**General Certificate of Secondary Education
June 2013**

Mathematics   **43602H**

Unit 2 Higher tier

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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.
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.
Q	Marks awarded for Quality of Written Communication
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
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.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.149.
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working

Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

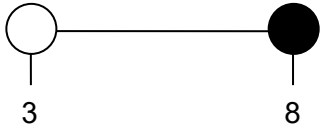Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Unit 2 Higher Tier

Q	Answer	Mark	Comments
1	Sight of 20, 0.5,10 or 2	M1	
	$\dfrac{20 \times 0.5}{2}$	M1	oe $\dfrac{10}{2}$ or 10×0.5 or 20×0.25
	5	A1	

Q	Answer	Mark	Comments
2a	$x + 5$ or $5 + x$	B1	
2b	x (+) $x + 5$ (+) $x + 10$ (+) $x + 15$ (=54)	B1	oe eg $4x + 30$
	their $4x$ + their $30 = 54$	M1	collecting their four or more different algebraic expressions and equating
	their $4x =$ their 24	M1	$54 -$ their 30 correctly evaluated from $ax + b = 54$ with a >1
	6	A1	SC2 6 on answer line with no correct algebraic working

Q	Answer	Mark	Comments
3a	30 p circled	B1	any indication
3b	4×30 (=120) or 5×50 (=250) or $4 \times 0.3(0)$(=1.20) or $5 \times 0.5(0)$(=2.50)	M1	Oe
	their 120 + their 250 or 370 or their 1.2(0) + their 2.5(0) or 3.7(0)	M1	
	(£)3.70	Q1	Strand (i) Do not accept 3.7 or (£)3.70p SC2 (£)3.50 must be supported by 1.50 + 2.00 SC1 350 must be supported by 150 + 200

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Q	Answer	Mark	Comments
4	$(\frac{1}{4}$ **and)** $\frac{2}{4}$ or $\frac{2}{8}$ **and** $\frac{4}{8}$ or 25(%) **and** 50(%) or 0.25 **and** 0.5	M1	oe into equivalent form fractions with common denominator or percentages or decimals
	$\frac{1.5}{4}$	A1	oe eg $\frac{37.5}{100}$ or 37.5% or 0.375
	$\frac{3}{8}$	Q1	oe fraction Strand (ii)
	Alternative method		
	$\frac{1}{4} + \frac{1}{2}$ $(= \frac{3}{4})$	M1	
	$\frac{3}{4} \times \frac{1}{2}$	A1	oe
	$\frac{3}{8}$	Q1	oe fraction Strand (ii)

5a	$6x + 12$ or $2x + 2$	M1	
	$6x + 12 + 2x + 2$	A1	
	$8x + 14$	A1ft	oe ft from their 4 terms

5b	$x(x-11)$ or $(x-11)x$	B1	

6	Meets all 4 criteria $(x =)$ 64 and $(y =)$ 27 or $(x =)$ 81 and $(y =)$ 64	B3	B2 Their 2 values meet any 3 criteria B1 Their 2 values meet any 2 criteria B1 Reversed $(x =)$ 27 and $(y =)$ 64 B1 Reversed $(x =)$ 64 and $(y =)$ 81 SC2 $(x =)$ 8^2 and $(y =)$ 3^3 with no working SC2 $(x =)$ 9^2 and $(y =)$ 4^3 with no working SC1 a two digit square number subtract either 27 or 64 SC1 full list of two digit squares 16,25,36,49,64,81 with 27 and 64

Q	Answer	Mark	Comments
7a	$4x \leq 13 + 7$ or $x - \dfrac{7}{4} \leq \dfrac{13}{4}$	M1	oe
	$x \leq 5$	A1	SC1 $x < 5$ or $x = 5$ or $x \geq 5$
7b		B2	B1 for or

8	$2a + 4b$ or $3a + 6b$	M1	
	$2a + 4b$ and $3a + 6b$	M1	
	$2(a + 2b)$ or $3(a + 2b)$ or $\dfrac{2}{3}$ with no evidence of incorrect working	A1	
	$\dfrac{2(a + 2b)}{3(a + 2b)}$ (=) $\dfrac{2}{3}$	Q1	Strand (ii) must see factorisation

9	$\dfrac{35}{100} \times 600$ (= 210)	M1	oe $100 - 35$ (= 65)
	$600 -$ their 210 (= 390)	M1	oe $600 \times$ their $\dfrac{65}{100}$ (= 390)
	their $390 \div 5$ (= 78)	M1	oe
	312	A1	
	Alternative method		
	$100 - 35$ (= 65)	M1	oe
	their $65 \div 5$ (=13)	M1	oe
	their 65 $-$ their 13 (=52) or $100 - (35 +$ their 13) (=52)	M1	oe $\dfrac{their\ 13}{100} \times 600$ (=78) or $\dfrac{their\ 48}{100} \times 600$ (=288)
	312	A1	

Q	Answer	Mark	Comments
10a	$y = -1.5x + 3$	B3	oe $\quad 3x + 2y = 6$ B2 $y = 1.5x + 3$ B2 $\quad -1.5x + 3$ B2 $y = -1.5x + c$ B1 $y = mx + 3$ B1 $y = 1.5x + c$ B1 $\quad 1.5x + 3$ B1 $\quad -\dfrac{3}{2}$ oe
10b	$y = 3x - 9$	B2	oe B1 $y = 3x + c$; c not 4 B1 $\quad 3x - 9$ B1 $-3 = 3 \times 2 + c$

11	$180 \times 5 \ (= 900)$ or $180 \times \dfrac{10}{9} = (200)$	M1	oe
	their 900 is $\dfrac{9}{10}$ or their $900 \times \dfrac{10}{9}$ or their 200×5	M1dep	oe $\dfrac{9000}{9}$ or 100×10
	1000	A1	
	Alternative method		
	$\dfrac{1}{5} \times \dfrac{9}{10} \ (= \dfrac{9}{50})$ or $5 \times \dfrac{10}{9} \ (= \dfrac{50}{9})$	M1	
	their $\dfrac{9}{50}$ is 180 or $180 \times$ their $\dfrac{50}{9}$	M1 dep	
	1000	A1	

12	$w - 3 = \sqrt{t}$	M1	or $\sqrt{t} = w - 3$ or $(w-3)^2$ or $-\sqrt{t} = 3 - w$
	$t = (w - 3)^2$	A1	oe ignore fw SC1 $t = (w + 3)^2$

Q	Answer		Mark	Comments
13	$2x + 3y = 53$ $9x - 3y = 57$	$6x + 9y = 159$ $6x - 2y = 38$	M1	oe Allow one error
	$11x = 110$	$11y = 121$	M1	
	$x = 10$ or $y = 11$		A1	
	$x = 10$ and $y = 11$		A1	
	Alternative method			
	$y = 3x - 19$	$x = \dfrac{y+19}{3}$	M1	oe Allow one error
	$2x+3(3x-19)=53$ $11x - 57 = 53$	$\dfrac{2(y+19)}{3} +3y = 53$ $11y + 38 = 159$	M1	
	$x = 10$ or $y = 11$		A1	
	$x = 10$ and $y = 11$		A1	

14a	1	B1	

14b	$\dfrac{1}{5^3}$ or $\dfrac{1}{125}$ or $0.2 \times 0.2 \times 0.2$	M1	$\left(\dfrac{1}{5}\right)^3$ or 125^{-1} or 0.2^3
	0.008 or $\dfrac{8}{1000}$	A1	
	8×10^{-3}	A1 ft	ft Any decimal $0 < x < 1$ correctly converted to standard form

15	$8x^2 - 12xy - 10xy + 15y^2$	M1	Allow one term error
	$8x^2 - 12xy - 10xy + 15y^2$	A1	
	$8x^2 - 22xy + 15y^2$	A1 ft	ft their four terms if M1 awarded Do not ignore fw for final mark

Q	Answer	Mark	Comments
16a	$\sqrt{4}$	M1	$\dfrac{2\sqrt{2}}{\sqrt{2}}$ or $\dfrac{\sqrt{8}}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$ or $\sqrt{\dfrac{8}{2}}$ or $\sqrt{\dfrac{4}{1}}$ or $\dfrac{\sqrt{16}}{2}$ or $\dfrac{\sqrt{8}\sqrt{2}}{2}$ or $\dfrac{2}{1}$
	2	A1	
16b	two correct steps	M1	eg two of: $\sqrt{4}=2$ or $\sqrt{1}=1$ or cancels $\sqrt{5}$ or combines any two surds
	$\sqrt{144}$	M1	oe eg $\sqrt{12}\sqrt{12}$ or $\sqrt{4}\sqrt{36}$
	$k=12$	A1	

Q	Answer	Mark	Comments
17a	$x+7.5$ or $7.5+x$	B1	$x+7\frac{1}{2}$
17b	$x(x+7.5)=2(x+x+7.5)$	M1	ft their $x+7.5$ from (a) in the form $x+c$ for all 4 method marks
	$x^2+7.5x=4x+15$	M1	
	$x^2+3.5x-15=0$ or $2x^2+7x-30=0$	M1	
	$(2x-5)(x+6)(=0)$	M1	
	2.5 and 10 **and** −6 and 1.5	A1	either order but in correct pairs SC1 one correct pair