



Rewarding Learning

**General Certificate of Secondary Education
2025**

Mathematics

M4

Calculator Paper

Higher Tier

[GMC41]

THURSDAY 15 MAY, 9.15AM–11.15AM

**MARK
SCHEME**

GCSE MATHEMATICS

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, reading from tables, graphs or answers. Accuracy marks may depend on preceding **M** (method) marks, hence **M0 A1** cannot be awarded, i.e. where the method is not correct no marks can be given.

MA indicates marks for combined method and accurate working.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

- (a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;
- (b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examining team).

General Marking Advice

- (i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.
- (ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.
- (iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.
- (iv) Work crossed out but not replaced should be marked.
- (v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line, if two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.
- (vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.
- (vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.
- (viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen, e.g. the answer in the mark scheme is 4.65 and the candidate then correctly round to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.
- (ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.
- (x) For any question, the range of answers given in the mark scheme is inclusive.

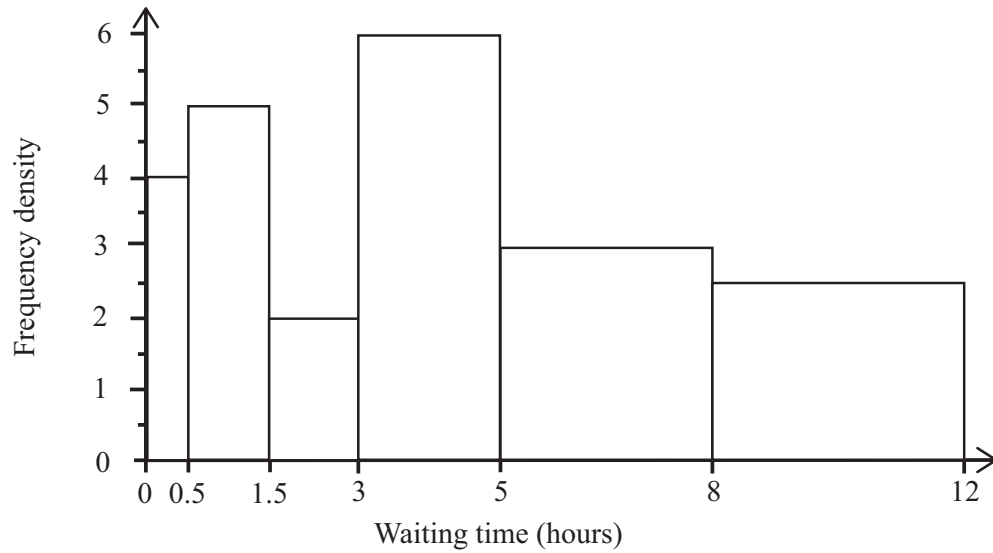
		AVAILABLE MARKS	
1	15% of 60 = 9	MA1	
	AB = 69	MA1	
	20% of 60 = 12		
	BC = 48	MA1	
	Original perimeter = 240cm		
	New perimeter = 234cm	MA1	
	% change = $\frac{6}{240} \times 100 = 2.5\%$		
	decreased by 2.5%	A1 MA1	
	Alternative solution		
	15% of 60 = 9	MA1	
2 × 9 = 18	MA1		
20% of 60 = 12			
2 × 12 = 24	MA1		
change in perimeter = 6cm	MA1		
% change = $\frac{6}{240} \times 100 = 2.5\%$			
decreased by 2.5%	A1 MA1	6	
2	(a) (1, 10)	A1 A1	
	(b) gradient = $\frac{8}{2} = 4$	MA1	
	y = 4x + 6	A1 A1	5
3	4a - 2 = 24	MA1	
	4a = 26	MA1	
	a = 6 $\frac{1}{2}$ or equivalent	MA1	3
4	m ² + (m ² - 2m + 7m - 14)	MA1	
	m ² + m ² + 5m - 14	MA1	
	2m ² + 5m - 14	MA1	3
5	n(n - 4) + 2(n - 4)	MA1	
	n ² - 4n + 2n - 8	MA1	
	n ² - 2n - 8	MA1	
	Alternative solution		
	n(n + 2) - 4(n + 2)	MA1	
	n ² + 2n - 4n - 8	MA1	
	n ² - 2n - 8	MA1	
	Alternative solution		
	(n + 2)(n - 4)	MA1	
	n ² + 2n - 4n - 8	MA1	
	n ² - 2n - 8	MA1	3

			AVAILABLE MARKS
6	(a) $\pi \times 6^2 \times 18$ 2035.75 (204)	M1A1 A1	6
	(b) $\pi \times 6^2 = 113.0973355$ 0.3×113.0973355 34	MA1 MA1 A1	
7	(a) 20	MA1	2
	(b) 8	MA1	
8	$x^2 = 10^2 - 6^2$	MA1	4
	$x^2 = 64$	MA1	
	$x = 8$	MA1	
	$A = \frac{1}{2} \times 13 \times 6 = 39$	MA1	
9	$12 = 3 \times 2 \times 2$ (or 3×4)		3
	$33 = 3 \times 11$	MA1	
	LCM = $3 \times 2 \times 2 \times 11$ (or $3 \times 4 \times 11$) = 132	MA1	
	packs of labels = $132 \div 33 = 4$	MA1	
Alternative solution			
	12 24 36 48 60 72 84 96 108 120 132		3
	33 66 99 132 ...	MA1	
	LCM = 132	MA1	
	4 packs of labels	MA1	
10	(a) (i) $4a(2ab + 3)$	A1 A1	6
	(ii) $(p + 7)(p - 7)$	A1	
	(b) $(w - 7)(w + 5) = 0$ $w = 7$ or $w = -5$	MA2 A1	
11	(a) (4, 22), 52, 76, 90, 97, 100	MA1	6
	(b) Plots all points correctly (100, 4), (150, 22), (200, 52), (250, 76), (300, 90), (350, 97), (400, 100) (allow MA1 for 4 correct) Line/curve through points	MA2 MA1	
	(c) Readings from graph (approx. 245 000 – 155 000) subtracted (approx. 245 000 – 155 000 = 90 000)	MA1 MA1	

			AVAILABLE MARKS
12	$\frac{260}{360} \times \pi \times 7$ 15.9	M1A1 A1	3
13	50kg: 47.5kg (to 52.5kg) 1500kg: (1450kg to) 1550kg $\frac{1550}{47.5} = 32.63157\dots\dots$ 32	A1 A1 MA1 A1	4
14	gradient of perpendicular = $-\frac{1}{4}$ $y = mx + c$ $3 = -\frac{1}{4}(8) + c$ $5 = c$ $y = -\frac{1}{4}x + 5$	A1 MA1 MA1 A1	4
15	(a) $\frac{1}{2}x(x+4) = 38.5$ $x^2 + 4x - 77 = 0$ (b) $(x+11)(x-7) = 0$ $x = 7$ $\tan C = \frac{11}{7}$ $C = 57.5^\circ$	M1A1 A1 A1 MA1 A1	6
16	$\sin 58.4 = \frac{h}{17.3}$ $h = 17.3 \sin 58.4 = 14.73487596$ $\cos x = \frac{14.73487596}{16}$ $x = 22.9^\circ$	MA1 MA1 MA1 A1	4
17	(a) 102° because opposite angles in a cyclic quadrilateral add up to 180° (b) $180 - 78 = 102$ $102 \div 2 = 51^\circ$ isosceles triangle 51° alternate segment theorem	A1 MA1 MA1 A1 MA1	5
18	Jim because 30% of $142 = 42.6$ which is close to 40 Jenny because 43 is a better approximation to 42.6 Alternative solution $\frac{40}{142} = 28.2\%$ which is close to 30% 30% of $142 = 0.3 \times 142 = 42.6$ so 42 or 43 in sample	A1 A1 A1 A1	2

			AVAILABLE MARKS
19	$1008 = 112\%$	MA1	
	$\frac{1008}{1.12} = 900$	A1	
	$900 \times 1.176 = 1058.40$	MA1	
	$1058.40 - 1008 = \text{£}50.40$	MA1	
Alternative solution			
	$C \times 1.12 = 1.176$	M1A1	4
	$C = 1.05$ so 5% profit	A1	
	5% of $\text{£}1008 = \text{£}50.40$	A1	
20	$\frac{2(5+w) + c(5+w)}{75 - 3w^2}$		
	$\frac{(2+c)(5+w)}{3(25-w^2)}$	MA1 numerator MA1 denominator	
	$\frac{(2+c)(5+w)}{3(5-w)(5+w)}$	MA1	
	$\frac{(2+c)}{3(5-w)}$	MA1	
21	$\frac{2x(x+1) - (x+3)(x+4)}{(x+4)(x+1)}$	M1 A1	
	$= \frac{2x^2 + 2x - [x^2 + 4x + 3x + 12]}{(x+4)(x+1)}$	MA1	
	$= \frac{2x^2 + 2x - x^2 - 7x - 12}{(x+4)(x+1)}$	MA1	
	$= \frac{x^2 - 5x - 12}{(x+4)(x+1)}$	MA1	

22 (a)



F.D. 4, 5, 2, 6, 3, 2.5

Scales and labels

Bars

(allow MA1 for 4 correct)

MA1

MA1

MA2

(b) $\frac{41}{2} = 20.5 \quad 3 < h \leq 5$

MA1

$3 + \frac{10.5}{12} \times 2$

M1A1

4.75

A1

Alternative solution

$\frac{41+1}{2} = 21 \quad 3 < h \leq 5$

MA1

$3 + \frac{11}{12} \times 2$

M1A1

4.83

A1

(c) 16 more than 6 hours

8 between 7 and 10 hours

MA1MA1

$\frac{8}{16} \times 5 = 2.5$

MA1

2 or 3

A1

12

Total

100

AVAILABLE MARKS