NON-CALC D · MARK SCHEME

GCSE Mathematics · Higher Tier

40 marks · 45 minutes · Non-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

Negative numbers · N2 · N3 · Number · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
1(a)	-53	M1	For $(5-9)^2 = 16$ and $20 \div (-4) = -5$, e.g. $-48 + (-5)$
		A1	cao
1(b)	**No, with reason**	C1	For stating Tom is not correct, with a reason, e.g. the index is worked out before the minus sign so $-4^2 = -16$; only $(-4)^2 = 16$

Question 2

Ratio with fractions · R4 · R8 · Ratio & proportion · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
2	**54**	P1	For tulips and daffodils together $= \frac{3}{5}$ of the flowers, so daffodils $= \frac{5}{8} \times \frac{3}{5} = \frac{3}{8}$ of the flowers
		P1	For roses $-$ daffodils $= \frac{2}{5} - \frac{3}{8} = \frac{1}{40}$ of the flowers $= 6$
		P1	For total number of flowers $= 240$
		A1	cao (roses 96, daffodils 90, tulips 54)

Question 3

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

QN	ANSWER	MARK	GUIDANCE
3(a)	**34**	**B1**	Accept 33 to 35
3(b)	**No, IQR** $= 21$	**M1**	For reading the lower quartile (24, accept 23 to 25) or the upper quartile (45, accept 44 to 46) at cumulative frequency 20 or 60
		C1	For IQR in the range 19 to 23 and stating Ellie is not correct

Question 4

Equation with fractions · A17 · Algebra · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
4	**7**	**M1**	For multiplying through by 12, e.g. $3(3x-1)-4(x+2)=24$
		M1	For expanding correctly and collecting terms, e.g. $5x-11=24$ or $5x=35$
		A1	cao

Question 5

Compound area · G16 · Geometry & measures · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
5	**£32**	**P1**	For the area of the rectangle, $12 \times 5 = 60$
		P1	For the height of the trapezium $9-5=4$ and its area $\frac{1}{2}(12+6)\times 4=36$
		P1	For the total area 96 m^2 and $96 \div 25 = 3.84$, so 4 boxes
		A1	cao. £30.72 scores P1 P1 P0 A0

Question 6

Geometric sequence · A24 · Algebra · AO2 · 2 marks

QN	ANSWER	MARK	GUIDANCE
6	**Yes, with reason**	**M1**	For a correct method, e.g. continuing the sequence 48, −96, 192, −384, 768, or $3 \times (-2)^{n-1}$ with $(-2)^8 = 256$
		C1	For stating Priya is correct as 768 is the 9th term

Question 7

Negative indices · N7 · Number · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
7(a)	$\frac{9}{4}$	**M1**	For $\left(\frac{27}{8}\right)^{\frac{2}{3}}$ or $\left(\frac{2}{3}\right)^{2} = \frac{4}{9}$ or $\sqrt[3]{\frac{27}{8}} = \frac{3}{2}$
		A1	oe, e.g. $2\frac{1}{4}$ or 2.25
7(b)	**Explanation**	**C1**	For explaining that a negative index means the reciprocal, not a negative number, so $25^{-\frac{1}{2}} = \frac{1}{5}$

Question 8

Negative enlargement · G7 · Geometry & measures · AO1 · 2 marks

QN	ANSWER	MARK	GUIDANCE
8	**Triangle with vertices** $(-2, -1)$, $(-6, -1)$, $(-2, -3)$	**B2**	For a correct triangle
			B1 for a triangle of the correct size and orientation in the wrong position, or two correct vertices

Question 9 — Velocity–time graph · R14 · A15 · Ratio & proportion · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
9(a)	1.5	B1	For $15 \div 10$, oe
9(b)	487.5 m	M1	For a correct method to find the area under the graph, e.g. $\frac{1}{2} \times 10 \times 15 + 20 \times 15 + \frac{1}{2} \times 15 \times 15$ or $\frac{1}{2}(45 + 20) \times 15$
		C1	For 487.5 and a conclusion that this is less than 500 m

Question 10 — Quadratic inequality · A22 · Algebra · AO1 · 3 marks

QN	ANSWER	MARK	GUIDANCE
10	$-\frac{3}{2} \leqslant x \leqslant 4$	M1	For $(2x + 3)(x - 4)$
		M1	For critical values $-\frac{3}{2}$ and 4
		A1	oe, e.g. $\{x : -1.5 \leqslant x \leqslant 4\}$

Question 11 — Composite functions · A7 · Algebra · AO1 · AO2 · 3 marks

QN	ANSWER	MARK	GUIDANCE
11(a)	Shown	C1	For $3(x^2 + 1) - 2$ leading to $3x^2 + 1$
11(b)	$\frac{x+2}{3}$	M1	For $x = 3y - 2$ or $y + 2 = 3x$, or a correct first step to rearrange
		A1	oe

Question 12

Tangent to a circle · A16 · Algebra · AO3 · 3 marks

QN	ANSWER	MARK	GUIDANCE
12	(10, 0)	P1	For the gradient of $OP = -2$
		P1	For the gradient of the tangent $= \frac{1}{2}$ and a correct equation, e.g. $y + 4 = \frac{1}{2}(x - 2)$ or $y = \frac{1}{2}x - 5$
		A1	cao

Question 13

Probability and quadratics · P8 · A18 · Probability · AO2 · AO3 · 4 marks

QN	ANSWER	MARK	GUIDANCE
13(a)	**Shown**	M1	For $\frac{n-4}{n} \times \frac{n-5}{n-1} = \frac{1}{3}$
		C1	For $3(n^2 - 9n + 20) = n^2 - n$ leading to $2n^2 - 26n + 60 = 0$ and $n^2 - 13n + 30 = 0$
13(b)	$\frac{2}{15}$	P1	For solving to get $n = 10$ (rejecting $n = 3$) and $\frac{4}{10} \times \frac{3}{9}$
		A1	oe, e.g. $\frac{12}{90}$

Paper overview

Q	TOPIC	SPEC REF	STRAND	AO	MARKS
1	Negative numbers	N2 · N3	Number	AO1 · AO2	3
2	Ratio with fractions	R4 · R8	Ratio & proportion	AO3	4
3	Cumulative frequency	S3	Statistics	AO1 · AO2	3
4	Equation with fractions	A17	Algebra	AO1	3
5	Compound area	G16	Geometry & measures	AO3	4
6	Geometric sequence	A24	Algebra	AO2	2
7	Negative indices	N7	Number	AO1 · AO2	3
8	Negative enlargement	G7	Geometry & measures	AO1	2
9	Velocity–time graph	R14 · A15	Ratio & proportion	AO1 · AO2	3
10	Quadratic inequality	A22	Algebra	AO1	3
11	Composite functions	A7	Algebra	AO1 · AO2	3
12	Tangent to a circle	A16	Algebra	AO3	3
13	Probability and quadratics	P8 · A18	Probability	AO2 · AO3	4
Total					**40**

Marks by strand

Number	**6 marks (15%)**
Algebra	**14 marks (35%)**
Ratio & proportion	**7 marks (18%)**
Geometry & measures	**6 marks (15%)**
Probability	**4 marks (10%)**
Statistics	**3 marks (8%)**

Marks by assessment objective

AO1 Standard techniques	**16 marks (40%)**
AO2 Reasoning	**11 marks (28%)**
AO3 Problem solving	**13 marks (32%)**