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# General Certificate Secondary of Education January 2011

Methods in Mathematics (Pilot) 9365

Unit 1 Higher Tier 93651H



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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.
- 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. (QWC)
- **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.
- 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  $\frac{1}{2}$ 

# M1 Higher Tier

## Section A

Q	Answer	Mark	Comments
		1	
1	<u>19</u> 12	B1	oe 1 <sup>7</sup> / <sub>12</sub> , 1.58(3)
	1.583 or 1.5833	Q1	QWC Strand (i) – Must be correct notation
			Changes their fraction correctly into a recurring decimal
			eg, $\frac{7}{12} = 0.583$ or 0.5833

2	10 red and 10 blue in bag A	M1	20 marbles in bag A
	10 red and 30 blue in bag B	M1	40 marbles in bag B
	20 red and 40 blue	A1	
	$\frac{40}{60}$	B1 ft	oe $\frac{2}{3}$ ft $\frac{\text{their blue total}}{\text{their total}}$

3(a)	The students who didn't visit either country	B1	(F U S)' F' ∩ S'
3(b)	217	B1	
3(c)	7 217	B1 ft	oe $\frac{1}{31}$ 0.032() ifw
3(d)	$\frac{7}{38}$	B2	oe 0.18() B1 For either, but not $\frac{7}{217}$

4(a)	–0.6 and 1.6	B2	B1 For each SC1 –0.3 and 1.3 or –0.8 and 1.8
4(b)	Any number between –0.6 and 1.6	B1ft	Between their two values in (a)

5	1 – 0.1 (= 0.9)	M1	Their three values add up to 0.9
	Their 0.9 ÷ 6 (= 0.15)	M1Dep	
	0.15, 0.3 and 0.45	A1	SC2 Correct numbers in wrong order
			SC1 P(C) = 2P(B) and P(D) = 3P(B), with all probabilities between, but not including, 0 and 1

Q	Answer	Mark	Comments
		I	
6(a)	2y = 9x + 7	B3	Changes the division by 2 to a multiplication by 2
	2y - 7 = 9x		Changes the addition of 7 to a subtraction of 7
	$x = \frac{2y-7}{9}$		Changes the multiplication by 9 to a division by 9
			B2 Any two of the above
			B1 Any one of the above
6(b)	$3\left(\frac{x^2+4x+3}{6}\right) - \left(\frac{3x^2+1}{6}\right)$	M1	
	$\frac{3x^2 + 12x + 9}{6} - \frac{3x^2 + 1}{6}$	M1	Allow one error
	12 <i>x</i> +8	M1 Dep	Dep on 2 <sup>nd</sup> M1
	6		Correct simplification of their expression
	$\frac{2(6x+4)}{6} = \frac{6x+4}{3}$	A1	Accept cancelling of 12, 8 and 6
Alt 1 6(b)	$6\left(\frac{x^2+4x+3}{2}\right)-6\left(\frac{3x^2+1}{6}\right)$	M1	
	$3x^2 + 12x + 9 - 3x^2 - 1$	M1	Allow one error
	12x + 8	M1 Dep	Dep on 2 <sup>nd</sup> M1
			Correct simplification of their expression
	$6\left(\frac{6x+4}{3}\right) = 2(6x+4) = 12x+8$	A1	
Alt 2 6(b)	$x^{2} + 4x + 3 - \frac{2(3x^{2} + 1)}{6} = \frac{2(6x + 4)}{3}$	M1	
	$6(x^2 + 4x + 3) - 2(3x^2 + 1) = 4(6x + 4)$	M1	
	$6x^2 + 24x + 18 - 6x^2 - 2 = 24x + 16$	M1	
	24x + 16 = 24x + 16	A1	

Q	Answer	Mark	Comments
Alt 3 6(b)	$\frac{x^2}{2} + \frac{4x}{2} + \frac{3}{2} - \frac{3x^2}{6} - \frac{1}{6}$	M1	Allow one error
	$2x + \frac{8}{6}$	M1	Correct simplification of their $\frac{x^2}{2} + \frac{4x}{2} + \frac{3}{2} - \frac{3x^2}{6} - \frac{1}{6}$
	$2x + \frac{4}{3}$	M1	Correct simplification of fractional part of their $2x + \frac{8}{6}$
	$\frac{6x}{3} + \frac{4}{3} = \frac{6x+4}{3} \text{ or}$ $\frac{6x+4}{3} = 2x + \frac{4}{3}$	A1	Allow recurring decimals throughout Allowing rounded decimals to M3

7	0.08	M1	oe
	$8 \times 10^{-2}$	A1	

8(a)	0.2	B1	oe
	0.7, 0.3 and 0.7	B1	oe
8(b)	0.8 × 0.3	M1	oe
	0.24	A1	oe

9(a)	$A = kR^2 \text{ or } A \propto R^2$	M1	
	$(k =) \frac{2826}{30^2}$	M1	
	$A = 3.14R^2$	A1	oe Accept k = 3.14 with first M1 awarded from A = kR <sup>2</sup> SC2 3.14R <sup>2</sup>
9(b)	(A =) their $3.14 \times 15^2$	M1	Must be from kR <sup>2</sup>
	706.5	A1 ft	

Q	Answer	Mark	Comments
10(a)	Draws correct graph	B1	Through (0, 0) $\pm$ 2 mm
10(b)	Draws correct graph in 1 <sup>st</sup> quadrant	B1	Not through axes
	Draws correct graph in 3rd quadrant	B1	2 <sup>nd</sup> and 4 <sup>th</sup> quadrants must be blank
10(c)(i)	Graph drawn above	B1	Disallow any intersection
10(c)(ii)	Graph drawn reflected in x-axis	B1	

## Section B

11(a)	3k + 12	B1	
11(b)	$x^2 - x$	B1	Condone $x^2 - 1x$
11(c)	4 <i>y</i> (2 <i>y</i> + 1)	B2	Condone $(4y \pm 0)(2y + 1)$ B1 For $4(2y^2 + y)$ or $y(8y + 4)$ or $2y(4y + 2)$ or $2(4y^2 + 2y)$

12(a)	250 ÷ 100 × 15 (= 37.5)	M1	oe 250 × 0.15
	250 + their 37.5	M1Dep	250 × 1.15 gets M2
	287.5	A1	
12(b)	600 ÷ 75 (= 8)	M1	600 ÷ 3 (= 200)
	Their 8 × 100	M1Dep	Their 200 × 4
			600 ÷ 0.75 gets M2
	800	A1	
12(c)	120 ÷ 10 × 2 × 20	M1	$24 \times 20$ , $120 \times 4$ Correct method seen to get 480
	480	A1	

13	53	B1	
	2-digit prime < 20	B1	11, 13, 17 or 19
	2-digit square, not 64	B1	
	531749	B1 ft	Six different digits if B2 awarded SC1 174953 or 495317

Q	Answer	Mark	Comments
14	5x - 2 = 3x + 6	M1	Any letter allowed
	2x = 8	M1	M2 Explains that 2 vouchers $=$ £8
	4	A1	
		Q1	Strand (iii) - Clear and organised solution Forms and solves equation or Gives difference as 8 or Shows that 4 gives the same answer of 18 for both

15	72 ÷ 9 × 4	M1	72 ÷ 9 × 5
	32 and 40	A1	
	Their 40 – $\frac{72}{2}$	M1	$\frac{72}{2}$ – their 32
	4	A1	
15 Alt 1	72 ÷ 9 × 5	M1	72 ÷ 9 × 4
	32 and 40	A1	
	(their 40 – their 32) ÷ 2	M1	8 ÷ 2
	4	A1	
15 Alt 2	1 part of money is $\frac{72}{9}$	M1	
	8	A1	
	Their 8 ÷ 2	M1	
	4	A1	

16	n  and  n+2	M1	Allow any letter
	n(n + 2)	M1	
	$n^2 + 2n + 1$	A1	SC1 $xy + 1$ any letters
	$(n + 1)^2$	Q1	QWC Strand (ii) - Correct algebra throughout with all steps clearly seen

Q	Answer	Mark	Comments
17	$x^{2}(1, 7x, 7x) = 10$	N/1	
	x (+7x - 7x) - 10		
	(x + 4)(x - 4)	A1	Allow $a = 4$
18	$4 \times 4^{x} (= 4^{8})$	M1	$4^{x} = 16384$
	7	A1	
10(-)		N44	
19(a)	√45	INIT	
	3√5	A1	
19(b)	$x^{2} + (x + 9)^{2} (= 45)$	M1	
	$x^2 + x^2 + 18x + 81 (= 45)$	M1	
	$2x^2 + 18x + 36 = 0$	A1	$x^2 + 9x + 18 = 0$
	(2)(x+3)(x+6) (= 0)	M1 ft	Correct factorisation or substitution into the quadratic formula for their quadratic expression
	x = -3 and $x = -6$	A1	Either point from correct working
	(-3, 6) and (-6, 3)	A1	Other point from correct working
			SC2 either point with no or insufficient working
Alt 19(b)	$y^2 + (y - 9)^2 (= 45)$	M1	
	$y^2 + y^2 - 18y + 81$ (= 45)	M1	
	$2y^2 - 18y + 36 = 0$	A1	$y^2 - 9x + 18 = 0$
	(2)(y - 3)(y - 6) (= 0)	M1 ft	Correct factorisation or substitution into the quadratic formula for their quadratic expression
	y = 3 and $y = 6$	A1	Either point from correct working
	(-3, 6) and (-6, 3)	A1	Other point from correct working SC2 Either point with no or insufficient working