



**General Certificate of Secondary Education
January 2013**

Mathematics (Linear)

4365

Paper 2 Higher Tier 43652H

Post-Standardisation

Mark Scheme

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Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

- M** Method marks are awarded for a correct method which could lead to a correct answer.
- M dep** A method mark dependent on a previous method mark being awarded.
- A** Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
- B** Marks awarded independent of method.
- B dep** A mark that can only be awarded if a previous independent mark has been awarded.
- Q** Marks awarded for quality of written communication. (QWC)
- ft** Follow through marks. Marks awarded following a mistake in an earlier step.
- SC** Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
- oe** Or equivalent. Accept answers that are equivalent.
eg, accept 0.5 as well as $\frac{1}{2}$
- [a, b]** Accept values between a and b inclusive.

Paper 2 Higher Tier

Q	Answer	Mark	Comments
1(a)	(C =) $15x + 20y$ or (C =) $5(3x + 4y)$	B2	Accept $0.15x + 0.2y$ B1 for one correct term Do not ignore fw Do not accept $x15 + y20$
1(b)	150×15 or 90×20 or 150×0.15 or 90×0.20	M1	$150 \div 5$ or $90 \div 5$ or $15 \div 5$ or $20 \div 5$
	150×15 and 90×20 or 150×0.15 and 90×0.20 or 2250 and 1800 or 4050 or 22.5 and 18 or 40.5	M1dep	$150 \div 5$ and $90 \div 5$ or $15 \div 5$ and $20 \div 5$ or 30 and 18 or 3 and 4
	$4050 \div 5$ or 810 or $40.50 \div 5$ or 8.10	M1dep	30×15 and 18×20 or 450 and 360 or 810 or 120 and 72 150×3 and 90×4 or 450 and 360 or 810 or 12 and 16
	$4050 - 810$ or $40.50 - 8.10$ or $4050 \div 5 \times 4$ or $40.50 \div 5 \times 4$	M1dep	$150 \times 12 + 90 \times 16$ or $1800 + 1440$ or 3240
	32.40	A1	
2(a)	108	B1	
	Corresponding	Q1	strand (i) Mark is dependent on scoring B1
2(b)	$180 - 117$	M1	oe
	63	A1	

Q	Answer	Mark	Comments
3	5×3.6	M1	
	$50 \times 5 \times 3.6$ or 18 or 900 seen	M1dep	
	$\frac{50 \times \text{their } 18}{3} + 45$	M1dep	Dependent on both previous method marks
	£345	A1	
4	8×6.5 or 52	M1	$8 \div 5$ or 1.6 or $6.5 \div 5$ or 1.3
	their $52 \div 5$ or 10.4	M1dep	their 1.6×4 or 6.4 or their 1.6×6.5 or 10.4 their 1.3×4 or 5.2 or their 1.3×8 or 10.4
	their $52 \div 5 \times 4$ or 41.6 or $1040 \div (\text{their } 5.2)$ or 200 (hours) $1040 \div (\text{their } 6.4)$ or 162.5	M1dep	their 6.4×6.5 or 41.6 or their 10.4×4 or 41.6 their 5.2×8 or 41.6
	$1040 \div (\text{their } 52 \div 5 \times 4)$ or $200 \div 8$ or $162.5 \div 6.5$	M1dep	$1040 \div \text{their } 41.6$
	25	A1	
	5	1 1 2 2 2 2 2 3	B2
6(a)	343	B1	
6(b)	Any two cube numbers from 8 or 27 or 64 or 125 or 216	M1	
	125 and 216	A1	Any order Accept 5^3 and 6^3 Accept 5 and 6

Q	Answer	Mark	Comments
7	$360 \div 4$ or 90 seen	M1	Right angle symbol may be on diagram May be implied from symmetry line and 45
	$360 - 90 - 36 (= 234)$	M1dep	If symmetry used $90 \div 2$ or 45 and $36 \div 2$ or 18 seen or 63 seen If isosceles triangles used $(180 - 90) \div 2$ or 45 and $(180 - 36) \div 2$ or 72 seen
	their $234 \div 2$ or $180 - 45 - 18$ or $45 + 72$	M1dep	Dependent on 1 st two Method marks
	117	A1	
Alt7	$360 \times 4 - 360$ or 6×180 or 1080	M1	oe
	$1080 - 36 \times 4 (= 936)$	M1dep	
	their $936 \div 8$	M1dep	
	117	A1	
8	Bearing of 040° from Hospital and Bearing of 270° from Stadium and Location marked (lines cross)	B3	B2 for one line in tolerance and other line intersecting or two lines in tolerance but not intersecting B1 for one line in tolerance
9	$15^2 - 7^2$ or $x^2 + 7^2 = 15^2$	M1	$\cos 27(\dots) = \frac{x}{15}$ or $\cos 28 = \frac{x}{15}$ or $\sin 62(\dots) = \frac{x}{15}$
	$\sqrt{15^2 - 7^2}$ or $\sqrt{176}$	M1dep	$15 \cos 27(\dots)$ or $15 \cos 28$ or $15 \sin 62(\dots)$
	13.26(...) or 13.3 or 13.27 or 13 or $4\sqrt{11}$	A1	

Q	Answer	Mark	Comments
10(a)	2 squares to the right and 3 up	B2	B1 for 2 squares to the right or 3 up
10(b)	Rotation	B1	
	90 clockwise or –90	B1	oe Accept $\frac{1}{4}$ of a turn clockwise
	(4, 3)	B1	
11	$120 \div 6$ or $\frac{1}{6}$ seen	M1	oe
	20	A1	SC1 for 100
12	$\frac{42}{300}$ or $\frac{33}{250}$ or $\frac{48}{400}$	M1	oe $\frac{258}{300}$ or $\frac{227}{250}$ or $\frac{352}{400}$ $300 \div 42$ or $250 \div 33$ or $400 \div 48$
	0.14 and 0.13(2) and 0.12 or 0.86 and 0.868 or 0.87 and 0.88	A1	14 and 13.(2) and 12 86 and 86.8 or 87 and 88 (non-faulty) 7.1(428) and 7.5(757) or 7.6 and 8.(3333)
	0.14 or A or 0.86	Q1ft	Strand (iii) Correct conclusion from their three answers with at least one correct
Alt12	Correct scaling for one pair	M1	e.g. 840 and 792 (out of 6000) A and B 7 and 6.6 (out of 50) A and B
	All three scaled for comparison	A1	e.g. 840 and 792 and 720 A, B and C 7 and 6.6 and 6 A, B and C 792 and 720 with 7 and 6.6 (B and C with A and B)
	A oe	Q1ft	Strand (iii) Correct conclusion from their three answers with at least one (pair) correct

Q	Answer	Mark	Comments
13(a)	$2a + 6 + 5a - 5$ or $7a + c$ or $na + 1$	M1	Allow one error
	$7a + 1$	A1	Do not accept fw
13(b)	$5c^6d^5$	B2	B1 for two correct terms
13(c)	$\frac{2(x-3)}{x+3}$ or $\frac{2x-6}{x+3}$	B2	B1 for $\frac{2(x-3)^2}{(x-3)(x+3)}$ or $\frac{8(x-3)}{4(x+3)}$ or $\frac{2(x-3)}{1(x+3)}$ Do not accept fw
14(a)	[64, 66]	B1	
14(b)	[53, 55]	B1	
15(a)	$2x(2x - 3y)$	B2	B1 for correct partial factorisation e.g. $2(2x^2 - 3yx)$ or $x(4x - 6y)$ Do not accept fw
15(b)	$2w - 1 = 8 - 4w$ or $\frac{2w}{4} - \frac{1}{4} = 2 - w$	B1	Do not accept $8w - 4 = 8 - 4w$
	$2w + 4w = 8 + 1$ or $\frac{2w}{4} + w = 2 + \frac{1}{4}$	M1	ft their 4 terms
	$(w =) 1.5$	A1ft	oe

Q	Answer	Mark	Comments
16(a)	Midpoints seen or implied 5, 15, 25, 35, 45	B1	
	their Σfx $5 \times 5 + 15 \times 22 + 25 \times 28 + 35 \times 21 + 45 \times 4$ or $25 + 330 + 700 + 735 + 180$ or 1970	M1	This mark is for the sum of their midpoints \times frequencies but condone one error $5 \times 5 = 25$ $15 \times 22 = 330$ $25 \times 28 = 700$ $35 \times 21 = 735$ $45 \times 4 = 180$
	their $\Sigma fx \div 80$	M1dep	their $1970 \div 80$
	24.6(...)	A1	Accept 25 with working shown
16(b)	$5 + 22 + 28$ or 55	M1	$21 + 4$ or 25
	$\frac{5 + 22 + 28}{80} \times 100$	M1	$\frac{21 + 4}{80} \times 100$
	68(...)(%) or 69 and No	A1	31(...)(%) and no
Alt 16(b)	$5 + 22 + 28$ or 55	M1	$21 + 4$ or 25
	$\frac{70}{100} \times 80$ or 56	M1	$\frac{30}{100} \times 80$ or 24
	55 and 56 and No or 56 is in the 30 – 40 group so No	A1	24 and 25 and No

Q	Answer	Mark	Comments
17	Setting up a correct equation	B1	e.g. $7x - 19 = 4x + 2$ or $7x - 19 = 6(x - 2)$
	Collects their 4 terms	M1	e.g. $7x - 4x = 2 + 19$
	$x = 7$	A1	
	Verifies that one side is equal to 30 or setting up another correct equation or substitutes their x into any expression and evaluates it correctly	B1ft	ft is only for their $x = 7$
	Verifies that all sides are equal	A1	e.g. Solves A and B then: calculates 3 sides including C and D Solves A and B and A and C then: calculates 2 sides including D Solves A and B and C and D then: calculates one side of each pair e.g. A and C Solves any three pairs

Q	Answer	Mark	Comments
18(a)	Fully correct c.f. diagram using UCBs and 2, 5, 25, 41, 50	B3	Ignore (50, 0) Ignore before 1 st point and after last point B2 for one error e.g. Consistent plotting at mid class intervals with line joining points Consistent plotting at lower bounds with line joining points One error on cf values e.g. 2, 6, 26, 42, 51 e.g. 2, 5, 25, 51, 60 Points not joined B1 for 2, 5, 25, 41, 50 B1 for bar chart indicating correct heights with no lines

18(b)	Using correct cf graph [6, 9] or [31, 34]	M1	Using incorrect cf graph Reading at 72 or reading at 85 $\pm \frac{1}{2}$ square tolerance
	[6, 9] and [31, 34]	M1	Reading at 72 and reading at 85 $\pm \frac{1}{2}$ square tolerance
	[22, 28]	A1ft	ft from their graph readings at 72 and 85

18(b) ALT	Using the table or dividing up frequency bars $\frac{4}{5} \times 20$ or 16 or $\frac{1}{2} \times 16$ or 8	M1	
	$\frac{4}{5} \times 20$ or 16 and $\frac{1}{2} \times 16$ or 8	M1	
	24	A1	

Q	Answer	Mark	Comments
19	1 2 or 3 7 or 8 6 or 7 3	B3	Note: Total must be 20 for B3 e.g. 1, 2, 8, 6, 3 B2 for 3 or 4 correct or 5 correct with total not equal to 20 or for actual 10% values i.e. 0.7, 2.1, 7.8, 6.4 and 3 B1 for 1 or 2 correct
20(a)	$R = \frac{k}{A}$ or $R \propto \frac{1}{A}$	M1	oe $R = \frac{1}{kA}$ or $R \propto \frac{1}{kA}$
	$12.1 = \frac{k}{1.5}$ or ($k =$) 12.1×1.5 or ($k =$) 18.15 or 18.2 or 18	M1dep	$12.1 = \frac{1}{1.5k}$ or ($k =$) $\frac{1}{1.5 \times 12.1}$ or ($k =$) 0.055(...)
	$R = \frac{18.15}{A}$ or $R = \frac{1}{0.055A}$	A1	oe Note: reciprocal of 18.15 is 0.055(...)
20(b)	$\frac{their 18.15}{4}$ or $\frac{1}{4 \times their 0.055}$	M1	oe
	4.5(375)	A1ft	
21	1800×1.04 or 1872	M1	oe $1800 \times 1.04^n = 2000$
	1800×1.04^2 or 1946.88 or 1946 or 1947	M1dep	oe Accept rounding [1946, 1947] $2000 \div 1800 = 1.04^n$
	1800×1.04^3 or 2024.7 ...	M1dep	oe Accept [2023, 2025] Between 2 and 3 years
	3	A1	Must not come from simple interest

Q	Answer	Mark	Comments
22	6 seen	B1	May be on diagram
	$\tan 70 = \frac{h}{(\text{their } 6) \div 2}$	M1	oe, x being an equal side of isosceles triangle $\sin 20 = \frac{3}{x}$ $\cos 70 = \frac{3}{x}$ $\frac{6}{\sin 40} = \frac{x}{\sin 70}$
	$(h =)$ [8.2, 8.3]	A1ft	[8.7, 8.8] e.g. 8.77
	$\frac{1}{2} \times$ their 6 \times their h	M1	$\frac{1}{2} \times$ their 6 \times their 8.77 \times sin 70 or $\frac{1}{2} \times$ their 8.77 ² \times sin 40
	[24.3, 24.9]	A1ft	
23(a)	$\mathbf{b - a}$ or $\mathbf{- a + b}$	B3	B2 if answer unsimplified or B2 for $\mathbf{b - 2a}$ or $\mathbf{2a - b}$ or $\frac{1}{2}(2\mathbf{b} - 4\mathbf{a})$ or $\frac{1}{2}(4\mathbf{a} - 2\mathbf{b})$ B1 for $\mathbf{2b - 4a}$ or $\mathbf{4a - 2b}$
Alt 23(a)	$\mathbf{b - a}$ or $\mathbf{- a + b}$	B3	Midpoint theorem B2 if answer unsimplified or B2 for $\mathbf{- 3a + \frac{1}{2}(4a + 2b)}$ B1 for $\frac{1}{2}(4\mathbf{a} + 2\mathbf{b})$

Q	Answer	Mark	Comments
23(b)	$(\overline{MC} =) \mathbf{a} + 2\mathbf{b} - 4\mathbf{a} + \mathbf{b}$	M1	oe
	$\overline{MC} = 3(\mathbf{b} - \mathbf{a})$ or $3\mathbf{b} - 3\mathbf{a}$	A1	
	MC is parallel to MN and M is a common point or $\overline{MC} = 3\overline{MN}$ (must be vectors)	Q1	strand (iii) for both facts stated or vector statement
Alt 23(b)	$(\overline{NC} =) \mathbf{b} - 2\mathbf{a} + \mathbf{b}$	M1	oe
	$\overline{NC} = 2(\mathbf{b} - \mathbf{a})$ or $2\mathbf{b} - 2\mathbf{a}$	A1	
	NC is parallel to MN and N is a common point or $\overline{NC} = 2\overline{MN}$ (must be vectors)	Q1	strand (iii) for both facts stated or vector statement
24	$2x^2 + 3x - 1 = x + 4$	M1	$2(y - 4)^2 + 3(y - 4) - 1 = y$
	$2x^2 + 2x - 5 = 0$ or $2x^2 + 2x = 5$	M1dep	$2y^2 - 14y + 19 = 0$ or $2y^2 - 14y = -19$
	$(x =) \frac{-2 \pm \sqrt{2^2 - 4(2)(-5)}}{2 \times 2}$	M1dep	Allow one error
	$(x =) \frac{-2 \pm \sqrt{2^2 - 4(2)(-5)}}{2 \times 2}$ or $\frac{-2 \pm \sqrt{44}}{4}$	A1	oe fully correct
	$(x =) 1.16$ and -2.16	A1	$(x =) 1.16$ and $(y =) 5.16$ or $(x =) -2.16$ and $(y =) 1.84$
	$(x =) 1.16$ and $(y =) 5.16$ and $(x =) -2.16$ and $(y =) 1.84$	A1	