



**General Certificate of Secondary Education  
June 2011**

**Mathematics**

**43602H**

**Higher**

**Unit 2**

**Final**

***Mark Scheme***

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**The following abbreviations are used on the mark scheme:**

<b>M</b>	Method marks awarded for a correct method.
<b>M dep</b>	A method mark which is dependent on a previous method mark being awarded.
<b>A</b>	Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied.
<b>B</b>	Marks awarded independent of method.
<b>Q</b>	Marks awarded for quality of written communication.
<b>ft</b>	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
<b>SC</b>	Special Case. Marks awarded for a common misinterpretation which has some mathematical worth.
<b>oe</b>	Or equivalent.
<b>[<i>a</i>, <i>b</i>]</b>	Accept values between <i>a</i> and <i>b</i> inclusive.

**UNIT 2**

**HIGHER TIER**

**43602H**

1	$9 (\times) (6 - 10)$ or $9 \times -4$ or $54 - 90$ or $-36$	M1	
	$\frac{-36}{-12}$ or $\frac{9}{3}$	A1	
	3	A1 ft	ft if M1 awarded

2	Any two of 800 or $2^2$ (or 4) or 10 seen	M1	
	$800 \div 40$ or $200 \div 10$ or $80 \div 4$	M1	oe
	20	A1	

3	$\frac{60}{100} \times 210$ or $210 - \frac{40}{100} \times 210$	M1	oe
	(£)126	A1	
	$\frac{2}{3} \times 195$ or $195 - \frac{1}{3} \times 195$	M1	oe Condone use of (0).33 (...) (0).66(...) and (0).67(...)
	(£)130	A1	Accept [128.7(0), 130.65]
	Clix	Q1 ft	Strand (iii) Correct conclusion from their working with all calculations shown Must have both Ms awarded

4	$(50 - 43)$ red or 7 red or 14 (red) or 36 (blue and yellow)	M1	$R + 3Y + Y = 43$ or $2R + 3Y + Y = 50$ oe or $R = 7$
	their $36 \div 4$	M1 dep	$4Y = 43 - 7$ oe
	9	A1	

5a	$7x + 3x = 15$ or $10x = 15$	M1	oe
	1.5 or $1\frac{1}{2}$	A1	oe Accept $\frac{3}{2}$ or $\frac{15}{10}$
5b	$2x + 32$ or $4x - 20$	M1	Accept $ax + ab$ for M1
	$6x + 12$ or $6(x + 2)$	A1	
	$a = 6$ and $b = 2$	A1 ft	ft from their $6x + 12$ if M1 earned SC2 $a = 6$ and $b = 12$ SC1 $a = 6$

6	$\frac{1}{5} - \frac{1}{6}$	M1	Value chosen eg	
			(£)60 and (£)12 or (£)10 seen	(£)100 and (£)20 or (£)[16,17]seen
	$\frac{5}{30}$ or $\frac{6}{30}$ oe	M1	12 and 10 seen	20 and [16, 17] seen
	$\frac{1}{30}$ or $\frac{14}{30}$ seen oe	A1	2 or 28 seen	[3, 4] or [46, 47] seen
	$\frac{6}{30} + \frac{5}{30} + \frac{14}{30}$ or $\frac{25}{30}$ or $\frac{16}{30} - \frac{5}{30} - \frac{6}{30}$ or $1 - \frac{14}{30} - \frac{5}{30} - \frac{6}{30}$	M1	12 + 10 + 28 = 50 or 60 - 28 - 12 - 10	20 + [46, 47] + [16, 17] = [82, 84] or 100 - [46, 47] - 20 - [16, 17]
$\frac{5}{30}$ or $\frac{1}{6}$	A1	Exact answer for their chosen value		
		(£)10		

7a	Plan A	B1	
	Valid reason	B1	eg cheaper (for 800 minutes)
7b	Attempt at any two readings from Plan B slope	M1	eg (600, 30), (700, 60), (800, 90), (900, 120), (1000, 150) need not be coordinates eg 600(min), (£)30 or (£)30, 600(min)
	Compares cost and time or 6000 (÷) 200 or 60 (÷) 200	M1 dep	oe eg (£)30 in 100 (minutes) (£)120 in 400 (minutes)
	30p or £0.30	A1	

8a	-4 and $\times 3$ or $\times 3$ and -12	B2	Must be in the correct order for B2 B1 for -4 or $n - 4$ in first box, or $\times 3$ or $3 \times n$ in first box <b>Note:</b> $\times 3$ and -4 scores B0  B1 for 3 and -12 (missing $\times$ sign)
8b	$3(n - 4) = n$ or $3n - 12 = n$	M1	
	6	A1	

9	$(b =) 2a - 4$	M1	oe
	$(c =) 2b - 4$ or $2(2a - 4) - 4$	M1	oe
	$(c =) 4a - 8 - 4$ or $(c =) 2a - 4 + 2a - 4 - 4$	A1	SC1 for substitution of value for $a$ and checked in $c$ eg $a = 10, b = 16, c = 28$ and $4 \times 7 = 28$
	Clear and logical algebraic solution	Q1	Strand (ii) Must have both M marks Do not award for a numerical verification

10a	$8x^4y^7$	B2	B1 for two out of three parts correct eg $6x^4y^7$
10b	$4y(5y - 2x)$	B2	B1 for $4y(? - ?)$ or $4(5y^2 - 2xy)$ or $8y(2.5y - x)$ or $y(20y - 8x)$ or $8(2.5y^2 - xy)$ or $2(10y^2 - 4xy)$ or $2y(10y - 4x)$
10c	$w - y = \frac{x}{r}$	M1	$wr = yr + x$ or $-x = yr - wr$ oe
	$r(w - y) = x$	A1	$wr - yr = x$ Must have $x = \dots$ oe
10d	$6x^2y^2$	B2	B1 for $18x^3y^3$ or any other common multiple

11	$3(x - 16) = x$	M1	oe
	$3x - x = 48$ or $2x = 48$	M1 dep	
	$x = 24$	A1	
	Girls original number = 35	A1	
	<b>Alternative method 1</b>		
	1st trial with $B + 11 = G$ $B - 16$ checked against $G - 11$ for 1 : 3	M1	Must be clearly shown eg $B = 20, G = 31$
	2nd trial with $B + 11 = G$ , fully checked	M1 dep	
	$B = 8$ or $G = 24$	A1	
	Girls original number = 35	A1	
	<b>Alternative method 2</b>		
	16 boys = 2 parts of ratio 1 : 3	M1	
	1 part = $\frac{16}{2}$	M1 dep	
	24 (+11)	A1	
	35	A1	
	<b>Alternative method 3</b>		
	$x + 16 = 3x$	M1	$x$ = Final number of boys at bus stop
	$16 = 3x - x$	M1 dep	
	$(x =) 8$	A1	
	Girls original number = 35	A1	
	<b>Alternative method 4</b>		
	$G = B + 11$	M1	oe eg $G - 11 = B$
	$3(B - 16) = G - 11$	M1	
	$B = 24$	A1	
	$G = 35$	A1	$G = 35$ scores both A marks
	<b>Alternative method 5</b>		
	1st trial using ratio 1 : 3, fully checked	M1	eg $B : G = 10 : 30$ $B + 16 = 26$ $26 \neq 30$
	2nd trial using ratio 1 : 3, fully checked	M1	eg $B : G = 7 : 21$ $B + 16 = 23$ $23 \neq 21$
	8 : 24	A1	
	35	A1	

12	$2x^2 - 7x - 3 + 3^2$	M1	
	$2x^2 - 7x + 6$	A1	
	$(2x + a)(x + b) (= 0)$	M1	$ab = \pm$ their 6 Must be a quadratic in $2x^2$ Substitution in quadratic formula (if used) must be correct for M1 eg for $2x^2 - 7x + 6 (= 0)$ $x = \frac{7 \pm \sqrt{7^2 - 4(2)(6)}}{4}$
	1.5 and 2	A1	oe SC3 for $2x^2 - 7x + 3 (= 0)$ leading to answers of 0.5 and 3

13	$7x + \frac{10x}{x+2} = 9$ or $7(x+2) + 10 = \frac{9}{x}(x+2)$ or $7 + \frac{10}{x+2} - \frac{9}{x} = 0$	M1	M1 for equating two correct fractions $\frac{7(x+2)+10}{x+2} = \frac{9}{x} \text{ or } \frac{10}{x+2} = \frac{9-7x}{x}$ Also M1 for $7 + \frac{10x}{x(x+2)} = \frac{9(x+2)}{x(x+2)}$
	$7x(x+2) + 10x = 9(x+2)$	M1 dep	oe
	$7x^2 + 14x + 10x = 9x + 18$ or $7x^2 + 14x + 10x - 9x - 18 = 0$	A1	



14	$\sqrt{10} \sqrt{15} - \sqrt{10} \sqrt{3} (+) \sqrt{2} \sqrt{15} - \sqrt{2} \sqrt{3}$	M1	or better ... Allow one error (sign or term) in the expansion
	Eliminating the two 'middle' terms	M1	These must be the correct two middle terms
	$\sqrt{10} \sqrt{15}$ simplified to $5\sqrt{6}$	M1	
	$4\sqrt{6}$	A1	
	<b>Alternative method 1</b>		
	$(\sqrt{5} \sqrt{2} + \sqrt{2})(\sqrt{5} \sqrt{3} - \sqrt{3})$ or $\sqrt{5} \sqrt{5} \sqrt{2} \sqrt{3} + \sqrt{5} \sqrt{2} \sqrt{3} - \sqrt{2} \sqrt{5} \sqrt{3} - \sqrt{2} \sqrt{3}$	M1	or better ... Allow one error (sign or term) in the expansion
	Eliminating the two 'middle' terms	M1	These must be the correct two middle terms
	$\sqrt{5} \sqrt{5} \sqrt{2} \sqrt{3}$ simplified to $5\sqrt{6}$	M1	
	$4\sqrt{6}$	A1	
	<b>Alternative method 2</b>		
	$(\sqrt{5} \sqrt{2} + \sqrt{2})(\sqrt{5} \sqrt{3} - \sqrt{3})$	M1	
	$\sqrt{2} \sqrt{3} (\sqrt{5} + 1)(\sqrt{5} - 1)$	M1	
	$\sqrt{2} \sqrt{3} \times (5 - 1)$	M1	
	$4\sqrt{6}$	A1	

15a	$\frac{1}{27}$	B3	B2 for 27 or $\frac{1}{3}$ or $\frac{1}{729}$ or $27^{-1}$ B1 for 3 or 729 or $\frac{1}{9^3}$ or -27
15b	$2^{3m} (= 2^{m^2})$ or $(2^3)^m (= 2^{m^2})$	M1	oe
	$m^2 = 3m$ or $m^2 - 3m = 0$ or $m(m - 3) = 0$ or $(m =) 0$ or $(m =) 3$	M1 dep	oe
	<b>0 and 3</b>	A1	