GCSE
MATHEMATICS

PRACTICE PAPER SET 3

Higher Tier Paper 3

Mark Scheme

8300/3H

Version 1.0

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between a and b inclusive.
[*a*, *b*)	Accept values $a \leq$ value $< b$
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

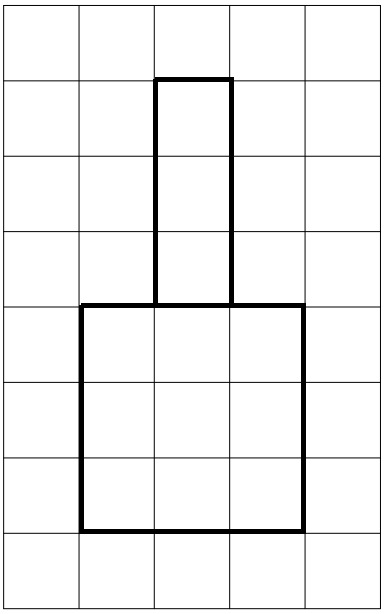
Premature approximation

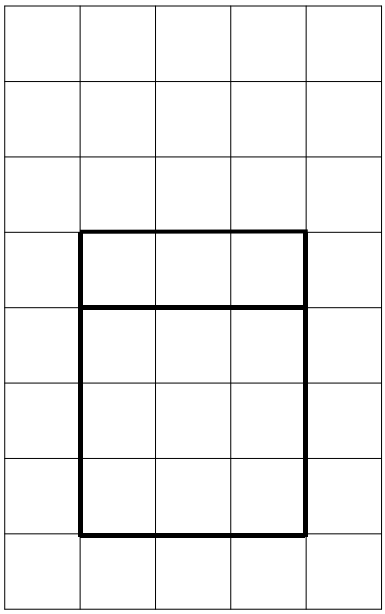
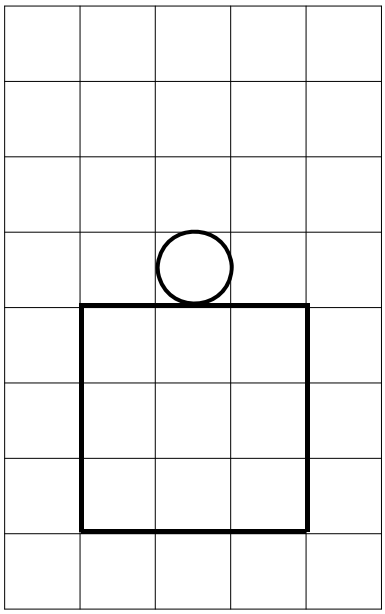
Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the candidate intended it to be a decimal point.

Q	Answer	Mark	Comments
1	$C = \frac{B}{A}$	B1	
2	10^{-3}	B1	
3	$(x - 3)^2 \equiv x^2 - 6x + 9$	B1	
4	D	B1	
5	**Alternative method 1**		
	(0.35 – 0.15) or 0.2	M1	oe
	80	A1	
	Alternative method 2		
	0.35 × 400 or 140 or 0.15 × 400 or 60	M1	oe
	80	A1	
	Additional Guidance		
6	Pair of intersecting arcs, equal radii > half *XY*, above and below *XY*	M1	
	Perpendicular bisector of *XY* drawn with correct construction	A1	
	Arc, centre *Y*, radius [5.3, 5.7] cm	B1	
	Correct region identified	B1ft	ft region to left of their perpendicular bisector and inside their arc
	Additional Guidance		

Q	Answer	Mark	Comments
7(a)		B1	Mark intention 3 cm by 3 cm square with 1 cm by 3 cm rectangle positioned centrally above Must be correct size and orientation but can be anywhere on the grid
	Additional Guidance		

Q	Answer	Mark	Comments
7(b)	**Front** 	B1	Mark intention 3 cm by 3 cm square with 3 cm by 1 cm rectangle above Must be correct size and orientation but can be anywhere on the grid Elevations may be on either grid
	Side 	B1	Mark intention 3 cm by 3 cm square with circle diameter 1 cm positioned centrally above Must be correct size and orientation but can be anywhere on the grid Elevations may be on either grid
	Additional Guidance		

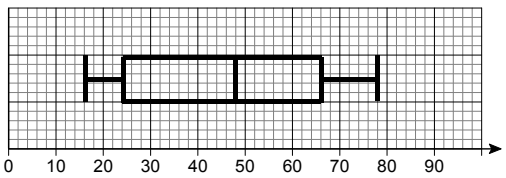
Q	Answer	Mark	Comments
8(a)	B	B1	
8(b)	(10 – 4) ÷ (12 – 8) or 6 ÷ 4	M1	
	1.5	A1	oe
	Additional Guidance		
9	$1 < t \leqslant 2$	B1	
10	**Alternative method 1**		
	$2(2x + 5)$ or $3(x – 1)$ or $7(x + 1)$	M1	oe
	$2(2x + 5) + 3(x – 1)$	M1	oe
	$4x + 10 + 3x – 3$	M1dep	oe Allow one error
	$7x + 7$ with correct working seen as answer to area of T-shape and $7(x + 1) = 7x + 7$ seen for area of rectangle or $7x + 7$ with correct working seen as answer to area of T-shape with factorisation to $7(x + 1)$ and area of rectangle stated as $7(x + 1)$	A1	
Question 10 mark scheme continues on the next page			

Q	Answer	Mark	Comments
10	**Alternative method 2**		
	$5(x – 1)$ or $2(x + 6)$ or $7(x + 1)$	M1	oe
	$5(x – 1) + 2(x + 6)$	M1	oe
	$5x – 5 + 2x + 12$	M1dep	oe Allow one error
	$7x + 7$ with correct working seen as answer to area of T-shape and $7(x + 1) = 7x + 7$ seen for area of rectangle or $7x + 7$ with correct working seen as answer to area of T-shape with factorisation to $7(x + 1)$ and area of rectangle stated as $7(x + 1)$	A1	
	Alternative method 3		
	$5(2x + 5)$ or $3(\frac{x}{2} + 3)$ or $7(x + 1)$	M1	oe
	$5(2x + 5) – 2[3(\frac{x}{2} + 3)]$	M1	oe Allow one error
	$10x + 25 – 3x – 18$	M1dep	oe
	$7x + 7$ with correct working seen as answer to area of T-shape and $7(x + 1) = 7x + 7$ seen for area of rectangle or $7x + 7$ with correct working seen as answer to area of T-shape with factorisation to $7(x + 1)$ and area of rectangle stated as $7(x + 1)$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
11	36×4^2	B1	

12	**Alternative method 1**		
	$4x + y = 32$ and $2x + y = 23$	M1	oe using any letters or words
	$4x - 2x = 32 - 23$ or $2x = 9$ or $2y - y = 46 - 32$	M1	oe elimination of a letter
	First number = 4.5 or second number = 14	A1	oe
	First number = 4.5 and second number = 14	A1	oe SC3 First number = 14 and second number = 4.5
	Alternative method 2		
	Identifies a pair of values that satisfy one statement and correctly evaluates the second statement for those values	M1	
	Identifies a different pair of values that satisfy one statement and correctly evaluates the second statement for those values	M1	
	First number = 4.5 and second number = 14	A2	oe SC3 First number = 14 and second number = 4.5
	Additional Guidance		
	A1 not possible in alternative method 2		

Q	Answer	Mark	Comments
13(a)	$2 = 5t^2$	M1	oe
	0.4 seen	M1dep	oe Implied by –0.6(3…)
	0.6(3…)	A1	Must be the positive value only
	Additional Guidance		
13(b)	**Alternative method 1**		
	$1 = 5t^2$	M1	oe
	0.4(4...) or 0.45	A1	
	Indicates **less than**	A1ft	ft their (a)
	Alternative method 2		
	$5 \times (\frac{1}{2} \times$ their 0.6(3...))^2	M1	oe their 0.6(3...) from (a)
	0.5	A1ft	ft their (a)
	Indicates **less than**	A1ft	ft their (a)
	Alternative method 3		
	States that the ball is accelerating	M1	
	States that this means the 2nd metre takes less time	A1	
	Indicates **less than**	A1	
	Additional Guidance		
	Explanation must mention acceleration		

Q	Answer	Mark	Comments
14	$\frac{12}{8}$ or $\frac{8}{12}$ or $\frac{6}{8}$ or $\frac{8}{6}$ seen	M1	oe
	$6 \times$ their $\frac{12}{8}$ or $6 \div$ their $\frac{8}{12}$ or $12 \times$ their $\frac{6}{8}$ or $12 \div$ their $\frac{8}{6}$	M1dep	oe
	9	A1	
	Additional Guidance		
15	$\div 4$	B1	
16	No units on the vertical axis	B1	oe
	Graph should be a straight line	B1	oe
	Additional Guidance		
17(a)	Fully correct box plot showing lowest, highest, lower quartile, upper quartile and median  Marks	B2	B1 Box plot showing at least three of lowest, highest, lower quartile, upper quartile and median correctly End whiskers not needed if position is clear and correct
	Additional Guidance		

Q	Answer	Mark	Comments
17(b)	(IQR =) 66 – 24 or 42	M1	
	boys and (IQR =) 42	A1	
	Additional Guidance		
	IQR = 42 and boys because median is lower		M1 A0
18	**Alternative method 1**		
	$a : b = 20 : 24$ and $b : c = 24 : 33$ or $a : b : c = 20 : 24 : 33$	M1	oe eg $\frac{a}{5} = \frac{20}{24}, \frac{b}{c} = \frac{24}{33}$ Two correct ratios with a common value for b or one ratio with a common value for b
	77	A1	
	Alternative method 2		
	$c = \frac{(11\times 6)a}{(5\times 8)}$ or $c = \frac{33a}{20}$	M1	oe Must have a link between a and c
	77	A1	
	Additional Guidance		
	Note $b = \frac{6a}{5}$ and $c = \frac{11b}{8}$		
19	105	B3	B2 $a \times b \times c$ with two correct from 3, 7 and 5 B1 $a \times b \times c$ with one correct from 3, 7 and 5 or any two of 3, 7 and 5 possibilities identified for two of the digits
	Additional Guidance		

Q	Answer	Mark	Comments
20	**Alternative method 1**		
	360 ÷ 12 or 30	M1	
	$\frac{\text{their } 30}{100} \times 79$ or 23.7	M1dep	oe
	0.09×260 or 23.4	M1	oe
	23.7 and 23.4 and Yes	A1	
	Alternative method 2		
	360 ÷ 12 or 30	M1	
	$\frac{\text{their } 30}{100} \times 79$ or 23.7	M1dep	oe
	$\frac{\text{their } 23.7}{260} \times 100$ or 9.1...	M1	
	9.1...% and Yes	A1	
	Alternative method 3		
	360 ÷ 12 or 30	M1	
	0.09×260 or 23.4	M1	
	23.4 ÷ 79 × 100 or 29.62	M1dep	Dependent on 2nd M1
	29.62 and 30 and Yes	A1	
	Alternative method 4		
	360 ÷ 12 or 30	M1	
	0.09×260 or 23.4	M1	
	or 23.4 ÷ 30 or 78	M1dep	Dependent on M1M1
	78 and Yes	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	$(5n -)\ 2n^2 + 2n + 3n + 3$ or $(5n -)\ 2n^2 + 5n + 3$	M1	oe Allow one error
	$-2n^2 - 3$	A1	
	$-2n^2 - 3$ and $n^2 \geqslant 0$ so $-2n^2 \leqslant 0$ and subtracting 3 means always negative	A1	oe valid argument eg $-2n^2 - 3$ and $-2n^2 - 3 \leqslant -3$ because $n^2 \geqslant 0$ and $-2n^2 \leqslant 0$
	Alternative method 2		
	$(5n -)\ 2n^2 + 2n + 3n + 3$ or $(5n -)\ 2n^2 + 5n + 3$	M1	oe Allow one error
	$-(2n^2 + 3)$	A1	
	$-(2n^2 + 3)$ and $n^2 \geqslant 0$ so $2n^2 \geqslant 0$ and adding 3 means $2n^2 + 3$ always positive	A1	oe valid argument eg $-(2n^2 + 3)$ and $2n^2 + 3 \geqslant 3$ because $n^2 \geqslant 0$ and $-2n^2 \geqslant 0$
	Additional Guidance		
	M1 One error is implied by expansion of $(2n + 3)(n + 1)$ to either $2n^2 + 5n + ...$ or $... + 5n + 3$		
	Expansion without working seen of $(2n + 3)(n + 1)$ to $2n^2 + kn + 3$ where $k \neq 5$		M0

Q	Answer	Mark	Comments
22(a)	**Alternative method 1**		
	$(x + 3)^2 + \ldots$ or $a = 3$	M1	
	$(x + 3)^2 + 1$	A1	Accept $a = 3$ and $b = 1$
	Alternative method 2		
	$2a = 6$ and $a^2 + b = 10$	M1	
	$(x + 3)^2 + 1$	A1	Accept $a = 3$ and $b = 1$
	Additional Guidance		
22(b)	(–3, 1)	B1ft	oe ft their a and their b
	Additional Guidance		
23	$x_2 = 2$ and $x_3 = 3.5$	M1	
	$x_4 = 3.83(6...)$ and $x_5 = 3.86(4...)$	M1	
	3.87	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
24	**Alternative method 1**		
	$\frac{AD}{\sin(180-32)} = \frac{40}{\sin(32-26)}$	M1	
	$\frac{40}{\sin(32-26)} \times \sin(180-32)$ or 202.7... or 202.8	M1dep	
	$\sin 26 = \frac{h}{\text{their } 202.8}$	M1	
	their $202.8 \times \sin 26$	M1	
	[88.89, 88.9] or 89	A1	
	Alternative method 2		
	$\frac{BD}{\sin 26} = \frac{40}{\sin(32-26)}$	M1	
	$\frac{40}{\sin(32-26)} \times \sin 26$ or 167.7... or 167.8	M1dep	
	$\sin 32 = \frac{h}{\text{their } 167.8}$	M1	
	their $167.8 \times \sin 32$	M1	
	[88.89, 88.9] or 89	A1	
Question 24 mark scheme continues on the next page			

Q	Answer	Mark	Comments
24	**Alternative method 3**		
	$BC \tan 32 = (BC + 40) \tan 26$	M1	oe
	$(BC =) \dfrac{40 \tan 26}{\tan 32 - \tan 26}$ or 142.26... or 142.3	M1dep	
	$(AC =)$ their 142.26... + 40 or 182.26... or 182.3 $\tan 32 = \dfrac{h}{142.26}$	M1	
	their 182.26... × tan 26 or their 142.26 × tan 32	M1	
	[88.89, 88.9] or 89	A1	
	Alternative method 4		
	$h = BC \tan 32$ and $h = (BC + 40) \tan 26$	M1	oe
	$h = \left(\dfrac{h}{\tan 32} + 40\right) \tan 26$	M1dep	Using $BC = \dfrac{h}{\tan 32}$
	$h \tan 32 =$ $h \tan 26 + 40 \tan 26 \tan 32$	M1	
	$\left(\dfrac{40 \tan 26 \tan 32}{\tan 32 - \tan 26}\right)$	M1	
	[88.89, 88.9] or 89	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
25	75 000 or 85 000	B1	
	7350 or 7450	B1	
	$\frac{\text{their } 7450}{\text{their } 75\,000}$ or 0.099(3..)	M1	their 7450 must be (7400, 7450] their 75 000 must be [75 000, 80 000)
	No and 9.9(3...) with no incorrect bounds used	A1	
	Additional Guidance		
26	$\frac{7}{12} \times \frac{6}{11}$ or $\frac{3}{12} \times \frac{2}{11}$ or $\frac{2}{12} \times \frac{1}{11}$	M1	oe
	$\frac{7}{12} \times \frac{6}{11}$ and $\frac{3}{12} \times \frac{2}{11}$ and $\frac{2}{12} \times \frac{1}{11}$	M1	oe This mark implies M1 M1
	$\frac{7}{12} \times \frac{6}{11} + \frac{3}{12} \times \frac{2}{11} + \frac{2}{12} \times \frac{1}{11}$	M1	
	$\frac{25}{66}$ or $\frac{50}{132}$	A1	oe fraction Accept 0.37(8...) or 0.38
	Additional Guidance		

Q	Answer	Mark	Comments
27	Draws tangent at $t = 3$	M1	
	Attempt at vertical ÷ horizontal for their tangent with at least one component correct	M1dep	
	[9.4, 9.8]	A1ft	ft their tangent at t = 3
	beats per min per min or beats/min^2	B1	oe
	Additional Guidance		
28(a)	Reflection (in the line) $y = 1$ or reflection (in) BC	B1	
	Additional Guidance		
28(b)	Rotation through 180° centre P or Q or R or S or T or U or enlargement sf –1 centre P or Q or R or S or T or U	B2	B1 Rotation centre P or Q or R or S or T or U or enlargement centre P or Q or R or S or T or U
	Additional Guidance		
	May use coordinates for centre $P \rightarrow (1, 3)$ or $Q \rightarrow (1, 1)$ or $R \rightarrow (3, 1)$ or $S \rightarrow (3, 2)$ or $T \rightarrow (2, 2)$ or $U \rightarrow (2, 3)$		
	May use about P instead of centre P		

SP/03/15