GCSE
MATHEMATICS

PRACTICE PAPER SET 3

Higher Tier Paper 1

Mark Scheme

8300/1H

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	18π	B1	
2	$6x^3 - 15x^2$	B1	
3	$x > -2$	B1	
4	50×3	B1	
5	$\frac{x}{3} = 12 + 9$ or $\frac{x}{3} = 21$ or $x - 9 \times 3 = 12 \times 3$ or $x - 27 = 36$	M1	$12 \rightarrow + 9 \rightarrow \times 3$ or $(12 + 9) \times 3$
	63	A1	
	Additional Guidance		
	$12 + 9 \times 3 = 39$		M0A0

Q	Answer	Mark	Comments
6(a)	**Alternative method 1**		
	7.2 – 4.8 or 2.4	M1	
	12	A1	
	Alternative method 2		
	7.2 – at least eight 0.2s or 4.8 + at least eight 0.2s	M1	
	12	A1	
	Alternative method 3		
	7.2 ÷ 0.2 or 36 and 4.8 ÷ 0.2 or 24	M1	
	12	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
6(b)	It will take fewer days	B1	oe the answer would be lower eg it will be less than 12
	Additional Guidance		
	Quicker/faster than 12 days		B1
	Quicker/faster alone		B0
7	*DAE* = 180 − 65 − 72 or 43 or *ABC* = 65 or *DAB* = 72 or *EDB* = 180 − 65 or 115 or *BAE* = 180 − 65 or 115	M1	May be on diagram in correct position
	BAC = 180 − 65 − 65 or 50 or *ADB* = 115 − 72 or 43 and *ACD* = 115 or *BAC* = 50, *BAE* = 115 and *ADB* = 115 − 72 or 43 or *CAE* = 65 and *DAE* = 43 or *DAB* = 72 and *BAC* = 50	M1	May be on diagram in correct position oe
	72 – 50 = 22 or 180 − 115 − 43 = 22 or 115 − 50 − 43 = 22 or 65 − 43 = 22	A1	
	Additional Guidance		
	eg 115 or *A* = 50 is ambiguous Written work takes precedence over diagrams if contradictory.		M0

Q	Answer	Mark	Comments
8(a)	**Alternative method 1**		
	43 – 28 or 15 seen	M1	
	15 – 13 (= 2) or 2, 13 and 15	A1	
	Alternative method 2		
	$x + 2y = 28$ and $2x + 3y = 43$	M1	oe equations
	Solves equations correctly obtaining $x = 2$	A1	
	Additional Guidance		
	If setting up two equations, they must be correct		
8(b)	$b - a$	M1	Second term
	$2b - a$	M1dep	oe Fourth term
	$3b - a$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
9	The method will **sometimes** give an answer which is a whole number	B1	
	$\sqrt{64} = 8$ or correctly evaluated example where the answer is a whole number	B1	eg $5^2 - 4^2 = 9$ and 9 is a square number or $5^2 - 4^2 = 3^2$ oe
	Correctly evaluated example where the answer is not a whole number	B1	eg $3^2 - 2^2 = 5$ and 5 is not a square number oe
	Additional Guidance		
	1 or 2 marks can be gained for example(s) even if the decision is incorrect		
	$3^2 - 2^2 = 5$ and 5 is between 4 and 9, implies 5 is not square		B0B0B1

Q	Answer	Mark	Comments
10(a)	**Alternative method 1**		
	25 ÷ 50 (× 60) or 30 minutes or $\frac{1}{2}$ h or 20 ÷ 30 (× 60) or 40 minutes or $\frac{2}{3}$ h or 30 ÷ 40 (× 60) or 45 minutes or $\frac{3}{4}$ h	M1	oe
	Two of 25 ÷ 50 (× 60) or 30 minutes or $\frac{1}{2}$ h and 20 ÷ 30 (× 60) or 40 minutes or $\frac{2}{3}$ h and 30 ÷ 40 (× 60) or 45 minutes or $\frac{3}{4}$ h	M1	oe
	25 ÷ 50 (× 60) or 30 minutes or $\frac{1}{2}$ h and 20 ÷ 30 (× 60) or 40 minutes or $\frac{2}{3}$ h and 30 ÷ 40 (× 60) or 45 minutes or $\frac{3}{4}$ h	M1	oe
	C with all working correct	A1	oe
	Additional Guidance		
	Condone missing units, but note that 30 is given as both a distance and a speed in the question		
	Mark scheme for 10(a) continues on the next page		

Q	Answer	Mark	Comments

10(a)	**Alternative method 2**			
	20 ÷ 30 (× 60) or 40 minutes or $\frac{2}{3}$ h	30 ÷ 40 (× 60) or 45 minutes or $\frac{3}{4}$ h	M1	25 ÷ 50 (× 10) or 30 minutes or $\frac{1}{2}$ h
	$50 \times \frac{2}{3}$ or 33(.3..) miles or $40 \times \frac{2}{3}$ or 26(.6..) miles or 26.7 miles	$50 \times \frac{3}{4}$ or 37.5 miles or $30 \times \frac{3}{4}$ or 22.5 miles	M1	$30 \times \frac{1}{2}$ or 15 miles or $40 \times \frac{1}{2}$ or 20 miles
	$50 \times \frac{2}{3}$ or 33(.3..) miles and $40 \times \frac{2}{3}$ or 26(.6..) miles or 26.7 miles	$50 \times \frac{3}{4}$ or 37.5 miles and $30 \times \frac{3}{4}$ or 22.5 miles	M1	
	C with all working correct		A1	oe
	Additional Guidance			
	Condone missing units, but note that 30 is given as both a distance and a speed in the question and 40 appears as both a time and a speed			

Q	Answer	Mark	Comments
10(b)	time = 30 minutes or $\frac{1}{2}$ h or 15 minutes difference or scale factor 2	B1	oe
	30×2 or $30 \div \frac{1}{2}$ or 60	M1	
	20 mph faster	A1	
	Additional Guidance		
	20 mph with no box ticked		B1M1A0
	20 mph with slower ticked		B1M1A0
11(a)	$\frac{1}{6}$ and $\frac{5}{6}$ on each pair of branches	B1	In correct order
	Additional Guidance		
11(b)	$\frac{1}{36}$	B1	

Q	Answer	Mark	Comments

11(c)	**Alternative method 1**		
	1 – their $\frac{1}{36}$	M1	
	$\frac{35}{36}$	A1ft	ft from part (b) provided probabilities < 1
	Alternative method 2		
	$\frac{1}{6} \times \frac{5}{6} \times 2 + \frac{5}{6} \times \frac{5}{6}$	M1	oe
	$\frac{35}{36}$	A1ft	ft from part (a)
	Additional Guidance		

12(a)	–5	B1	
	Additional Guidance		

12(b)	A is negative	B1	

13(a)	B (0, 2) and D (6, 5) or B (4, 4) and D (–2, 1)	B2	B1 for one correct or for one correct and one incorrect or B and D reversed or correct diagonal drawn of any length
	Additional Guidance		
	eg B(0,2) and D(–2, 1)		B1

13(b)	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$	B2	B1 for vector of same size or for any perpendicular vector
	Additional Guidance		

Q	Answer	Mark	Comments
14	20 or 100 or 10	M1	
	400 or 300 from correct rounding to 1 sig fig	M1dep	
	700	A1	
	Additional Guidance		
	19^2 = 361 → 400 (no other working)		M0M0
15	$2x + \frac{1}{x}$	B1	
16	A	B1	$19^2 = 361 \rightarrow 400$ (no other working)

Q	Answer	Mark	Comments
	Alternative method 1		
17	$\frac{9}{15}$ or 0.6 or $\frac{24}{15}$ or 1.6	M1	oe
	$\frac{9}{15} \times 24$ or $\frac{24}{15} \times 9$ or 14.4(0)	M1dep	oe
	their 14.4(0) + 189 or 203.4(0)	M1	11 - 189
	203.4(0) and Yes	A1	11 and 14.4(0) and Yes or (11 ÷ $\frac{9}{15}$ =) 18.3(3...) and Yes
	Alternative method 2		
	200 – 189 or 11	M1	
	$\frac{9}{15}$ or 0.6 or $\frac{24}{15}$ or 1.6	M1	oe
	$\frac{9}{15} \times 24$ or $\frac{24}{15} \times 9$ or 14.4(0) or 11 ÷ $\frac{9}{15}$ or 18.3(3…)	M1dep	oe
	11 and 14.4(0) and Yes or 18.3(3…) and Yes	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
18	At least 1 point from (–2, 8) (–1, –1) (0, –4) (1, –1) (2, 8) (3, 23) (4, 44)	M1	Seen or implied If only seen plotted allow ± 0.5 square
	At least 3 correct points from (–2, 8) (–1, –1) (0, –4) (1, –1) (2, 8) plotted correctly (± 0.5 square) and attempt to join their points with a smooth curve (± 0.5 square)	M1	
	[–0.75, –0.95]	A1	
	[1.45, 1.65]	A1	
	Additional Guidance		
	For first M1 allow (3, 23) or (4, 44) even though they cannot be plotted		
19(a)	4	B1	
	Additional Guidance		
19(b)	$2 + 3\sqrt{2} + 3\sqrt{2} + 9$	M1	Allow one error
	$11 + 6\sqrt{2}$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
20	$\frac{1}{3}$ or 0.33…	B2	B1 3^{-1} or $\frac{\sqrt{1}}{3}$ or $\left(\frac{1}{9}\right)^{\frac{1}{2}}$ or $\sqrt{\frac{1}{9}}$ or $\frac{1}{9^{\frac{1}{2}}}$ or $\frac{1}{\sqrt{9}}$
	Additional Guidance		
	For B1 responses $\frac{1}{2}$ can be 0.5		
	For final two B1 responses 1 can be $\sqrt{1}$		

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	$(\frac{1}{2} \times BE \times) 10 \times \sin 30$ or $\frac{5}{2} BE$ or (perpendicular height of triangle $=$) 5	M1	oe May have $BE = x$ (or any letter)
	$\frac{1}{2} \times BE \times 10 \times \sin 30 = BE \times BC$	M1dep	oe May have $BE = x$ and $BC = x - 2$ (or any common letter)
	$BC = \frac{1}{2} \times 10 \times \frac{1}{2}$ or $2\frac{1}{2}$ or $BE = 2 + \frac{1}{2} \times 10 \times \frac{1}{2}$ or $2 + 2\frac{1}{2}$	M1dep	oe Must divide by BE and substitute $\sin 30 = \frac{1}{2}$ May have $BC = x - 2$ (or any letter)
	$4\frac{1}{2}$	A1	oe
	Mark scheme for 21 continues on the next page		

Q	Answer	Mark	Comments
21	**Alternative method 2**		
	$(\frac{1}{2} \times (BC + 2) \times) 10 \times \sin 30$ or $\frac{5}{2}(BC + 2)$ or (perpendicular height of triangle $=$) 5	M1	oe May have $BC = x$ (or any letter)
	$\frac{1}{2} \times (BC + 2) \times 10 \times \sin 30$ $= (BC + 2) \times BC$	M1dep	oe May have $BC = x$ (or any common letter)
	$BC = \frac{1}{2} \times 10 \times \frac{1}{2}$ or $2\frac{1}{2}$ or $BE = 2 + \frac{1}{2} \times 10 \times \frac{1}{2}$ or $2 + 2\frac{1}{2}$	M1dep	oe Must divide by (BC + 2) and substitute $\sin 30 = \frac{1}{2}$ May have $BC = x$ (or any letter)
	$4\frac{1}{2}$	A1	oe
	Additional Guidance		
22	0.8×10 or 8 or 1.6×20 or 32 or 2.2×10 or 22 or 2×5 or 10	M1	Any one fd $\times$ class width
	$0.8 \times 10 + 1.6 \times 20 + 2.2 \times 10$ $+ 2 \times 5$ or 8 + 32 + 22 + 10	M1dep	oe
	72	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
23	**Alternative method 1**		
	$\frac{5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ or $\frac{5\sqrt{3}}{3}$	M1	oe $5 - \sqrt{3}\sqrt{6\frac{3}{4}} = 3k$
	$(\sqrt{6\frac{3}{4}} = \sqrt{\frac{27}{4}} =)$ $\frac{\sqrt{27}}{2}$ or $\frac{3\sqrt{3}}{\sqrt{4}}$ or $\frac{3\sqrt{3}}{2}$	M1	
	$(\frac{5\sqrt{3}}{3} - \frac{3\sqrt{3}}{2} =)$ $\frac{10\sqrt{3}}{6} - \frac{9\sqrt{3}}{6}$	M1dep	oe dep on M1 M1 Any correct common denominator with at least one numerator correct $\frac{10\sqrt{3}}{2} - \frac{9\sqrt{3}}{2} = 3k$
	$\frac{1\sqrt{3}}{6}$ or $\frac{\sqrt{3}}{6}$ or $\frac{1}{6}\sqrt{3}$	A1	oe but must be $k\sqrt{3}$
	Alternative method 2		
	$(\sqrt{6\frac{3}{4}} = \sqrt{\frac{27}{4}} =)$ $\frac{\sqrt{27}}{2}$ or $\frac{3\sqrt{3}}{\sqrt{4}}$ or $\frac{3\sqrt{3}}{2}$	M1	
	$(\frac{5}{\sqrt{3}} - \frac{3\sqrt{3}}{2} =)$ $\frac{10}{2\sqrt{3}} - \frac{9}{2\sqrt{3}}$ or $\frac{1}{2\sqrt{3}}$	M1dep	oe Any correct common denominator with at least one numerator correct ft their $\frac{3\sqrt{3}}{2}$
	$\frac{1}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	M1dep	oe
	$\frac{1\sqrt{3}}{6}$ or $\frac{\sqrt{3}}{6}$ or $\frac{1}{6}\sqrt{3}$	A1	oe but must be $k\sqrt{3}$
	Additional Guidance		
	Alt 1 first M1 and alt 2 third M1 oe Multiplying by eg $\frac{2\sqrt{3}}{2\sqrt{3}}$		

Q	Answer	Mark	Comments
24	**Alternative method 1**		
	$(x =)$ 0.288..... and $(10x =)$ 2.88.....	M1	At least two 8s needed
	$9x = 2.6$ or $\frac{2.6}{9}$	M1dep	oe
	$\frac{13}{45}$	A1	
	Alternative method 2		
	$(10x =)$ 2.88..... and $(100x =)$ 28.8.....	M1	At least two 8s needed
	$90x = 26$ or $\frac{26}{90}$	M1dep	oe
	$\frac{13}{45}$	A1	
	Alternative method 3		
	$(1x =)$ 0.288..... and $(100x =)$ 28.8.....	M1	At least two 8s needed
	$99x = 28.6$ or $\frac{28.6}{99}$	M1dep	oe
	$\frac{13}{45}$	A1	
	Alternative method 4		
	$\frac{2}{10} + \frac{8}{90}$	M1	oe fractions
	$\frac{18}{90} + \frac{8}{90}$ or $\frac{26}{90}$	M1dep	oe Correct conversion to a common denominator
	$\frac{13}{45}$	A1	
	Additional Guidance		
	Any fraction equivalent to $\frac{13}{45}$		M1 M1 A0

Q	Answer	Mark	Comments
25(a)	$\frac{39}{295}$	B1	
	Additional Guidance		
25(b)	$\frac{14}{43}$	B1	
	Additional Guidance		
25(c)	x in History only (and $3x$ in English only) or expressions inside circles such that the number who take English is twice the number who take History	M1	
	x + their x + their $3x$ + 125 = 295	M1	oe equation Must have three expressions inside circles
	34	A1	
	Additional Guidance		
	$2x$ in History only and $5x$ in English only		M1
26(a)	$0^2 + (-5)^2 = 25$ or $(0^2 +) y^2 = 25$ and $y = -5$ or radius of the circle is 5	B1	 oe
	Additional Guidance		
	B is on the y-axis		B0
	B is below the Origin		B0

Q	Answer	Mark	Comments

26(b)	Tangents from an external point are equal in length	B1	
	Additional Guidance		

26(c)	**Alternative method 1**		
	$(a-3)^2 + (-5-4)^2 = a^2$	M1	oe $PA^2 = PB^2$
	$a^2 - 3a - 3a + 9 + 81 = a^2$	M1	Expands brackets Allow one error
	$6a = 90$	M1	Rearranges their quadratic equation to $ka = c$
	$(a =)$ 15 and $(b =) -5$	A1	SC1 $b = -5$
	Alternative method 2		
	(grad $AP =$) $-1 \div \frac{4}{3}$ or $-\frac{3}{4}$	M1	
	$y - 4 = -\frac{3}{4}(x-3)$ or $y = -\frac{3}{4}x + c$ and substitutes (3, 4)	M1	oe eg $y = -\frac{3}{4}x + \frac{25}{4}$ ft their gradient AP
	$-5 = -\frac{3}{4}x + \frac{25}{4}$	M1	oe ft their equation AP
	$(a =)$ 15 and $(b =) -5$	A1	SC1 $b = -5$
	Mark scheme for 26(c) continues on the next page		

Q	Answer	Mark	Comments
26(c)	**Alternative method 3**		
	$\frac{XP}{4--5}=\frac{4}{3}$	M1	oe May be seen on diagram *X* is foot of perpendicular from *A* to *BP*
	$XP=\frac{4}{3}\times(4--5)$ or $XP=12$	M1	oe Must have calculation or value for *XP*
	12 + 3 or 15	M1	oe
	$(a=)$ 15 and $(b=)$ –5	A1	SC1 $b=-5$
	Additional Guidance		

SP/03/15