GCSE
MATHEMATICS

New Specimen Papers published June 2015
Paper 3 Higher - Mark Scheme

8300/3H

Version 1.0

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

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.
3.14 …	Accept 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.

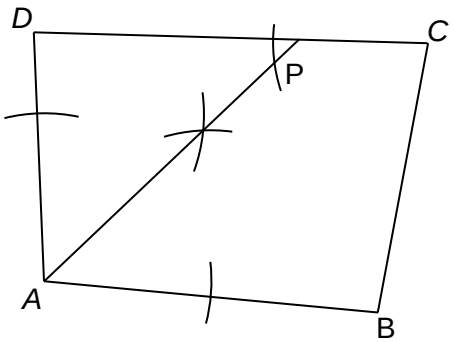
Work replaced

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.

Q	Answer	Mark	Comments
1	10 000	B1	
2	$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$	B1	
3	0.667	B1	
4	D	B1	
5	**Alternative method 1**		
	6.31 – 3.6(0) or 2.71	M1	
	their 2.71 ÷ 3.6(0) (× 100) or 0.752(7…) or 0.753	M1dep	
	75.2(7…) or 75.28 or 75.3	A1	Allow 75 with correct method seen
	Alternative method 2		
	6.31 ÷ 3.6(0) (× 100) or 1.752(7…) or 1.753 or 175.2(7…) or 175.3	M1	
	1.752(7…) – 1 or 1.753 – 1 or 175.2(7…) – 100 or 175.3 – 100	M1dep	
	75.2(7…) or 75.28 or 75.3	A1	Allow 75 with correct method seen

Q	Answer	Mark	Comments
6	$9 + 3x + x - 5 + 2x$ or $6x + 4$ or $3x + x - 5 + 2x$ or $6x - 5$	M1	oe
	their $(6x + 4) = 100$ or their $6x - 5 = 91$ or $6x = 96$	M1	oe $\frac{9}{\text{their } (6x + 4)} = \frac{9}{100}$
	$x = 16$	A1	
	$\frac{11}{100}$	B1ft	ft their 16
7	One continuous arc, centre *A*, intersecting *AB* and *AD* or Two arcs, each with same radius and centre *A,* intersecting *AB and AD*	M1	Allow ± 2 mm for radii
	Intersecting arcs with same radius and centres at the intersections with *AB* and *AD* and angle bisector drawn	A1	Allow ± 2 mm for radii The radius of these arcs need not be the same as those used for M1
	Arc of radius [5.8, 6.2] cm, centre *C,* intersecting their angle bisector and *P* labelled  		SC1 Arc of radius [5.8, 6.2] cm, centre *C* with no angle bisector attempted

Q	Answer	Mark	Comments
8(a)	375.112(1656)	B1	Condone if correctly rounded to 7 significant figures or better eg 375.1122
8(b)	20^2 or 400 or $\sqrt[3]{1000}$ or 10 or 5	M1	
	400 – 10 ÷ 5 = 398 or 400 – 2 = 398	A1	
9	octagon	B1	

Q	Answer	Mark	Comments
10	**Alternative method 1**		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB =$ their 75 and $\angle BCD = 180 -$ their 75 or $105°$	M1	oe Angle may be seen on diagram
	$x = 105 - 75 = 30°$	A1	Full method required
	Alternative method 2		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB =$ their 75 and $\angle ABP =$ their $75 - 15$ or $60°$ and $\angle BAC = 180 - 90 -$ their 60	M1	oe Angles may be seen on diagram
	$x = \angle BAC = 30°$	A1	Full method required
	Alternative method 3		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB =$ their 75 and $\angle BAC = 180 -$ their $75 -$ their 75	M1	oe Angle may be seen on diagram
	$x = \angle BAC = 30°$	A1	Full method required

Q	Answer	Mark	Comments
11	100(%) – 14(%) or 86(%) or 1 – 0.14 or 0.86	M1	Implied by 87 139(.5)
	$101\ 325 \times 0.86^4$	A1	oe eg 101 325 × 0.86 or 87 139(.5) and their 87 139(.5) × 0.86 or 74 939(.97) and their 74 939(.97) × 0.86 or 64 448(.3742) and their 64 448(.3742) × 0.86
	55 425(...)	A1	May be implied by 55 000 or 55 400 or 55 430 or 55 426
	55 000	B1ft	ft their answer rounded to 2sf
12(a)	Ticks 'False' and states that x could be -4	B1	oe
12(b)	True and $20n \div 2n = 10$	B1	oe
12(c)	False and y could be between 0 and 1	B1	oe eg False and $y = 0.5$
13	Cumulative frequency 46 should be 48	B1	oe
	Points should be plotted at end of class intervals	B1	oe
14(a)	1536	B1	
14(b)	$2^{n+2} + 2^{n+1}$	B1	

Q	Answer	Mark	Comments
15	6.5 – 2.3 or 4.2 and 5 or 85 seen	M1	
	$\sin 5 = \frac{6.5 - 2.3}{AD}$ or $\cos 85 = \frac{6.5 - 2.3}{AD}$ or $\left(\frac{6.5 - 2.3}{\tan 5}\right)^2 + (6.5 - 4.2)^2$	M1	oe
	$\frac{6.5 - 2.3}{\sin 5}$ or $\frac{6.5 - 2.3}{\cos 85}$ or $\sqrt{\left(\frac{6.5 - 2.3}{\tan 5}\right)^2 + (6.5 - 4.2)^2}$	M1dep	oe
	[48, 48.2]	A1	

Q	Answer	Mark	Comments
16	**Alternative method 1**		
	$\frac{5}{6+5+7}$ or $\frac{5}{18}$ or $\frac{7}{9+7+8}$ or $\frac{7}{24}$	M1	oe fraction, decimal or percentage
	Attempt to convert to any common denominator eg $\frac{20}{72}$ and $\frac{21}{72}$ or to decimals eg 0.27(7…) and 0.29 eg 3 0.28 and 0.29) or to percentages eg 28% and 29%	M1	Attempt to convert both to comparable form with one correct oe
	$\frac{20}{72}$ and $\frac{21}{72}$ and Yes	A1	oe fractions, decimals or percentages
	Alternative method 2		
	Chooses a number of counters that is a multiple of 18 and 24 eg 72	M1	
	$5 \times \frac{\text{their } 72}{18}$ or 20 or $7 \times \frac{\text{their } 72}{24}$ or 21	M1	
	20 and 21 and Yes	A1	
	Alternative method 3		
	35 : 42 : 49 and 35 : 45 : 40	M1	
	$\frac{35}{35+\text{their } 42+\text{their } 49}$ or $\frac{35}{126}$ or $\frac{35}{35+\text{their } 45+\text{their } 40}$ or $\frac{35}{120}$	M1	
	$\frac{35}{126}$ and $\frac{35}{120}$ and Yes	A1	

Q	Answer	Mark	Comments
17	$(3x + a)(x + b)$ where $ab = 8$ or $a + 3b = 14$ or $3x(x + 4) + 2(x + 4)$ or $x(3x + 2) + 4(3x + 2)$	M1	
	$(3x + 2)(x + 4)$	A1	oe
18	16×2 or 32 or $7 \times x$ or $7x$ or 20×12 or 240 or 10×17 or 170 or $16 + x + 20 + 10$ or $46 + x$	M1	oe
	$16 \times 2 + 7 \times x + 20 \times 12 + 10 \times 17$ or $16 \times 2 + 7x + 240 + 170$ or $442 + 7x$	M1	oe Must be the sum of 4 products Award if correct expression seen, even if in an incorrect equation
	their $(32 + 7x + 240 + 170) = 8.5 \times$ their $(16 + x + 20 + 10)$ or their $(442 + 7x) = 8.5 \times$ their $(46 + x)$	M1	oe equation ft their sum of at least 3 products, one of which must be $7 \times x$ ft sum of at least 3 frequencies, one of which must be x
	their $442 -$ their $(8.5 \times 46) = 8.5x - 7x$	M1dep	oe equation dep on 3rd M1 Expands and rearranges their equation Allow one sign or expansion error
	34	A1	Answer 34 with no incorrect working gains 5 marks

Q	Answer	Mark	Comments
19	$x^2 + 6$ or $(x - 3)^2$	M1	
	$x^2 - 3x - 3x + 9$	M1	4 terms with 3 correct
	$6x < 3$	M1dep	oe linear inequality dep on two quadratic expressions ft their quadratic expressions
	$x < 0.5$	A1	oe
20	$\frac{\sin y}{16} = \frac{\sin 34}{10}$	M1	oe
	$\frac{\sin 34}{10} \times 16$ or [63.47, 63.5]	M1	
	[116.5, 116.53]	A1	

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	27.5 or 26.5 or 20.5 or 19.5 or 15.5 or 14.5 or 14.35 or 14.25 or 19.25 or 19.15 or 1.55 or 1.45	B1	Any one seen
	a bound of 27 ÷ a bound of 1.5	M1	Must see the calculation written down $26.5 \leqslant$ a bound of $27 \leqslant 27.5$ but not 27 $1.45 \leqslant$ a bound of $1.5 \leqslant 1.55$ but not 1.5 eg 1 27.49 ÷ 1.45 eg 2 26.45 ÷ 1.54999
	26.5 ÷ 1.55	M1	Must see the calculation written down 26.5 ÷ 1.55 scores B1 M1 M1
	[17.0, 17.1]	A1	Must see method
	Alternative method 2		
	27.5 or 26.5 or 20.5 or 19.5 or 15.5 or 14.5 or 14.35 or 14.25 or 19.25 or 19.15 or 1.55 or 1.45	B1	Any one seen
	17 × a bound of 1.5	M1	Must see the calculation written down $1.45 \leqslant$ a bound of $1.5 \leqslant 1.55$ but not 1.5 eg 1 17 × 1.45 eg 2 17 × 1.54999
	17 × 1.55	M1	Must see the calculation written down 17 × 1.55 scores B1 M1 M1
	26.35 and 26.5	A1	Must see method

Alternative method 3 on next page

Q	Answer	Mark	Comments
21	**Alternative method 3**		
	27.5 or 26.5 or 20.5 or 19.5 or 15.5 or 14.5 or 14.35 or 14.25 or 19.25 or 19.15 or 1.55 or 1.45	B1	Any one seen
	a bound of 27 ÷ 17	M1	Must see the calculation written down 26.5 ⩽ a bound of 27 ⩽ 27.5 but not 27 eg 1 27.49 ÷ 17 eg 2 26.45 ÷ 17
	26.5 ÷ 17	M1	Must see the calculation written down 26.5 ÷ 17 scores B1 M1 M1
	[1.558, 1.559] and 1.55	A1	
22	$\frac{9}{27}$ or $\frac{18}{27}$ or fraction with denominator 22	M1	oe
	$\frac{9}{27} \times \frac{8}{22}$ or $\frac{72}{594}$ or $\frac{18}{27} \times \frac{7}{22}$ or $\frac{126}{594}$	M1	oe
	their $\frac{72}{594}$ + their $\frac{126}{594}$ or $\frac{198}{594}$	M1dep	oe dep on 2nd M1
	Clear indication that $\frac{198}{594}$ and $\frac{9}{27}$ are equivalent fractions	A1	
23(a)	C	B1	
23(b)	Draws tangent at $t = 3$	M1	
	[3.6, 4.4]	A1	SC1 correct gradient for their tangent

Q	Answer	Mark	Comments
24	0.5 × 20 × 8 or 80 or 30 × 8 or 240 or 0.5 × (50 + 30) × 8 or 320	M1	oe Attempt at any part of the area below the graph up to 50s
	0.5 × (8 + 5) × 14 or 91	M1	oe Attempt at area below the graph for time between 50s and 64s
	their 80 + their 240 + their 91 or their 320 + their 91 or 411	M1dep	dep on M1 M1 An attempt at total area for 64 seconds
	411 and Amina	A1	
25(a)	$\overrightarrow{BC} = 2\mathbf{a} - 3\mathbf{b}$ or $\overrightarrow{CB} = -2\mathbf{a} + 3\mathbf{b}$ or $\overrightarrow{AM} = \mathbf{a}$ or $\overrightarrow{MA} = -\mathbf{a}$ or $\overrightarrow{BN} = \frac{2}{5}\overrightarrow{BC}$ or $\overrightarrow{CN} = -\frac{3}{5}\overrightarrow{BC}$	M1	oe
	$\mathbf{a} + \frac{3}{5}(-2\mathbf{a} + 3\mathbf{b})$ or $-\mathbf{a} + 3\mathbf{b} + \frac{2}{5}(2\mathbf{a} - 3\mathbf{b})$	M1	oe
	$-\frac{1}{5}\mathbf{a} + \frac{9}{5}\mathbf{b}$	A1	oe eg $-0.2\mathbf{a} + 1.8\mathbf{b}$ or $\frac{1}{5}(9\mathbf{b} - \mathbf{a})$ Must collect terms
25(b)	$\overrightarrow{MN}$ is not a multiple of $\overrightarrow{AB}$	B1ft	oe

Q	Answer	Mark	Comments
26(a)	$-\frac{1}{2}$ or –0.5	B1	
	$-\frac{25}{64}$ or –0.390625	B1ft	ft their $-\frac{1}{2}$
26(b)	–0.381966	B1ft	ft their $-\frac{25}{64}$
27	$y = -x^2 + 5x - 2$	B1	
28	**Alternative method 1**		
	$y = 2x$ or $(x, 2x)$	M1	oe
	$x^2 + (2x)^2 = 2645$	M1	oe
	$x^2 = 2645 \div 5$ or $x^2 = 529$ or $x = 23$	M1	
	(23, 46)	A1	
	Alternative method 2		
	$\frac{1}{2}y = x$ or $(\frac{1}{2}y, y)$	M1	oe
	$(\frac{1}{2}y)^2 + y^2 = 2645$	M1	oe
	$y^2 = 2645 \div \frac{5}{4}$ or $y^2 = 2116$ or $y = 46$	M1	
	(23, 46)	A1	

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