GCSE Mathematics (1MA1)

Themed papers – Simultaneous Equations

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme
M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect. P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question. A1 – accuracy mark. This mark is generally given for a correct answer following correct working. B1 – working mark. This mark is usually given when working and the answer cannot easily be separated. C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working. Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$3x - 3x = 0$, $y - -4y = 5y$, $4 - 6 = -10$ $5y = -10$	M1	This mark is given for a method to eliminate one variable
	$y = -2$ $3x - 2 = -4$ or $3x + 8 = 6$	M1	This mark is given for substituting one found value in one of the equations
	$3x = -2$ $x = -\frac{2}{3}$, $(y = -2)$	A1	This mark is given for a correct pair of answers only

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$6x - 4y = -10$ $2x - 4y = 2$ $4x = -12$ or $6x - 4y = -10$ $6x - 12y = 6$ $8y = -16$	M1	This mark is given for a method to eliminate either x or y
	$x = -3$ $-6 - 4y = 2$ or $y = -2$ $6x + 8 = -10$	M1	This mark is given for correct substitution of the value of x or y or for a method to eliminate the other unknown
	$x = -3$, $y = -2$	A1	This mark is given for the correct answer only

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$15x + 3y = 63$ $x - 3y = 9$	M1	This mark is given for a method to eliminate one variable
	$16x = 72$ $x = 4.5$	M1	This mark is given for a method to find the value of one variable
	$4.5 - 3y = 9$ $y = -1.5$	A1	This mark is given for both correct solutions

Question 4 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for a method to eliminate one variable
	$x = \frac{3}{5}$ or $y = \frac{8}{5}$	A1	This mark is given for find the value of one variable
		M1	This mark is given for substituting the value found into one of the equations
	$x = \frac{3}{5}$ and $y = \frac{8}{5}$	A1	This mark is given for both correct solutions

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$20x + 30y = 25$ $42x + 30y = -63$ or $28x + 42y = 35$ $28x + 20y = -42$	M1	This mark is given for a process to eliminate one variable or a rearrangement of one equation leading to substitution
	$-22x = 88$, $x = -4$ or $22y = 77$, $y = 3.5$	A1	This mark is given for finding a correct value of x or a correct value of y
	$x = -4$, so $-16\ x + 6y = 5$ or $y = 3.5$, so $4x + 21 = 5$	M1	This mark is given for x to find y or of a correct substitution of y to find x
	$x = -4$ $y = 3.5$	A1	This mark is given for the correct answer only

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y - 3x = 13$, so $y = 3x + 13$ $x^2 + (3x + 13)^2 = 25$	M1	This mark is given for the substitution of $y = 3x + 13$ into $x^2 + y^2 = 25$
	$x^2 + 9x^2 + 39x + 39x + 169 = 25$	M1	This mark is given for the expansion of $x^2 + (3x + 13)^2 = 25$
	$10x^2 + 78x + 144 = 0$	M1	This mark is given for forming a quadratic equation equal to zero
	$2(5x^2 + 39x + 72) = 0$ $2(5x + 24)(x + 3) = 0$	M1	This mark is given for a method to solve the quadratic equation
	$x = -3$, $y = 4$ $x = -\frac{24}{5}$, $y = -\frac{7}{5}$	A1	This mark is given for a pair of correct solutions only

Question 7 (Version 1) (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$x = \frac{7-4y}{3}$	M1	This mark is given for a method to find an expression for x to substitute into $x^2 - 4y^2 = 9$
	$\left(\frac{7-4y}{3}\right)^2 - 4y^2 = 9$ $\left(\frac{49-56y+16y^2}{9}\right) - 4y^2 = 9$ $49 - 56y + 16y^2 - 36y^2 = 81$	M1	This mark is given for a method to expand and simplify
	$20y^2 + 56y + 32 = 0$ Dividing through by 4 gives $5y^2 + 14y = 8 = 0$	M1	This mark is given for a method to form a quadratic equation to be solved
	$(5y + 4)(y + 2) = 0$	M1	This mark is given factorising the quadratic to solve for y (and hence x)
	$x = 3\frac{2}{5}$, $y = -\frac{4}{5}$ $x = 5$, $y = -2$	A1	This mark is given for the correct answers only

Question 7 (Version 2) (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$y = \dfrac{7-3x}{4}$	M1	This mark is given for a method to find an expression for y to substitute into $x^2 - 4y^2 = 9$
	$x^2 - 4\left(\dfrac{49-42x+9x^2}{16}\right) = 9$ $4x^2 - 49 + 42x - 9x^2 = 36$	M1	This mark is given for a method to expand and simplify
	$5x^2 - 42x + 85 = 0$	M1	This mark is given for a method to form a quadratic equation to be solved
	$(5x - 17)(x - 5) = 0$	M1	This mark is given factorising the quadratic to solve for x (and hence y)
	$x = 3\dfrac{2}{5}$, $y = -\dfrac{4}{5}$ $x = 5$, $y = -2$	A1	This mark is given for the correct answers only

Question 8 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$(2y - 3)^2 + y^2 = 18$	M1	This method mark is given for rearranging $x - 2y = -3$ to find an expression for x and substituting
	$4y^2 - 6y - 6y + 9$	M1	This method mark is given for the expansion of the expression $(2y - 3)^2$
	$5y^2 - 12y - 9 = 0$	M1	This method mark is given for rearranging to find a quadratic equation to be solved
	$(5y + 3)(y - 3) = 0$	M1	This method mark is given for factorising the quadratic equation
	$x = 3$, $y = 3$; $x = -4.2$, $y = -0.6$	A1	This accuracy mark is given for the correct pair of solutions only

Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = \frac{1-x}{x}$ $2x^2 - \left(\frac{1-x}{2}\right)^2 = 17$	M1	This mark is given for a method to find y in terms of x and substitute
	$2x^2 - \frac{(1-2x+x^2)}{4} = 17$ $8x^2 - 1 + 2x - x^2 = 68$	M1	This mark is given for an expansion of the bracket after substitution
	$7x^2 + 2x - 69 = 0$	M1	This mark is given for forming a quadratic equation to be solved
	$(7x + 23)(x - 3) = 0$	M1	This mark is given for factorising the quadratic equation
	$x = -\frac{23}{7}$ or $x = 3$ $y = \frac{15}{7}$ or $y = -1$	A1	This mark is given for two sets of correct solutions

Question 10 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2x + 2 = 2x^2 - 3x - 10$	M1	This mark is given for eliminating one variable
		M1	This mark is given for rearranging to get a quadratic in one variable
		M1	use of factorisation or correct substitution into quadratic formula or completing the square to solve an equation of the form $ax^2 + bx + c = 0$
	$x = -1.5$, $x = 4$ **or** $y = -1$, $y = 10$	A1	
	$x = -1.5$, $y = -1$ and $x = 4$, $y = 10$	C1	This mark is given for correctly matched x and y values

Mark scheme for 1MA1 Higher themed papers: Simultaneous Equations

Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1	2	June 2017	3H	3	Algebra	A9	2	66	3.32	4.76	4.33	3.82	3.43	2.94	2.18	1.09	-	-	0.44
2	5	Mock Set 3	1H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	6	Nov 2018	1H	3	Algebra	A19	1	32	0.95	3.00	2.73	2.39	1.81	1.32	0.72	0.30	-	-	0.13
4	10	Mock Set 4	2H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	14	Mock Set 2	2H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	20	June 2017	1H	5	Algebra	A19	1	20	1.02	3.62	2.36	1.45	0.72	0.26	0.07	0.01	-	-	0.00
7	20	June 2019	3H	5	Algebra	A19	1	12	0.60	2.92	1.39	0.66	0.27	0.09	0.03	0.01	-	-	0.01
8	20	Mock Set 1	1H	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	19	Nov 2018	3H	5	Algebra	A19	1	10	0.48	4.90	3.94	2.49	1.23	0.43	0.10	0.01	-	-	0.00
10	20	Mock Set 4	3H	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				42					**6.37**	**19.2**	**14.75**	**10.81**	**7.46**	**5.04**	**3.1**	**1.42**	**0**	**0**	**0.58**