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General Certificate of Secondary Education
March 2011

Mathematics 43602H

Higher

Unit 2

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting 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.

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The following abbreviations are used on the mark scheme:

M	Method marks awarded for a correct method.
M dep	A method mark which is dependent on a previous method mark being awarded.
A	Accuracy marks awarded when following on from a correct method. It is not necessary always to 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 for a common misinterpretation which has some mathematical worth.
oe	Or equivalent.

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1a	51, 54, 59	B2	B1 for two terms correct
1b	$n^2 + 50 < 100$ or $n^2 < 50$	M1	oe Allow $n^2 = 50$
	7	A1	
	Alternative method 1		
	(51, 54, 59) 66, 75, 86, 99 (114)	M1	At least one correct and in correct position
	7	A1	Provided no errors
	Alternative method 2		
	Sight of correct differences added to their 59	M1	eg their 59 + 7 + 9 + 11 + 13 Must reach 100
	7	A1	Provided no errors

2	450 ÷ 2 or 225 450 ÷ 4 or 112.5 450 × 7 or 3150 450 × 14 or 6300 450 × 3 or 1350 450 × 4 or 1800	M1	oe
	their 225 × 7, their 112.5 × 14 their 3150 ÷ 2, their 6300 ÷ 4 their 1350 + 450 ÷ 2 their 1800 – 450 ÷ 2	M1	or equivalent complete method scores M2
	1575	A1	

3	$\frac{-6\times4}{-6+(-2)}$	M1	Allow M1 for –24 and –8 seen
	$\frac{-24}{-8}$	A1	For no substitution shown allow M1 A0 for $\frac{-24}{8}$ $\frac{-24}{-4}$ $\frac{-24}{4}$
	3	A1 ft	ft if only one error

4	50(p) – $\frac{30}{100}$ × 50(p) or $\frac{70}{100}$ × 50(p)	M1	oe
	35(p) or (£)(0).35 420(p) or (£)4.2(0) 140(p) or (£)1.4(0)	A1	
	$\frac{3}{4}$ × 48(p) or 9 × 48(p) or 3 × 48(p)	M1	
	36(p) or (£)(0).36 432(p) or (£)4.32 144(p) or (£)1.44	A1	Note: for **both** A marks to be awarded they must be buying the same number of tins
	Correct conclusion from their working with all calculations shown	Q1	Strand (iii) Must have both Ms awarded and be comparing like with like

5a	$C = 8d + 16$	B1	Last one
5b	Plots graph … at least two correct coordinates for $C = 9d + 11$	M1	Works out costs for at least 2 days for Woods Tool Hire … 20, 29, 38, 47, 56 … (minimum of 2 of these)
	Correct straight line to intersection at (5, 56)	A1	Identifies equal cost for 5 days
	No ticked with valid statement No may be implied	A1	eg cheaper up to 4 days, equal costs for 5 days, more expensive for 6 days onwards
	Alternative method 1		
	$8d + 16 = 9d + 11$	M1	
	$d = 5$	A1	
	No ticked with valid statement No may be implied	A1	eg cheaper up to 4 days, equal costs for 5 days, more expensive for 6 days onwards
	Alternative method 2		
	9 × their d + 11	M1	their $d \geq 5$
	Correct calculation	A1	
	Corresponding correct value from Branch Tool Hire **and** No ticked No may be implied	A1	From graph or using correct formula

6a	$w^2 - 4w$	B2	B1 for w^2 or $-4w$
6b	$8(t + 3)$	B1	Accept $4(2t + 6)$ or $2(4t + 12)$
6c	$y^2 - 2y + 7y - 14$	M1	Allow one error Must see 4 terms
	$y^2 + 5y - 14$	A1	

7	$\frac{10\times10}{0.5}$	M1	oe eg $\frac{10^2}{0.5}$
	200	A1	

8	455 ÷ (1 + 2 + 4) (= 65)	M1	oe
	4 × their 65	M1 dep	$\frac{4}{7}$ × 455 scores M2
	260	A1	Accept 65 : 130 : 260

9a	$4x$ + 12 = 17 or x + 3 = $\frac{17}{4}$	M1	$4x$ + 3 = 17 is M0
	$4x$ = 17 – 12 or 5 or x = $\frac{17}{4}$ – 3	M1	for correct rearranging $4x$ = 17 – 3 is M1 $4x$ = 17 + 12 is M0
	$x = 1\frac{1}{4}$	A1 ft	oe ft if M1 M0 or M0 M1 awarded
9b	$2n$ > 5 + 1 or $2n$ > 6	M1	
	n > 3	A1	n = 3 is A0

10	Right-angled triangle drawn above or below either line, with lengths indicated or Either 2 and 6 or 3 and 9 used as a ratio or fraction	M1	Correct substitution into gradient formula $\frac{y2-y1}{x2-x1}$ … or inverted Award for $\frac{1}{3}$ seen with no working
	$\frac{2}{6}$ and $\frac{3}{9}$	A1	
	Both simplify to $\frac{1}{3}$ so lines parallel or have same gradient or Equations are $y = \frac{1}{3}x + 2$ and $y = \frac{1}{3}x - 3$ hence lines are parallel or lines have same gradient	A1	

11	(£)280 = 80%	M1	oe
	280 ÷ 80 × 100 or 280 ÷ 0.8	M1	oe
	(£)350 and No	A1	oe

12a	(0).00528	B1	
12b	49×10^6 or 49 000 000	B1	
	4.9×10^7	B1 ft	ft their 49×10^6 or 49 000 000

13	$2h - 2y = 5y + 3$	M1	$2h - y = 5y + 3$ is M0
	$2h = 5y + 2y + 3$ or $2h = 7y + 3$	M1	for correct rearranging after attempt at expansion seen $2h = 5y + y + 3$ is M1 $2h = 5y + 2y + 3$ is M0
	$h = \frac{7y+3}{2}$ or $h = \frac{5y+2y+3}{2}$	A1 ft	Must see $h = \ldots$ ft if M1 M0 or M0 M1 awarded
	Alternative method		
	$h - y = \frac{5y+3}{2}$	M2	$h - y = 2.5y + 1.5$
	$h = \frac{5y+3}{2} + y$ or $h = \frac{5y+2y+3}{2}$	A1 ft	$h = 2.5y + y + 1.5$ or $h = 3.5y + 1.5$ Must see $h = \ldots$

14a	Sight of $\sqrt{4} = 2$ followed by 2^3 or 4^3 followed by $\sqrt{64}$	B2	B1 for partial solution but incomplete eg for $\sqrt{4} = 2$ seen or 64 seen
14b	$(4^y =) (4^{1.5})^6$ or $(2^2)^y = (2^3)^6$	M1	Allow 1.5×6 or $2 \times y = 3 \times 6$
	9	A1	Allow $\frac{18}{2}$ and 4^9

15	$(5x \pm a)(x \pm b)$ (= 0) $ab = 24$	M1	
	$(5x - 6)(x + 4)$ (= 0)	A1	
	$1\frac{1}{5}$ and –4	A1	oe eg $\frac{6}{5}$ or 1.2
	Alternative method 1		
	$x = \frac{-14 \pm \sqrt{14^2 - 4(5)(-24)}}{2 \times 5}$	M1	Allow one substitution error but not a conceptual error
	$x = \frac{-14 \pm \sqrt{676}}{10}$	A1	or better
	$(x =) 1\frac{1}{5}$ and –4	A1	oe
	Alternative method 2		
	$(x + 1.4)^2 - 1.96 - 4.8$ (= 0)	M1	Allow one numerical error
	$x + 1.4 = \pm\sqrt{6.76}$	A1	
	$(x =)$ 1.2 and –4	A1	oe

16	$3b + g = 62$ or $b + 2g = 59$	B1	
	$3b + g = 62$ and $3b + 6g = 177$ or $6b + 2g = 124$ and $b + 2g = 59$ or $3b + g = 62$ and $2b - g = 3$	M1	oe Correct attempt at elimination … Allow one error in the two elimination steps If substitution method used then allow one error in the substitution or simplification
	$5g = 115$ or $5b = 65$	M1 dep	oe
	$b = 13$ and $g = 23$	A1	SC2 for correct solution by trial and improvement

17	$(x\sqrt{2} =)\ (5 + \sqrt{3})(5 - \sqrt{3})$	M1	
	$(x\sqrt{2} =)\ 5 \times 5 + 5\sqrt{3} - 5\sqrt{3} - \sqrt{3} \times \sqrt{3}$ (= 22)	M1	or better
	$x = \frac{\text{their } 22}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$	M1 dep	oe eg $x\sqrt{2}\ \sqrt{2} = 22\sqrt{2}$ or $2x^2 = 484$ their 22 must be an integer Dependent on the first M1
	$(x =)\ 11\sqrt{2}$	A1	

18	$n^2 + (n + 1)^2$	M1	Condone missing brackets if recovered
	$n^2 + n^2 + 2n + 1$	M1 dep	
	$2n^2 + 2n + 1$	A1	
	$2n(n + 1) + 1$	A1	Accept $2n(n + 1) + 1 = 2n^2 + 2n + 1$ or $2n(n + 1) = 2n^2 + 2n$ for this mark provided the first 3 marks have been earned
	Complete solution with all stages clearly shown	Q1	Strand (ii) Clear explanation Do not award if first line assumes answer with use of = sign eg $n^2 + (n + 1)^2 = 2n(n + 1) + 1$
	Alternative method		
	$n^2 + (n + 1)^2 – 2n(n + 1)$	M1	Condone missing brackets if recovered
	$n^2 + n^2 + 2n + 1 – 2n(n + 1)$	M1 dep	
	$2n^2 + 2n + 1 – 2n(n + 1)$	A1	
	$2n^2 + 2n + 1 – 2n^2 – 2n$	A1	Allow $2n^2 + 2n + 1 – (2n^2 + 2n)$
	Complete solution with all stages clearly shown	Q1	Strand (ii) Clear explanation Do not award if first line assumes answer with use of = sign eg $n^2 + (n + 1)^2 – 2n(n + 1) = 1$