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Mark Scheme (Results)

June 2011

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

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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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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		2450 ÷ 7 =350 Bill 5 × 350; Maggie 2 ×350 1750 – 700 = OR 2450 ÷ 7 × 3 =	1050	4	M1 2450 ÷ (5+2) M1(dep on M1) for 5 × '350' or 2 × '350' or 1750 or 700 seen M1 5 × '350' – 2 × '350' A1 cao OR M1 2450 ÷ (5+2) M2 450 ÷ '7' × 3 A1 cao
2	(a)		Diagram	2	M1 trapezium with at least one side correct A1 cao
	(b)	Length of roof = 6.2 m Area of roof = 6.2 × 4 = 24.8 Other areas are 10, 16, 19.5 and 24	113.8	5	M1 a correct method to find the area of a rectangular face **or** 10 or 24 or 16 or '24.8' seen M1 a correct method to find the area of a trapezoidal face A1 for 19.5 or for 15 and 4.5 M1 for adding areas of 5 or 6 faces A1 113 – 115 (accept 89 – 91)

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)	Grid completed with 6 out of 36 doubles OR $\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$, $6\times\frac{1}{36}=\frac{1}{6}$	AG	2	M1 shows 6 doubles on grid A1 $\frac{6}{36}=\frac{1}{6}$ OR M1 $\frac{1}{6}\times\frac{1}{6}=\frac{1}{36}$ A1 $6\times\frac{1}{36}=\frac{1}{6}$
	(b)	Grid with 30 out of 36 identified as not doubles OR $1-\frac{1}{6}$	$\frac{5}{6}$	3	M1 grid with 30 out of 36 identified as not doubles A1 $\frac{5}{6}$ oe OR M1 $1-\frac{1}{6}$ A1 $\frac{5}{6}$ oe

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		10 × 5 = 50 50 ÷ 20 = 2.5 50 × 2.5 = 25 × 2.5 = 100 × 2.5 = OR 10 × 5 = 50 50 ÷ 20 = 2.5 25 ÷ 20 = 1.25 100 ÷ 20 = 5 2.5 × 50 = 1.25 × 50 = 5 × 50 =	125 62.5 250	5	M1 10 × 5 (= 50) M1 '50' ÷ 20 M1 50 × '2.5' or 25 × '2.5' or 100 × '2.5' A2 all 3 correct (A1 for 2 correct) OR M1 10 × 5 (= 50) M1 50 ÷ 20 or 25 ÷ 20 or 100 ÷ 20 M1 '2.5' × '50' or '1.25' × '50' or '5' × '50' A2 all 3 correct (A1 for 2 correct)
5			Correct region	4	B4 fully correct OR B1 straight line parallel to *BC* and 2 cm (± 0.2 cm) from it B1 shading to the right of the line B1 circle radius 2 cm (± 0.2 cm) centre the centre of the rectangle B1 shading inside the circle Ignore any drawing outside the given rectangle

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		Liz and explanation	1	B1 Liz because she carried out most trials
	(b)	12 + 34 + 57 = 103 40 + 100 +300 $103 \div 40$	0.23 or $\frac{103}{440}$	2	M1 (12 + 34 + 57)/*b* where *b* > 103 or *a*/(12 + 28 + 34 + 66 + 57 + 243) where *a* < 440 A1 0.23or 0.234(09..) or $\frac{103}{440}$ oe SC If M0 then B1 for $12 \div 40$ or $34 \div 100$ or $57 \div 300$
7	(a)	Area CDEF = 10× 4 = 40	40	3	B1 10 M1 '10' × 4 A1 cao
	(b)	Area ABFG = 10 × 10 = 100 Area semi circle = $\pi \times 5^2 \div 2$ = 39… Total area = 179 179 ÷ 20 = 8.9….	9	5	M1 area *ABFG* = '10' × '10' M1 $\pi \times \left(\frac{'10'}{2}\right)^2 \div 2$ or $\pi \times \left(\frac{'10'}{2}\right)^2$ M1 '40' + '39' + '100' dep on M1 M1 '179' ÷ 20 A1 9 cao
8	(a)	$12^2 + 2 \times (-2) \times 11 = 100$	10	2	M1 $12^2 + 2 \times (-2) \times 11$ A1 cao (accept ±10 or –10)
	(b)	$20^2 = 10^2 + 2 \times a \times 25$ $20^2 = 10^2 + 50 \times a$	6	2	M1 $20^2 = 10^2 + 50 \times a$ oe or 400 = 100 + 2 × *a* × 25 oe A1 cao
	(c)	$12.05^2 + 2 \times (-1.85) \times 10.5$ = 145.2025 – 38.85 = 106.3525	10.3	3	B1 at least 1 out of 12.05, – 1.85, 10.5 M1 $u_{UB}^2 + 2 \times a_{UB} \times s_{LB}$ where $12 < u_{UB} \leq 12.05$ $-1.9 < a_{UB} \leq -1.85$ $10.5 \leq s_{LB} < 11$ A1 10.3 – 10.32

<table>
<tr><th colspan="6">5AM2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>9</td><td>(a)</td><td>$x \times x \times x + 3 \times 4 \times x$</td><td>AG</td><td>2</td><td>M1 split into two cuboids with at least one expression correct
A1 fully correct</td></tr>
<tr><td></td><td>(b)</td><td><table><tr><th>x</th><th>f(x)</th></tr><tr><td>1</td><td>13</td></tr><tr><td>2</td><td>32</td></tr><tr><td>3</td><td>63</td></tr><tr><td>3.1</td><td>66.(991)</td></tr><tr><td>3.2</td><td>71.(168)</td></tr><tr><td>3.3</td><td>75..(537)</td></tr><tr><td>3.4</td><td>80.(104)</td></tr><tr><td>3.5</td><td>84.(875)</td></tr><tr><td>3.6</td><td>89.(856)</td></tr><tr><td>3.7</td><td>95.(053)</td></tr><tr><td>3.8</td><td>100.(472)</td></tr><tr><td>3.75</td><td>97.7(3438)</td></tr></table></td><td>3.8</td><td>5</td><td>M1 any trial that is attempted to be evaluated for positive x
B2 trial between 3 and 4 exclusive
(B1 trial at 3 or 4)
B1 different trial between 3.7 and 3.8 exclusive. Trials must be evaluated correctly (truncated or rounded) to at least the nearest whole number if x is an integer. Otherwise evaluated correctly (truncated or rounded) to at least 1 decimal place
B1 cao</td></tr>
<tr><td>10</td><td></td><td>$x + 3x + x + 24 > 2(x + 24)$
$5x + 24 > 2x + 48$
$5x - 2x > 48 - 24$
$x > 8$</td><td>9</td><td>5</td><td>B1 sight of $3x$ and $x + 24$
B1 $x + 3x + x + 24 > 2(x + 24)$
B1 $2x + 48$
M1 correct method of rearranging an ‘inequality’ with at least one x term and one number on each side
A1 9 cao</td></tr>
</table>

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$\frac{AD}{25} = 63°$ $AD = 25 \times \tan 63° = 49.07$ $\tan x = \frac{49.07}{37} = 1.3261$	53.0	5	M1 $\frac{AD}{25} = \tan 63°$ M1 (AD =) $25 \times \tan 63°$ A1 49.06 – 49.1 M1 $\tan x = \frac{'49.07'}{25+12}$ A1 52.9 – 53.0
12		$4\times24 + 4\times8 + 4\times6$ $AC^2 = 8^2 + 6^2 = 100$ $AG^2 = 6^2 + 24^2 + 8^2 = 676$ 96 + 32 + 24 + 10 + 26	188 cm	5	M1 $AC^2 = 8^2 + 6^2$ M1 $\sqrt{8^2 + 6^2}$ M1 $AG^2 = 6^2 + 24^2 + 8^2$ oe or 26 seen M1 $4 \times 24 + 4 \times 8 + 4 \times 6$ A1 cao SC B3 answer of 36
13	(a)	7300 – 6600	700	2	M1 '7300' – '6600' with at least one correct A1 600 – 800
	(b)	$\frac{7300}{6600} = 1.106$	1.11	2	M1 $\frac{'7300'}{'6600'}$ oe (any pair of values which differ by one day) ft from (a) A1 1.09 – 1.17

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(c)	$A = 20000 \times \left(\frac{100+3}{100}\right)^{10} =$ 20000×1.03^{10}	26900	2	M1 $A = 20000\left(\frac{100+3}{100}\right)^{10}$ A1 26850 – 26900
	(d)	$2 = 1 \times \left(\frac{100+r}{100}\right)^{8}$ $\sqrt[8]{2} = \frac{100+r}{100}$ $r = \sqrt[8]{2} \times 100 - 100$ OR $2 = x^8$ $x = \sqrt[8]{2}$ $r = \sqrt[8]{2} \times 100 - 100$	9.05	3	M1 $2 = 1 \times \left(\frac{100+r}{100}\right)^{8}$ M1 $\sqrt[8]{2} = \frac{100+r}{100}$ A1 9.05 – 9.051 OR M1 $2 = x^8$ oe M1 $x = \sqrt[8]{2}$, can be implied by 1.095(...) seen A1 9.05 – 9.051
14	(a)	$\frac{30-21}{3} = 3$	– 3	2	M1 $\frac{30-21}{3}$ or $\frac{9}{3}$ A1 – 3
	(b)	Tangent at $t = 3$ Height ÷ base	– 6	3	M1 tangent drawn at $t = 3$ M1 height ÷ base for a triangle with the tangent as hypotenuse A1 – 5 to – 7

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		0.8 on 1st branch 0.3 and 0.05 on 2nd branches	2	B1 0.8 oe on 1st branch B1 0.3 and 0.05 oe on 2nd branches
	(b)	0.2 ×0.3 + .8×0.05 = 0.1 50 × 0.1	Shown	4	M2 0.2 ×'0.3' + 0.8×'0.05' (M1 for 0.2 ×'0.3' or 0.8×'0.05') M1 (dep on at least M1) 50 × '0.1' C1 all working shown and fully correct with the estimate of 5 days the clear outcome of the working

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$v = kt^2$ $k = \frac{8}{16} = 0.5$ When $t = 10$, $v = 0.5 \times 10^2 = 50$	50	4	M1 $v = kt^2$ or $v \propto t^2$ M1 $k = 8 \div 16$ M1 $v =$ '0.5' $\times 10^2$ A1 50 cao OR M1 $t^2 = kv$ or $t^2 \propto v$ M1 $k = 16 \div 8$ M1 $v = \frac{10^2}{'2'}$ A1 50 cao OR M1 $\frac{v_2}{v_1} = \frac{t_2^2}{t_1^2}$ M1 $\frac{v_2}{8} = \frac{10^2}{4^2}$ M1 $v_2 = 8 \times 6.25$ A1 50 cao
	(b)	Values of s are 0, .5, 2, 4.5 , 8 Area = $\frac{0+.5}{2} + \frac{.5+2}{2} + \frac{2+4.5}{2} + \frac{4.5+8}{2}$ .25 + 1.25 + 3.25 + 6.25	11	3	M1 attempts to find area under curve M1 $\frac{0+.5}{2} + \frac{.5+2}{2} + \frac{2+4.5}{2} + \frac{4.5+8}{2}$ oe A1 10 – 12

5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(c)	Draw graph of $v = 1 + 2t$ Intersection with $v = 0.5t^2$ OR $1 + 2t = 0.5t^2$ $t = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 0.5 \times (-1)}}{2 \times 0.5}$	$t = 4.4$	4	M1 draws a straight line that is not horizontal or vertical A1 graph of $s = 1 + 2t$ correct M1 indicates intersection with $s = 0.5t^2$ A1 4.4 – 4.5 Alternative method: M1 $1 + 2t = 0.5t^2$ M1 $t = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 0.5 \times (-1)}}{2 \times 0.5}$ allow errors in the signs of b and c A1 4.4 or – 0 4 A1 4.4 – 4.5
17		Suppose A goes first: Pr(10p) = $\frac{1}{5}$ Suppose A goes second: Pr(10p) = $\frac{4}{5} \times \frac{1}{4} = \frac{1}{5}$ Suppose A goes third: Pr (10p) = $\frac{4}{5} \times \frac{3}{4} \times \frac{1}{3} = \frac{1}{5}$	It does not matter	5	B1 Suppose A goes first: Pr(10p) = $\frac{1}{5}$ M1 Suppose A goes second: Pr(10p) = $\frac{4}{5} \times \frac{1}{4}$ A1 $\frac{1}{5}$ M1 Suppose A goes third: Pr (10p) = $\frac{4}{5} \times \frac{3}{4} \times \frac{1}{3}$ C1 $\frac{1}{5}$ and full explanation in words that it does not matter whether Alan goes first, second or third

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