CALC I · MARK SCHEME

GCSE Mathematics · Higher Tier

40 marks · 45 minutes · Calculator

M method **A** accuracy (depends on M) **B** independent **P** process **C** communication

oe or equivalent cao correct answer only ft follow through Accept any correct, fully justified method.

Question 1

Percentage increase · R9 · Ratio & proportion · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
1(a)	£29 981.88	M1	For $28\,400 \times 1.035 \times 1.02$, or $28\,400 \times 1.035$ $(= 29\,394)$ then $\times 1.02$
		A1	cao
1(b)	5.57%	B1	Accept 5.57 (from $1.035 \times 1.02 = 1.0557$), or ft their part (a)

Question 2

Standard form · N9 · Number · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
2	81.2	M1	For $(5.97 \times 10^{24}) \div (7.35 \times 10^{22})$, or 81.22 . . . seen
		A1	cao

Question 3

Scatter graphs · S6 · Statistics · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
3(a)	Negative correlation	C1	For, e.g., as the temperature increases, fewer hot drinks are sold
3(b)	Reason	C1	For a sensible reason for the point $(12,\ 24)$, e.g. the café closed early, or there were few customers that day
3(c)	Explanation	C1	For, e.g., 35°C is outside the range of the data, so it would be extrapolation

Question 4

Angles forming equations · A21 · Algebra · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
4	**Shown**	**M1**	For $(2x + 15) + (3x - 10) + (x + 25) = 180$, i.e. $6x + 30 = 180$
		M1	For $x = 25$
		C1	For the angles 65°, 65° and 50° found, with the statement that two angles are equal, so the triangle is isosceles

Question 5

Trigonometry: angle · G20 · Geometry & measures · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
5	73.9°	**M1**	For $\cos\theta = \frac{1.8}{6.5}$
		A1	Accept 73.9 to 74

Question 6

Speed–time graph · R14 · A15 · Ratio & proportion · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
6(a)	**0.4 m/s^2**	**B1**	For $8 \div 20$
6(b)	**380 m**	**M1**	For a correct method for the area under the graph, e.g. $\frac{1}{2} \times 20 \times 8 + 30 \times 8 + \frac{1}{2} \times 15 \times 8$
		A1	cao

Question 7

Relative frequency · P5 · Probability · AO1 · AO2 · 2 marks

QN	ANSWER	MARK	GUIDANCE
7(a)	**112**	**B1**	For $\frac{64}{200} \times 350$
7(b)	**Explanation**	**C1**	For, e.g., Bella dropped the drawing pin more times, so her estimate is more reliable

Question 8

Cosine rule · G22 · Geometry & measures · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
8	**11.5 cm**	**M1**	For $9.6^2 + 13.2^2 - 2 \times 9.6 \times 13.2 \times \cos 58°$
		M1	For $QR^2 = 132.09\ldots$, or the square root of their correct expression
		A1	Accept 11.49 to 11.5

Question 9

Direct proportion · R13 · Ratio & proportion · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
9	**39.2 cm**	**P1**	For $T = k\sqrt{L}$ with $k = \frac{1.61}{\sqrt{0.65}}$ $(= 1.996\ldots)$
		P1	For $L = \left(\frac{1.25}{k}\right)^2$ $(= 0.3918\ldots)$ m
		A1	Accept 39.1 to 39.2

Question 10

Quadratic formula · A18 · Algebra · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
10	2.81 **and** −0.47	**M1**	For $\frac{7 \pm \sqrt{(-7)^2 - 4 \times 3 \times (-4)}}{2 \times 3}$
		M1	For $\frac{7 \pm \sqrt{97}}{6}$
		A1	For both values correct to 2 decimal places

Question 11

Upper and lower bounds · N16 · Number · AO3 · AO2 · 4 marks

QN	ANSWER	MARK	GUIDANCE
11(a)	**0.709 g/cm^3**	**P1**	For 412.5 or 8.35 seen
		P1	For $412.5 \div 8.35^3$
		A1	Accept 0.7085 to 0.709
11(b)	**No, with reason**	**C1**	For, e.g., the upper bound of the density is more than 0.7, so the density could be more than 0.7 g/cm^3; ft their part (a)

Question 12

Volume of a frustum · G17 · Geometry & measures · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
12	**No, with 11.9 litres**	**P1**	For using similar triangles to find the height of the full cone, 72 cm, or of the removed cone, 48 cm, e.g. $\frac{h}{h+24} = \frac{10}{15}$
		P1	For $\frac{1}{3}\pi \times 15^2 \times 72$ $(= 16\,964.6\ldots)$ or $\frac{1}{3}\pi \times 10^2 \times 48$ $(= 5026.5\ldots)$
		P1	For $16\,964.6\ldots - 5026.5\ldots$ $(= 11\,938\ldots \text{ cm}^3)$
		C1	For 11.9 litres (accept 11.93 to 11.94) and stating Vicky is not correct

Question 13

Line meets a circle · A16 · A19 · Algebra · AO2 · AO3 · 5 marks

QN	ANSWER	MARK	GUIDANCE
13(a)	**Shown**	**M1**	For substituting, $x^2 + (2x - 3)^2 = 40$
		C1	For $x^2 + 4x^2 - 12x + 9 = 40$ leading to $5x^2 - 12x - 31 = 0$
13(b)	**12.4**	**P1**	For solving, $x = 3.964\ldots$ and $x = -1.564\ldots$
		P1	For $y = 4.928\ldots$ and $y = -6.128\ldots$, and $\sqrt{5.528\ldots^2 + 11.056\ldots^2}$
		A1	Accept 12.3 to 12.4

Paper overview

Q	TOPIC	SPEC REF	STRAND	AO	MARKS
1	Percentage increase	R9	Ratio & proportion	AO1	3
2	Standard form	N9	Number	AO1	2
3	Scatter graphs	S6	Statistics	AO2	3
4	Angles forming equations	A21	Algebra	AO2	3
5	Trigonometry: angle	G20	Geometry & measures	AO1	2
6	Speed–time graph	R14 · A15	Ratio & proportion	AO1	3
7	Relative frequency	P5	Probability	AO1 · AO2	2
8	Cosine rule	G22	Geometry & measures	AO1	3
9	Direct proportion	R13	Ratio & proportion	AO3	3
10	Quadratic formula	A18	Algebra	AO1	3
11	Upper and lower bounds	N16	Number	AO3 · AO2	4
12	Volume of a frustum	G17	Geometry & measures	AO3	4
13	Line meets a circle	A16 · A19	Algebra	AO2 · AO3	5
Total					**40**

Marks by strand

Number	**6 marks (15%)**
Algebra	**11 marks (28%)**
Ratio & proportion	**9 marks (22%)**
Geometry & measures	**9 marks (22%)**
Probability	**2 marks (5%)**
Statistics	**3 marks (8%)**

Marks by assessment objective

AO1 Standard techniques	**17 marks (42%)**
AO2 Reasoning	**10 marks (25%)**
AO3 Problem solving	**13 marks (32%)**