

## GCSE Mathematics (1MA1) – Higher Tier Paper 3H

### Mock Set 3 student-friendly mark scheme

**Please note that this mark scheme is not the one used by examiners for making 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.**

### NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme
<p>M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.</p> <p>P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.</p> <p>A1 – accuracy mark. This mark is generally given for a correct answer following correct working.</p> <p>B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.</p> <p>C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.</p> <p>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).</p>

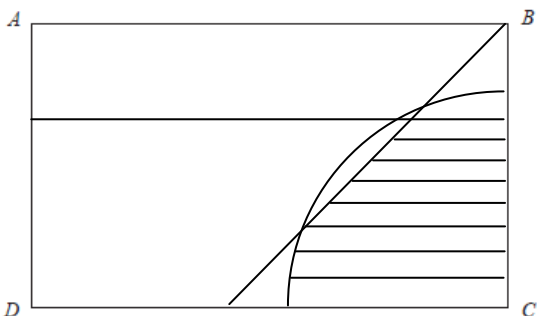
### Question 1 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	168 $2 \times 84$ $2 \times 2 \times 42$ $2 \times 2 \times 2 \times 21$	M1	This mark is given for a method to find the prime factors (at least two steps seen)
	2, 2, 2, 3, 7	M1	This mark is given for a correct list of factors seen
	$2^3 \times 3 \times 7$ or $2 \times 2 \times 2 \times 3 \times 7$	A1	This mark is given for a correct answer only
(b)	2, 3, 4, 6, 7, 8, 12, 14, 21, 24, 28, 42, 56, 84 2, 3, 4, 6, 9, 10, 12, 15, 18, 20, 30, 45, 60, 90 or $168 = 2 \times 2 \times 2 \times 3 \times 7$ $180 = 2 \times 2 \times 3 \times 3 \times 5$	M1	This mark is given for lists of factors of 168 and 180
	$2 \times 2 \times 3 = 12$	A1	This mark is given for the correct answer only

### Question 2 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	Eric: 36.4 miles in 48 minutes $\frac{36.4}{48} \times 60 = 45.5$ miles per hour	P1	This mark is given for a process to find out Eric's average speed per hour
	Geraldine: 65.2 miles in 85 minutes $\frac{65.2}{85} \times 60 = 46.023\dots$ miles per hour	P1	This mark is given for a process to find out Geraldine's average speed per hour
	Geraldine drove at the greater average speed	C1	This mark is given for a correct conclusion supported by working

### Question 3 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B1	This mark is given for a correct arc of radius 4.5 cm, centred on the point $C$
		B1	This mark is given for a correct angle bisector drawn at angle $ABC$
		B1	This mark is given for a line drawn 2 cm from $AB$
		C1	This mark is given for the correct region shaded

### Question 4 (Total 4 marks)

Part	Working or answer an examiner might expect to see				Mark	Notes								
(a)	<table><tr><td>Colour</td><td>red</td><td>yellow</td><td>green</td></tr><tr><td>Probability</td><td><math>\frac{1}{11}</math></td><td><math>\frac{3}{11}</math></td><td><math>\frac{7}{11}</math></td></tr></table>				Colour	red	yellow	green	Probability	$\frac{1}{11}$	$\frac{3}{11}$	$\frac{7}{11}$	M1	This mark is given for at least one probability with a denominator of 11 shown
					Colour	red	yellow	green						
	Probability	$\frac{1}{11}$	$\frac{3}{11}$	$\frac{7}{11}$										
A1	This mark is given for a completely correct table													
(b)	$68 \div \frac{3}{11}$				P1	This mark is given for as process to find the total number of counters								
	249				A1	This mark is given for the correct answer only (accept 250)								

### Question 5 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	Maryam's second line should contain +4 rather than -4	C1	This mark is given for a correct explanation
(b)	Josh's reasoning gives +6x rather than -6x	C1	This mark is given for a correct explanation
(c)	Shona's line should have a positive y-intercept rather than the negative one shown	C1	This mark is given for a correct explanation

**Question 6 (Total 4 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$4.5^2 + 7^2$	P1	This mark is given for a process using Pythagoras to find the length $KM$
	$\sqrt{4.5^2 + 7^2} = \sqrt{69.25} = 8.32\dots$	P1	This mark is given for finding the length $KM$
	$\sin KLM = \frac{\sqrt{69.25}}{15} = 0.55477\dots$	P1	This mark is given for a process to find the sine of angle $KLM$
	$\angle KLM = 33.7$	A1	This mark is given for the correct answer only

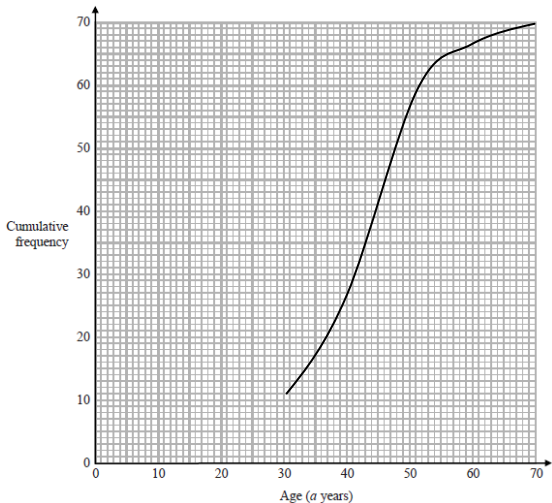
**Question 7 (Total 3 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	Mass of A = $7 \times 1.42 = 9.94$ Mass of C = $(7 + 125) \times 1.05 = 138.6$	P1	This mark is given for a process to find the mass of liquids A and C
	Mass of B = $138.6 - 9.94 = 128.66$ Density of B = $\frac{128.66}{125}$	P1	This mark is given for a process to find the mass and density of liquid B
	1.03	A1	This mark is given for the correct answer only

**Question 8 (Total 2 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$7.3 \leq x < 7.4$	B2	These two marks are given for a correct answer only (B1 is given for numbers 7.3 and 7.4 seen)

### Question 9 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)		B1	This mark is given for at least 4 points plotted correctly (30, 10), (40, 26), (50, 58), (60, 66), (70, 70)
		B1	This mark is given for points joined by a curve (though accept straight lines)
(b)	43	B1	This mark is given for an answer in the range 41–45
(c)	15 people aged less than 35 years 7 people aged more than 55 years	M1	This mark is given for taking readings at 35 and 55 years
	63 – 15 = 48 people 60% of 70 people = 42 people	M1	This mark is given for working out the number of people between 35 and 55 years old
	Yes, Francesco is correct	C1	This mark is given for a correct conclusion supported by working

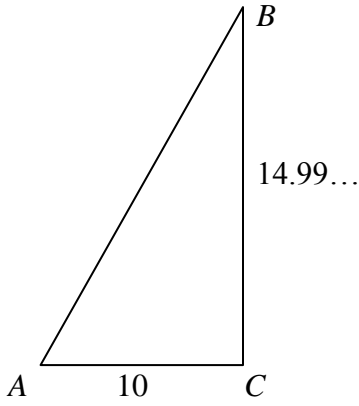
### Question 10 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$293.25 \div 0.85 = 345$	P1	This mark is given for a process to find the price of the TV after the second reduction
	$345 \div 0.75$	P1	This mark is given for a process to find the price of the TV after the second reduction
	460	A1	This mark is given for the correct answer only

**Question 11 (Total 3 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(x + 2)(x + 8) = x^2 + 10x + 16$	M1	This mark is given for a method to find the product of two brackets
	$(x^2 + 10x + 16)(x - 4)$ $= x^3 - 4x^2 + 10x^2 - 40x + 16x - 64$	M1	This mark is given for finding six terms
	$x^3 + 6x^2 - 24x - 64$	A1	This mark is given for the correct answer only

**Question 12 (Total 4 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\pi \times 5^2 \times h = 1178$	P1	This mark is given for a correct substitution into the formula for the volume of a cylinder
	$h = \frac{1178}{25\pi} = 14.99\dots$	P1	This mark is given for a process to find the height of the cylinder
	 <p><math>x</math> = the angle between the road and the base of the tin</p> $\tan x = \frac{14.99}{10} = 1.499\dots$	P1	This mark is given for a process to find the tangent of the angle to be found
	56.31	A1	This mark is given for an answer in the range 56 – 56.31

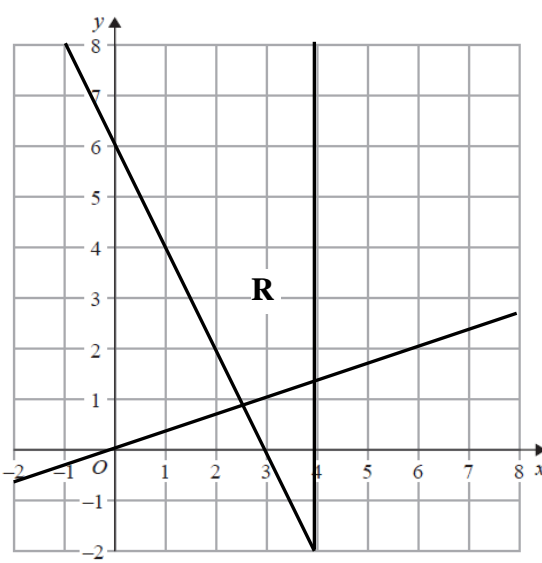
### Question 13 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	Consider consecutive numbers $n$ , $n + 1$ , and $n + 2$	M1	This mark is given for expressing consecutive numbers algebraically
	One less than the square of the of the middle number is $(n + 1)^2 - 1$ $= n^2 + 2n + 1 - 1$ $= n^2 + 2n$	M1	This mark is given for expressing the square of the middle number minus one algebraically
	$= n(n + 2)$ Thus the largest and smallest of the three consecutive numbers are factors	C1	This mark is given for a correct conclusion following correct algebra

### Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$10x = 4.575757\dots$ $1000x = 457.575757\dots$	M1	This mark is given for finding values for $x$ , $10x$ or $1000x$
	$990x = 453$	M1	This mark is given for finding an integer multiple of $x$ equal to another integer
	$x = \frac{453}{990} = \frac{151}{330}$	A1	This mark is given for finding a simplified fraction for $x$

### Question 15 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B2	These marks are given for the lines $x = 4$ , $2x + y = 6$ and $y = \frac{1}{3}x$ drawn  (B1 is given for one or two of these lines drawn)
		A1	This mark is given for the correct region <b>R</b> identified

**Question 16 (Total x marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{10}{N} = \frac{3}{20}$	P1	This mark is given for proportions seen
		P1	This mark is given for a correct equation using proportions
	$3N = 200$ $N = 67$	A1	This mark is given for the correct answer only

**Question 17 (Total 3 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$0.87 \times 30 = 26.1$	M1	This mark is given for a method to find the quantity in 2017
	$0.87 \times 26.1 = 22.707$	M1	This mark is given for a method to find the quantity in 2018
	$0.87 \times 22.707 = 19.76$	A1	This mark is given finding a correct quantity in 2019 (accept answer in the range 19–20)

**Question 18 (Total 2 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sin (180 + a)^\circ = -1$ , so $b = -1$	B1	This mark is given for the correct answer only
	$\sin (180 + a)^\circ = -1$ , so $180 + a = 270$ so $a = 90$	B1	This mark is given for the correct answer only



**Question 19 (Total 4 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\overrightarrow{BC} = 2\mathbf{b} - 3\mathbf{a}$ $\overrightarrow{CB} = 3\mathbf{a} - 2\mathbf{b}$	B1	This mark is given for finding the vector equation for at least one of $\overrightarrow{BC}$ or $\overrightarrow{CB}$
	$\overrightarrow{AD} = \overrightarrow{AB} + \frac{3}{4} \overrightarrow{BC}$ $\overrightarrow{DE} = \frac{3}{4} \overrightarrow{CB} + \overrightarrow{BE}$	M1	This mark is given for a method to find the vector expression for at least one of $\overrightarrow{BC}$ or $\overrightarrow{CB}$
	$\overrightarrow{AD} = 3\mathbf{a} + \frac{3}{4}(2\mathbf{b} - 3\mathbf{a}) = \frac{3}{4}(2\mathbf{b} + \mathbf{a})$ $\overrightarrow{DE} = \frac{3}{4}(3\mathbf{a} - 3\mathbf{b}) + 6\mathbf{b} = \frac{9}{4}(2\mathbf{b} + \mathbf{a})$	A1	This mark is given for a method to find the vector equation for at least one of $\overrightarrow{BC}$ or $\overrightarrow{CB}$
	$\overrightarrow{DE} = 3\overrightarrow{AD}$ so vectors are parallel and have the point $D$ in common Thus $ADE$ is a straight line	C1	This mark is given for a complete correct conclusion

**Question 20 (Total 5 marks)**

Part	Working an or answer examiner might expect to see	Mark	Notes
	$P(\text{OOO}) = \frac{6}{9} \times \frac{5}{8} \times \frac{4}{7} = \frac{120}{504}$	P1	This mark is given for a process to find the probability of one combination of counters that give an odd number
	$P(\text{OEE}) = \frac{6}{9} \times \frac{3}{8} \times \frac{2}{7} = \frac{36}{504}$	P1	This mark is given for a process to find the probability of a second combination of counters that give an odd number
	$P(\text{EOE}) = \frac{3}{9} \times \frac{5}{8} \times \frac{2}{7} = \frac{36}{504}$	P1	This mark is given for a process to find the probability of a third combination of counters that give an odd number
	$P(\text{EEO}) = \frac{3}{9} \times \frac{6}{8} \times \frac{2}{7} = \frac{36}{504}$	P1	This mark is given for a process to find the probability of all four combinations of counters that give an odd number
	$P(\text{odd}) = \frac{120}{504} + \frac{36}{504} + \frac{36}{504} + \frac{36}{504}$ $= \frac{228}{504}$	A1	This mark is given for the correct answer only

**Question 21 (Total 5 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$g(2) = (4 \times 2) - 1 = 7$	M1	This mark is given for finding the value of $g(2)$
	$f(7) = fg(2)$ $= 7^3 = 343$	A1	This mark is given for the correct answer only
(b)	$h(x) = (4x - 1)^3$	M1	This mark is given for a method to find an expression for $h(x)$
	$\sqrt[3]{x} = 4y - 1$ $\sqrt[3]{x} + 1 = 4y$	M1	This mark is given for a method to find $h^{-1}(x)$
	$\frac{\sqrt[3]{x} + 1}{4}$	A1	This mark is given for a correct answer only

**Question 22 (Total 5 marks)**

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sqrt{261 - 15^2} = \sqrt{36} = 6$	P1	This mark is given for a process to find $p$
	$\frac{-15}{6} = -\frac{5}{2}$	P1	This mark is given for a process to find the gradient of $OA$
	Gradient of tangent $= \frac{2}{5}$	P1	This mark is given for a process to find the gradient of the tangent at $A$ (perpendicular to $OA$ )
	$y = \frac{2}{5}x + c$  When $y = -15$ , $x = 6$ so $-15 = \frac{12}{5} + c$  $c = -17\frac{2}{5}$	P1	This mark is given for a process to find the $y$ -intercept of the tangent at $A$
	$y = \frac{2}{5}x - 17\frac{2}{5}$  or $y = 0.4x - 17.4$	A1	This mark is given for the correct answer only