CALC E · 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

Speed · R11 · Ratio & proportion · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
1	**110**	**M1**	For a time of 1 hour 24 minutes used correctly, e.g. $154 \div 1.4$ or $154 \div 84 \times 60$
		A1	cao

Question 2

Percentages of a group · N12 · Number · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
2	**34.5**	**P1**	For $\frac{2}{5} \times 45$ $(= 18)$, or 0.4×0.45
		P1	For 0.3×55 $(= 16.5)$, or 0.3×0.55
		A1	For 34.5 cao

Question 3

Box plots · S4 · Statistics · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
3	**Box plot**	**B1**	For median 30, lower quartile 21 and upper quartile 38 found or plotted
		B1	For a fully correct box plot with whiskers at 12 and 47

Question 4

Angles in polygons · G3 · Geometry & measures · AO2 · 2 marks

QN	ANSWER	MARK	GUIDANCE
4	**Explanation**	M1	For the exterior angle $180 - 155 = 25°$
		C1	For $360 \div 25 = 14.4$, which is not a whole number, so the polygon cannot exist (oe argument, e.g. interior angles of 14- and 15-sided polygons are 154.3° and 156°)

Question 5

Expand and factorise · A4 · Algebra · AO1 · 4 marks

QN	ANSWER	MARK	GUIDANCE
5(a)	$6x^2 + 11x - 10$	M1	For 3 out of 4 terms correct in $6x^2 + 15x - 4x - 10$
		A1	cao
5(b)	$6xy(2x - 3y^2)$	M1	For a correct partial factorisation, e.g. $3xy(4x - 6y^2)$ or $6x(2xy - 3y^3)$
		A1	cao

Question 6

Repeated % change · R9 · Ratio & proportion · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
6	**No, with 4.3%**	M1	For using a multiplier, e.g. 1.06×0.96 or $1.06 \times 0.96 \times 1.025$
		M1	For 1.04304 or 104.304 . . . %, or a starting value taken through all three changes
		C1	For 4.3(04)% and stating Sam is not correct

Question 7

Dependent events · P8 · Probability · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
7	0.905	P1	For $1 - 0.62$ $(= 0.38)$
		P1	For 0.38×0.75 $(= 0.285)$
		A1	For $0.62 + 0.285 = 0.905$ oe

Question 8

Volume of a sphere · G17 · Geometry & measures · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
8	4.32	P1	For the sphere volume $\frac{4}{3}\pi \times 9^3$ $(= 972\pi = 3053.6\ldots)$
		P1	For dividing by $\pi \times 15^2$ $(= 706.8\ldots)$
		A1	For 4.32 cao

Question 9

Drawing histograms · S3 · Statistics · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
9	Histogram	M1	For finding frequency densities: 0.8, 2.4, 3.6, 1.4, 0.5
		A1	For at least 3 bars of the correct width and height
		A1	For a fully correct histogram

Question 10

Sine rule: angle · G22 · Geometry & measures · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
10	45.5	M1	For $\frac{\sin C}{8.4} = \frac{\sin 72}{11.2}$ oe
		M1	For $\sin C = \frac{8.4 \sin 72}{11.2}$ $(= 0.7132\ldots)$
		A1	Accept 45.5 to 45.51

Question 11

Direct proportion · R13 · Ratio & proportion · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
11	180	M1	For $m = kr^3$
		M1	For $33.6 = k \times 2^3$, so $k = 4.2$
		A1	For 180 (from 180.075)

Question 12

Trigonometric graphs · A12 · Algebra · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
12(a)	110.5	B1	Accept 110.4 to 110.5
12(b)	69.5, 290.5	M1	For $180 - 110.5 = 69.5$ (using the symmetry of the graph), ft from (a)
		C1	For both 69.5 and 290.5 ($= 360 - 69.5$), accept 69.5 to 69.6 and 290.4 to 290.5

Question 13

Bounds · N16 · Number · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
13	No, with 45.4125	M1	For 8.65 or 5.25 seen
		M1	For 8.65×5.25
		C1	For 45.4125 and stating Tom is not correct, as the area must be less than 45.4125 cm^2

Question 14

Quadratic in context · A18 · A21 · Algebra · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
14	10.6	P1	For forming $(2x+3)(x-1)=30$ and simplifying to $2x^2+x-33=0$
		P1	For $x=\frac{-1\pm\sqrt{1^2-4\times2\times(-33)}}{2\times2}$ $(x=3.819\ldots)$
		A1	Accept 10.6 to 10.64 (from $2\times3.8197\ldots+3$)

Paper overview

Q	TOPIC	SPEC REF	STRAND	AO	MARKS
1	Speed	R11	Ratio & proportion	AO1	2
2	Percentages of a group	N12	Number	AO3	3
3	Box plots	S4	Statistics	AO1	2
4	Angles in polygons	G3	Geometry & measures	AO2	2
5	Expand and factorise	A4	Algebra	AO1	4
6	Repeated % change	R9	Ratio & proportion	AO2	3
7	Dependent events	P8	Probability	AO3	3
8	Volume of a sphere	G17	Geometry & measures	AO3	3
9	Drawing histograms	S3	Statistics	AO1	3
10	Sine rule: angle	G22	Geometry & measures	AO1	3
11	Direct proportion	R13	Ratio & proportion	AO1	3
12	Trigonometric graphs	A12	Algebra	AO1 · AO2	3
13	Bounds	N16	Number	AO2	3
14	Quadratic in context	A18 · A21	Algebra	AO3	3
Total					**40**

Marks by strand

Number	**6 marks (15%)**
Algebra	**10 marks (25%)**
Ratio & proportion	**8 marks (20%)**
Geometry & measures	**8 marks (20%)**
Probability	**3 marks (8%)**
Statistics	**5 marks (12%)**

Marks by assessment objective

AO1 Standard techniques	**18 marks (45%)**
AO2 Reasoning	**10 marks (25%)**
AO3 Problem solving	**12 marks (30%)**