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Mark Scheme (Results)

June 2011

Applications of Mathematics (GCSE)
Unit 1: 5AM1H_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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		500 × 1.2 (oe) = 600 600 ÷ 12 =	50	4	M2 for 500 × 1.2 (=600) (oe) (M1 for 500 × 0.2 (=100) (oe) M1 for 600 ÷ 12 or 100 ÷ 12 or 1.2 ÷ 12 or 500 ÷ 12 A1 cao SC: B2 for an answer of 8.33 or 8.34
2	(i) (ii)		E2 total: A2+B2+C2+D2 F2 mean: E2/4	3	B1 for =A2+B2+C2+D2, =SUM(A2:D2) B1 for =E2/4, =(A2+B2+C2+D2)/4, =AVERAGE(A2:D2) B1 for using correct spreadsheet notation; condone missing "=" throughout. NB: do not accept "÷" in place of "/": this would be counted as incorrect notation.
3	(a) (b)	 (5×170) + (25×190) + (48×210) + (22×230) = 850 + 4750 + 10080 + 5060 = 20740 ÷ 100 =	$200 < x \leq 220$ 207.4	1 4	B1 for $200 < x \leq 220$ (accept 200 to 220) M1 for $f \times h$ for at least 3 consistent values of h in or at either end of intervals M1 (dep) for use of all correct mid-interval values M1 (dep on 1st M1) for $\Sigma fh \div \Sigma f$ A1 cao

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)(i)	1:4 = 8:32 OR 40÷5=8	8	5	M1 40÷5 (=8) oe A1 cao
	(ii)	8×41 = 328 or 3.28 13.52-3.28=10.24 10.24÷32=0.32	32		M1 "8" × 41 (=328) or "8" × 0.41 M1 (1352-"328") ÷ (40-"8") or 1024 ÷ 32 A1 cao NB: mark digits (ignore currency) but final answer must have units shown
	(b)	16 kg is 16000 g (or 900g is 0.9 kg) 16000 ÷ 900 OR 16 ÷ 0.9 =17.777… Round down.	17	3	M1 conversion 16 × 1000, 900 ÷ 1000, sight of 16000 or 0.9 M1 "16000" ÷900, 16 ÷ "0.9" (=17.777) oe A1 cao

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		Decision box with > 5 NO leading to "charge £20" YES leading to "charge £30" Write down & stop. **OR** Decision box with ≤ 5 NO leading to "charge £30" YES leading to "charge £20" Write down & stop.	Completed flow chart	5	B1 with > 5 (allow in words) B1 for NO leading to "charge £20" accept C for charge B1 for YES leading to "charge £30" accept C for charge [NB: -B1 for missing "charge" or other statement with the amount] B1 end box (stop) B1 for correctly shaped boxes **OR** B1 with ≤ 5 (allow in words) B1 for NO leading to "charge £30" accept C for charge B1 for YES leading to "charge £20" accept C for charge [NB: -B1 for missing "charge" or other statement with the amount] B1 end box (stop) B1 for correctly shaped boxes NB: do not penalise if the YES or NO are put in a box.
6	(a)(i)	Find the gradient eg by drawing a triangle against the graph, find *y*/*x*	0.3-0.5	4	M1 method to find gradient eg 16/40, 8/20, triangle drawn. A1 0.3-0.5 SC: B1 for a negative gradient within the range.
	(ii)	Pick two points 15 units apart, and read off values associated with these, finding the difference	4 - 8		M1 eg 15×"0.4"=6; read off values from graph 15 apart ±1mm A1 6 ± 2
	(b)(i)	Draw line	46 - 54	3	B1 plot at least 4 points ±1 mm B1 draw line from 0 units to at least 100 units (within overlay)
	(ii)	Read off solution from intersection			B1ft 46-54 from single intersection point of two straight line segments

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			(6, 1.5, 1)	2	M1 identification of any other vertex as a 3D coordinate, or at least one coordinate. A1 cao
8		(24 ÷ 8) × 6 = 18 cm	18 cm	4	M2 for (24÷8) ×6 (M1 for 24÷8, 8÷6, 6÷8, 8÷24 or a ratio eg ?:6=24:8 etc) A1 cao C1 (indep) for units: cm
9		2000 × 0.04 = 80 2080 × 0.04 = 83.20 2163.20 × 0.04 = 86.528 2249.72 or 2249.73	2249.72 or 2249.73	3	M2 for 2000×1.04^3 (=2249.728) OR M1 for 2000 × 0.04 or sight of 80, 2080, 2240 M1 for compound percentage calculation (eg 2080×0.04, 2163.20, or sight of 83.20 or 86.528 A1 for 2249.72 or 2249.73

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)	4 sq paving stones per $1m^2$ Large squares: 16 stones each = 5×16=80 Each large triangle: 4 small triangle & 6 sqs 4 lg triangles: 16 triangle stones & 24 square stones Total stones: square 104, triangle 16	104 square stones 16 triangular stones OR 80 square stones 64 triangular stones	4	M1 divides the shape into triangles and squares, or triangles, of any size (by diagram or calculation) M1 divides the shape into triangles and squares, or triangles, of the correct size (by diagram or calculation) A1 gives the number of square stones as 104 or 80 A1 gives the number of triangular stones as 16 or 64 SC: for one answer correct award B2 if at most M1 awarded.
	(b)	Area of squares: 5×4=20 area of triangles: 4×2=8 Total area: 28 "28" ÷5.6 = OR Area of square = 0.5×0.5=0.25 Area of triangle = 0.5×0.5×0.5=0.125 Total area = "104" × 0.25 + "16" × 0.125 = 26 + 2 =28 "28" ÷5.6 =	5	4	M1 for square 5×2×2 (=20) or triangles 4×2×2÷2 (=8) or finding the area of an appropriate shape as part of a general method. M1 for "20" + "8" (=28) or for any appropriate whole method. M1 for "28" ÷5.6 A1 cao OR M1 for 0.5×0.5(=0.25) or 0.5×0.5×0.5 (=0.125) M1 for "104" × 0.25 + "16" × 0.125 (=28) (=26+2) M1 for "28" ÷ 5.6 A1 ft
11		$720 \times \frac{100}{120}$ oe	600	3	M2 for $720 \times \frac{100}{120}$ oe (M1 for 720 = 120 % or $x \times 1.20 = 720$) A1 cao

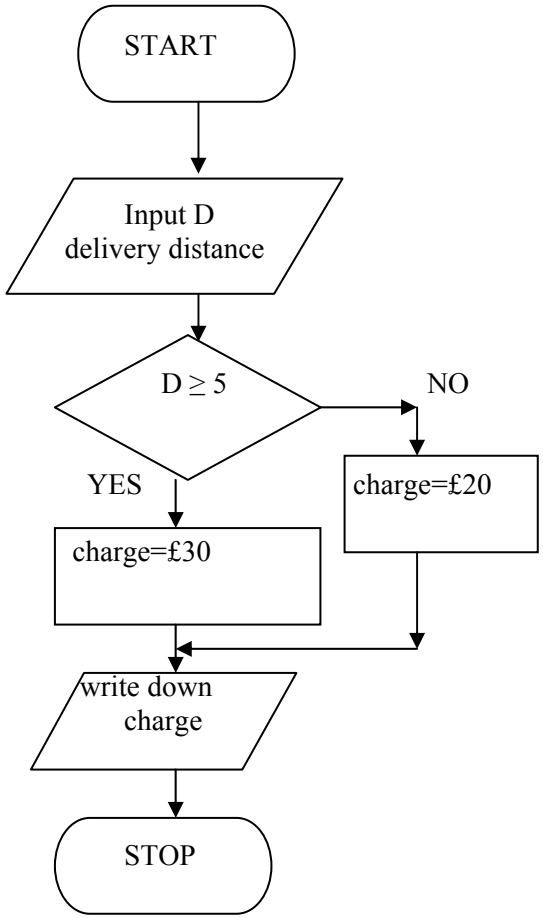
5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		2×2×5 (=20) 2×2×3 (=24) 5 × 5 (=25)	30 25 24 600	4	M2 for an attempt to find LCM by eg lists of multiples, or summing of 20s, 24s, 25s, with at least 3 numbers in each lists (M1 for an attempt to find multiples of one of the numbers 20s, 24s, 25s, with at least 3 numbers for any one of these numbers) A1 for 30, 25, 24 cao A1 for 600 cao OR M1 expansion of either numbers into its prime factors in a factor tree eg 2×2×2, 2×2×3, 5×5 M1 for "600" ÷ 20, 24, 25 oe A1 for 30, 25, 24 cao A1 for 600 cao
13	(a)	69.99 × 1.20 = 83.988	83.99 or 83.98	3	M2 for 69.99 × 1.20 oe or sight of 83.988 (M1 for 69.99 × 0.20 oe or sight of 13.998 or 14) A1 cao
	(b)	$3x+2y=95.40$ $5x+3y=151.50$	Black (x) 16.8(0) Colour (y) 22.5(0)	5	M1 for attempt to derive the equations A1 derivation of equations: $3x+2y=95.40$, $5x+3y=151.50$ M1 for correct process to eliminate either x or y (condone one arithmetic error) M1 (dep) for substituting found value into either equation A1 cao SC: B2 for one value found with no working

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		4x+4x+3x+4+3x+4=14x+8 5x+5x+x-3+7x-3=18x-6 18x-6=14x+8 4x=14 x=14/4 = 3.5 oe Area of trapezium = Length is 3*x*+4 = 3×3.5+4= Width is 4*x* = 4×3.5 =	*x*=3.5 L= 14.5 W= 14	6	M1 4x+4x+3x+4+3x+4 (=14x+8) M1 5x+5x+x-3+7x-3 (=18x-6) M1 equating eg 18x-6=14x+8 (4x=14) A1 x=14/4 = 3.5 oe A1 for 14.5 or "3.5" × 3+4 ft A1 for 14 or "3.5" × 4 ft
15	(a)		cf graph	2	B1 for 4 or 5 points plotted correctly ±1 full (2 mm) B1 (dep) for points joined by curve or straight line segments provided no gradient is negative – ignore any part of graph outside range of points
	(b)	median: 37 → 82 IQR: 18.5 → 63, 55.5 → 96 so 96 – 63 = 33 median: 82, 61 IQR 22, 23	median: 82, (61 given) IQR: 33, (22 given) with comment about each comparison	5	B1 for reading off median at 37 to give 81-83 M1 reading off IQR figures from 18.5, 55.5 eg 63, 96 A1 for IQR 29-37 C1 for a simple comparative comment relating to both medians or both IQRs C1 for a more complex comparative comment (in context) relating both medians or both IQRs
16	(a)		Explanation	1	B1 for explanation relating to bias, or that sampling equal numbers does not reflect the fact that there are not equal numbers in the two year groups
	(b)	$80 \times \frac{72}{798}$	7	3	M1 for $80 \times \frac{72}{798}$ A1 for 7.218… A1 for 7

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)	$1:2^2$ is 1:4	4	2	M1 sight of $1:2^2$ or 1:4 A1 cao
	(b)	$1:2^3$ £1.50 × 2^3 =£1.50×8=	£12	3	M1 sight of 2^3 (but not 8, as this is the diameter in the question) M1 for sight of 2^3 × £1.50 or 8 x £1.50 A1 cao
18	(a)	20 h = 20 × 60 = 1200 min 40x + 20y ≤ 1200	2x + y ≤ 60	2	M1 sight of $40x + 20y$ linked to 1200 A1 oe
	(b)	$y \geq 2x$ and x ≥ 6 drawn & shaded y≥x/5 drawn & shaded combined region indicated		4	M1 for $y \geq 2x$ drawn & shaded M1 for x≥6 drawn & shaded M1 for $2x+y \leq 60$ drawn & shaded A1 cao for indicating a combined region NB: line segments should be drawn between x=0 and x=30; for at least M2 shading must be consistently in or out; accept incorrect line style for M marks (dashed and solid lines acceptable).
	(c)	use of x + y = 600	114	4	M1 indication of use of any of the intersection points M1 for attempt to find the number of toy A,B to maximum (eg A 6, B 48) M1 for use of money to calculate max: use of intersection point (x,y) as 3×x+2×y eg 6×£3+48×£2 A1 cao SC: without intersection point: B2 for A 6, B 48

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		Bar heights: 1,4,10,3,0.5 fd: 0.5,2,5,1.5,0.25	Bar heights 1,4,10,3,0.5	4	M2 frequency density applied to at least 1 column (could be implied by one bar correct) (M1 Frequency density given as 5 bulbs = 1cm^2 or as stated figures in calculations) A2 all bars correct (A1 at least 3 columns (bars) correct) NB: candidates do not need to label the vertical axes.

Question 5 flowchart:



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