CALC D · 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

Using a calculator · N2 · N3 · Number · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
1(a)	**14.16666667**	**B1**	For 14.1666... (at least 5 figures)
1(b)	**14.2**	**B1**	ft from their answer to (a) if it has more than 3 significant figures

Question 2

Population density · N9 · R11 · Number · AO1 · AO2 · 4 marks

QN	ANSWER	MARK	GUIDANCE
2(a)	**131**	**M1**	For $5.62 \times 10^6 \div (4.3 \times 10^4)$
		A1	Accept 130.6 to 131
2(b)	**Yes, with working**	**M1**	For $1.27 \times 10^8 \div (3.78 \times 10^5)$ ($= 336$, accept 335.9 to 336)
		C1	For stating Sam is correct with a comparison, e.g. $2 \times 131 = 262 < 336$, or $336 \div 131 = 2.57 > 2$

Question 3

Simple vs compound · R16 · Ratio & proportion · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
3	No, with working	M1	For Account P: $4000 \times 0.035 \times 6$ $(= 840)$, or £4840
		M1	For Account Q: 4000×1.03^6
		C1	For £4840 and £4776.21 (accept £4776 to £4776.21) and stating Ella is not correct, as Account P gives more

Question 4

Mean with a missing value · S4 · Statistics · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
4	15	P1	For $\sum fx = 12 + 2m + 27 + 24 + 15 = 78 + 2m$ and $\sum f = 30 + m$
		P1	For forming the equation $\frac{78+2m}{30+m} = 2.4$, oe
		A1	cao

Question 5

Linear inequalities · A22 · Algebra · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
5(a)	$x < -4.4$	M1	For $4x - 10 > 7x + 3.2$ and a correct step to collect terms, e.g. $-13.2 > 3x$
		A1	oe
5(b)	-5	B1	ft from their inequality in (a)

Question 6

Relative frequency · P5 · Probability · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
6(a)	0.328	B1	For $\frac{82}{250}$ oe
6(b)	No, with reason	C1	For a reason, e.g. red has a relative frequency of 0.328, much more than 0.25, after a large number of spins (or 82 compared with the 62.5 expected)
6(c)	No, with reason	C1	For a reason, e.g. $600 \times 0.328 = 196.8$ is only an estimate; the actual number of reds will vary

Question 7

Cone surface area · G17 · Geometry & measures · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
7	235 cm^2	P1	For $\frac{1}{3}\pi \times 6.5^2 \times h = 420$
		P1	For $h = 9.49$ (accept 9.49 to 9.5)
		P1	For $l = \sqrt{6.5^2 + h^2}$ $(= 11.5)$
		A1	Accept 234 to 235

Question 8

Iteration · A20 · Algebra · AO1 · AO2 · 4 marks

QN	ANSWER	MARK	GUIDANCE
8(a)	Shown	M1	For substituting $x = 2$ and $x = 3$: $2^3 - 10 + 1 = -1$ and $3^3 - 15 + 1 = 13$
		C1	For stating there is a change of sign, so there is a solution between 2 and 3
8(b)	2.1218	M1	For $x_1 = 2.0800\ldots$ and $x_2 = 2.1104\ldots$
		A1	For 2.1218 cao

Question 9

Exponential growth · R16 · A21 · Ratio & proportion · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
9	$a = 800$, $b = 1.5$	P1	For $ab^2 = 1800$ and $ab^5 = 6075$, and dividing to get $b^3 = 3.375$
		A1	For $b = 1.5$
		P1	For substituting their b, e.g. $a = 1800 \div 1.5^2$
		A1	For $a = 800$

Question 10

Cosine rule · G22 · G23 · Geometry & measures · AO1 · AO2 · 4 marks

QN	ANSWER	MARK	GUIDANCE
10(a)	**Shown**	M1	For $\cos B = \frac{8.4^2+10.5^2-12.6^2}{2\times 8.4\times 10.5}$
		C1	For $\cos B = 0.125$ and $B = 82.819\ldots = 82.8°$
10(b)	**43.8 cm^2**	M1	For $\frac{1}{2} \times 8.4 \times 10.5 \times \sin 82.8°$
		A1	Accept 43.7 to 43.8

Question 11

Area under a curve · A15 · Algebra · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
11(a)	**60 m**	M1	For a correct method using trapezia of width 2 with velocities 2, 3, 6, 11, 18, e.g. $\frac{1}{2} \times 2 \times (2 + 2(3 + 6 + 11) + 18)$
		A1	Accept 59 to 61
11(b)	**Overestimate**	C1	For a reason, e.g. the tops of the trapezia lie above the curve, so the trapezia include extra area

Question 12

Tangent to a circle · A16 · Algebra · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
12	$3x - 5y = 34$	M1	For the gradient of $OP = -\frac{5}{3}$
		M1	For the gradient of the tangent $= \frac{3}{5}$ and substituting $(3, -5)$, e.g. $y + 5 = \frac{3}{5}(x - 3)$
		A1	For $3x - 5y = 34$ oe with integers

Paper overview

Q	TOPIC	SPEC REF	STRAND	AO	MARKS
1	Using a calculator	N2 · N3	Number	AO1	2
2	Population density	N9 · R11	Number	AO1 · AO2	4
3	Simple vs compound	R16	Ratio & proportion	AO2	3
4	Mean with a missing value	S4	Statistics	AO3	3
5	Linear inequalities	A22	Algebra	AO1	3
6	Relative frequency	P5	Probability	AO1 · AO2	3
7	Cone surface area	G17	Geometry & measures	AO3	4
8	Iteration	A20	Algebra	AO1 · AO2	4
9	Exponential growth	R16 · A21	Ratio & proportion	AO3	4
10	Cosine rule	G22 · G23	Geometry & measures	AO1 · AO2	4
11	Area under a curve	A15	Algebra	AO1 · AO2	3
12	Tangent to a circle	A16	Algebra	AO1	3
Total					**40**

Marks by strand

Number	**6 marks (15%)**
Algebra	**13 marks (32%)**
Ratio & proportion	**7 marks (18%)**
Geometry & measures	**8 marks (20%)**
Probability	**3 marks (8%)**
Statistics	**3 marks (8%)**

Marks by assessment objective

AO1 Standard techniques	**17 marks (42%)**
AO2 Reasoning	**12 marks (30%)**
AO3 Problem solving	**11 marks (28%)**