

Mark Scheme (Results)

June 2011

GCSE Mathematics (1380)
Paper 3H (Non-Calculator)

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**

M marks: method marks

A marks: accuracy marks

B marks: unconditional accuracy marks (independent of M marks)

2 **Abbreviations**

cao – correct answer only

ft – follow through

isw – ignore subsequent working

SC: special case

oe – or equivalent (and appropriate)

dep – dependent

indep - independent

3 **No working**

If no working is shown then correct answers normally score full marks

If no working is shown then incorrect (even though nearly correct) answers score no marks.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5 **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.

6 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.

7 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.

8 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.

9 Parts of questions

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

10 Money notation

Accepted with and without the “p” at the end.

11 Range of answers

Unless otherwise stated, when any 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).

1380_3H					
Question		Working	Answer	Mark	Notes
1		$15 \div 10$ 80×1.5 60×1.5 30×1.5 36×1.5	120, 90, 45, 54	3	M2 for any one of $80 + 40$ or $60 + 30$ or $30 + 15$ or $36 + 18$ or 120 or 90 or 45 or 54 seen A1 cao OR M1 for $15 \div 10$ or $3 \div 2$ or sight of 1.5 M1(dep) for $80 \times '1.5'$ or $60 \times '1.5'$ or $30 \times '1.5'$ or $36 \times '1.5'$ A1 cao OR M1 for $80 \div 10$ or $60 \div 10$ or $30 \div 10$ or $36 \div 10$ or 8 or 6 or 3 or 3.6 M1(dep) for $'8' \times 15$ or $'6' \times 15$ or $'3' \times 15$ or $'3.6' \times 15$ A1 cao OR M1 for $80 \div 2$ or $60 \div 2$ or $30 \div 2$ or $36 \div 2$ or 40 or 30 or 15 or 18 M1 (dep) for $'40' \times 3$ or $'30' \times 3$ or $'15' \times 3$ or $'18' \times 3$ A1 cao
2	(a)		Positive correlation	1	B1 for positive correlation or as the number of pages increases the time taken increases or the longer the book the more time it takes to read oe
	(b)		7.5	2	M1 for line of best fit drawn between (50, 2) and (50, 4) and (200, 9) and (200, 11) A1 for 6.5 – 8.5
3	(i)		55	1	B1 cao
	(ii)		Corresponding angles	1	B1 for corresponding (angles), accept F angles

1380_3H				
Question	Working	Answer	Mark	Notes
4	$\frac{7 \times 20}{0.5}$	280	3	M1 for any two of 7, 20 and 0.5 seen or 140 or 40 or 14 M1 for 14×20 or $\frac{140}{0.5}$ or 7×40 or 7.2×40 or $144 \div 0.5$ or 140×2 A1 for 280 – 300
5	(a)(i) $5 \times (-2)^2 + 2$ $= 5 \times 4 + 2$	22	1	B1 cao
	(ii) $47 - 2 = 45$ $45 \div 5 = 9$	3	2	M1 for $\frac{47-2}{5}$ or $\frac{47+2}{5}$ A1 for 3 or -3 (accept ± 3)
	(b)	-1, 0, 1, 2, 3	2	B2 cao (B1 for at least 4 correct and not more than one incorrect integer)
6	$360 \div 30$	12	2	M1 for $360 \div 30$ A1 cao
7	(a)	Reflection	2	B2 for vertices of shape plotted at (-3, 2), (-3, 3), (-5, 3), (-6, 2.5), (-5, 2) (B1 for a reflection in any vertical or horizontal line)
	(b)	Translation; $\begin{pmatrix} -6 \\ -1 \end{pmatrix}$	2	B1 for translation B1 (indep.) for 6 left and 1 down OR $\begin{pmatrix} -6 \\ -1 \end{pmatrix}$ Note B0 if more than one transformation given

1380_3H					
Question		Working	Answer	Mark	Notes
8	(a)		Question + response boxes	2	B1 for an appropriate question with a specific time frame e.g. each day B1 for at least 3 non-overlapping boxes. Do not accept inequalities N.B. Do not accept frequency tables or data collection sheets
	(b)		e.g. biased (sample)	1	B1 for a correct reason, e.g. biased (sample) or more likely to exercise more oe
9	(a)		4, 7	1	B1 cao
	(b)		$4n - 3$	2	B2 cao (B1 for $4n + a$ or $n = 4n - 3$)
10		$(7 \times 2 + 2 \times 5) \times 200 = 4800$ 4800×8	38 400 g	5	M1 for 7×2 or 2×5 or 7×7 or 5×5 or 2×2 M1 for “ 7×2 ” + “ 2×5 ” oe or “ 7×7 ” – “ 5×5 ” M1 (dep on 1 st M) for ‘24’ \times 200 or ‘0.0024’ \times 2 M1 for ‘4800’ \times 8 or ‘0.0048’ \times 8 000 000 or ‘0.0048’ \times 8000 A1 for 38 400g or 38.4kg SC B3 for any answer including digits 384

1380_3H				
Question	Working	Answer	Mark	Notes
11	<p>P: T: B = 1 : 3 : 6 $54 \div 10 \times 6$ or T = 3P and B = 2T oe So, B = 2 × (3P) = 6P P + T + B = P + 3P + 6P = 10P P = $54 \div 10 = \text{£}5.40$ B = $6 \times \text{£}5.40$</p>	32.40	3	<p>M1 for 1 : 3 : 6 or any three numbers, in any order, in the ratio 1 : 3 : 6 M1 for $54 \div (1 + 3 + 6) \times 6$ A1 for 32.4(0)</p> <p>Or M1 for 1: 3: 6 oe or P + 3P + 6P (=10P) oe e.g T/3 + T + 2T (=10T/3) or e.g B/6 + B/2 + B (=10B/6) or 5.4(0) or 16.2(0) seen M1 for $54 \div 10 \times 6$ or $[54 \div \frac{10}{3}] \times 2$ or $54 \div \frac{10}{6}$ “ oe A1 for 32.4(0)</p> <p>Alternative M1 for a partial decomposition of £54 in ratio 1 : 3: 6, e.g. (£)5 + (£)15 + (£)30 (= (£)50) M1 for a decomposition of the remaining amount, e.g. 40(p) + 120(p) + 240(p) (= 400(p)) A1 for 32.4(0)</p>

1380_3H					
Question		Working	Answer	Mark	Notes
12	(a)(i)	w^{6+4}	w^{10}	2	B1 accept w^{6+4}
	(ii)	h^{8-3}	h^5		B1 accept h^{8-3}
	(b)	$(12 \div 3)(x \div x^2)(y^3 \div y^3)$	$\frac{4}{x}$	2	B2 for $\frac{4}{x}$ or $4x^{-1}$ (B1 for any one from: $12 \div 3$ in numerator OR x^{1-2} in numerator or x^{2-1} in denominator OR y^{3-3} in numerator OR y^3 cancelled in both numerator and denominator)
13		Points plotted at (2,10), (6,17), (10,28), (14,25), (18,20) and joined with line segments	2	B2 for correct plotting of 5 points ($\pm 1/2$ sq) and joining with line segments (B1 for points plotted correctly at midpoints of intervals OR joining points with line segments at the correct heights and consistent within the class interval (including end values) OR correct frequency polygon with one point incorrect OR correct frequency polygon with first and last point joined) NB Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted	

1380_3H					
Question		Working	Answer	Mark	Notes
14			Construction	3	M1 for arcs construction of 60 degrees M1 (dep) for arcs bisector of '60 degrees' (not 90 degrees) A1 (dep on both M marks) for 30 degrees within guidelines OR M1 for arc construction of 90 degrees M1(dep) for arc construction of 60 degrees A1 (dep on both M marks) for 30 degrees within guidelines
15	(a)		$x^2 + 2x$	2	M1 for $x \times x + x \times 2$ or two terms including $x \times x = (x^2)$ or $x \times 2 = (2x)$ A1 for $x^2 + 2x$
	(b)	$x^2 + 3x - 4x - 12$	$x^2 - x - 12$	2	M1 for all 4 terms correct ignoring signs or 3 out of 4 terms correct from x^2 , $3x$, $-4x$, -12 A1 for $x^2 - x - 12$ (accept $x^2 - 1x - 12$)
	(c)		$2y(y - 2)$	2	B2 cao (B1 for $y(2y - 4)$ or $2(y^2 - 2y)$ or $2y(y - \dots)$) or $(2y + 0)(y - 2)$ or $2y(y + 2)$
	(d)		$(x - 3)(x + 3)$	1	B1 oe

1380_3H																						
Question		Working	Answer	Mark	Notes																	
16	(a)	$\frac{2}{3} \times \frac{6}{5}$	$\frac{4}{5}$	3	M1 for $\frac{2}{3} \times \frac{6}{5}$ M1 for $\frac{2 \times 6}{3 \times 5}$ or 12/15 oe A1 cao																	
	(b)	$(2-1) + \frac{5}{15} - \frac{6}{15}$ or $\frac{35}{15} - \frac{21}{15}$ Or <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td></td><td>1</td><td>3</td></tr> <tr><td>2</td><td></td><td>6</td></tr> <tr><td>5</td><td>5</td><td>15</td></tr> </table> <table border="1" style="display: inline-table;"> <tr><td></td><td>7</td><td>3</td></tr> <tr><td>7</td><td></td><td>21</td></tr> <tr><td>5</td><td>35</td><td>15</td></tr> </table>		1	3	2		6	5	5	15		7	3	7		21	5	35	15	$\frac{14}{15}$	3
	1	3																				
2		6																				
5	5	15																				
	7	3																				
7		21																				
5	35	15																				
17		$PBC = 90 - PAC$ $BCP = 90 - (90 - PAC)$	Proof	3	M1 for $PBC = 90 - PAC$ or $PAC = 90 - PBC$ or $ACP = 90 - PCB$ M1 for $BCP = 90 - (90 - PAC)$ or $PAC = 90 - (90 - BCP)$ oe A1 for $PAC = PCB$ and $PCA = PBC$ and $APC = CPB$ B1 SC if M0 awarded for $APC = BPC = 90^\circ$ or statement matching the 3 equal sets of angles																	

					$PAC = PCB$ and $PCA = PBC$ and $APC = CPB$
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1380_3H					
Question		Working	Answer	Mark	Notes
18	(a)		$90 < m \leq 100$	1	B1 cao
	(b)		(4), 16, 50, 82, 108, 120	1	B1 cao
	(c)		Cumulative frequency graph	2	B2 ft for “all 6 points” plotted and drawn correctly as a cf graph (B1 ft for 5 or 6 points plotted correctly (± 0.5 sq) at the end of intervals dep on sensible table (condone one addition error) SC B1 if 5 or 6 points plotted not at ends but consistent within each interval and joined.
	(d)		103	1	B1 for 101 – 105 otherwise ft their cf graph
19		$4x + y = 10$ $4x - 6y = 38$ - $7y = -28, y = -4$ $4x - 4 = 10, x = 3.5$ or $12x + 3y = 30$ $2x - 3y = 19$ + $14x = 49, x = 3.5$ $7 - 3y = 19, y = -4$ Alternative $y = 10 - 4x$ $2x - 3(10 - 4x) = 19$ $14x - 30 = 19; x = 3.5$ $4 \times 3.5 + y = 10; y = 4$	$x = 3.5$ $y = -4$	3	M1 for full method to eliminate x or y , allow one error in calculation M1(dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 3.5 and -4 Alternative M1 for full method to rearrange and substitute to eliminate x or y , allow one error in calculation M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 for 3.5 and -4

1380_3H				
Question	Working	Answer	Mark	Notes
20		Two correct comparisons	2	<p>B1 for Median for boys = median for girls oe OR boys highest score > girls highest score oe or boys lowest score < girls lowest score oe or lower quartile for boys < lower quartile for girls oe or upper quartile for boys = upper quartile for girls</p> <p>B1 for IQR boys > IQR girls oe OR range boys > range girls oe</p>
21	<p>(a) e.g. $-\frac{2}{4}$</p> <p>(b) $2 = -\frac{1}{2} \times 6 + c$ $2 + 3 = c$</p> <p>Alternative $y - 2 = "-\frac{1}{2}"(x - 6)$ $y - 2 = -\frac{1}{2}x + 3$</p>	<p>$-\frac{1}{2}$</p> <p>$y = -\frac{1}{2}x + 5$</p>	<p>2</p> <p>2</p>	<p>M1 for attempt to find $\frac{\text{(difference in y)}}{\text{(difference in x)}}$</p> <p>A1 for $-\frac{1}{2}$ oe</p> <p>SC B1 for $\frac{1}{2}$ or -2 seen with or without working or sight of $y = -\frac{1}{2}x + 2$ or $y = -\frac{1}{2}x$ or $-\frac{1}{2}x$</p> <p>M1 for $y = '-\frac{1}{2}'x + c$ or $y = mx + 5$</p> <p>A1 cao</p> <p>SC B1 for $-\frac{1}{2}x + 5$</p>

1380_3H				
Question	Working	Answer	Mark	Notes
22	(a) $27^{\frac{1}{3}} = 3$ $3^{-2} = \frac{1}{3^2}$	$\frac{1}{9}$	2	M1 for a correct cube root, reciprocal or square A1 for $\frac{1}{9}$ or 0.11(1...)
	(b) $\frac{8 - \sqrt{18}}{\sqrt{2}} = \frac{8}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}}$ $= \frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}}$ $\frac{8\sqrt{2}}{2} - 3$	a = -3 b = 4	3	M1 for attempt to rationalise denominator, e.g. $\frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or $\frac{8 - \sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ Or $8 - \sqrt{18} = \sqrt{2}(a + b\sqrt{2})$ oe A2 for $-3 + 4\sqrt{2}$ (A1 for -3) (A1 for 4) SC B1 if M0 scored for -3 or 4 seen on either answer line
23	$t(k - 2) = k$ $tk - 2t = k$ $tk - k = 2t$ $k(t - 1) = 2t$	$k = \frac{2t}{t-1}$	4	M1 for attempt to multiply LHS by (k-2) or sight of $t(k-2)$ or $tk - 2t$ or $tk - 2$ (ignore RHS) M1 for attempt to subtract k from LHS or sight of $tk - k$ (ignore RHS) or attempt to subtract tk to give $-2t = k - tk$ (ignore LHS) M1 for attempt to factorise for k e.g. $k(t-1)$ or $k(1-t)$ A1 for $\frac{2t}{t-1}$ or $\frac{-2t}{1-t}$ oe
24	(a)	84, 60	2	B1 for 84 B1 for 60
	(b)		2	B1 for bar with width 160-180 and height 2cm (± 1 mm) B1 for bar with width 180-210 and height 6mm (± 1 mm)

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Question	Working	Answer	Mark	Notes
25	$\pi x l = 2\pi x^2$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$ Alternative $\pi x \sqrt{h^2 + x^2} = 2\pi x^2$ $\sqrt{h^2 + x^2} = 2x$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$	$\sqrt{3}x$	4	B1 for curved surface area of one of the shapes e.g. $\pi x l$ or $2\pi x^2$ M1 for attempt to equate surface areas e.g. $\pi x l = 2\pi x^2$ or $l = 2x$ M1 for attempt to connect h and x using Pythagoras's theorem e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ Alternative B1 for $h^2 + x^2 = l^2$ oe M1 for attempt to equate surface areas e.g. $\pi x \sqrt{h^2 + x^2} = 2\pi x^2$ oe M1 (dep) for attempt to square both sides of their formula e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ SC B1 for attempt to equate surface areas in terms of r , rather than x
26	(a) $\overline{AB} = \overline{AO} + \overline{OB}$ (b) $\overline{OP} = 2\mathbf{a} + \frac{2}{5}(3\mathbf{b} - 2\mathbf{a})$ $= \frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b}$ $= \frac{6}{5}(\mathbf{a} + \mathbf{b})$ parallel	$-2\mathbf{a} + 3\mathbf{b}$ $\frac{6}{5}(\mathbf{a} + \mathbf{b})$ is parallel to $\mathbf{a} + \mathbf{b}$	1 3	B1 for $-2\mathbf{a} + 3\mathbf{b}$ or $3\mathbf{b} - 2\mathbf{a}$ M1 for $2\mathbf{a} \pm \frac{2}{5}(3\mathbf{b} - 2\mathbf{a})$ OR $3\mathbf{b} \pm \frac{3}{5}(2\mathbf{a} - 3\mathbf{b})$ A1 for $\frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b}$ oe A1 for $\frac{6}{5}(\mathbf{a} + \mathbf{b})$ is parallel to $\mathbf{a} + \mathbf{b}$ oe

1380_3H				
Question	Working	Answer	Mark	Notes
27	$\frac{x \times 2(x+1)}{2} - \frac{2 \times 2(x+1)}{x+1} = 1 \times 2(x+1)$ $x(x+1) - 4 = 2(x+1)$ $x^2 + x - 4 = 2x + 2$ $x^2 - x - 6 = 0$ $(x-3)(x+2) = 0$	$x = 3, -2$	4	<p>M1 for an attempt to multiply one term of the equation by 2 or $x + 1$ or $2(x + 1)$ or $2 \times x + 1$ with or without cancelling or attempt to write LHS with a common denominator</p> <p>M1 for attempt to multiply all terms by $2(x + 1)$ with or without cancelling e.g. $\frac{x \times 2(x+1)}{2} - \frac{2 \times 2(x+1)}{x+1} = 1 \times 2(x+1)$ Or $x(x + 1) - 4 = 2(x + 1)$</p> <p>A1 for $x^2 + x - 4 = 2x + 2$ or $x^2 - x - 6 = 0$</p> <p>A1 cao for 3 and - 2</p>

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