

GCSE Mathematics (1MA1) – Aiming for Grade 7 3H

Student-friendly mark scheme

Please note that this mark scheme is not the one used by examiners for marking scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

The following table shows the marks scored on average at certain grades on similar questions from live exams.

For example: A student who achieved a Grade 7 on similar questions from either the Summer 2023 or November 2023 exam sittings achieved on average 24.3 marks from these questions.

Grade	9	8	7	6	5	4	3
Mark	30.7	28.2	24.3	18.7	11.8	5.3	2.2

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 (a) (i) Write $x^2 - 8x + 3$ in the form $(x - a)^2 - b$ where a and b are integers.

1 mark

$$(x-4)^2 - 16 + 3$$

$$\text{so } (x-4)^2 - 13$$

Final mark

$$(x-4)^2 - 13$$

(2)

- (ii) Hence, write down the coordinates of the turning point on the graph of $y = x^2 - 8x + 3$

$$(4, -13)$$

1 mark

(1)

- (b) Solve $7x^2 + 8x - 5 = 0$

Give your solutions correct to 3 significant figures.

$$a = 7 \quad b = 8 \quad c = -5$$

Answers accepted in the range 0.448 to 0.449 and -1.59 to -1.60

$$x = \frac{-8 \pm \sqrt{8^2 - 4 \times 7 \times -5}}{2 \times 7}$$

1 mark

$$= \frac{-8 \pm \sqrt{204}}{14}$$

1 mark

Final mark

$$0.449, -1.59$$

$$= 0.448775... \quad \text{or} \quad -1.5916...$$

(3)

Alex has to find the solutions of the quadratic equation $3k^2 + 10k - 8 = 0$

Here is his working and answer.

$$(3k - 2)(k + 4) = 0$$

$$k = 2 \text{ or } k = -4$$

- (c) What mistake has Alex made?

1 mark

correct solution from $3k - 2 = 0$
should be $3k = 2$
 $k = \frac{2}{3}$ not 2

(1)

(Total for Question 1 is 7 marks)

- 2 Make m the subject of $k = p + \frac{2m}{5}$

$$k - p = \frac{2m}{5} \quad 1 \text{ mark}$$

$$\times 5 \qquad \qquad \qquad \times 5$$

$$\frac{5(k-p)}{2} = \frac{2m}{2} \quad 1 \text{ mark}$$

$$\text{so } m = \frac{5(k-p)}{2}$$

Final mark

$$m = \frac{5(k-p)}{2}$$

(Total for Question 2 is 3 marks)

- *3 It takes 14 hours for 5 identical pumps to fill a water tank.
How many hours would it take 4 of these pumps to fill another water tank of the same size?

inverse proportion

$$\begin{array}{lcl} 14 \text{ hours} & = & 5 \text{ pumps} \\ \times 5 \downarrow & & \downarrow \div 5 \\ 70 \text{ hours} & = & 1 \text{ pump} \\ \div 4 \downarrow & & \downarrow \times 4 \\ 17.5 \text{ hours} & = & 4 \text{ pumps} \end{array}$$

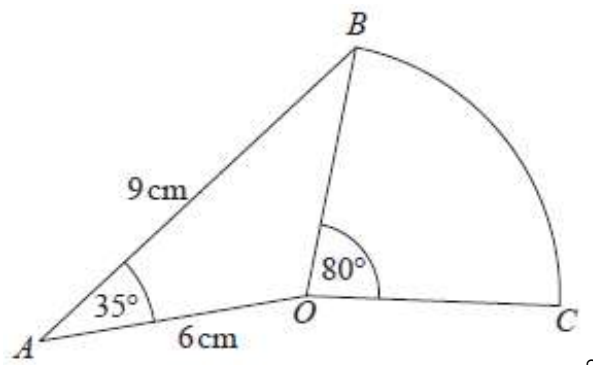
1 mark

Final mark

$$17.5 \text{ hours}$$

(Total for Question 3 is 2 marks)

- 4 OAB is a triangle.
 OBC is a sector of a circle, centre O .



Calculate the area of OBC .

Give your answer correct to 3 significant figures.

$$BO^2 = 9^2 + 6^2 - 2 \times 9 \times 6 \times \cos 35 \quad 1 \text{ mark} \\ = 28.53 \dots \quad 1 \text{ mark}$$

$$BO = \sqrt{28.53 \dots} \\ = 5.341 \dots$$

$$\text{area } OBC = \frac{80}{360} \times \pi \times 5.341 \dots^2 \quad 1 \text{ mark} \\ = 19.9187 \dots \quad \text{Final mark}$$

$$3\text{s.f.} = 19.9$$

19.9

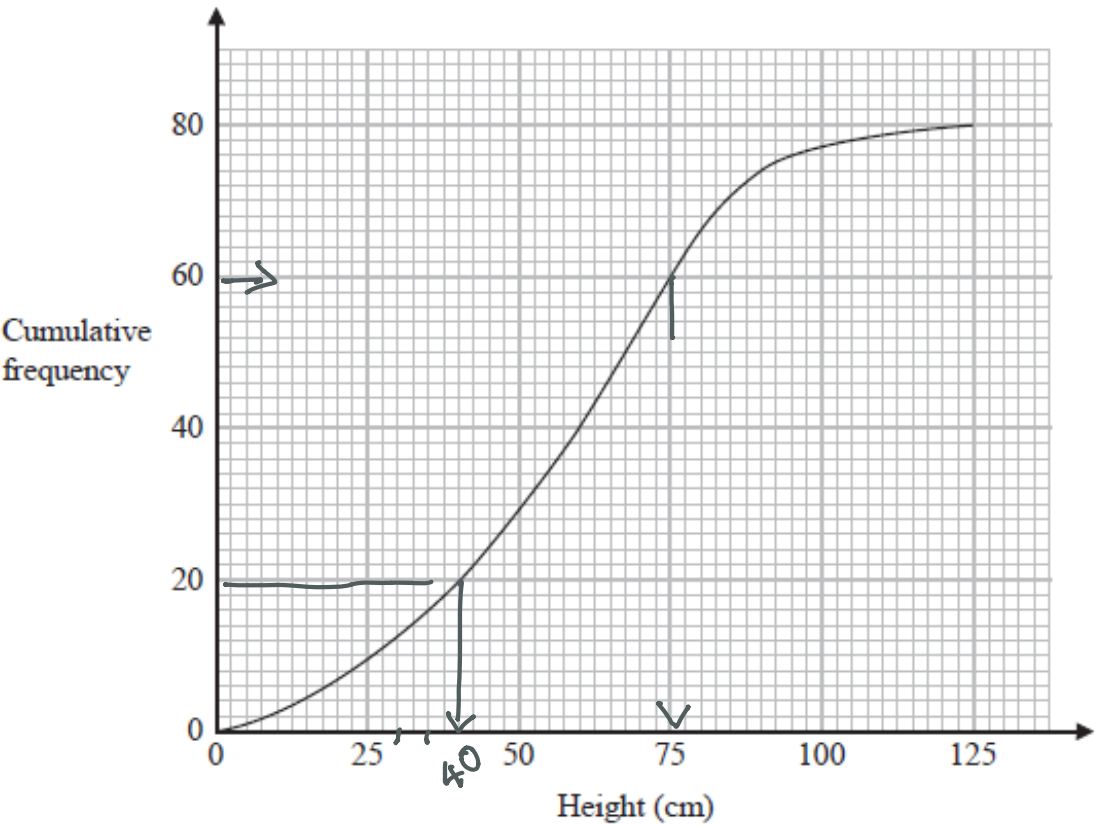
..... cm^2

(Total for Question 4 is 4 marks)

Range accepted 19.8 to 20

5 Alan grew 80 plants of the same type outside.

The cumulative frequency graph shows information about the heights, in cm, of these plants.



Use the graph to find an estimate for the interquartile range of the heights.

1 mark for either of these

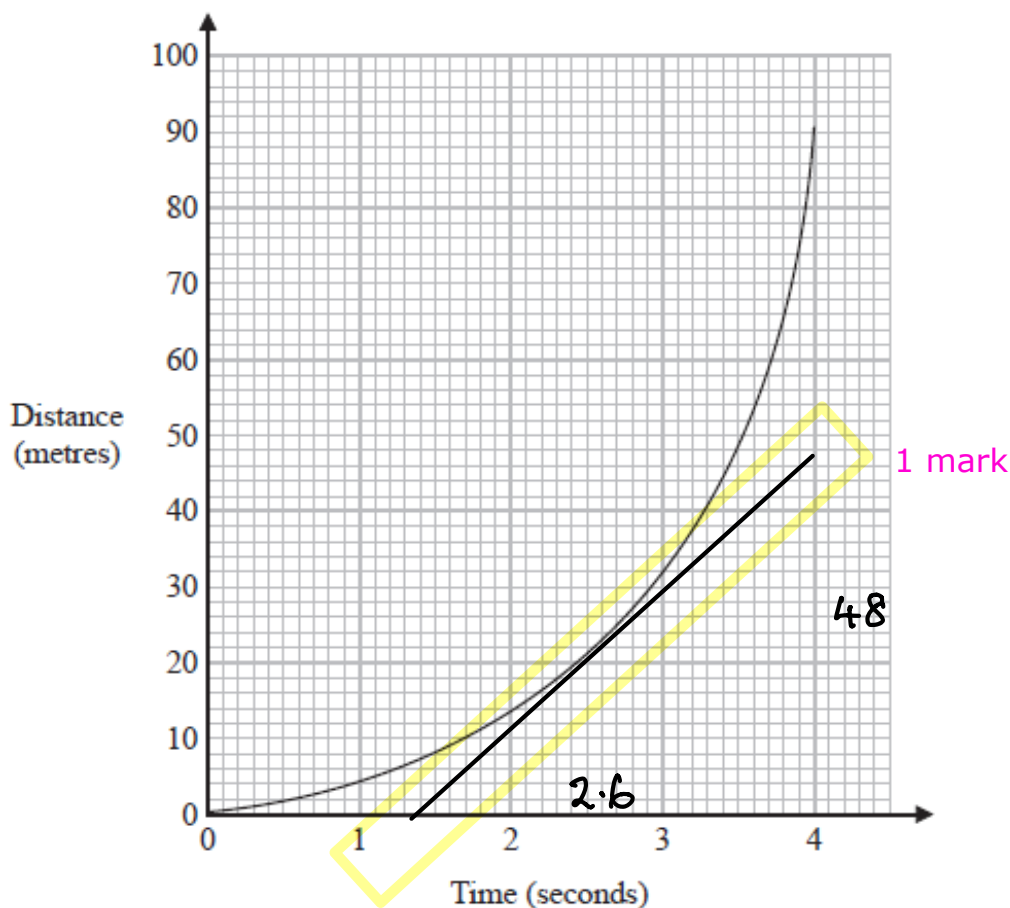
$LQ = 40$ $UQ = 75$
 $75 - 40$

Final mark

35

..... cm
 (Total for Question 5 is 2 marks)

6 Here is a distance-time graph.



Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

gradient = $\frac{48}{2.6}$ 1 mark

..

= 18.46 ..

(This will depend on
your tangent line ...
range of final answers
allowed = 18 to 22

Final mark 18.5

(Total for Question 6 is 3 marks)

*7 Seija works at a weather station.

The table gives information about the temperature, $T^{\circ}\text{C}$, at midday for each of 50 cities in the UK on Tuesday.

1 mark for five multiplications of frequency $\times$ "a point within the interval"

Temperature ($T^{\circ}\text{C}$)	Frequency	Mid	$F \times m$
$10 < T \leq 15$	2	12.5	25
$15 < T \leq 20$	8	17.5	140
$20 < T \leq 25$	13	22.5	292.5
$25 < T \leq 30$	21	27.5	577.5
$30 < T \leq 35$	6	32.5	195
	50		1230

Calculate an estimate for the mean temperature.

1 mark

$1230 \div 50 = 24.6$

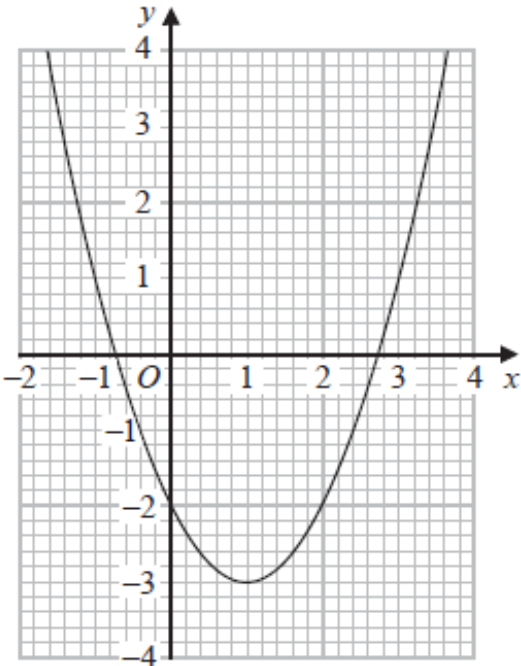
Final mark

24.6

$^{\circ}\text{C}$

(Total for Question 7 is 3 marks)

*8 Here is the graph of $y = x^2 - 2x - 2$



1 mark

Write down an estimate for one of the roots of $x^2 - 2x - 2 = 0$

$x = -0.75 \quad x = 2.75$

(Total for Question 8 is 1 mark)

range (-0.8 to -0.6 2.6 to 2.8)

*9 A and B are numbers such that

$$A = 2^2 \times 3^4 \times 7$$

$$B = 3^2 \times 7^2$$

Find the lowest common multiple (LCM) of A and B .

1 mark may be awarded if at least three multiples of 2268 and 441 are shown.

$$\begin{array}{l} A = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7 \\ B = \quad \quad 3 \times 3 \quad \quad \times 7 \times 7 \end{array}$$

$$\begin{aligned} \text{LCM} &= 3 \times 3 \times 7 \times 2 \times 2 \times 3 \times 3 \times 7 \\ &= 15876 \end{aligned}$$

$$= 15876 \quad \text{2 marks}$$

(Total for Question 9 is 2 marks)

10 Here are the first six terms of a quadratic sequence.

$$\begin{array}{cccccc} 5 & 11 & 21 & 35 & 53 & 75 \\ 6 & 10 & 14 & 18 & 22 & \end{array}$$

$$\begin{array}{l} 50 \quad 4 \div 2 \\ = 2 \end{array}$$

Find an expression, in terms of n , for the n th term of this sequence.

1 mark for either of these

$$\begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 11 & 21 & 35 & 53 & 75 \\ 2 & 8 & 18 & 32 & 50 & 72 \\ +3 & +3 & +3 & +3 & +3 & +3 \end{array}$$

$$\text{so } 2n^2 + 3$$

$$2n^2 + 3 \quad \text{Final mark}$$

(Total for Question 10 is 2 marks)

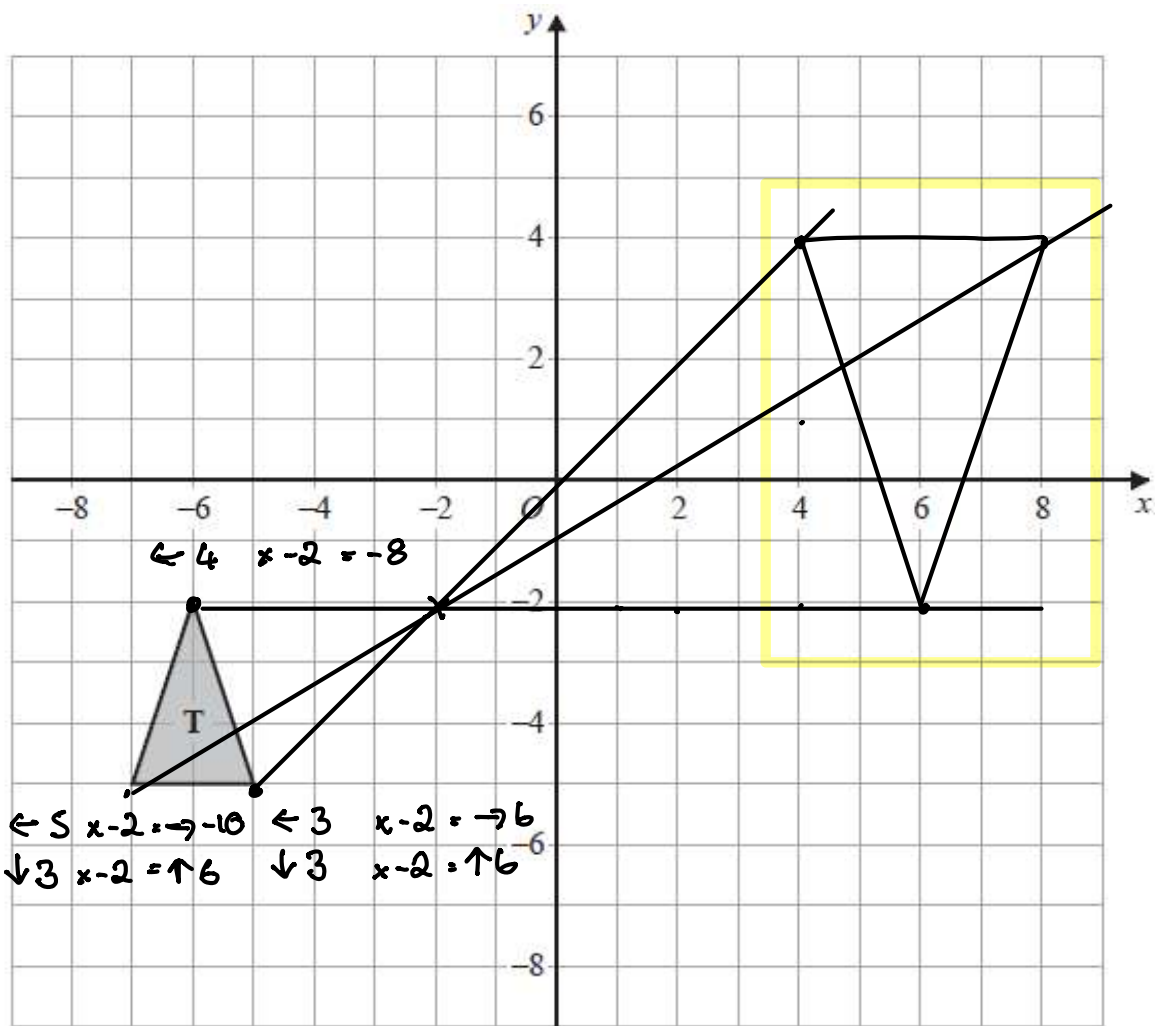
11 Factorise $a^2 - b^2$

$$(a - b)(a + b)$$

1 mark

$$\dots (a - b)(a + b)$$

(Total for Question 11 is 1 mark)



On the grid, enlarge triangle T by scale factor -2 with centre of enlargement $(-2, -2)$

2 marks for fully correct triangle

1 mark may be awarded for two correct points or correct shape & orientation in the wrong place

(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 32 MARKS