Mark Scheme (Results)

Summer 2009

GCSE Mathematics (Linear) - 1380
Paper: 1380/4H

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     If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

1380/4H					
Question		Working	Answer	Mark	Notes
1	(a)	325×1.68	546	2	M1 for 325×1.68 seen or digits 546 A1 for 546, accept 546.00, 546.0
	(b)	$117 \div 1.5$	78	2	M1 for $117 \div 1.5$ seen or digits 78 A1 for 78, accept 78.00, 78.0
2	(a)		Correct shape	2	B2 for correct shape; any orientation. (B1 for any two sides correct or all correct for scale factor other than 1 or 2), tolerance to within half square
	(b)		Reflection in line $x = 0$	2	B1 for reflection, reflect, reflected. B1 for line $x = 0$ or y-axis NB: more than one transformation should be awarded 0 marks.
3		$1^2 + 1$ $2^2 + 1$ $3^2 + 1$	2, 5, 10	2	M1 for 1^2+1 or 2^2+1 or 3^2+1 (but not 1^2+1, 2^2+2, 3^2+3) A1 for 2, 5, 10 SC: B1 for 1, 2, 5 with or without working
4	(a)		(65, 100), (80, 110) plotted	1	B1 for plotting both points (65, 100), (80, 110) correctly (tolerance one square); ignore any additional plots given.
	(b)		positive (correlation)	1	B1 for positive (correlation) or length increases with height oe
	(c)		105 - 110	2	M1 for a single line segment with positive gradient that could be used as a line of best fit or a vertical line from 76 A1 for given answer in the range $105 - 110$

1380/4H					
Question		Working	Answer	Mark	Notes
5		$143.64 \div 19 = 7.56$ $7.56 \times 31 =$	234.36	3	M1 for $143.64 \div 19$ (or 7.56 seen) or 143.64×31 (or 4452.84 seen) M1(dep) for '7.56' × 31 or '4452.84' ÷ 19 or 143.64 + 12×'7.56' A1 for 234.36 cao accept 234.36p Alternative method: M1 for $\dfrac{31}{19}$ (or 1.63(1...) seen) M1 (dep) '1.63...' × 143.64 A1 for 234.36 cao accept 234.36p
6	(a)	$1.8 \times -8 + 32$	17.6	2	M1 for 1.8×-8 or -14.4 or $\dfrac{-72}{5}$ seen or $32 - '1.8 \times 8'$ or $1.8 \times -8 + 32$ seen A1 for 17.6 or $\dfrac{88}{5}$ or 17.60 oe
	(b)	$68 = 1.8C + 32$ $1.8C = 68 - 32$ $C = 36 \div 1.8$	20	2	M1 for $68 - 32$ or 36 or $68 = 1.8C + 32$ seen; condone replacement of C by another letter. A1 for 20 cao NB Trial and improvement score 0 or 2
7			diagram	3	M1 for line drawn or point marked within guidelines from *P* M1 for line drawn or point marked within guidelines from *Q* up to top guideline from *P* A1 for point indicated within region where guidelines intersect

1380/4H					
Question		Working	Answer	Mark	Notes
8	(a)	$18 \div 6 : 12 \div 6$	3 : 2	2	M1 for 18 : 12 or 12 : 18 or 1.5:1 oe or any correct ratio reversed eg 2:3 A1 for 3 : 2 or 1 : 0.6 … [recurring]
	(b)	5 + 1 = 6 $54 \div 6 = 9$ 5 × 9	45	2	M1 for $\dfrac{5}{5+1} \times 54$ or $\dfrac{1}{5+1} \times 54$ or $54 \div {}'5+1'$ or 54×5 or 270 or 9 : 45 or 9 seen, as long as it is not associated with incorrect working. A1 for 45 cao
9			2.6	4	B2 for trial $2.6 \le x \le 2.7$ evaluated (B1 for trial $2 \le x \le 3$ evaluated) B1 for different trial $2.6 < x \le 2.65$ B1(dep on at least one previous B1) for 2.6 Values evaluated can be rounded or truncated, but to at least 2sf when x has 1dp and 3sf when x has 2dp NB Allow 72 for evaluation using $x = 2.66$ NB No working scores no marks even if answer is correct
10			construction	2	M1 for arcs from same centre on 2 lines at same distance from meeting point ($\pm$ 2mm) A1 for bisector ($\pm 2°$) and correct arcs SC: B1 for bisector ($\pm 2°$) with no arcs, or incorrect arcs if M0 awarded. Accept bisectors that are dashed or dotted.

Working table for question 9:

2	48
3	87
2.5	65.(625)
2.6	69.(576)
2.7	73.(683)
2.65	71.6(09)
2.61	69.9(79)
2.62	70.3(84)
2.63	70.7(91)
2.64	71.1(99)
2.66	72.(021)
2.67	72.4(34)
2.68	72.8(48)
2.69	73.2(65)

1380/4H				
Question	Working	Answer	Mark	Notes
11		2 + 'prime number' is odd	2	M1 for a counter example showing intent to add 2 and another prime number; ignore incorrect examples A1 for a correctly evaluated counter example with no examples given that involve either non-primes or incorrect evaluation **Alternative method** B2 for fully correct explanation '2 is a prime number, odd + even (or 2) = odd' oe with no accompanying incorrect statements or examples (B1 for '2 is a prime number' or recognition that not all prime numbers are odd or odd + even (or 2) = odd; ignore incorrect examples or statements)
12		$15 \times 3 = 45$ 15×3.5 $25 \times 9 = 225$ 25×9.5 $20 \times 15 = 300$ 20×15.5 $12 \times 21 = 252$ 12×21.5 $8 \times 27 = 216$ 8×27.5 $1038 \div 80 =$ $1078 \div 80 =$ 12.975 13.475	12.97 – 13.48	4	M1 for fx consistently within interval including ends (allow 1 error) M1 (dep) consistently using appropriate midpoints M1 (dep on first M) for $\Sigma fx \div \Sigma f$ A1 for 12.97 – 13.48 with no arithmetic errors

1380/4H					
Question		Working	Answer	Mark	Notes
13		$(0.5 \times 3.14... \times 8) + 8$	20.56 – 20.58	3	M2 for $(0.5 \times \pi \times 8)$ or $\pi \times 4$ or $(\pi \times 8 + 8)$ or $(0.5 \times \pi \times 8 + 8)$ oe (M1 for $\pi \times 8$ or $2\pi \times 4$; for a value 25.1-25.2 inclusive unless seen with incorrect working eg πr^2) A1 for 20.56 – 20.58 (SC: B2 if M0 scored for 12.56 – 12.58)
14	(a)		a^3	1	B1 for a^3 cao
	(b)	$5 \times 3x - 5 \times 2$	$15x - 10$	1	B1 for $15x - 10$ cao
	(c)	$3y \times y + 3y \times 4$	$3y^2 + 12y$	2	M1 for $3y \times y + 3y \times 4$ or $3y^2 + a$ or $3y^2+ay$ or $b + 12y$ or by^2+12y where a, b are integers, and can be zero A1 for $3y^2 +12y$ or $3 \times y^2 + 12 \times y$ NB: If more than 2 terms in expansion MOA0
	(d)	$2x-8+3x+6$	$5x-2$	2	M1 for $2 \times x - 2 \times 4$ or $2x-8$ or $3 \times x + 3 \times 2$ or $3x+6$ A1 for $5x-2$ cao
	(e)	$x^2 + 4x - 3x - 12$	$x^2 + x - 12$	2	M1 for 4 terms correct with or without signs, or 3 out of no more than 4 terms, with correct signs (the terms may be in an expression or table) or $x(x-3)+4(x-3)$ or $x(x+4)-3(x+4)$ A1 for $x^2 + x - 12$ cao
15		4.6 + 3.85 = 8.45 $3.2^2 - 6.51 = 3.73$ 8.45 ÷ 3.73 =	2.26541555	2	M1 for $\dfrac{169}{20}$ or $\dfrac{256}{25}$ or $\dfrac{373}{100}$ or 3.73 or 10.24 or 8.45 seen A1 for 2.265(41555); accept $\dfrac{845}{373}$

1380/4H					
Question		Working	Answer	Mark	Notes
16	(a)	t^{6+2}	t^8	1	B1 for t^8 or for t^{6+2}
	(b)	m^{8-3}	m^5	1	B1 for m^5 or for m^{8-3}
	(c)	$2^3 \times x^3$	$8x^3$	2	B2 for $8x^3$ cao (B1 for ax^3, $a \neq 8$ or $2x \times 2x \times 2x$ or $8x^n$ $n \neq 0,3$)
	(d)	$3 \times 4 \times a^{2+5} \times h^{1+4}$	$12a^7h^5$	2	B2 for $12a^7h^5$ (B1 for $12a^7h^n$, $n \neq 0,5$ or $12a^mh^5$, $m \neq 0,7$ or ka^7h^5, $k \neq 12$ or $3 \times 4 \times a^{2+5} \times h^{1+4}$)
17		$9^2 - 6^2$ $81 - 36 = 45$ $\sqrt{45}$	6.705 - 6.71	3	M1 for $9^2 - 6^2$ or $81 - 36$ or 45 or $9^2 = AB^2 + 6^2$ oe M1 for $\sqrt{81-36}$ or $\sqrt{45}$ A1 for $6.705 - 6.71$ [SC: M1 for $\sqrt{81+36}$ or $\sqrt{117}$]
18	(a)		Heaviest bag is 29kg	1	B1 for 23kg is the upper quartile oe, or the heaviest bag is 29kg oe, or 25% of bags are heavier than 23kg or range is 5 - 29 oe
	(b)		17	1	B1 for 17 cao
	(c)	23 − 10	13	1	B1 for 13 cao
	(d)	$\dfrac{25}{100} \times 240$	60	2	M1 for $\dfrac{25}{100} \times 240$ oe or $\dfrac{25}{100} \times 241$ oe A1 for 60 cao (SC: B1 for 25% or 0.25 or quarter seen)

1380/4H					
Question		Working	Answer	Mark	Notes
19	(a)	4500×1.04^2	4867.20	3	M1 for 4500×1.04 or for $4500 + 0.04 \times 4500$ or for 4680 or 180 or 360 or 4860 M1 (dep) '4680' $\times 1.04$ or for '4680' + 0.04 $\times$ '4680' A1 for 4867.2(0) cao (If correct answer seen then ignore any extra years) **Alternative method** M2 for 4500×1.04^2 or 4500×1.04^3 A1 for 4867.2(0) cao [SC: 367.2(0) seen B2]
	(b)	2400×1.075^n 2580 2773.5 2981.5125 3205.12... 3445.51...	5	2	M1 for an attempt to evaluate 2400×1.075^n for at least one value of n (not equal to 1) or $3445.51 \div 1.075^n$ ($n \geq 2$) or $\dfrac{3445.51}{2400}$ (=1.4356...) and 1.075^n evaluated, $n \geq 2$ A1 for 5 cao

1380/4H					
Question		Working	Answer	Mark	Notes
20	(a)	$\cos x = \dfrac{5}{8}$	51.3 - 51.35	3	M1 for $\cos\left(x=\right)\dfrac{5}{8}$ M1 for $\cos^{-1}\dfrac{5}{8}$ or $\cos^{-1}0.625$, or cos^{-1}(5÷8) A1 for 51.3 - 51.35 (SC B2 for 0.89 – 0.9 or 57 - 57.1 seen) **Alternative Scheme** $h^2 = 8^2 - 5^2$ (=39) M1 for $\sin(x=)\ \dfrac{\sqrt{"39"}}{8}$ or $\tan(x=)\dfrac{\sqrt{"39"}}{5}$ or $\dfrac{\sin x}{\sqrt{"39"}} = \dfrac{\sin 90}{8}$ oe or $(\sqrt{"39"})^2 = 8^2 + 5^2 - 2\times 8\times 5\times \cos x$ M1 for $\sin^{-1}(\dfrac{\sqrt{"39"}}{8})$ or $\sin^{-1}(\dfrac{\sqrt{"39"}\times\sin 90}{8})$ or $\tan^{-1}(\dfrac{\sqrt{"39"}}{5})$ or $\cos^{-1}(\dfrac{8^2+5^2-(\sqrt{"39"})^2}{2\times 8\times 5})$ A1 for 51.3 - 51.35

1380/4H				
Question	Working	Answer	Mark	Notes
(b)	$\tan 40 = \dfrac{y}{12.5}$ $y = 12.5 \times \tan 40$	10.4 - 10.5	3	M1 for $\tan 40 = \dfrac{y}{12.5}$ M1 for $12.5 \times \tan 40$ A1 for $10.4 - 10.5$ SC: B2 for $\pm(13.9 - 14.0)$ or 9 - 9.1 seen Alternative scheme M1 for $\dfrac{y}{\sin 40} = \dfrac{12.5}{\sin 50}$ oe M1 for $y = \dfrac{12.5}{\sin 50} \times \sin 40$ A1 for $10.4 - 10.5$ SC: B2 for $\pm(35.4 - 35.5)$ or 10.39 - 10.396 seen
21 (a)	$\dfrac{26}{258} \times 50$	5	2	M1 for $\dfrac{a}{258} \times 50$ or $50 \div \dfrac{258}{a}$ oe, a < 258 or 5.03(8...) or $26 \div 5.16$ A1 for 5 cao
(b)	$\dfrac{(25 + 48 + 62)}{258} \times 50$	26	2	M1 for $\dfrac{135}{258} \times 50$ or $\dfrac{(25 + 48 + 62)}{258} \times 50$ or $\left(\dfrac{25}{258} \times 50 + \dfrac{48}{258} \times 50 + \dfrac{62}{258} \times 50 \right)$ oe or 26.1(6...) or 5 + 9 + 12 or $135 \div 5.16$ A1 for 26 or 27

1380/4H					
Question		Working	Answer	Mark	Notes
22		$\left(9n^2 + 6n + 1\right) -$ $\left(9n^2 - 6n + 1\right)$ $= 12n$	12*n* correct comment	3	M1 for $(3n)^2 + 3n + 3n + 1$ or $(3n)^2 - 3n - 3n + 1$ or $\left((3n+1) - (3n-1)\right)\left((3n+1) + (3n-1)\right)$ A1 for 12*n* from correct expansion of both brackets A1 for 12*n* is a multiple of 4 or 12n = 3 × 4n or 12n = 4 × 3*n* or $\dfrac{12n}{4} = 3n$ or $\dfrac{12n}{3} = 4n$ NB: Trials using different values for *n* score no marks.
23	(a)		b − a	1	B1 for b − a or − a + b oe
	(b)	$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $\overrightarrow{OP}$ = a + $\dfrac{3}{5}$ (b − a) $\overrightarrow{OP}$ = $\dfrac{1}{5}$ (2a + 3b)	proof	3	M1 for $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ oe or $\overrightarrow{OP} = \overrightarrow{OB} + \overrightarrow{BP}$ oe M1 for $\overrightarrow{AP} = \dfrac{3}{5}$ x "(b – a)" oe or $\overrightarrow{BP} = \dfrac{2}{5}$ x "(a – b)" oe A1 for a + $\dfrac{3}{5}$ x (b – a) oe or b + $\dfrac{2}{5}$ x (a – b) oe leading to given answer with correct expansion of brackets seen

1380/4H				
Question	Working	Answer	Mark	Notes
24	$\dfrac{1}{2} \times 6 \times 6 \times \sin 60$ $- \dfrac{60}{360} \times \pi \times 3^2$ = 15.588 - 4.712	10.8 - 10.9	4	M1 for $\dfrac{1}{2} \times 6 \times 6 \times \sin 60$ or for $0.5 \times 6 \times \sqrt{6^2 - 3^2}$ or 15.5 - 15.6 or 14.5 - 14.6 or $\pm 5.48(65\ldots)$ M1 for $\dfrac{60}{360} \times \pi \times 3^2$ (= 4.712...) M1(dep on 1 previous M1) for 'area of triangle' − 'area of sector' A1 for 10.8 − 10.9 SC: B3 for 10.1 - 10.2 or 9.84 - 9.85
25	$\dfrac{(x-3)\,(x-5)}{(2x+3)\,(x-5)}$	$\dfrac{(x-3)}{(2x+3)}$	3	B1 for $(x-3)(x-5)$ or $x(x-5) - 3(x-5)$ M1 for $(2x \pm 3)(x \pm 5)$ or $2x(x+5) \pm 3(x+5)$ or $2x(x-5) \pm 3(x-5)$ A1 for $\dfrac{(x-3)}{(2x+3)}$ cao as final answer

1380/4H				
Question	Working	Answer	Mark	Notes
26	$\dfrac{5}{20}\times\dfrac{7}{19}+\dfrac{5}{20}\times\dfrac{8}{19}+\dfrac{7}{20}\times\dfrac{5}{19}+$ $\dfrac{7}{20}\times\dfrac{8}{20}+\dfrac{8}{20}\times\dfrac{5}{19}+\dfrac{8}{20}\times\dfrac{7}{19}$ or $\left(\dfrac{5}{20}\times\dfrac{15}{19}+\dfrac{7}{20}\times\dfrac{13}{19}+\dfrac{8}{20}\times\dfrac{12}{19}\right)$ or $1-$ $\left(\dfrac{5}{20}\times\dfrac{4}{19}+\dfrac{7}{20}\times\dfrac{6}{19}+\dfrac{8}{20}\times\dfrac{7}{19}\right)$	$\dfrac{131}{190}$	4	M1 for at least one product of the form $\dfrac{a}{20}\times\dfrac{b}{19}$ M1 for identifying all products (condone 2 errors in 6 products, 1 error in 3 products) Either $\left(\dfrac{5}{20}\times\dfrac{7}{19},\dfrac{5}{20}\times\dfrac{8}{19},\dfrac{7}{20}\times\dfrac{5}{19},\dfrac{7}{20}\times\dfrac{8}{19},\dfrac{8}{20}\times\dfrac{5}{19},\dfrac{8}{20}\times\dfrac{7}{19}\right)$ or $\left(\dfrac{5}{20}\times\dfrac{15}{19}\,,\,\dfrac{7}{20}\times\dfrac{13}{19}\,,\,\dfrac{8}{20}\times\dfrac{12}{19}\right)$ or $\left(\dfrac{5}{20}\times\dfrac{4}{19}\,,\,\dfrac{7}{20}\times\dfrac{6}{19}\,,\,\dfrac{8}{20}\times\dfrac{7}{19}\right)$ M1 (dep) for $\left('\dfrac{5}{20}\times\dfrac{7}{19}+\dfrac{5}{20}\times\dfrac{8}{19}+\dfrac{7}{20}\times\dfrac{5}{19}+\dfrac{7}{20}\times\dfrac{8}{19}+\dfrac{8}{20}\times\dfrac{5}{19}+\dfrac{8}{20}\times\dfrac{7}{19}'\right)$ oe or $\left('\dfrac{5}{20}\times\dfrac{15}{19}+\dfrac{7}{20}\times\dfrac{13}{19}+\dfrac{8}{20}\times\dfrac{12}{19}'\right)$ oe or $1-\left('\dfrac{5}{20}\times\dfrac{4}{19}+\dfrac{7}{20}\times\dfrac{6}{19}+\dfrac{8}{20}\times\dfrac{7}{19}'\right)$ oe A1 for $\dfrac{131}{190}$ oe or 0.68947... correct to at least 2 decimal places or answer that rounds to 0.69 NB : If decimals used for products then must be correct to at least 2 decimal places

With replacement
M0
M1 for identifying all products
(condone 2 errors in 6 products, 1 error in 3 products)
either

$$\left(\frac{5}{20} \times \frac{7}{20}, \ \frac{5}{20} \times \frac{8}{20}, \ \frac{7}{20} \times \frac{5}{20}, \frac{7}{20} \times \frac{8}{20}, \ \frac{8}{20} \times \frac{5}{20}, \ \frac{8}{20} \times \frac{7}{20} \right) \text{ or}$$

$$\left(\frac{5}{20} \times \frac{5}{20}, \ \frac{7}{20} \times \frac{7}{20}, \ \frac{8}{20} \times \frac{8}{20} \right) \text{ or}$$

$$\left(\frac{5}{20} \times \frac{15}{20}, \frac{7}{20} \times \frac{13}{20}, \ \frac{8}{20} \times \frac{12}{20} \right)$$

M1 (dep) for

$$\left('\frac{5}{20} \times \frac{7}{20} + \frac{5}{20} \times \frac{8}{20} + \frac{7}{20} \times \frac{5}{20} + \frac{7}{20} \times \frac{8}{20} + \frac{8}{20} \times \frac{5}{20} + \frac{8}{20} \times \frac{7}{20}' \right)$$

$$\text{or} \left('\frac{5}{20} \times \frac{15}{20} + \frac{7}{20} \times \frac{13}{20} + \frac{8}{20} \times \frac{12}{20}' \right)$$

$$\text{or } 1 - \left('\frac{5}{20} \times \frac{5}{20} + \frac{7}{20} \times \frac{7}{20} + \frac{8}{20} \times \frac{8}{20}' \right)$$

A0 for $\frac{262}{400}$ oe or 0.655 (NB: $\frac{262}{400}$ oe or 0.655 implies M2)

Partial replacement
SC: B2 for $\frac{141}{200}$ oe or 0.705 or $\frac{121}{190}$ oe or 0.6368... correct to at least 2 decimal places