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Mark Scheme (Results)

November 2011

GCSE Mathematics (1380)
Paper 4H

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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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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 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_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	4.636809….. ÷ 3.44	1.3479(09665…)	2	M1 for 4.63(6809…..)or 3.44 seen or $\frac{86}{25}$ A1 for 1.3479(09665…)
	(b)		1.35	1	B1 ft for 1.35
2		$\frac{3500\times2.5\times3}{100}$	262.50	3	M1 for $\frac{3500\times2.5}{100}$ oe (=87.5) **or** 3500×1.025^{n} M1 for '87.5' x 3 **or** 3500 + '87.5'×3 A1 for 262.5 or 262.50 SC: B2 for 3762.50 or 3762.5 if M0 scored SC : B2 for 269.12 or 269.11 (B1 for 3769.12 or 3769.11)

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		Overlapping boxes Not exhaustive No time period stated	2	1st aspect : no time frame 2nd aspect : overlapping boxes 3rd aspect : not exhaustive boxes ie. no < 1 B2 for 2 aspects (B1 for 1 aspect)
	(b)		Example: "How many hours a day do you listen to music" 0 to3, over 3 to 5, over 5	2	1st aspect : question including time frame and units (or question and time frame in response boxes) 2nd aspect : at least 3 boxes – all non-overlapping with discrete values or a range; need not be inclusive of all **or** a set of at least 3 boxes which are exhaustive for all integer numbers of hours (but which may overlap) NB : Do not accept the use of inequalities with response boxes B2 for 2 aspects (B1 for 1 aspect)
4	(a)		6	1	B1 cao
	(b)		60	2	M1 for at least 4, 8, 12 and 5, 10, 15 and 6, 12, 18 A1 cao **or** M1 for 2×2×3×5 or identifying 2, 2, 3, 5 A1 cao SC : B1 for any other multiple of 60

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		2800 ÷ (13 + 12 + 10) = 80p / share 80 × 12 = 960 $960 \times \frac{2}{3}$	6.40	4	M1 for 2800 ÷ (13 + 12 + 10) (=80) or 28 ÷ (13 + 12 + 10) (=0.8) **or** 80 **or** 0.8 **or** 10.4(0) **or** 1040 **or** 8 **or** 800 **or** $\frac{13}{35}$ **or** $\frac{12}{35}$ **or** $\frac{10}{35}$ oe seen M1 for '80' × 12(=960) or'0.80' × 12(=9.6(0)) **or** $\frac{12}{35} \times 2800$ **or** $\frac{12}{35} \times 28$ M1 (indept) for $\times \frac{2}{3}$ oe A1 for £6.40 or 640 pence [accept 6.4] SC : B2 for answer of 10 supported by working

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)	$2x - 10 + x + 50$ (ext angle of a triangle = sum of interior opp angles) OR $180 - (2x - 10 + x + 50) = 140 - 3x$ (sum of the angles in a triangle = 180) $180 - (140 - 3x)$ (sum of the angles on a straight line = 180)	Show result, with reasons	3	M1 for $2x - 10 + x + 50$ **or** $2x + x$ and $50 - 10$ A1 for completing the algebra to complete the proof and showing $y = 3x + 40$ B1 for '**ext angle** of a **triangle** = **sum** of interior **opp** angles' OR M1 for $180 - (2x - 10 + x + 50)$ or $140 - 3x$ seen A1 for completing the algebra to complete the proof and showing $y = 3x + 40$ B1 for 'sum of the **angles** in a **triangle** = **180**' oe **and** 'sum of the **angles** on a straight **line** = **180**' oe
	(b)(i)	$3x = 145 - 40 = 105$ $105 \div 3$ $35 + 50 = 85$	35	4	M1 for clear attempt to subtract 40 from both sides of the equation **or** divide all 3 terms by 3 **or** ($3x =$) 145 – 40 or 105 seen A1 cao
	(ii)	$2 \times 35 - 10 = 60$ $180 - 145 = 35$	85		M1 ft for $2\times$'35' – 10 **or** '35' + 50 **or** 180 – 145 **or** can be implied by sight of 85 or 60 **or** for substituting '35' in order to find at least one angle implied by sight of 85 or 60 A1 for 85 or ft for '35' provided 'x' < 47

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7		$\frac{1}{2} \times 8 \times 15 = 60$ $60 \div 12$	5	4	M1 for $\frac{1}{2} \times 8 \times 15$ (=60) **or** $12x$ **or** $12 \times ?$ oe M1(dep) for equating 'area of triangle' to 'area of rectangle' ('areas' must be dimensionally correct) eg. $\frac{1}{2} \times 8 \times 15 = 12x$ **or** $60 = 12x$ (NB. x may have a numerical value) M1 (indep) for '60' ÷ 12 A1 cao SC : B3 for an answer of 10
8	(a)	$\pi \times 6 \times 2$	37.7	2	M1 for $\pi \times 12$ or $\pi \times 2 \times 6$ A1 for 37.6- 37.8
	(b)	$(100 \div 12) \times (50 \div 12) = 8 \times 4$ whole CDs	36	2	B2 for 33, 34, 35, 36 **or** M1 for $(100 \div 12) \times (50 \div 12)$ oe **or** 8×4 A1 for 32 SC : B1 for 44

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		1 ÷ 1.14 = 0.877… is worse than 0.86 OR 1 ÷ 0.86 = 1.162… is better than 1.14 OR Change say £100 1.14 × 100 = 114 $100 \times \frac{1}{0.86} = 116.28$	Paris since 1.16..> 1.14	3	M1 for an attempted conversion using 1.14 or 0.86 A1 for arriving at two comparable amounts of money in the same currency A1 for Paris with correct figures
10		(12×2 + 16×8 +20×14 +24×23 +28×9 +32×4) ÷ 60 = (24 + 128 + 280 + 552 + 252 + 128)÷60 = 1364 ÷ 60 **Alternative** (12.5×2 + 16.5×8 +20.5×14 +24.5×23 +28.5×9 +32.5×4) ÷ 60 = (25 + 132 + 287 + 563.5 + 256.5 + 130)÷60 = 1394 ÷ 60	22.7	4	M1 for *fx* consistently within intervals including the ends (allow 1 error) M1 (dep) for use of all correct mid-interval values (allow 12 – 12.5 etc) M1 (dep on 1st M1) for $\sum fx \div \sum f$ A1 for 22.7 – 23.23…
11	(a)		m^9	1	B1 cao
	(b)		p^6	1	B1 cao
	(c)		$16n^{12}$	2	B2 cao (B1 for an^{12} **or** $16n^k$ **or** $2^4n^{3\times4}$ **or** $16 + n^{12}$)

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		−2, −1, 0, 1, 2, 3, 4	2	B2 for all 7 correct values; ignore repeats, any order (-1 for each omission or additional value)
	(b)	$4x > 10$	$x > 2.5$	2	M1 for $4x > 11 - 1$ or clear attempt to subtract 1 from both sides **or** clear attempt to divide all 3 terms by 4 or $4x > 10$ **or** $4x = 10$ **or** $4x < 10$ etc A1 $x > 2.5$ oe [SC: B1 for 2.5 oe seen if M0 scored]
13	(a)		**6**, 4.5, 3, **1.5, 0**, –1.5	2	B2 for all 3 correct values of y [B1 for 1 or 2 correct values of y]
	(b)		Single straight line from (–2, 6) to (3, –1.5)	2	B2 for a straight line from (–2, 6) to (3, –1.5) [B1 for 5 of their points correctly plotted ±1 sq or a single line passing through (0, 3) or a single line of gradient –1.5]
	(c)		− 1.5 oe	2	M1 for a right-angled triangle drawn on their line graph with vertical and horizontal lengths correct for their triangle **or** sight of –1.5oe **or** 1.5oe or $\frac{2}{3}$ oe or $-\frac{2}{3}$ oe or $\frac{3}{2}$ or $-\frac{3}{2}$ A1 (ft their single line graph) for − 1.5 oe **or** M1 for a correct full method to rearrange the equation to make y the subject **or** sight of $y = k - 1.5x$ **or** $y = -1.5x$ **or** $-1.5x$ **or** $y + 1.5x = k$ A1 for –1.5oe

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		$2(3x + 2)$	1	B1 cao
	(b)		$3xy(3x - 5)$	2	B2 cao (B1 for $3x(3xy - 5y)$ **or** $3y(3x^2 - 5x)$ or $xy(9x - 15)$ **or** a factor of $3xy(a - b)$ or $3xy(3x + 5)$)
15	(a)	$(34 + 46 + 28) \div 3$ $(46 + 28 + 40) \div 3$	36 38	2	M1 for either $(34 + 46 + 28) \div 3$ or $(46 + 28 + 40) \div 3$ (condone missing brackets) **or** one of 36 or 38 in correct position on answer lines A1 cao (SC: If no marks scored B1 for 38, 36)
	(b)		increasing	1	B1 for upwards or increasing oe or ft from part (a)
16	(a)		55	1	B1 cao
	(b)		23	2	M1 for $k - 47$ **or** $47 - k$ **or** $70 - k$ **or** $k - 70$ where k can be any value A1 cao
	(c)		Box plot	2	B2 for a fully correct box plot ± ½ square (B1 for 3 correctly plotted points with box or whiskers drawn in)
	(d)		Eg: Adults greater spread, greater iqr, higher median, etc	2	B1 for a correct comparison of a specific value (lowest, highest, median, UQ, LQ) B1 for a correct comparison of spread (iqr, range)

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$\frac{15+6}{15}\times 12.5$	17.5	3	M1 for $\frac{DE}{12.5}=\frac{15+6}{15}$ oe **or** $\frac{15}{15+6}$ **or** $\frac{15+6}{15}$ **or** $\frac{7}{5}$ **or** $\frac{5}{7}$ **or** $\frac{2}{5}$ **or** $\frac{5}{2}$ (1.4 or 0.4 or 2.5 or 0.714…) M1 for $\frac{15+6}{15}\times 12.5$ **or** $\frac{7}{5}\times 12.5$ oe **or** $12.5+\frac{2}{5}\times 12.5$ oe A1 cao
18		9×100	900	2	M1 for 10×10 (=100) **or** 9×100 **or** $1\text{cm}^2 = 100\text{mm}^2$ **or** 30×30 A1 cao

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		$x^2 + 3 = 7x$ $x^2 - 7x + 3 = 0$ $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 3}}{2}$ OR $(x - 3.5)^2 = 3.5^2 - 3 = 9.25$ $x - 3.5 = \pm\sqrt{9.25}$	$= \frac{7 \pm \sqrt{37}}{2}$ OR $3.5 \pm\sqrt{9.25}$	3	M1 for $x^2 + 3 = 7x$ oe **or** clear intention to multiply all terms by x M1 for $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 3}}{2}$ ft from a quadratic equation of the form $ax^2 + bx + c = 0$ where $a,b,c \neq 0$; condone wrong signs for a, b, c in substitution A1 for $= \frac{7 \pm \sqrt{49 - 12}}{2}$ or for $= \frac{7 \pm \sqrt{37}}{2}$ as the final exact solution **OR** M1 for $x^2 + 3 = 7x$ oe **or** clear intention to multiply all terms by x M1 for $(x - 3.5)^2 - 3.5^2 + 3 = 0$ ft from a quadratic equation of the form $ax^2 + bx + c = 0$ where $a,b,c \neq 0$ A1 for $3.5 \pm\sqrt{9.25}$ SC : B2 for both 6.54(1381265..) **and** 0.458(6187349…)

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(a)	$\frac{8}{\sin 62}$	9.06	3	M1 for $\sin 62 = \frac{8}{PR}$ **or** cos(90-62) = $\frac{8}{PR}$ **or** $\frac{\sin 90}{PR} = \frac{\sin 62}{8}$ oe M1 for (PR=) $\frac{8}{\sin 62}$ **or** $\frac{8}{\cos(90-62)}$ **or** sin90 × $\frac{8}{\sin 62}$ A1 for 9.06 – 9.061 SC: B2 for -10.82 to -10.83 using rad **or** 9.672 to 9.674 using grad **or** For methods involving trig or Pythagoras and then trig or Pythag No marks until a correct trig or pythag statement linking SR = 4.25(36…) and PR For example M1 for (PR^2=) $8^2 + 4.25(36…)^2$ or $\cos 62 = \frac{4.25(36...)}{PR}$ M1 for $\sqrt{64 + 18.0(9...)}$ or $\frac{4.25(36...)}{\cos 62}$ A1 9.06 – 9.061

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(b)	$QR^2 = 14^2 + 9.06^2 - 2.\ 14.\ 9.06\ \cos 62$ $= 196 + 82.08 - 253.68\cos 62$ $= 158.98\ldots.$	12.6	4	B1 for angle $QPR = 62^o$ M1 for $QR^2 = 14^2 + $ '9.06'$^2 - 2\times 14\times$'9.06'$\times \cos 62$ M1 for correct order of evaluation **or** 158.9… A1 (ft *PR*) for 12.6 – 12.62 **or** For methods using trigonometry and Pythagoras No marks until a correct Pythag statement with *QR* as only unknown (Let M be on *PQ* such that angle *RMQ* is 90^o) For example B1 for angle $QPR = 62^o$ M1 for $(QR^2 =)\ 8^2 + (14 - PR\cos 62)^2$ M1 for $\sqrt{64+'94.995...'}$ **or** 158.9… A1 (ft *PR*) for 12.6 – 12.62 SC: B3 for 10.3(5511) or 10.4 using rad **or** 11.6(402014) using grad
21	(a)		34, 12	2	M1 for frequency = fd × column width, can be implied by one frequency correct **or** fd correctly marked on vertical axis (1cm = 4 units) **or** identifying 1 cm^2 as frequency of 4 oe A1 34 and 12 both correct
	(b)		Bars of height 6 cm and 4.5 cm	2	B1 for bar of height 6 cm B1 for bar of height 4.5 cm

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		*AM = MC* (given *M* is midpoint) *AL = LB* (given *L* is midpoint) *LB = MN* (opp sides of a parallogram) So *AL = MN* *BN = NC* (given *N* is midpoint) *BN = LM* (opp sides of a parallogram) So *LM = NC* triangles are congruent SSS OR *AM = MC* (given *M* is midpoint) Angle *ALM* = angle *ABN* = angle *MNC* (corresponding angles) Angle *AML* = angle *MCN* (corresponding angles) triangles are congruent ASA OR Angles CNM = Angles NML (alternate angles) Angle NML = Angle MLA (alternate angles) Therefore Angle MLA = Angle CNM [Then lines 2 to 7 of the first method] triangles are congruent SAS	Proof	3	M1 for either *AM = MC* or *AL = LB* or *BN = NC* M1 for either *LB = MN* or *BN = LM* A1 for conclusion of congruency (eg SSS) with all three sides shown as equal OR M1 for *AM = MC* M1 for either Angle *ALM* = angle *MNC* or Angle *AML* = angle *MCN* or Angle *MAL* = angle *CMN* A1 for conclusion of congruency (eg ASA) with two angles and one side shown to be equal OR M1 for either Angle MLA = Angle CNM or AL = LB or BN = NC M1 for either LB = MN or BN = LM A1 for conclusion of congruency (e.g. SAS) with two sides and one angle shown to be equal SC : Include appropriate pair of sides (eg. LM = NC) with justification of mid-point rule in any of above

1380_4H					
Question		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	$x(x+p)+q(x+p)$	$(x+p)(x+q)$	2	M1 for $x(x+p)+q(x+p)$ **or** $x(x+q)+p(x+q)$ A1 cao
	(b)		$(m-2)(m+2)$	1	B1 cao
	(c)	$\frac{2(x+3)-(x-4)}{(x-4)(x+3)}$ $=\frac{2x+6-x+4}{(x-4)(x+3)}$	$\frac{x+10}{(x-4)(x+3)}$	3	M1 for common denominator of $(x-4)(x+3)$ M1 for $\frac{2(x+3)}{(x-4)(x+3)}-\frac{(x-4)}{(x-4)(x+3)}$ $\frac{2(x+3)-(x-4)}{(x-4)(x+3)}$ oe condone missing brackets around $x-4$ A1 for $\frac{x+10}{(x-4)(x+3)}$ or $\frac{x+10}{x^2-x-12}$
24		$3\times\pi\times8^2$	603	3	M1 for $\frac{1}{2}\times4\times\pi\times8^2$ oe (=402(.12…)) M1 (dep) for '402' + $\pi\times8^2$ or 192π A1 for 603 – 603.23
25		642.5 × 397.5	255000	3	B1 for 642.5 or 647.5 or 397.5 or 402.5 seen M1 for $l_{LB}\times w_{LB}$ where $642.5\le l_{LB}<645$ and $397.5\le w_{LB}<400$ A1 for 255393.75 or 255 000 coming from 255393.75 or from correct method

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