

Mark Scheme (Results)

November 2011

Applications of Mathematics (GCSE)
Unit 2: 5AM2H_01 (Higher)

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NOTES ON MARKING PRINCIPLES

- 1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- 2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- 3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- 4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- 5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- 6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.
 - ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
 - iii) *organise information clearly and coherently, using specialist vocabulary when appropriate.*
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

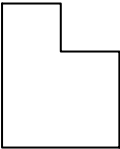
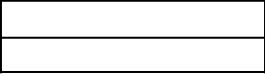
13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme

M1 – method mark
A1 – accuracy mark
B1 – Working mark
C1 – communication mark
QWC – quality of written communication
oe – or equivalent
cao – correct answer only
ft – follow through
sc – special case
dep – dependent (on a previous mark or conclusion)
indep – independent
isw – ignore subsequent working

5AM2H_01					
Question		Working	Answer	Mark	Notes
1	(a)	$\frac{10 \times 0.8}{2}$	4	2	M1 for $\frac{10 \times 0.8}{2}$ oe A1 cao
	(b)	$30 \times 5 - 4.9 \times 5^2$	27.5	2	M1 for 30×5 and 4.9×5^2 or 150 and 122.5 A1 cao
2	(a)	$\pi \times 4.5^2$	63.6	2	M1 for $\pi \times 4.5^2$ A1 for 63.5 – 63.7
	(b)	$1000 \div 4$	250	4	M1 for $1000 \div 4$ or 250 or 750 seen
		$\frac{1000 - 250 = 750}{(2 + 3)} \times 2$	300		M1 for $(1000 - 250) \div (2 + 3)$ oe or $\frac{2}{5}$ or $\frac{3}{5}$ oe or 150 seen
$\frac{750}{(2 + 3)} \times 3$	450	M1 (dep) for '150' $\times 2$ or '150' $\times 3$ or $\frac{2}{5} \times 750$ or $\frac{3}{5} \times 750$ A1 for 250, 300 and 450 in correct places (SC: B2 for 250, 450, 300, i.e. tulips and hyacinths transposed)			
3			$P = 9h + 60$	2	M1 for $9 \times h + k$ ($k \neq 0$) or $m \times h + 60$ ($m \neq 9$) or $9 \times h + 60$ A1 for $P = 9h + 60$ condone inclusion of money notation
4	(a)	$23 \times 50 \div 100$	11.5	2	M1 for 23×50 or 1150 seen or 0.23×50 or 23×0.5 A1 cao
	(b)	$2.4 \div 50 \times 100$	4.8	2	M1 for $2.4 \div 50$ or 0.048 seen or $240 \div 50$ or $2.4 \div 0.5$ A1 cao

5AM2H_01					
Question		Working	Answer	Mark	Notes
5	(a)		Correct elevation 	2	B2 for correct elevation in correct orientation (B1 for incorrect orientation)
	(b)		Correct plan 	2	B2 for correct plan with internal line shown (B1 for internal line missing or for rectangle with one incorrect dimension)
6		$1 - (0.008 + 0.015)$	0.977	2	M1 for $1 - (0.008 + 0.015)$ oe A1 for 0.977 oe
7			Correct region shaded	3	B1 for perpendicular bisector within guidelines B1 for arc of circle within guidelines B1 for correct region shaded or otherwise indicated
*8		$\frac{60 \times 60 \times 50}{2}$ $= 90\,000$ $90\,000 \div 1000 = 90$ $90 \div 15 = 6$ $6 \times 12 = 72, 72 < 100$ OR $100 \div 6 = 16.66\dots, 16.66\dots > 12$ OR $100 \div 12 = 8.33\dots, 8.33 > 6$	Yes with full supporting working	5	M1 for $\frac{60 \times 60 \times 50}{2}$ or 90 000 M1 for '90 000' \div 1000 or '90 000' \div 15 or 90 or 6000 seen M1 for '90' \div 15 or '6000' \div 1000 oe A1 for 6 or 72 C1 for correct decision with appropriate comparison

5AM2H_01					
Question		Working	Answer	Mark	Notes
9			Point marked	3	M1 for line drawn or point marked within guidelines from A M1 for a line drawn or a point marked within guidelines from B A1 for a point marked within region where guidelines intersect
10	(a)	$(x \times x - 4) \times x$ $x \times x \times x - 4 \times x$		2	M1 for showing $(x \times x - 4) \times x$ or $x \times x \times x - 4 \times x$ A1 (dep on M1) for simplifying and equating to 80
	(b)	4 48 5 105 4.5 73.125 4.6 78.936 4.7 85.023 4.8 91.392 4.9 98.049 4.61 79.53218 4.62 80.13113 4.63 80.73285 4.64 81.33734 4.65 81.94463	4.6	4	B2 for trial $4.6 \leq x \leq 4.7$ evaluated (B1 for trial $4 \leq x \leq 5$ evaluated) B1 for different trial $4.6 \leq x \leq 4.65$ evaluated B1 (dep on at least one previous B1) for 4.6 Values evaluated can be rounded or truncated, but to nearest whole number when x has 1 dp or less and to 1 dp when x has 2 dp

5AM2H_01					
Question		Working	Answer	Mark	Notes
11		$70 \times \pi = 219.9$ $1000 \div 219.9 = 4.55$	4	4	M1 for $70 \times \pi$ or $0.7 \times \pi$ or 219(.9) or 2.1(9) M1 for using 1000 or ' $70 \times \pi$ ' \div 100 oe M1 for $1000 \div (70 \times \pi)$ or $10 \div (70 \times \pi \div 100)$ A1 cao
12		$\frac{85 + 48 + 62}{500} \times 80$	31 or 32	3	M1 for $\frac{85 + 48 + 62}{500}$ or $\frac{195}{500}$ oe or 0.39 M1 for $\frac{85 + 48 + 62}{500} \times 80$ oe or 31.2 A1 for 31 or 32
13		$\frac{1}{40} \times \frac{1}{10} \times 350\,000 \times 15$	13125	3	M1 for $\frac{1}{40} \times \frac{1}{10} \times 350\,000$ oe or 875 seen M1 for ' 875 ' $\times 15$ A1 cao
14		$109 + 73 \neq 180$ or $66 + 112 \neq 180$ $180 - 109 \neq 73$ $180 - 73 \neq 109$ $180 - 66 \neq 112$ $180 - 112 \neq 66$	No with reasoning given	2	M1 for finding total of an appropriate pair of angles A1 for stating total of co-interior angles is not 180 OR M1 for stating an appropriate pair of alternate angles 71, 107, 114 or 68 A1 for stating that alternate angles are not equal

5AM2H_01				
Question	Working	Answer	Mark	Notes
15	$5^2 - 2.5^2 = 18.75$ $\sqrt{18.75} = 4.33$ OR $5 \times \cos 30$ OR $5 \times \sin 30$ OR $\frac{2.5}{\tan 30} \times 2$	4.33	4	B1 for a right-angled triangle shown or 2.5 or 30° or 60° seen. M1 for $5^2 - 2.5^2$ M1 for $\sqrt{18.75}$ or $\sqrt{5^2 - 2.5^2}$ A1 for 4.33 or better OR M1 for $\frac{x}{5} = \cos 30$ M1 for $5 \times \cos 30$ A1 for 4.33 or better OR M1 for $\frac{2.5}{x} = \tan 30$ M1 for $(x =) \frac{2.5}{\tan 30}$ A1 for 4.33 or better
*16	$\frac{17}{25} = 0.68$ $\frac{21}{30} = 0.7$	Steven with explanation	3	M1 for either probability $\frac{17}{25}$ or $\frac{21}{30}$ oe seen A1 for both converted correctly to a comparable form C1 for identification of Steven with explanation based on correct comparison, e.g. '0.7 > 0.68'

5AM2H_01				
Question	Working	Answer	Mark	Notes
17	$P = kr^2$ $36 = k \times 20^2$ $P = 0.09 r^2$ <p>OR</p> $\frac{20^2}{r^2} = \frac{36}{P}$ $P = \frac{36}{20^2} r^2$	$P = 0.09 r^2$	3	M1 for $P = kr^2$ (accept any $k \neq 0$ or 1) M1 (dep) for $36 = k \times 20^2$ A1 for $P = 0.09 r^2$ oe OR M2 for $\frac{20^2}{r^2} = \frac{36}{P}$ oe, e.g. $20^2 : r^2 = 36 : P$ A1 for $P = \frac{36}{20^2} r^2$ oe
18	$\sqrt{170^2 - 50^2} = 162.48$ $\cos^{-1} \frac{50}{162.48}$ <p>OR</p> $\sqrt{100^2 + 100^2} = 141.42$ $141.42 \div 2 = 70.71$ $\sqrt{170^2 - 70.71^2} = 154.59$ $\tan^{-1} \frac{154.59}{50}$	72.1	5	M1 for $\sqrt{170^2 - 50^2}$ or $\sqrt{26\ 400}$ A1 for 162.4(8) M1 for $\cos y = \frac{50}{162.4(8)}$ M1 for $\cos^{-1} \frac{50}{162.4(8)}$ A1 for 72.0 – 72.1 OR M1 for $\sqrt{100^2 + 100^2}$ or 141.4(2) or $\sqrt{170^2 - 70.7(1)^2}$ or $\sqrt{23\ 900}$ A1 for 154.5(9) M1 for $\tan y = \frac{154.5(9)}{50}$ M1 for $\tan^{-1} \frac{154.5(9)}{50}$ A1 for 72.0 – 72.1

5AM2H_01					
Question	Working	Answer	Mark	Notes	
19		A C D B	2	B2 for 4 correct (B1 for 2 or 3 correct)	
20	(a)	$15 \div 40$	0.375	2	M1 for $\frac{15}{40}$ oe or sight of right-angled triangle against line A1 0.375 or 0.38
	(b)		Describes motion	2	B1 for constant speed oe for 50 seconds oe B1 for slows down (to stop) for 30 seconds oe
	(c)	$\frac{40 \times 15}{2} + 50 \times 15 + \frac{30 \times 15}{2}$	1275	2	M1 for $\frac{50 + 120}{2} \times 15$ or correct area for at least one of 3 sections 300, 750 or 225 seen A1 cao
	(d)	$\frac{1275 \div 1000}{120 \div 3600}$	38.25	3	M1 for attempt to find $\frac{\text{total distance}}{\text{total time}}$ M1 for '1275' \div 1000 or 120 \div 3600 oe A1 for 38 – 38.3 or ft '1275'
21	(a)	$4 \times 62.1 \div 10.8$	23	2	M1 for 4×62.1 or $62.1 \div 10.8$ A1 cao
	(b)	$1.2 \times 62.1 \div 18$	4.14	3	M1 for use of 1.2 or $\frac{120}{100}$ oe or $\frac{20}{100} \times 62.1$ M1 for 1.2×62.1 or $62.1 \div 18$ A1 for 4.14

5AM2H_01					
Question		Working	Answer	Mark	Notes
22		$\frac{18}{12} = 1.5$ 80×1.5^3	270	3	M1 for $\frac{18}{12}$ or $\frac{12}{18}$ oe or $\left(\frac{18}{12}\right)^3$ or $\left(\frac{12}{18}\right)^3$ oe or 18:12 or 12:18 or $18^3 : 12^3$ or $12^3 : 18^8$ oe M1 for 80×1.5^3 oe A1 cao (SC B1 for 120)
23			11	3	M1 for tangent drawn at $t=2$ M1 (dep) for $\frac{diff. y}{diff. x}$ ft from tangent A1 for 9 – 14
24	(i)		400.5	4	B1 for 400.5 accept 400.49 and 400.499(...)
	(ii)		52.635		B1 cao
	(iii)	$400.5 \div 52.635$	7.609		M1 for '400.5' \div '52.635' A1 for 7.60(9...) rounded or truncated
	(b)	$399.5 \div 52.645$	7.589	2	M1 for $399.5 \div 52.645$ A1 for 7.58(85...) rounded or truncated
	(c)		7.6	1	B1 cao

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Question	Working	Answer	Mark	Notes
25	<p>Growth factor = $\frac{100+n}{100}$</p> <p>$500 \times \frac{100+n}{100} \times \frac{100+n}{100} = 700$</p> <p>$(100+n)^2 = 14000$ $100+n = 118.32$ $n = 18.32$ After 5 years, 500×1.1832^5</p> <p>OR</p> <p>$500 \times 1.1 \times 1.1 = 605$ too low $500 \times 1.2 \times 1.2 = 720$ too big $500 \times 1.18 \times 1.18 = 696.2$ too low $500 \times 1.19 \times 1.19 = 708.05$ too big $500 \times 1.183 \times 1.183 = 699.745$ too low $500 \times 1.184 \times 1.184 = 700.9$ too big $500 \times 1.1832 \times 1.1832 = 699.98$ After 5 years, 500×1.1832^5</p>	1159 or 1160	5	<p>M1 for introducing growth factor</p> <p>M1 for $500 \times \frac{100+n}{100} \times \frac{100+n}{100} = 700$</p> <p>A1 for 18.32 or 118.32</p> <p>M1 for 500×1.1832^5</p> <p>A1 for 1158 or 1159 or 1160 (accept 1143 or 1144)</p> <p>OR</p> <p>M1 for any trial evaluated and compared with 700</p> <p>M1 for trials above and below</p> <p>A1 for 1.1832 or better</p> <p>M1 for 500×1.1832^5</p> <p>A1 for 1158 or 1159 or 1160 (accept 1143 or 1144)</p> <p>OR</p> <p>M1 for introducing a growth factor</p> <p>M1 for $500r^2 = 700$</p> <p>A1 for $(r=) \sqrt{\frac{700}{500}}$ oe or 1.18(3)</p> <p>M1 for $500 \times \left(\sqrt{\frac{700}{500}}\right)^5$ oe</p> <p>A1 for 1158 or 1159 or 1160 (accept 1143 or 1144)</p> <p>(B2 for 2689 or 2690)</p>

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