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**General Certificate of Secondary Education
November 2012**

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 candidates' 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 candidates' 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 candidates' 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
1a	$8y + 24$ or $24 + 8y$	B1	
1b	$x\,(4 - x)$	B1	

Q	Answer	Mark	Comments
2	$x + x + 50 = 600$	M1	oe (letting x represent Sat)
	$2x = 600 - 50$	M1dep	
	275	A1	
	Alternative method 1		
	$x + x - 50 = 600$	M1	oe (letting x represent Sun)
	$2x = 600 + 50$ ($x = 325$)	M1dep	
	275	A1	
	Alternative method 2		
	$x + y = 600$ and $y = x \pm 50$	M1	oe
	$2x = 600 - 50$ or $2x = 600 + 50$ ($x = 325$)	M1dep	
	275	A1	
	Alternative method 3		
	$600 - 50\ (= 550)$	M1	
	Their $550 \div 2$	M1dep	
	275	A1	
	Alternative method 4		
	$600 + 50\ (= 650)$	M1	
	Their $650 \div 2\ (= 325)$	M1dep	M2 325 seen
	275	A1	
	Alternative method 5		
	$600 \div 2\ (= 300)$ **and** $50 \div 2\ (= 25)$	M1	oe
	Their 300 – their 25	M1dep	
	275	A1	

Q	Answer	Mark	Comments
3	$\frac{30}{100} \times 250$ or 75	M1	oe eg 3×25
	(£) 175	A1	Electric Supplies
	$240 \div 3$ or 80	M1	Allow 0.33 or better as a multiplier
	(£) 160	A1	New Homes
	(£) 170	B1	Fridges for Us
	New Homes	Q1 ft	Strand (iii) Must have both method marks and three values to compare ft for a correct decision based on their answers

Q	Answer	Mark	Comments
4	Any 3 of $33 = 3 \times 11$ $34 = 2 \times 17$ $35 = 5 \times 7$ $38 = 2 \times 19$	B3	B2 for 2 correct B1 for 1 correct SC1 two or more correct but outside range 30 to 40

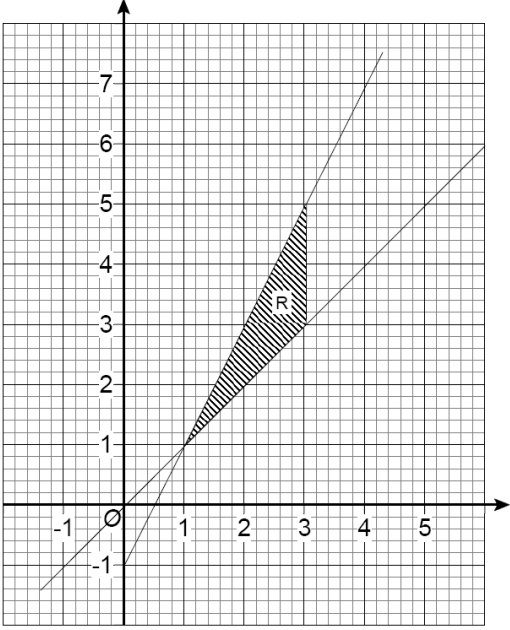| Q	Answer	Mark	Comments
5	Line drawn across grid through (0, 8) and (5, -2)	B3	B2 part of correct line drawn B2 plotting at least 3 correct points (ignore incorrect points) B1 plotting 2 correct points (ignore incorrect points) B1 line of gradient -2 B1 line through (0, 8) or (4, 0) SC1 line $y = -\frac{1}{2}x + 4$ from (0, 4) to (5, 1.5)

Q	Answer	Mark	Comments
6a	A correct value for the sequence for $n > 1$ (2, 4.5, 8, 12.5, 18, 24.5, 32, 40.5, 50) or $n^2 > 100$ or a value of $n > 1$ substituted into $\dfrac{n^2}{2}$ and an attempt to evaluate	M1	
	$n = 11$ or 60.5	A1	oe SC1 $\dfrac{11^2}{2}$ (11 embedded with no attempt to evaluate)
6b	$3n + 4$ or $4 + 3n$	B2	B1 $3n + k$ or $k + 3n$ $\quad$ k any value

7	$280 \div 7 \times 4$ or $280 \div 7 \times 3$	M1	oe If a diagram is used: rectangle split into 7 sections with 3 or 4 shaded (or indicated in some way), at least one of which has a 40 in it
	160 (W) or 120 (M)	A1	
	$180 \div 5 \times 3$ or $180 \div 5 \times 2$	M1	oe $\quad$ eg $180 - (180 \div 5 \times 3)$ If a diagram is used: rectangle split into 5 sections with 3 or 2 shaded (or indicated in some way), at least one of which has a 36 in it.
	108 (B) or 72 (G)	A1	
	232 (F) and 228 (M) or 232 is more than 230 (half of 460) or 228 is less than 230 (half of 460)	A1 ft	oe $\quad$ allow ft if **either** M awarded **Must** add men and boys and/or women and girls otherwise A0ft.

Q	Answer	Mark	Comments
8	$3x$ or $5x - 9$	M1	$\dfrac{3x+9}{5}$
	$5x - 9 = 3x$	M1	oe $\dfrac{3x+9}{5} = x$
	$5x - 3x = 9$ or $2x = 9$	M1dep	oe dep on M2
	4.5	A1	oe
Alternative method			
	4.5	B4	oe B3 correct trial using 4.5 but 4.5 not explicitly given as answer B2 correct trials using 4 and 5 (11 and 16) B1 any correct trial

Q	Answer	Mark	Comments
9	$\dfrac{17}{8}\ (-\dfrac{2}{3})$	M1	Or $1\dfrac{9}{8}\ (-\dfrac{2}{3})$
	Common denominator with at least one numerator correct	M1	ft their fractions $\dfrac{51}{24}\ (-)\ \dfrac{16}{24}$ if correct **Or** grid method with correct bottom right cell and at least one other cell correct
	$\dfrac{35}{24}$ or $1\dfrac{11}{24}$	A1	oe
	Alternative method 1		
	Common denominator with at least one numerator correct	M1	eg $2\dfrac{3}{24}-\dfrac{16}{24}$ if fully correct **Or** grid method with correct bottom right cell and at least one other cell correct
	$1\dfrac{27}{24}-\dfrac{16}{24}$	M1	ft their $2\dfrac{3}{24}$
	$\dfrac{35}{24}$ or $1\dfrac{11}{24}$	A1	
	Alternative method 2		
	Common denominator with at least one numerator correct	M1	eg $2\dfrac{3}{24}-\dfrac{16}{24}$ if fully correct **Or** grid method with correct bottom right cell and at least one other cell correct
	$2-\dfrac{13}{24}$	M1	Award for subtraction of numerators (one may be wrong)
	$\dfrac{35}{24}$ or $1\dfrac{11}{24}$	A1	
	Alternative method 3		
	$1\dfrac{1}{3}+\dfrac{1}{8}$	M1	
	Common denominator with at least one numerator correct	M1	eg $\dfrac{32}{24}+\dfrac{3}{24}$ if fully correct
	$\dfrac{35}{24}$ or $1\dfrac{11}{24}$	A1	

Q	Answer	Mark	Comments
10a	$2a^5 b^7$	B2	B1 2 terms correct B1 3 correct terms but the '2' not at front B1 3 correct terms but one or more × signs remaining in expression or brackets in expression
10b	$\dfrac{c^2}{2}$	B2	oe B1 2 terms correct ie 2 of $\dfrac{1}{2}$, c^2 or 1 eg $2c^2$

11	Line for $x = 3$	B1	
	Line for $y = x$	B1	
	Line for $y = 2x - 1$	B1	
	R in the correct region 	B1 ft	ft if two correct lines and only three drawn

Q	Answer	Mark	Comments
12a	$1(.0) \times 10^{-6}$	B1	
12b	50 000 000 000 000	B1	
12c	$4^3 = 2^6$	M1	$2^{10} = 4^5$
	their $2^6 \times 2 \times 2 \times 2 \times 2$	M1	$4^5 \div 4 \div 4$ For this mark the correct number of 2s or 4s needed for their 2^6 or their 4^5
	5	A1	SC1 answer only
	Alternative method 1		
	64 and 128	M1	Allow one arithmetical slip when multiplying by 2.
	64, 128, 256, 512 and 1024	M1dep	
	5	A1	If one arithmetical slip then A0 SC1 answer only
	Alternative method 2		
	64 and 1024	M1	
	$1024 \div 64 = 16$	M1	oe
	5	A1	SC1 answer only

Q	Answer	Mark	Comments
13a	$2x^2 + x - 4x - 2$	M1	4 terms, allow one error but must have a term in x^2
	$2x^2 + x - 4x - 2$	A1	
	$2x^2 - 3x - 2$	A1 ft	oe ft their 4 terms if M1 awarded SC1 answer of $2x^2 - 5x - 2$ or $2x^2 + 3x - 2$ or $2x^2 - 3x + 2$ without working worth at least M1
13b	$3(x^2 - 16y^2)$	M1	
	$(3)(x + ay)(x + by)$	M1	where $ab = -16$
	$3(x - 4y)(x + 4y)$	A1	oe
	Alternative method		
	$(3x + ay)(x + by)$	M1	where $ab = -48$
	$(3x + 12y)(x - 4y)$ or $(3x - 12y)(x + 4y)$	M1	
	$3(x - 4y)(x + 4y)$	A1	oe

14	$w - x = y(2x - 3)$	M1	oe multiplying through by y
	$w - x = 2xy - 3y$	M1	oe multiplying out bracket (this line gets M2 even if 1st line not seen)
	$w + 3y = 2xy + x$	M1	oe collecting terms
	$x = \dfrac{w + 3y}{2y + 1}$	A1	oe

Q	Answer	Mark	Comments
15a	$\sqrt{25 \times 3}$ or $\sqrt{25}\sqrt{3}$	M1	oe
	$(a =)$ 5	A1	Accept $5\sqrt{3}$
	Alternative method		
	$\dfrac{\sqrt{75}}{\sqrt{3}} = \sqrt{\dfrac{75}{3}}$ ($= \sqrt{25}$)	M1	
	$(a =)$ 5	A1	Accept $5\sqrt{3}$
15b	$\dfrac{1}{27^{\frac{2}{3}}}$ or $\dfrac{1}{\sqrt[3]{27^2}}$ or 3^{-2} or $\sqrt[3]{27} = 3$	M1	
	$\dfrac{1}{3^2}$ or 9^{-1} or $3^2 = 9$	M1dep	Do not allow any marks for 9 or $\dfrac{1}{9}$ from inappropriate working eg $27 \div 3 = 9$
	$\dfrac{1}{9}$	A1	

Q	Answer	Mark	Comments
16a	use of $(x-4)^2$	M1	
	$(x-4)^2 - 16 \ (+ \ 20)$	A1	
	$(x-4)^2 - 16 + 20 = (x-4)^2 + 4$	Q1	Strand (ii) Complete and correct algebraic explanation
	Alternative method 1		
	use of $(x-4)^2$	M1	
	$= x^2 - 8x + 16$	A1	
	$(x-4)^2 + 4 = x^2 - 8x + 20$	Q1	Strand (ii) Complete and correct algebraic explanation
	Alternative method 2		
	$x^2 - ax - ax + a^2 \ (+a)$	M1	
	$a = 4$	A1	
	Also $4^2 + 4 = 20$	Q1	Strand (ii) Complete and correct algebraic explanation
16b	explains that a square is always positive (or zero)	B1	oe
	and a positive number is added so is always positive	B1	oe

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