

Mark Scheme (Results)

November 2011

GCSE Mathematics (5384H)
Paper 14H (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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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).

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Question		Working	Answer	Mark	Notes
1	(a)	$10x - 7 + 7 = 28 + 7$ or $10x/10 - 7/10 = 28/10$ $10x = 35$	3.5	2	M1 for attempt to '+7' both sides or $\div 10$ all three terms A1 for 3.5 oe
	(b)	$4y = 54$	13.5	2	M1 for $\times 9$ or $\div 4$ or $\div 0.44(44\dots)$ both sides A1 for 13.5 oe
2		$650 \times 20 / 100 = 130$ $24 \times 26 = 624$ $130 + 624 = 754$ $754 - 650 =$	104	4	M1 $650 \times 20 / 100 (=130)$ oe M1 $24 \times 26 (=624)$ oe M1 "130"+"624" (=754) OR "754" - 650 A1 cao SC: Award 3 marks for 754 seen
3	(a)		Front elevation	2	B2 for correct front elevation (B1 for correct shape, but one dimension incorrect)
	(b)		Plan	2	B2 for correct plan (B1 for rectangle, but one dimension incorrect)
4	(a)	$\frac{6^7}{6^4}$ or $6^1 \times 6^2$ or $\frac{6^5}{6^2}$	6^3	2	M1 for $\frac{6^7}{6^4}$ or $6^1 \times 6^2$ or $\frac{6^5}{6^2}$ A1 cao SC B1 for 216 if M0 scored.
	(b)		x^{15}	1	B1 cao
5		$\pi \times 6 \times 2$	37.7	2	M1 for $\pi \times 12$ A1 37.6 - 37.8

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Question		Working	Answer	Mark	Notes
6	(a)	$2x - 10 + x + 50$ (ext angle of a triangle = sum of interior opposite 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)	Results with reasons	3	M1 for $2x - 10 + x + 50$ or $2x + x$ and $50 - 10$ A1 for completing the algebra to complete the proof showing $y=3x+40$. B1 for ' <u>ext. angle of a triangle = sum of opp. int. angles</u> ' OR M1 for $180 - (2x - 10 + x + 50)$ or $140 - 3x$ seen. A1 for completing the algebra to complete the proof showing $y=3x+40$. B1 for ' <u>sum of angles in triangle = 180</u> ' oe and ' <u>sum of angles on a straight line = 180</u> ' oe
	(b)	$3x = 145 - 40 = 105$ $105 \div 3$ $35 + 50 = 85$ $2 \times 35 - 10 = 60$ $180 - 145 = 35$	35 85	4	M1 for $(3x =) 145 - 40$ or 105 seen or for clear attempt to subtract 40 from both sides of the equation or divide all 3 terms by 3 A1 cao M1 for $2 \times 35 - 10$ or $35 + 50$ or $180 - 145$ or for substituting '35' in order to find at least one angle; can be implied by sight of 85 or 60 A1 for 85 or ft for '35' provided ' x ' < 47
7		$2800 \div (13 + 12 + 10) = 80\text{p / share}$ $80 \times 12 = 960$ $960 \times \frac{2}{3}$	6.40	4	M1 for $2800 \div (13 + 12 + 10)$ or $28 \div (13 + 12 + 10)$ OR 80 or 0.8 or 10.4(0) or 1040 or 8 seen OR 13/35 or 12/35 or 10/35 oe seen M1 for ' 80 ' $\times 12(=960)$ or ' 0.8 ' $\times 12$ OR 960 or 9.6 seen OR $12/35 \times 2800$ or $12/35 \times 28$ oe M1 (indep) 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

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Question	Working	Answer	Mark	Notes
8	$1 \div 1.14 = 0.877\dots$ worse than 0.86 OR $1 \div 0.86 = 1.162\dots$ better than 1.14 OR Change say £100: $1.14 \times 100 = 114$ $100 \times \frac{1}{0.86} = 116.28$	Paris since $1.16 > 1.14$	3	M1 for any 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.
9	$12^2 = h^2 + 6^2$ $h = \sqrt{144 - 36} = \sqrt{108} = 10.392$ Area = $\frac{1}{2} \times 6 \times 10.392$	31.17 to 31.18	4	M1 for $12^2 = h^2 + 6^2$ or $(h^2 =) 12^2 - 6^2$ M1 for $\sqrt{(144-36)}$ or 10.3(9...) M1 (indep) for $\frac{1}{2} \times 6 \times$ "height" A1 for 31.17 – 31.18 NB: the figure for "height" has to be less than 12 or ft from their Pythagoras calculation.
10	$y = -\frac{1}{2}x + c$ $x = -2y + c$	$y = -\frac{1}{2}x + c$	2	M1 for identification or statement of $-\frac{1}{m}$ or sight of $-\frac{1}{2}$ A1 for equation $y = -\frac{1}{2}x + c$ oec any number or absent.

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Question		Working	Answer	Mark	Notes
11		$4x > 10$	$x > 2.5$	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 oe SC: B1 for 2.5 oe seen if M0 scored.
12		$\frac{15+6}{15} \times 12.5$	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 $\frac{5}{2}$ or 1.4 or 0.4 or 2.5 or 0.714...oe M1 for $\frac{15+6}{15} \times 12.5$ or $\frac{21}{15}$ or $\frac{7}{5} \times 12.5$ oe or $12.5 + \frac{2}{5} \times 12.5$ oe A1 cao
13	(a)		-4,-2,-4,0	2	B2 for all points correctly calculated (B1 for at least 2 calculated correctly)
	(b)		Graph plotted	2	B1 ft for plotting points from their table (allow 1 error) ± 1 small square B1 (dep on previous B1) for joining points with a curve; curve within tolerance of all points.

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Question	Working	Answer	Mark	Notes
14	$x^2 + 3 = 7x$ $x^2 - 7x + 3 = 0$ $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 3}}{2}$ 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 $x^2 + 3 = 7x$ 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 $x = \frac{7 \pm \sqrt{49 - 12}}{2}$ or for $= \frac{7 \pm \sqrt{37}}{2}$ as the final exact solution. OR M1 for $x^2 + 3 = 7x$ 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 : If no marks awarded then B2 for both 6.54(1381265..) and 0.458(6187349...)

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Question	Working	Answer	Mark	Notes
15	$QR^2 = 14^2 + 9.06^2 - 2 \cdot 14 \cdot 9.06 \cos 62$ $= 196 + 82.08 - 253.68 \cos 62$ $= 158.98 \dots$	12.6	4	<p>B1 for angle $QPR = 62^\circ$ 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 for 12.6 – 12.62</p> <p>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°) For example B1 for angle $QPR = 62^\circ$ M1 for $(QR^2 =) 8^2 + (14 - 9.06 \cos 62)^2$ M1 for $\sqrt{64 + '94.995 \dots'}$ or 158.9... A1 for 12.6 – 12.62</p> <p>SC: B3 for 10.3(5511) or 10.4 using rad or 11.6(402014) using grad</p>

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Question	Working	Answer	Mark	Notes
16	<p> $AM = MC$ (given M is midpoint) $AL = LB$ (given L is midpoint) $LB = MN$ (opp sides of a parallelogram) So $AL = MN$ $BN = NC$ (given N is midpoint) $BN = LM$ (opp sides of a parallelogram) So $LM = NC$ triangles are congruent SSS OR $AM = MC$ (given M is midpoint) Angles: $ALM = ABN = MNC$ (corresponding) Angle $AML = angle MCN$ (corresponding) triangles are congruent ASA OR Angle $CNM = angle NML$ (alternate) Angle $NML = angle MLA$ (alternate) SO angle $MLA = angle CNB$ $AL = LB$ (L midpoint of AB) $LB = MN$ (opp sides of a parallelogram) SO $AL = MN$ $BN = NC$ (N midpoint of BC) $BN = LM$ (opposite of a parallelogram) SO $LM = NC$ Triangles are congruent </p>	Proof	3	<p> M1 for either $AM = MC$ or $AL = LB$ or $BN = NC$ M1 for either $LB = MN$ or $BN = LM$ A1 conclusion of congruency (eg SSS) with all three sides shown as equal. </p> <p>OR</p> <p> M1 for $AM = MC$ M1 for either Angle $ALM = angle MNC$ or Angle $AML = angle MCN$ or angle $LAM = angle NMC$ A1 conclusion of congruency (eg ASA) with two angles and one side shown as equal. </p> <p>OR</p> <p> M1 for either $MLA = CNM$ or $AL = LB$ or $BN = NC$ M1 for either $LB = MN$ or $BN = LM$ A1 conclusion of congruency (eg SAS) with two sides and one angle shown as equal. </p> <p>SC: include appropriate pair of sides with justification of midpoint rule for M1 in any of the above.</p>

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Question		Working	Answer	Mark	Notes
17		$2500 \div 64.45 = 38.7897595$	38.8	4	M1 for 2500 or 1500 seen or 2499 (recurring) M1 for 64.55 or 64.45 seen or 64.5499(recurring) M1 for $\text{area}_{\text{max}} \div \text{length}_{\text{min}}$ eg "2500" \div "64.45" A1 for 38.8 or better Accept equivalent working in cm for M marks.

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