CALC H · 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

Error intervals · N15 · Number · AO1 · 4 marks

QN	ANSWER	MARK	GUIDANCE
1(a)	$4650 \leqslant L < 4750$	B1	For 4650 as the lower bound
		B1	For 4750 as the upper bound, with correct inequality signs
1(b)	$6.4 \leqslant y < 6.5$	B1	For 6.4 as the lower bound
		B1	For 6.5 as the upper bound, with correct inequality signs

Question 2

Area unit conversions · R1 · Ratio & proportion · AO2 · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
2(a)	**No, with reason**	C1	For No, as 1 $m^2 = 100 \times 100 = 10\,000$ cm^2
2(b)	**£185**	P1	For the area of the floor in cm^2, $360 \times 240 = 86\,400$ (or the tile area in m^2, 0.09), or 12 by 8 tiles
		P1	For the number of tiles, $86\,400 \div 900 = 96$
		A1	For 10 packs, so £185

Question 3

Pie charts · S2 · Statistics · AO2 · 2 marks

QN	ANSWER	MARK	GUIDANCE
3	No, with 50 and 54	M1	For $\frac{100}{360} \times 180 = 50$ or $\frac{81}{360} \times 240 = 54$
		C1	For 50 and 54 and stating Jo is not correct, as $54 > 50$

Question 4

Angles in polygons · G3 · Geometry & measures · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
4	Shown	M1	For the interior angle of a regular pentagon $= 108°$ (from $180 - \frac{360}{5}$ or $\frac{540}{5}$)
		M1	For the interior angle of **P**, $360 - 2 \times 108 = 144°$
		C1	For the exterior angle $180 - 144 = 36°$ and $360 \div 36 = 10$ sides

Question 5

Rearranging formulae · A5 · G17 · Algebra · AO1 · 4 marks

QN	ANSWER	MARK	GUIDANCE
5(a)	$h = \frac{A-2\pi r^2}{2\pi r}$	M1	For $A - 2\pi r^2 = 2\pi rh$
		A1	For $h = \frac{A-2\pi r^2}{2\pi r}$ oe, e.g. $\frac{A}{2\pi r} - r$
5(b)	6.11 cm	M1	For $\frac{300-2\pi \times 4.5^2}{2\pi \times 4.5}$ or $300 = 127.2\ldots + 28.27\ldots h$
		A1	For 6.11 (accept 6.11 to 6.111)

Question 6

Density of an alloy · R11 · Ratio & proportion · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
6	**8.28**	**P1**	For the volume of copper, $450 \div 8.96 = 50.22\ldots$ cm^3
		P1	For the mass of zinc, $30 \times 7.13 = 213.9$ g
		P1	For $\frac{450+213.9}{50.22\ldots+30} = \frac{663.9}{80.22\ldots}$
		A1	For 8.28 (accept 8.27 to 8.28)

Question 7

Pythagoras and trig · G20 · Geometry & measures · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
7	**Yes, with** $29.9°$ **and 2.24 m**	**P1**	For the height $= \sqrt{4.5^2 - 3.9^2}$ $(= 2.244\ldots)$
		P1	For the angle $= \cos^{-1}\left(\frac{3.9}{4.5}\right)$ $(= 29.9\ldots°)$
		C1	For "Yes" with both correct values compared: $25 < 29.9 < 35$ and $2.24\ldots < 2.5$

Question 8

Cumulative frequency · S3 · S4 · Statistics · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
8(a)	**30 minutes**	**B1**	For 30 (accept 29 to 31)
8(b)	**Comparison**	**C1**	For comparing the medians in context, e.g. the median time for Town **B** (40 min) is greater than for Town **A** (30 min), so on average adults in Town **B** take longer
		C1	For comparing the IQRs in context, e.g. the IQR for Town **A** ($40 - 20 = 20$ min) is greater than for Town **B** ($45 - 35 = 10$ min), so times in Town **B** are more consistent

Question 9

Recurrence relations · A23 · R16 · Algebra · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
9(a)	3271	M1	For $P_1 = 0.9 \times 3000 + 400 = 3100$ and $P_2 = 3190$
		A1	cao
9(b)	No, with reason	C1	For No, e.g. the values get closer and closer to 4000 (as $0.9 \times 4000 + 400 = 4000$), so it never goes above 4000

Question 10

Sine rule and bearings · G22 · G15 · Geometry & measures · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
10	Shown	M1	For angle $SAB = 50°$ and angle $SBA = 30°$, so angle $ASB = 100°$
		M1	For $\frac{AS}{\sin 30°} = \frac{15}{\sin 100°}$ oe
		C1	For $AS = 7.615\ldots$, which is 7.62 km to 3 s.f.

Question 11

Quadratic inequalities · A22 · Algebra · AO1 · 4 marks

QN	ANSWER	MARK	GUIDANCE
11(a)	$-1.61 < x < 5.61$	M1	For finding the critical values using the quadratic formula or completing the square, e.g. $\frac{4 \pm \sqrt{16+36}}{2}$ or $2 \pm \sqrt{13}$
		A1	For -1.61 and 5.61
		A1	For $-1.61 < x < 5.61$
11(b)	5	B1	cao

Question 12

Conditional probability · P9 · Probability · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
12	$\frac{1}{3}$	P1	For $P(F \cup S) = 1 - 0.35 = 0.65$, or a Venn diagram with 0.35 outside
		P1	For $P(F \cap S) = 0.45 + 0.3 - 0.65 = 0.1$
		A1	For $\frac{0.1}{0.3} = \frac{1}{3}$ (accept 0.333 or better)

Paper overview

Q	TOPIC	SPEC REF	STRAND	AO	MARKS
1	Error intervals	N15	Number	AO1	4
2	Area unit conversions	R1	Ratio & proportion	AO2 · AO3	4
3	Pie charts	S2	Statistics	AO2	2
4	Angles in polygons	G3	Geometry & measures	AO2	3
5	Rearranging formulae	A5 · G17	Algebra	AO1	4
6	Density of an alloy	R11	Ratio & proportion	AO3	4
7	Pythagoras and trig	G20	Geometry & measures	AO3	3
8	Cumulative frequency	S3 · S4	Statistics	AO1 · AO2	3
9	Recurrence relations	A23 · R16	Algebra	AO1 · AO2	3
10	Sine rule and bearings	G22 · G15	Geometry & measures	AO2	3
11	Quadratic inequalities	A22	Algebra	AO1	4
12	Conditional probability	P9	Probability	AO3	3
Total					**40**

Marks by strand

Number	**4 marks (10%)**
Algebra	**11 marks (28%)**
Ratio & proportion	**8 marks (20%)**
Geometry & measures	**9 marks (22%)**
Probability	**3 marks (8%)**
Statistics	**5 marks (12%)**

Marks by assessment objective

AO1 Standard techniques	**15 marks (38%)**
AO2 Reasoning	**12 marks (30%)**
AO3 Problem solving	**13 marks (32%)**