{560}{2}$ mm

$= 0.28$ m

length of rectangle $= (1400 - 2 \times 280)$ mm

$= 840$ mm

$= 0.84$ m

Total area = rectangle + circle

Total area $= (0.84 \times 0.56 + \pi \times 0.28^2)$ m^2

$= 0.7167 \ldots$ m^2

$\therefore$ Total area $= 0.7167 \ldots$ m^2

$\therefore$ Volume $= 0.7167 \times 0.81$

$= 0.580\,527\ldots$ m^3

$= 580.527\ldots$ litres

$= 581$ L

Question 28 (a)

Criteria	Marks
• Provides correct financial expectation or numerical expression	2
• Makes some relevant progress	1

Sample answer:

$$\frac{1}{3} \times \$5 + 2 \times \frac{1}{3} \times \$0.5 - \$2 = 0$$

Financial expectation = \$0

Question 28 (b) (i)

Criteria	Marks
• Provides correct solution	1

Sample answer:

$$(360 - 320) + 74 = 40 + 74$$
$$= 114°$$

Question 28 (b) (ii)

Criteria	Marks
• Provides correct solution	2
• Substitutes correctly into cosine rule	1

Sample answer:

$$AB^2 = 287^2 + 211^2 - 2 \times 287 \times 211 \times \cos 114°$$
$$= 176\,151.5018$$
$$AB = 419.704$$
$$AB = 420 \text{ m}$$

Question 28 (b) (iii)

Criteria	Marks
• Provides correct solution in hectares to two significant figures	3
• Calculates correct area	2
• Makes some relevant progress eg correct substitution into appropriate formula; correct conversion into hectares; correct rounding to two significant figures	1

Sample answer:

$$A = \frac{1}{2} \times 287 \times 211 \times \sin 114°$$

$$= 27\,660.78614 \text{ m}^2$$

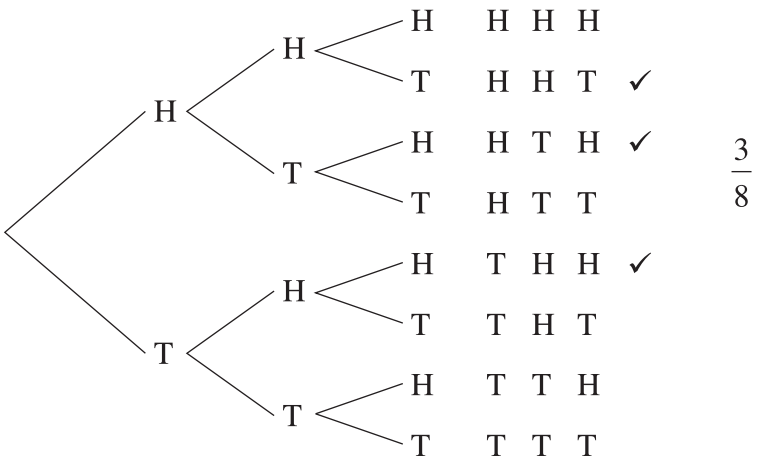
$$= 2.766 \ldots \text{ ha}$$

$$= 2.8 \text{ hectares}$$

Question 28 (c)

Criteria	Marks
• Provides correct numerical expression	2
• Makes some relevant progress	1

Sample answer:



$\frac{3}{8}$

Question 28 (d) (i)

Criteria	Marks
• Provides correct answer	1

Sample answer:

1 cm = 6.25 m

Question 28 (d) (ii)

Criteria	Marks
• Provides correct answer using measured length	1

Sample answer:

$5.1 \times 6.25 = 31.875$ m (Measurement between 5.0 and 5.2, ie length 31.25 m to 32.5 m)

Question 28 (d) (iii)

Criteria	Marks
• Provides correct volume approximation or numerical expression	3
• Makes progress towards eg evidence of two applications of Simpson's Rule	2
• Makes some relevant progress eg correct value of h	1

Sample answer:

$$A = \frac{12.5}{3}\left(21.88 + 4 \times 25.63 + 31.88\right) + \frac{12.5}{3}\left(31.88 + 4 \times 36.25 + 21.88\right)$$

$$= \frac{12.5}{3}\left(156.28\right) + \frac{12.5}{3}\left(198.76\right)$$

$$= 651.166\,666\,7 + 828.166\,666\,7$$

$$V = 1479.33 \text{ m}^2 \times 1.2$$

$$= 1775.2 \text{ m}^3$$

OR Cross-sectional areas:

$$CD = 21.88 \times 1.2$$
$$= 26.256$$

$$EF = 25.63 \times 1.2$$
$$= 30.756$$

$$GH = 31.88 \times 1.2$$
$$= 38.256$$

$$IJ = 36.25 \times 1.2$$
$$= 43.5$$

$$KL = 21.88 \times 1.2$$
$$= 26.256$$

$$V = \frac{12.5}{3}\left(26.256 + 4 \times 30.756 + 38.256\right) + \frac{12.5}{3}\left(38.256 + 4 \times 43.5 + 26.256\right)$$
$$= 1775.2 \text{ m}^3$$

Question 29 (a) (i)

Criteria	Marks
• Provides the three correct values	1

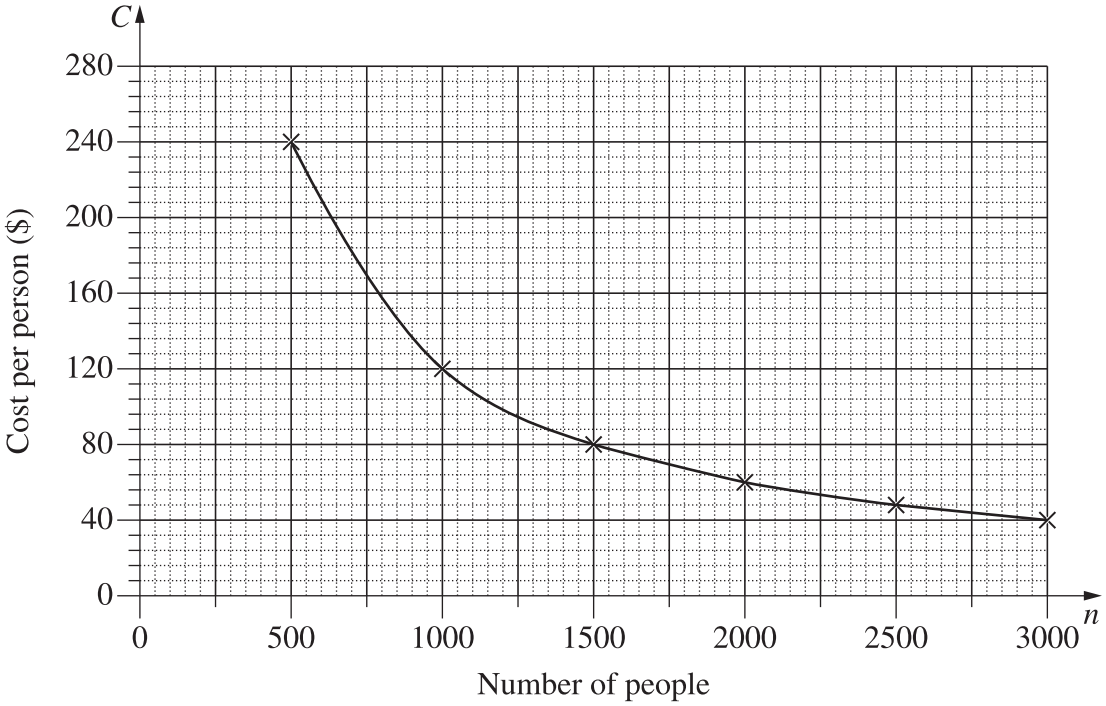
Sample answer:

n	500	1000	1500
C	240	120	80

Question 29 (a) (ii)

Criteria	Marks
• Draws a smooth continuous curve using values in the table	2
• Plots points from table	1

Sample answer:



Question 29 (a) (iii)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$C = \frac{120\,000}{n}$$

Question 29 (a) (iv)

Criteria	Marks
• Provides a correct limitation	1

Sample answer:

Cost cannot be zero.
OR Number of people cannot be zero.
OR Number of people must be positive integer.

Question 29 (a) (v)

Criteria	Marks
• Provides correct conclusion with appropriate calculations	1

Sample answer:

$$94 = \frac{120\,000}{n}$$

$$94n = 120\,000$$

$$n = 1276.59\ldots$$

Cost cannot be \$94 because n must be an integer.

Question 29 (b)

Criteria	Marks
• Provides correct solution	3
• Makes significant progress	2
• Substitutes correctly in a BAC formula	1

Sample answer:

$$BAC_{\text{male}} = \frac{10N - 7.5H}{6.8M}$$

$M = 84$
$N = ?$
$H = 4$

$$\frac{10N - 7.5(4)}{6.8 \times 84} < 0.05$$

$$10N - 7.5(4) < 28.56$$

$$10N < 58.56$$

$$N < 5.856$$

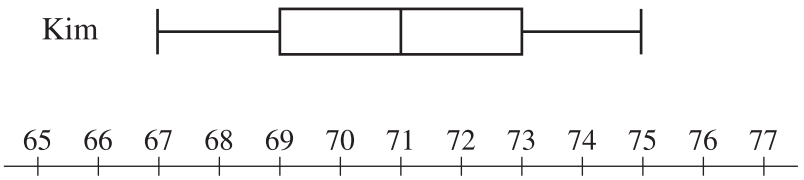
$$\therefore N = 5$$

$\therefore$ 5 drinks is the maximum he can have.

Question 29 (c) (i)

Criteria	Marks
• Draws correct box-and-whisker plot	1

Sample answer:



Question 29 (c) (ii)

Criteria	Marks
• Provides correct answer	1

Sample answer:

50%

Question 29 (c) (iii)

Criteria	Marks
• Supports a conclusion with valid justification with reference to summary statistics and skewness	4
• Supports a conclusion by comparisons of location or spread AND reference to skewness	3
• Provides two correct comparisons with numerical justification where appropriate	2
• Provides one correct comparison	1

Sample answer:

Even though Terry has the highest mark of 76 overall, Kim's results seem better because:

- 75% of Kim's results are above 69 while only 50% of Terry's are above 69
- The range is smaller (75 – 67 = 8) compared to Terry's (76 – 67 = 9)
- The IRQ is also smaller (73 – 69 = 4) compared to Terry's (74 – 68 = 6)
- The median of 71 is higher than Terry's 69
- They are symmetrical while Terry's are positively skewed.

Question 30 (a)

Criteria	Marks
• Provides correct solution	3
• Substitutes correct value for r or n into correct formula	2
• Converts rate or time or equivalent	1

Sample answer:

$$PV = \frac{FV}{(1+r)^n}, \quad FV = 20\,000, \quad r = 0.03 \div 12 = 0.0025, \quad n = 180$$

$$= \frac{20\,000}{(1+0.0025)^{180}}$$

$$= 12\,759.72643$$

$\therefore$ The amount they need to invest would be \$12 759.73

Question 30 (b) (i)

Criteria	Marks
• Describes correct relationship	1

Sample answer:

The higher the percentage of GDP spent, the higher the life expectancy.

OR

Strong positive correlation because r is close to 1.

Question 30 (b) (ii)

Criteria	Marks
• Provides correct answer	1

Sample answer:

22.5 – 8.4 = 14.1

Question 30 (b) (iii)

Criteria	Marks
• Provides correct conclusion from correct calculation	2
• Substitutes into an outlier formula OR • Provides correct justification consistent with incorrect calculation	1

Sample answer:

Yes, it is an outlier.

$Q_U + 1.5 \times IQR = 22.5 + 1.5 \times 14.1$

$= 43.65$

Since $47.6 > 43.65$

Question 30 (b) (iv)

Criteria	Marks
• Provides correct answers	2
• Provides one correct answer	1

Sample answer:

$\bar{x} = 16.14$

$\sigma_x = 7.03$

Question 30 (b) (v)

Criteria	Marks
• Substitutes correctly into both the gradient formula and the y-intercept formula	2
• Substitutes correctly into the gradient formula or the y-intercept formula	1

Sample answer:

$$m = \frac{10.94}{7.03} \times 0.83$$

$= 1.291\,635\,846$

$\cong 1.29$

y-intercept $= 70.73 - 1.29 \times 16.14$

$= 49.9094$

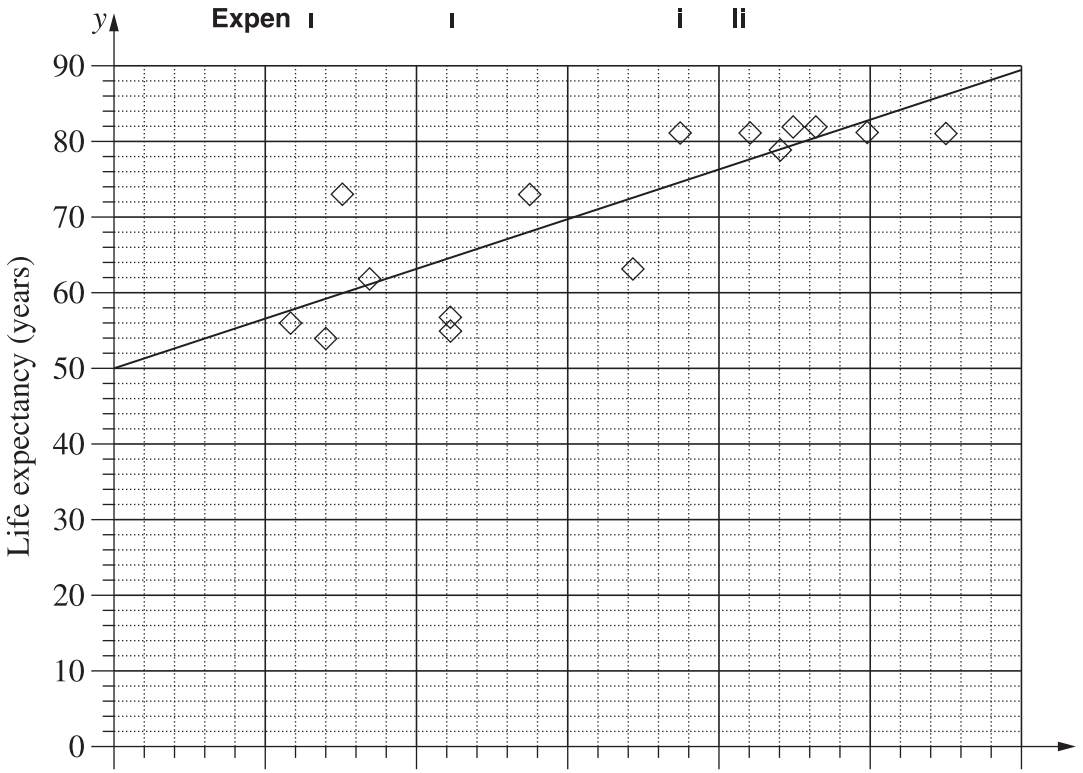
≈ 49.9

$\therefore$ Equation of line of best fit is $y = 1.29x + 49.9$

Question 30 (b) (vi)

Criteria	Marks
• Draws correct line	2
• Draws straight line through y-intercept of approximately 50	1

Sample answer:



Question 30 (b) (vii)

Criteria	Marks
• Provides correct answer	1

Sample answer:

74 years (from graph)

OR $y = 1.29 \times 18 + 49.9$
$= 73.12$
$\therefore$ 73 years

Question 30 (b) (viii)

Criteria	Marks
• Gives a correct reason	1

Sample answer:

The line is based on x-values from 5% to 30%, and 60% is beyond the bounds of the data points to which it was fitted. So, it is not valid to draw conclusions from it.

Mathematics General 2

2014 HSC Examination Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	FSCo1 Mobile phone plans	MGP–6, MGP–9
2	1	MM1 Units of measurement and applications	MGP–6
3	1	AM5 Modelling non-linear relationships	MG2H–3
4	1	FSHe2 Medication	MG2H–2, MG2H–5, MG–5, MG–10
5	1	FSCo2 Digital downloads and file storage	MGP–5, 9
6	1	PB1 Relative frequency and probability	MGP–8
7	1	AM2 Interpreting linear relationships	MGP–2
8	1	PB2 Multistage event and applications of probability DS4 Interpreting sets of data	MG2H–2, MG2H–8
9	1	FSDr2 Running costs and depreciation	MGP–6
10	1	MM4 Further applications of area and volume	MG2H–5
11	1	AM3 Further algebraic skills and techniques	MG2H–10
12	1	MM4 Further applications of area and volume	MG2H–4
13	1	FM1 Earning and managing money	MGP–6
14	1	DS4 Interpreting sets of data	MG2H–2
15	1	MM6 Spherical geometry	MG2H–4
16	1	FSRel Water availability and usage	MG2H–2
17	1	FSHe2 Medication	MG2H–2, MG2H–5
18	1	FSRe3 Energy and sustainability	MG2H–1, MG2H–5
19	1	PB2 Multistage events and applications of probability	MG2H–2, MG2H–8
20	1	FSRe3 Energy and cost	MG2H–1, MG2H–5
21	1	FM5 Annuities and loan repayments	MG2H–3, MG2H–6
22	1	FSDr2 Running costs and depreciation	MGP–6, MGP–9
23	1	MM5 Applications of trigonometry	MG2H–4, MG2H–5
24	1	DS5 The normal distribution	MG2H–7, MG2H–9
25	1	MM4 Further applications of area and volume	MG2H–4

Section II

Question	Marks	Content	Syllabus outcomes
26 (a)	1	AM3 Further algebraic skills and techniques	MG2H–3
26 (b)	2	MM5 Applications of trigonometry	MGH–4
26 (c)	3	AM3 Further algebraic skills and techniques	MG2H–10
26 (d)	3	AM3 Further algebraic skills and techniques	MG2H–10
26 (e)	2	DS4 Interpreting sets of data FSCo2 Digital download and file storage	MGP–2
26 (f)	2	AM4 Modelling linear relationships	MGH–3
26 (g)	2	MM6 Spherical geometry	MG2H–4
27 (a) (i)	1	FSDr1 Cost of purchase and insurance	MGP–5
27 (a) (ii)	4	FM4 Credit and borrowing	MG2H–9
27 (a) (iii)	3	FSDr1 Cost of purchase and insurance	MGP6, MGP–8
27 (a) (iv)	1	FSDr1 Cost of purchase and insurance	MGP–10
27 (b)	2	FSDr2 Running costs and depreciation	MGP–1
27 (c)	4	FSRe1 Water availability and usage	MG2H–4
28 (a)	2	PB2 Multistage events and applications of probability	MG2H–8
28 (b) (i)	1	MM5 Applications of trigonometry	MG2H–4
28 (b) (ii)	2	MM5 Applications of trigonometry	MG2H–4
28 (b) (iii)	3	MM5 Applications of trigonometry	MG2H–5
28 (c)	2	PB2 Multistage events and applications of probability	MG2H–2
28 (d) (i)	1	FSRe2 Dams, land and catchment areas	MG2H–1/5
28 (d) (ii)	1	MM3 Similarity of two dimensional figures, right angled triangles	MGP–4/5
28 (d) (iii)	3	FSRe2 Dams, land and catchment areas	MG2H–4
29 (a) (i)	1	AM5 Modelling non-linear relationships	MG2H–1, MG2H–3
29 (a) (ii)	2	AM5 Modelling non-linear relationships	MG2H–1, MG2H–3
29 (a) (iii)	1	AM5 Modelling non-linear relationships	MG2H–1
29 (a) (iv)	1	AM5 Modelling non-linear relationships	MG2H–3
29 (a) (v)	1	AM5 Modelling non-linear relationships	MG2H–4
29 (b)	3	FSDr3 Safety	MGP–1
29 (c) (i)	1	DS2 Displaying and interpreting single data sets	MGP–7
29 (c) (ii)	1	DS4 Interpreting sets of data	MG2H–1
29 (c) (iii)	4	DS4 Interpreting sets of data	MG2H–2 and 10

Question	Marks	Content	Syllabus outcomes
30 (a)	3	FM4 Credit and borrowing	MG2H–3
30 (b) (i)	1	FSHe3 Life expectancy	MG2H–2
30 (b) (ii)	1	DS4 Interpreting sets of data	MG2H–7
30 (b) (iii)	2	DS4 Interpreting sets of data	MG2H–9
30 (b) (iv)	2	DS3 Summary statistics DS3 Summarise statistics	MGP–9
30 (b) (v)	2	FSHe1 Line of best fit	MG2H–1
30 (b) (vi)	2	FSHe1 Line of best fit FSHe3 Line of best fit	MG2H–7
30 (b) (vii)	1	FSHe3 Interpreting data	MG2H–1 and 2
30 (b) (viii)	1	FSHe3 Interpreting data	MG2H–1 and 3