



5.11H Simultaneous Equations: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Solve the simultaneous equations $2x + y = 7$ and $x - y = 1$.

(Total for Question 1 is 3 marks)

- 2** Solve the simultaneous equations $3x + 4y = 1$ and $5x - 2y = 13$.

(Total for Question 2 is 3 marks)

- 3** A school sells pencils and rulers. A packet of pencils and 2 rulers costs 5 pounds. Two packets of pencils and 3 rulers cost 8 pounds. Use simultaneous equations to find the cost of one packet of pencils and the cost of one ruler.

(Total for Question 3 is 4 marks)

- 4 Show that the system $y = x^2 - x$ and $y = 3x - 4$ has exactly one real solution, and find that solution.

(Total for Question 4 is 4 marks)

- 5 Solve the simultaneous equations $(1/2)x + (2/3)y = 7$ and $x - (3/2)y = -1$. Give your answers as exact fractions or mixed numbers.

(Total for Question 5 is 4 marks)

- 6 Find the value(s) of m for which the pair of equations $2x + 3y = 5$ and $4x + m y = 10$
(a) has infinitely many solutions,
(b) has no solution.
Explain your answers.

(Total for Question 6 is 4 marks)

- 7 Solve the simultaneous equations $y = x^2 - 4$ and $y = x + 2$. Give both solutions and find the corresponding y values.

(Total for Question 7 is 4 marks)

8 Solve the following system of three equations in three variables:

$$x + y + z = 6$$

$$2x - y + 3z = 14$$

$$x + 4y - z = 2$$

Give the values of x , y and z .

(Total for Question 8 is 5 marks)

9 Priya, Kwame and Omar share 120 pounds between them. After Priya gives 10 pounds to Kwame, Priya has twice as much money as Kwame has then. After Kwame gives 5 pounds to Omar, Omar has 5 pounds less than Priya has at that time. Let P , K and O be their initial amounts. (a) Write down three simultaneous equations in P , K and O representing these facts. (b) Solve your equations to find how much each person had initially. Show all steps.

(a) Write down three equations in P , K and O to represent the situation. (3)

(b) Solve the equations to find P , K and O . (6)

(Total for Question 9 is 9 marks)

Mark scheme · 5.11H Simultaneous Equations: Higher Tier Practice

Question 1

- **M1** method to eliminate y, e.g. add the equations or substitute correctly
- **A1** $x = 8/3$ cao
- **A1** $y = 5/3$ cao
- **Answer:** $x = 8/3, y = 5/3$

Question 2

- **M1** method to eliminate one variable, e.g. multiply equations to eliminate y or x
- **A1** $x = 27/13$ cao
- **A1** $y = -17/13$ cao
- **Answer:** $x = 27/13, y = -17/13$

Question 3

- **M1** form two equations correctly, e.g. $p + 2r = 5$ and $2p + 3r = 8$
- **M1** eliminate one variable correctly, e.g. multiply first equation by 2 then subtract
- **A1** $p = 1$ cao
- **A1** $r = 2$ pounds cao
- **Answer:** packet of pencils = 1 pound, ruler = 2 pounds

Question 4

- **M1** substitute $3x - 4$ for y to get $x^2 - x = 3x - 4$ and rearrange
- **dM1** complete square or factor the quadratic correctly to show $(x - 2)^2 = 0$
- **A1** $x = 2$ cao
- **A1** $y = 2$ cao
- **Answer:** One solution: $x = 2, y = 2$

Question 5

- **M1** clear denominators correctly, e.g. multiply first by 6 and second by 2 to obtain $3x + 4y = 42$ and $2x - 3y = -2$
- **M1** eliminate one variable correctly and solve for the other
- **A1** $x = 118/17$ cao
- **A1** $y = 90/17$ cao
- **Answer:** $x = 118/17, y = 90/17$

Question 6

- **M1** recognise that for multiples the ratios of coefficients must match, compare $4/2$ and $m/3$ and $10/5$
- **A1** for infinitely many solutions require $4/2 = m/3 = 10/5$ leading to $m = 6$ cao
- **M1** state condition for no solutions: coefficient ratios equal but constant ratio different, and check whether this is possible with the right-hand side fixed at 10
- **A1** conclude no value of m gives no solutions: $m = 6$ makes every ratio equal ($4/2 = m/3 = 10/5 = 2$), giving infinitely many solutions rather than none, and any $m \neq 6$ gives a unique solution cao
- **Answer:** (a) $m = 6$ gives infinitely many solutions ($4x + 6y = 10$ is exactly twice $2x + 3y = 5$). (b) No value of m gives no solutions: with the right-hand side fixed at 10, $m = 6$ makes the constant ratio match too (infinitely many solutions), and every other value of m gives a unique solution.

Question 7

- **M1** substitute $x + 2$ for y to get $x^2 - 4 = x + 2$ and rearrange to quadratic
- **M1** factorise correctly to $(x - 3)(x + 2) = 0$
- **A1** $x = 3, x = -2$ cao
- **A1** corresponding y values $y = 5$ and $y = 0$ cao
- **Answer:** $x = 3, y = 5$ and $x = -2, y = 0$

Question 8

- **M1** use first equation to express $z = 6 - x - y$ and substitute into one other equation
- **M1** get two linear equations in x and y , e.g. $x + 4y = 4$ and $2x + 5y = 8$
- **M1** solve the 2×2 system to find x and y
- **A1** $x = 4$ cao
- **A1** $y = 0$ and $z = 2$ cao
- **Answer: $x = 4, y = 0, z = 2$**

Question 9

- (a) **B1** $P + K + O = 120$
- (a) **B1** $P - 10 = 2(K + 10)$ or equivalent rearrangement
- (a) **B1** $P = O + 5$ or $O + 5 = P$ (from Kwame gives 5 to Omar)
- **(a) Answer: Equations: $P + K + O = 120$; $P - 10 = 2(K + 10)$; $P = O + 5$**
- (b) **M1** substitute $P = O + 5$ into $P - 10 = 2(K + 10)$ and rearrange to relate O and K
- (b) **M1** use $P + K + O = 120$ with $P = O + 5$ to form a second equation in O and K
- (b) **M1** solve the two linear equations to find K and O
- (b) **A1** $K = 13$ cao
- (b) **A1** $O = 51$ cao
- (b) **A1** $P = 56$ cao
- **(b) Answer: Initial amounts: Priya 56 pounds, Kwame 13 pounds, Omar 51 pounds**