Simultaneous Equations

GCSE Mathematics • **Higher Tier** • Grades 6–7 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 78 / 78

Show all your working. Marks are given for correct method as well as the final answer.

1. Solve $x + y = 10$ and $x - y = 4$. **[3 marks]**

ADD: $2x = 14$
$x = 7$
$7 + y = 10 \Rightarrow y = 3$

Answer: $x = 7, y = 3$

2. Solve $2x + y = 11$ and $x - y = 1$. **[3 marks]**

ADD: $3x = 12$
$x = 4$
$4 - y = 1 \Rightarrow y = 3$

Answer: $x = 4, y = 3$

3. Solve $3x + y = 14$ and $x + y = 6$. **[3 marks]**

SUBTRACT: $2x = 8$
$x = 4$
$y = 2$
same sign → subtract

Answer: $x = 4, y = 2$

4. Solve $4x + 3y = 18$ and $4x + y = 10$. **[3 marks]**

SUBTRACT: $2y = 8$
$y = 4$
$4x + 4 = 10 \Rightarrow x = 1.5$

Answer: $x = 1.5, y = 4$

5. Solve $2x + 3y = 16$ and $x + y = 6$. **[4 marks]**

double the second: $2x + 2y = 12$
SUBTRACT: $y = 4$
$x = 2$

Answer: $x = 2, y = 4$

6. Solve $3x - 2y = 7$ and $x + 2y = 9$. **[3 marks]**

ADD (the 2y cancels): $4x = 16$
$x = 4$
$4 + 2y = 9 \Rightarrow y = 2.5$
opposite signs → add

Answer: $x = 4, y = 2.5$

7. Solve $5x - y = 13$ and $2x - y = 4$. **[3 marks]**

SUBTRACT: $3x = 9$
$x = 3$
$15 - y = 13 \Rightarrow y = 2$
$-y - (-y) = 0$, not $-2y$

Answer: $x = 3, y = 2$

8. Solve $3x + 2y = 19$ and $2x + 5y = 31$. **[4 marks]**

$\times 5$: $15x + 10y = 95$
$\times 2$: $4x + 10y = 62$
SUBTRACT: $11x = 33$
$x = 3$
$9 + 2y = 19 \Rightarrow y = 5$

Answer: $x = 3, y = 5$

9. Solve $4x + 5y = 22$ and $3x - 2y = 5$. **[4 marks]**

$\times 2$: $8x + 10y = 44$
$\times 5$: $15x - 10y = 25$
ADD (the $10y$ cancels): $23x = 69$
$x = 3$
$12 + 5y = 22 \Rightarrow y = 2$

Answer: $x = 3, y = 2$

10. Solve $y = 2x + 1$ and $3x + y = 11$ by substitution. **[3 marks]**

$3x + (2x + 1) = 11$
$5x = 10$
$x = 2, y = 5$

Answer: $x = 2, y = 5$

11. Solve $x = 3y - 2$ and $2x + y = 10$ by substitution. **[4 marks]**

$2(3y - 2) + y = 10$
$7y = 14$
$y = 2, x = 4$

Answer: $x = 4, y = 2$

12. Solve $y = 5 - x$ and $2x + 3y = 13$. **[4 marks]**

$2x + 3(5 - x) = 13$
$-x + 15 = 13$
$x = 2, y = 3$

Answer: $x = 2, y = 3$

13. Solve $2x = y + 4$ and $3x + 2y = 13$. **[4 marks]**

rearrange: $y = 2x - 4$
$3x + 2(2x - 4) = 13$
$7x = 21$
$x = 3, y = 2$

Answer: $x = 3, y = 2$

14. Solve $x + 2y = 8$ and $3x = 2y + 8$. **[4 marks]**

$3x - 2y = 8$
add to the first: $4x = 16$
$x = 4$, $y = 2$

Answer: $x = 4, y = 2$

15. Solve $2x + y = 1$ and $x - y = -4$. **[3 marks]**

ADD: $3x = -3$
$x = -1$
$-1 - y = -4 \Rightarrow y = 3$

Answer: $x = -1, y = 3$

16. Solve $4x + 2y = 5$ and $2x - 2y = 1$. **[4 marks]**

ADD: $6x = 6$
$x = 1$
$4 + 2y = 5 \Rightarrow y = 0.5$

Answer: $x = 1, y = 0.5$

17. Three coffees and two teas cost \$11. One coffee and two teas cost \$5. Work out the cost of each. **[5 marks]**

$3c + 2t = 11$
$c + 2t = 5$
SUBTRACT: $2c = 6$
$c = 3$, $t = 1$

Answer: coffee £3, tea £1

18. Five pens and one ruler cost \$4.20. Two pens and one ruler cost \$2.10. Work out the cost of a pen. **[4 marks]**

$5p + r = 4.20$
$2p + r = 2.10$
SUBTRACT: $3p = 2.10$
$p = 0.70$

Answer: 70p

19. The line $y = x + 1$ meets the curve $y = x^2 - 1$.

(a) Show that $x^2 - x - 2 = 0$. **[3 marks]**

$x^2 - 1 = x + 1$
$x^2 - x - 2 = 0$ ✓

(b) Find the coordinates of both intersection points. **[4 marks]**

$(x - 2)(x + 1) = 0$
$x = 2$ or $x = -1$
$y = 3$ and $y = 0$
(2, 3) and (−1, 0)

Answer: (2, 3) and (−1, 0)

20. A cinema charges $\$a$ for an adult and $\$c$ for a child. Two adults and three children cost $\$31$. One adult and five children cost $\$33$.

(a) Write down two equations. **[2 marks]**

$2a + 3c = 31$

$a + 5c = 33$

(b) Solve them to find both prices. **[4 marks]**

double the second: $2a + 10c = 66$

SUBTRACT: $7c = 35$

$c = 5$

$a + 25 = 33 \Rightarrow a = 8$

Answer: adult £8, child £5

Free to print and use at home or in class. Please do not re-host or sell. Written by Hampstead Tuition Centre from the published exam specifications.