



**General Certificate of Secondary Education
November 2012**

**Mathematics (Linear) B
Paper 2
Higher Tier**

4365

Final

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	$180 - 105 (= 75)$ or 225	M1	May be on diagram
	$360 - \text{their } 75 - 100 - 50$ or $360 - 225$	M1dep	oe
	135	A1	
2	$\frac{18}{25} (\times 100) (= 72\%)$ or $\frac{72}{100}$ or $18 \div 25$ or 0.72 oe	M1	Working with marks lost $\frac{7}{25} (\times 100) (= 28\%)$ or $\frac{28}{100}$ or $7 \div 25$ or 0.28 oe
	$\frac{30}{40} (\times 100) (= 75\%)$ or $\frac{75}{100}$ or $30 \div 40$ or 0.75 oe	M1	$\frac{10}{40} (\times 100) (= 25\%)$ or $\frac{25}{100}$ or $10 \div 40$ or 0.25 oe Note: 18×8 and 30×5 implies M2
	Test B and correct pair compared (30 out of 40)	A1	e.g. 0.72 and 0.75 72 and 75 144 and 150 (marks out of 200) 28 and 25 (% incorrect)
Alt 2	$18 \div 25$ or $30 \div 40$	M1	
	$18 \div 25 \times 40$ or $30 \div 40 \times 25$	M1	
	Test B and correct pair compared (30 out of 40)	A1	e.g. 28.8 (and 30) or 18.75 (and 18)

Q	Answer	Mark	Comments
3	$6x + 12 (+ 8)$	M1	$3(2x + 4) = 50 - 8$
	$6x + \text{their } 20 = 50$ or $6x + 12 = 42$	M1	$2x + 4 = \frac{\text{their } 42}{3}$ Note: their 20 = their 12 + 8 Terms simplified on each side
	$6x = 50 - 8 - 12$ or $6x = 30$	M1dep	$2x = \frac{\text{their } 42}{3} - 4$ Terms collected Dependent on at least one other M mark
	5	A1	
4(a)	Fully correct cells 64 27 8 11 2 or 64 27 8 and 64 11 2	B3	B2 for 3 or 4 correct cells B1 for 1 or 2 correct cells
4(b)	Valid reason	B1	Accept Square number has more than 2 factors Prime number only has 2 factors Square numbers cannot be prime as they have at least 3 factors (except 1 which is non-prime) Any square number is divisible by its square root so cannot be prime A prime number can only be divided by itself and 1 Do not accept Prime number cannot be a square number Square number cannot be prime

Q	Answer	Mark	Comments
5	$\frac{4(6) + 3(-1)}{6 - -1}$ or $\frac{24-3}{6+1}$	M1	oe
	21 on numerator or 7 on denominator	M1	
	3	A1	
6	B and D	B2	B1 for 1 correct (and 1 incorrect) or 2 correct and 1 incorrect
7	$8 \div 2 (= 4)$	M1	oe
	$\pi \times \text{their } 4 \times \text{their } 4$	M1dep	oe Allow 3.14 or better for π
	[50.2, 50.3] or 16π	A1	Condone [13.7, 13.8] or $64 - 16\pi$ as fw
8	$\frac{1}{2} \times 8.6 \times 5.2$	M1	oe
	22.36	A1	
	22.4	B1 ft	ft from 2 d.p. or more
9	2.2 \rightarrow 28(.248) (and too small) or trial evaluated correctly for $2.2 < \text{trial} < \text{root}$	B1	If equation has been rearranged to equal 0 $2.2 \rightarrow -(1.752)$ If equation has been rearranged to $0 =$ $2.2 \rightarrow +(1.752)$
	2.3 \rightarrow 30.5(67) (and too big) or trial evaluated correctly for $\text{root} < \text{trial} < 2.3$	B1	If equation has been rearranged to equal 0 $2.3 \rightarrow +(0.567)$ If equation has been rearranged to $0 =$ $2.3 \rightarrow -(0.567)$ Note: Root is $x = 2.276\dots$

Q	Answer	Mark	Comments
10(a)	$1.5 + 7.5 (= 9)$	M1	9 seen as denominator
	$\frac{1.5}{\text{their } 9}$ or $\frac{3}{18}$	M1dep	oe
	$\frac{1}{6}$	A1	0.16... or 0.17 implies M1M1A0 SC2 $\frac{5}{6}$ SC1 $\frac{1}{5}$ or $\frac{4}{5}$
10(b)	12 litres = 75% or $12 \div 3$	M1	oe $3(2 + x) = 12$ or $6 + 3x = 12$ $\frac{x+2}{x+2+12} = \frac{1}{4}$ or $4(x+2) = x+2+12$ or $4x+8 = x+2+12$ $\frac{B}{B+12} = \frac{1}{4}$ or $4B = B+12$
	4 litres = 25% or 4 litres = $\frac{1}{4}$ or 16 litres = 100% or $\frac{4}{16}$	M1dep	oe $2 + x = 4$ or $3x = 12 - 6$ $4x - x = 2 + 12 - 8$ $4B - B = 12$
	(Add) 2 (litres)	A1	
11(a)	$4 \div 2.5$	M1	
	1.6	A1	Ignore further working

Q	Answer	Mark	Comments
11(b)	Week 4	B1	
	Valid reason or working	Q1	<p>Accept:</p> <p>4.8, 2.3, 4.8 are total weights in weeks 1, 2 and 3</p> <p>Total weight in weeks 1, 2 and 3 always less than 5kg</p> <p>5.7kg caught in week 4 (so possible)</p> <p>Largest (total) weight caught in week 4</p> <p>More than 5 (kg) caught in week 4</p> <p>Most weight in week 4</p> <p>Do not accept:</p> <p>Most in week 4</p> <p>More in week 4</p> <p>Mean is bigger in week 4</p> <p>Strand (ii)</p> <p>SC1 for 4.8, 2.3 4.8 and 5.7 seen</p>
12(a)	$x^2 + 6x + 6x + 36$	M1	Allow one error
	$x^2 + 12x + 36$	A1	Do not ignore further working
12(b)	$27wx - 36wy$ or $-5wx - 5wy$	M1	
	$27wx - 36wy - 5wx - 5wy$	A1	
	$22wx - 41wy$ or $w(22x - 41y)$	A1ft	ft only if 3 of the 4 terms are correct Do not ignore further working
	Correct symbolic notation for their simplified answer	Q1	Strand (i) Must contain terms in wx and wy only
13(a)	$200 \div 5$ or $\frac{1}{5}$ seen	M1	oe
	40	A1	

Q	Answer	Mark	Comments
13(b)	Valid statement	M1	e.g. Not (approximately) equal amounts on each number Should all be (around) 40 3 is (more than) double 4 Only 2 is near expected value Biased towards 3
	No or Cannot tell	A1	May be implied by comment
14	$(5 - 2) \times 180$ or $(2 \times 5 - 4) \times 90$ or 108×5 or 540 or $A = C$ or $E = D$	M1	Line of symmetry drawn with 90° seen or implied (and 360)
	Pentagon used $6 + 3 + 4 + 3 + 4$ or $6x + 3x + 4x + 3x + 4x$	M1	Quadrilateral used $3 + 3 + 4$ or $3x + 3x + 4x$
	20 or $20x (= 540)$ oe	M1dep	10 or $10x (+ 90 = 360)$ oe
	$540 \div 20 \times 6$ oe	M1dep	$(360 - 90) \div 10 \times 6$ oe
	162	A1	
15	tan identified	M1	If hypotenuse used must see $\frac{16}{\cos 31} = 18.6(\dots)$ or 18.7 or $\frac{16}{\sin 59} = 18.6(\dots)$ or 18.7
	$\tan 31 = \frac{h}{16}$ or $\frac{h}{\sin 31} = \frac{16}{\sin(90 - 31)}$	M1dep	oe $h^2 + 16^2 = \text{their } 18.6^2$ or $h^2 = \text{their } 18.6^2 - 16^2$ or $\frac{h}{\sin 31} = \frac{\text{their } 18.6}{(\sin 90)}$
	9.61(...) or 9.6	A1	

Q	Answer	Mark	Comments
16(a)	80	B1	
16(b)	20	B1 ft	ft their (a) 90 in (a) \rightarrow 21 or 22
	35	B1 ft	ft their (a) 90 in (a) \rightarrow 36 or 37 SC1 for reversed answers eg 35, 20
16(c)	25 – 15	M1	90 in (a) \rightarrow 29 or 30 – 16 or 17
	10	A1 ft	ft their (a) 90 in (a) \rightarrow [12, 14]
16(d)	Test A and valid reason	B1	Accept Lower median for test A Lower on average for test A Marks are generally lower for test A Lower and upper quartiles are less for test A More people got higher marks for test B Do not accept Marks are lower for test A Lower quartiles are lower for test A Top mark less for test A Comparing IQR or range only Top mark is (only) 40 for test A
17	$x + x + 3 + 4x$ ($\div 3$)	M1	oe
	$(6x + 3) \div 3$	M1dep	Condone missing brackets
	$2x + 1$	A1	

Q	Answer	Mark	Comments
18	$3(10 - x)$ or $30 - 3x$	M1	Do not accept $54 + 15x = 3(10 - x)$ Do not accept $54 + 15x = 30 - 3x$ $\frac{18}{3} + \frac{5x}{3}$ or $6 + \frac{5x}{3}$
	$18 + 5x = 30 - 3x$	M1dep	$6 + \frac{5x}{3} = 10 - x$
	$5x + 3x = 30 - 18$	M1	Collecting their 4 terms (2 stages) oe $\frac{5x}{3} + x = 10 - 6$
	1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$	A1ft	dep on 3 rd M1
19	Attempt to work out gradient	M1	e.g. $3 \div 6$ seen oe Right-angled triangle drawn on diagram
	$m = \frac{1}{2}$ or $c = 4$ seen or implied	M1	e.g. $\frac{1}{2}x + 4$ oe Gradient = $\frac{1}{2}$ or Intercept = 4
	$y = \frac{1}{2}x + 4$	A1	oe
20	$180 - 42 - 42 (= 96)$	M1	oe Angle $BOC = 2a$ Angle $BOC = 96$ Angle $OBC = 42$ $2a + 42 + 42 = 180$
	their $96 \div 2$	M1dep	$a + 42 = 90$ or $2a = 96$
	48	A1	

Q	Answer	Mark	Comments
21(a)	64	B1	
	Alternate segment (theorem)	B1	
21(b)	97	B1	
22	Up to 30 minutes late on both days seen or implied or 30 minutes to 1 hour late on one day and on time on the other day seen or implied	M1	Lists all nine possibilities but does not select from them (probabilities or words) May be on a tree diagram
	Up to 30 minutes late on both days seen or implied and 30 minutes to 1 hour late on one day and on time on the other day seen or implied	M1dep	Must be selected (2 or 3) Need not state both ways
	$0.3 \times 0.3 (= 0.09)$ or $0.6 \times 0.1 (\times 2) (= 0.06 \text{ or } 0.12)$	M1	Must be selected if on a tree diagram (2 or 3)
	$0.3 \times 0.3 (= 0.09)$ + $0.6 \times 0.1 (\times 2) (= 0.06 \text{ or } 0.12)$	M1dep	Dep on 3 rd M1
	0.21	A1	
23	$\pi \times 8 \times 8$	M1	oe
	$\frac{130}{360} \times \pi \times 8 \times 8$	M1dep	oe
	72.5 ... or 72.6 ...	A1	
	73 or 72.6	B1 ft	

Q	Answer	Mark	Comments
24	$\frac{8}{\sin 35} = \frac{10}{\sin C}$	M1	oe Using perpendicular height, h $\frac{h}{10} = \sin 35$ and $h = 5.73576\dots$ or $BC = 13.7\dots$
	$\sin C = 0.71(697\dots)$	M1dep	$\cos y = \frac{5.73(576\dots)}{8}$
	$(C =) 45.8$ or 46	A1	$y = 44.195$ or 44 or 44.2
	$(A =) 99.2$ or 99 or $99.19\dots$	A1	

25	$(n + 1)(n + 2)$	B1	$n(n + 3) + 2$	Using $n^2 + 3n + 2$ If n is odd $\text{odd}^2 = \text{odd}$ and $3 \times \text{odd} = \text{odd}$ or $\text{odd} \times \text{odd} = \text{odd}$
	If $n + 1$ is odd then $n + 2$ is even	B1	If n is odd, $n + 3$ is even $\text{odd} \times \text{even}$ is even	If n is odd $\text{odd} + \text{odd} + 2 = \text{even}$
	If $n + 1$ is even then $n + 2$ is odd	B1	If n is even, $n + 3$ is odd $\text{even} \times \text{odd}$ is even	If n is even $\text{even}^2 = \text{even}$ and $3 \times \text{even} = \text{even}$ or $\text{odd} \times \text{even} = \text{even}$
	Odd \times even = even (so multiple of 2)	B1	Even $+ 2 = \text{even}$ (so multiple of 2)	If n is even $\text{even} + \text{even} + 2 = \text{even}$ (so multiple of 2)

26(a)	Correct sketch (Cubic)	B1	
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26(b)	Correct sketch (Reciprocal)	B1	
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Q	Answer	Mark	Comments
27	Squares any side	M1	$(5.8 \times 10^2)^2$ or $(1.16 \times 10^3)^2$ or $(580\sqrt{5})^2$ or $(1296.9\dots)^2$
	336400 or 1345600 or 1682000	M1dep	
	336400 + 1345600 = 1682000 or $580\sqrt{5} = 1296.9$ and $\sqrt{1\ 682\ 000} = 1296.9$	A1	oe Uses cosine rule to obtain $\cos(\text{angle}) = 0$
	Correct conclusion for their values	Q1 ft	Strand (iii) dependent on M1M1 Conclusion may be implied: e.g. Pythagoras works from $\cos(\text{angle}) = 0$, states angle = 90
28	$10 - x = 2x^2 + 4$	M1	oe $y = 2(10 - y)^2 + 4$
	$2x^2 + x - 6 = 0$	M1dep	$2y^2 - 41y + 204 = 0$
	$(2x - 3)(x + 2)$ $(x =) (-1 \pm \sqrt{49})/4$	M1dep	$(2y - 17)(y - 12)$ $(y =) (41 \pm \sqrt{49})/4$
	$x = -2$ and $x = 1.5$ oe e.g. $\frac{3}{2}$	A1	$y = 12$ and $y = 8.5$ oe e.g. $\frac{17}{2}$
	$x = -2$ and $y = 12$ and $x = 1.5$ and $y = 8.5$	Q1	Must be paired correctly for final mark Strand (ii) SC2 for one correct final pair