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Mark Scheme (Results)

Summer 2010

GCSE

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

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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
isw – ignore subsequent working
oe – or equivalent (and appropriate)
indep - independent
ft – follow through
SC: special case
dep – dependent

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

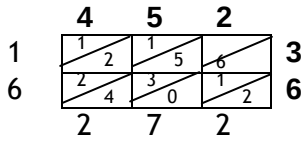
1380/3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			$8x + 6y$	2	B2 for $8x + 6y$ or $6y + 8x$ or $2(4x + 3y)$ or $2(3y + 4x)$; accept $x8$ or $y6$ etc. [B1 for $8x$ or $6y$, accept $x8$ or $y6$]
2			4 | 3 5 7 7 5 | 0 3 3 5 6 7 8 8 8 6 | 1 2 2 Key Eg. 4 | 3 means 43g	3	B2 for a fully correct diagram. Accept a stem of 40, 50, 60 (the order of the numbers in the stem may be reversed) (B1 for ordered or unordered leaves, with just one error or omission) B1 for a correct key (units may be omitted)
3	(i) (ii)	$180 - 110 = 70$ 180 – 2 × 70	40 Reasons	4	M1 for $180 - 110$ or 70 seen M1 for $180 - 2 \times "70"$ or 110 – "70" A1 cao B1 for two out of three of: angles on a line add to $180°$; isosceles triangle (accept 2 sides equal or 2 angles equal) ; sum of the angles in a triangle is equal to $180°$ **OR** for two out of three of: angles on a line add to $180°$; isosceles triangle (accept 2 sides equal or 2 angles equal) ; exterior angle of a triangle is equal to the sum of the interior opposite angles

Question		Working	Answer	Mark	Notes
4	(a)		10 10	1	B1 for 10 10 or equivalent
	(b)		13 – 14	1	B1 for answer in range 13–14 inclusive
	(c)		Line from (11 10, 40) to (11 50, 0)	1	B1 for a line drawn from (11 10, 40) to (11 50, 0) Accept a tolerance of ± 2 mm
5			Triangle at (1,–2), (–1,–2), (1,–5)	2	B2 for triangle at (1,–2), (–1,–2), (1,–5) (B1 for rotation of 180° about the wrong centre or for a rotation of 90°, centre (1,0) clockwise or anticlockwise)
6			Enlargement scale factor 2 centre (1,0)	3	B1 for enlargement B1 for scale factor 2 oe (eg 'x2',' by 2',' of 2') B1 for (1,0) [condone omission of brackets and/or the word 'centre'; do not accept a vector] Note: A combination of transformations gets NO marks

Question		Working	Answer	Mark	Notes
7		$40 \div (2+3) = 8$ 8×2 8×3	16, 24	3	M1 for $40 \div (2+3)$ (= 8) oe or $\frac{2}{5}$ oe or $\frac{3}{5}$ oe or for listing at least 3 multiples of 2 and 3 M1 (dep) for "8"$\times 2$ or "8"$\times 3$ oe A1 for 16 and 24 in correct places [SC : B2 for 24, 16 if M0 scored] [SC: If M0 scored, B1 may be awarded for just one correct answer, in the correct place]
8	(a)		15 – 19	1	B1 for 15 – 19 oe (eg 15 to 19)
	(b)		Freq polygon through (2, 8), (7, 11), (12, 9), (17, 14) and (22, 18)	2	B2 for a complete and correct polygon (ignore any histograms, any lines below a mark of 2 or above a line of 22, but award B1 only if there is a line joining the first to last point) (B1 for one vertical or one horizontal plotting error OR for incorrect but consistent error in placing the midpoints horizontally (accept end points of intervals) OR for correct plotting of mid-interval values but not joined) Plotting tolerance ± ½ square Points to be joined by lines (ruled or hand-drawn but **not** curves)

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>9</td><td></td><td>$\frac{1}{2} \times 3 \times 4 \times 20$</td><td>120</td><td>2</td><td>M1 for ½ x 3 x 4 x 20
A1 cao</td></tr>
<tr><td>10</td><td></td><td>452
36
2712

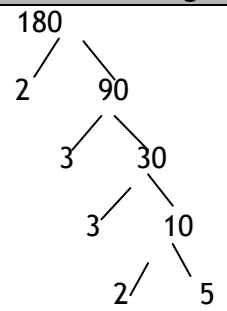
13560
16272

<table><tr><th></th><th>400</th><th>50</th><th>2</th></tr><tr><td>30</td><td>12000</td><td>1500</td><td>60</td></tr><tr><td>6</td><td>2400</td><td>300</td><td>12</td></tr></table>
$12000 + 1500 + 60 + 2400 + 300 + 12 = 16272$</td><td>162.72</td><td>3</td><td>M1 for complete method with relative place value correct. Condone 1 multiplication error, addition not necessary.
OR
M1 for a complete grid. Condone 1 multiplication error, addition not necessary.
OR
M1 for sight of a complete partitioning method, condone 1 multiplication error. Final addition not necessary.
A2 for 162.72
(A1 (dep on M1) for correct placement of decimal point after final addition (of appropriate values) or for digits 16272 seen)
(SC; B1 for attempting to add 36 lots of 4.52)</td></tr>
</table>

Question		Working	Answer	Mark	Notes
11		$300 \div 6 = 50$ $300 \div 10 \times 3 = 90$ $300 - 90 - 50$ or $\frac{1}{6} + \frac{3}{10} = \frac{7}{15}$ $\frac{7}{15} \times 300 = 140$ $300 - 140$	160	4	M1 for $300 \div 6$ or 50 seen M1 for 300 ÷ 10 × 3 oe or $30 + 30 + 30$ or 90 seen M1 (dep on at least 1 previous M1) for $300 - "50" - "90"$ A1 cao or M1 for $\frac{1}{6} + \frac{3}{10}$ or $\frac{7}{15}$ oe M1 for "$\frac{7}{15}$" × 300 or 140 seen or 1- "$\frac{7}{15}$" or $\frac{8}{15}$ oe seen M1 (dep on at least 1 previous M1) for 300-"140" or 160 seen or "$\frac{8}{15}$"× 300 A1 cao

Question		Working	Answer	Mark	Notes
12		$360 \div 5$ or $180 - (3 \times 180 \div 5)$	72	2	M1 for $360 \div 5$ or $180 - (3 \times 180 \div 5)$ A1 cao
13			2 reasons	2	B2 for 2 out of 3 of these aspects Aspect1: no time frame, Aspect 2: overlapping, Aspect 3: not exhaustive (B1 for 1 aspect) [SC: B1 for designing a better question identifying at least one aspect]
14	(a)		3, –3, –1	2	B2 for all 3 correct (B1 for 1 or 2 correct)
	(b)		Graph	2	B2 for a fully correct graph or B1 ft for "7 points" plotted correctly ± 2 mm B1 for a smooth curve drawn through their points provided B1 awarded in (a) Note: A straight line drawn from (-1, -3) to (0, -3) gets a maximum of B1
	(c)		–2.3 and 1.3	1	B1 for –2.3 and 1.3 or ft ± 2 mm on a graph with exactly 2 points of intersection with the *x*-axis.

Question		Working	Answer	Mark	Notes
15		2) 180 2) 90 3) 45 3) 15 5) 5 1 	$2\times2\times3\times3\times5$	3	M1 for attempt at continual prime factorization (at least two correct divisions); could be shown as a factor tree OR sight of at least one of each 2,3,5 as factors of 180 A1 for a fully correct factor tree or 2, 2, 3, 3, 5 which may include 1, but no other numbers A1 for $2\times2\times3\times3\times5$ **or** $2^2\times3^2\times5$ [Note $1\times2\times2\times3\times3\times5$ or 2,2,3,3,5 or 2.2.3.3.5 do **not** get the final A1]
16		$\frac{13}{4}\times\frac{8}{3}$	$\frac{26}{3}$	3	M1 for attempt to convert to improper fractions eg. $\frac{3\times4+1}{4}$ oe or $\frac{2\times3+2}{3}$ oe seen M1 (dep) for $\frac{"13"\times"8"}{4\times3}$ or $\frac{104}{12}$ oe seen A1 for $\frac{26}{3}$ or $8\frac{2}{3}$ **OR** M1 for 3.25 × 2.66 or better M1 for a fully correct multiplication method A1 for 8.66…. (recurring)

Question		Working	Answer	Mark	Notes
17	(a)		$3(x+4)$	1	B1 for $3(x+4)$ Accept 3 × (*x* + 4), (*x* + 4)3 and (*x* + 4) × 3
	(b)	$8x-12=5x+7$ $8x-5x=7+12$ $3x=19$	$\frac{19}{3}$ oe	3	M1 for 4 × 2*x* − 4 × 3 or $8x-12$ seen or for an intent to divide by 4 throughout eg. $\frac{5}{4}x+\frac{7}{4}$ oe seen M1 for a correct method to isolate terms in *x* **and** isolate number terms on opposite side of a 4-term equation eg. '8*x*' − 5*x* = 7 + '12' or 3*x* = 19 seen A1 for $\frac{19}{3}$ oe (accept 6.33 or better)
	(c)	$y^2+5y+4y+20$ *y* +4 *y* y^2 4*y* +5 5*y* 20	$y^2+9y+20$	2	B2 cao (B1 for 4 correct terms with or without signs, or 3 out of no more than 4 terms, with correct signs. The terms may be in an expression or in a table)
	(d)		$4x(2x+3y)$	2	B2 cao [B1 for 4(2x^2 + 3*xy*) or *x*(8*x* + 12*y*) or 2*x*(4*x* + 6*y*) or 2(4x^2 + 6*xy*) or 4*x*(a linear expression in x and y, with just one error); for example 4*x*(*kx* + 3*y*) or 4*x*(2*x* + *ky*) *k* ≠0]

Question		Working	Answer	Mark	Notes
18	(a)	$12\times\frac{6}{4}$	18	2	M1 for sight of $\frac{6}{4}$ oe or $\frac{4}{6}$oe or $\frac{12}{4}$oe or $\frac{4}{12}$oe or a ratio eg. 6:4 oe or decimal eg. 1.5 oe A1 cao
	(b)	$15\times\frac{4}{6}$	10	2	M1 for $15\times\frac{4}{6}$ oe or $\frac{15}{"18"}\times 12$ oe A1 cao
19		$4000-\frac{10}{100}\times 4000=3600$ $3600-\frac{10}{100}\times 3600$	3240	3	M1 for $4000-\frac{10}{100}\times 4000$ or 0.9×4000 oe or 3600 or 400 or 3200 or 800 seen M1 (dep) $"3600"-\frac{10}{100}\times"3600"$ or "3600"×0.9 oe A1 cao **or** M2 for 4000×0.9^2 (M1 for 4000×0.9^3) A1 cao [SC: B2 for an answer of £4840, with or without working]

Question		Working	Answer	Mark	Notes
20	(a)		$a^2(c+b)$ $4abc$	2	B1 for a^2 $(c + b)$ B1 for $4abc$ [−1 for each additional incorrect answer, up to a minimum of 0]
	(b)	8 × 100 × 100 × 100	8 000 000 or 8 x 10^6 or 8 million	2	M1 for sight of 10^6 oe or $100\times100\times100$ or $200\times200\times200$ A1 for 8 000 000 or 8 x 10^6
21		$6x+4y=16$ $6x+15y=-6$ $-11y=22$ $6x+4\times-2=16$ **Alternative method** $x=\frac{8-2y}{3}$ $2\left(\frac{8-2y}{3}\right)+5y=-2$ 16 − 4y + 15y = −6 11y = −22 $x=\frac{8-2\times-2}{3}$	x = 4, y = −2	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either x = 4 or y = −2 M1 (dep on 1st M1) for correct substitution of their found variable OR M1 (indep of 1st M1 for a correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both x = 4 and y = −2 [SC: B1 for x =4 or y =-2 if M0 scored]

Question		Working	Answer	Mark	Notes
22	(a)		$20 < n \leq 30$	1	B1 for $20 < n \leq 30$ Accept 20 to 30, 20 - 30 oe but **not** 26 Accept an indication of chosen interval on the diagram (circling) if no answer on the answer line
	(b)		16,42,65,75,80	1	B1 cao
	(c)		Points plotted and joined	2	B1 ft for at least 4 of "5 points" plotted correctly ±2 mm at end of interval dep on sensible table (condone 1 addition error) B1 ft (dep on previous B1) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points (SC B1 if 4 or 5 pts plotted not at end but consistent within each interval **and** joined)
	(d)(i)		28 – 30	3	B1 for an answer in the range 28 – 30 or from "cf graph"
	(ii)		15 – 17		M1 for horizontal lines drawn at cf = 20 and cf = 60 oe and vertical lines drawn to '*x*'-axis or 'correct' marks drawn on '*x*'-axis only or for UQ = 36 – 38 **and** LQ = 20.5 – 23 or ft "cf graph" A1 For answer in the range of 15-17 or ft from "cf graph"

Question		Working	Answer	Mark	Notes
23		Gradient = $\frac{10--2}{3-0}$	$y = 4x - 2$	3	M1 for gradient = $\frac{10--2}{3-0}$ oe or $(y =) 4x + c$ or a right angle triangle with sides 12 and 3 shown M1 for (y =) mx – 2, $m \neq 0$ or 10 = 3 $m + c$ or – 2 = c (but not 'y-intercept = −2') A1 for $y = 4x - 2$ oe [the y must be included in the equation]
24	(i)		1	1	B1 cao
	(ii)		8	1	B1 for 8 or -8 or $\pm$ 8
	(iii)		$\frac{4}{9}$	2	M1 for $\left(\frac{8}{27}\right)^{\frac{2}{3}}$ oe or $\left(\frac{3}{2}\right)^{-2}$ oe or $\left(\frac{2}{3}\right)^{2}$ oe or $\left(\frac{1}{\sqrt[3]{27/8}}\right)^{2}$ or better or $\frac{9}{4}$ oe seen A1 cao

Question		Working	Answer	Mark	Notes
25	(a)	$x^2+(x+2)^2=(x+4)^2$ $x^2+x^2+4x+4=x^2+8x+16$ $x^2+4x-8x+4-16=0$	Proof	3	M1 for $x^2 + (x + 2)^2 = (x + 4)^2$ oe A1 for $x^2+x^2+4x+4 = x^2+8x+16$ A1 for completing the proof
	b)(i)	$(x-6)(x+2)=0$ $x-6=0$ or $x+2=0$ or $x=\frac{--4\pm\sqrt{(-4)^2-4\times1\times-12}}{2\times1}$ $x=\frac{4\pm\sqrt{64}}{2}$ $(x - 2)^2 - 16 = 0$ $x - 2 = \pm\sqrt{16}$ $x = 2 \pm\sqrt{16}$	6, -2	4	M1 for $(x \pm 6)(x \pm 2)$ (= 0) OR $\frac{--4\pm\sqrt{(-4)^2-4\times1\times-12}}{2\times1}$ allow ±4 for b and ±12 for c OR $(x - 2)^2 - 16 = 0$ A1 $x = 6$ cao A1 $x = -2$ cao [SC: B1 for 1 correct solution if MO scored]
	(ii)		10		B1 ft from (b)(i), provided x is a positive value [Note: an answer of 10 and 2 gets B0]

Question	Working	Answer	Mark	Notes
26	$\left(\frac{3}{10}\times\frac{2}{9}\right)+\left(\frac{2}{10}\times\frac{1}{9}\right)+\left(\frac{5}{10}\times\frac{4}{9}\right)=\frac{6+2+20}{90}$	$\frac{28}{90}$ oe	4	B1 for $\frac{2}{9}$ (orange) or $\frac{1}{9}$ (red) or $\frac{4}{9}$ (yellow) seen as 2nd probability M1 for $\left(\frac{3}{10}\times\frac{2}{9}\right)$ or $\left(\frac{2}{10}\times\frac{1}{9}\right)$ or $\left(\frac{5}{10}\times\frac{4}{9}\right)$ M1 for $\left(\frac{3}{10}\times\frac{2}{9}\right)$ + $\left(\frac{2}{10}\times\frac{1}{9}\right)$+$\left(\frac{5}{10}\times\frac{4}{9}\right)$ A1 for $\frac{28}{90}$ oe **Alternative scheme for replacement** M1 for $\left(\frac{3}{10}\times\frac{3}{10}\right)$ or $\left(\frac{2}{10}\times\frac{2}{10}\right)$ or $\left(\frac{5}{10}\times\frac{5}{10}\right)$ M1 for $\left(\frac{3}{10}\times\frac{3}{10}\right)$ + $\left(\frac{2}{10}\times\frac{2}{10}\right)$+$\left(\frac{5}{10}\times\frac{5}{10}\right)$ No further marks may be awarded

Question	Working	Answer	Mark	Notes
27	$PQT = 58^o$ (Alternate segment theorem) $QTP = (180 - 58)/2$ (= 61^o) (Isosceles triangle) $OTQ = 61 - (90-58)$ (Angle between tangent and radius) Alternative: $OTP = 90 - 58$ (=32^o) (angle between radius and tangent) $OTP = OPT = 32^o$ (isosceles triangle) $POT = 180 - 32 - 32 = 116^o$ (angles in a triangle) $PQT = 116 \div 2 = 58^o$ (angle at centre = 2 × angle at circumference) $QTP = QPT = (180 - 58)/2$ (= 61^o) (Isosceles triangle) $OTQ = 61 - 32$	29	5	M1 for $PQT = 58^o$ or ½ (180 – 2(90 – 58)) M1 (dep) for QPT or QTP = (180 – "58")/2 A1 for $OTQ = 29^o$ B2 for fully correct reasons (B1 for alternate segment theorem or equivalent circle theorems leading to PQT)

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