Simultaneous Equations — Manipulation of Both Equations

Starter

1. Solve the simultaneous equations $5x - 7y = 27$
$3x - 4y = 16$

Working: To eliminate x

The 1st equation is multiplied by 3 so that the coefficient of x is 15

The 2nd equation is multiplied by 5 so that the coefficient of x is 15

$$\begin{array}{ll} & 5x - 7y = 27 \\ & 3x - 4y = 16 \\ \times 3 & 15x - 21y = 81 \\ \times 5 & 15x - 20y = 80 \\ \text{Sub.} & -y = 1 \\ & y = -1 \\ & 5x + 7 = 27 \\ & 5x = 20 \\ & x = 4 \\ & x = 4, y = -1 \end{array}$$

Remember: $-21 - -20 = -1$

The rest of the working is exactly as before

E.g. 1 Solve the simultaneous equations $2x + 3y = 5$ and $5x - 2y = -16$.

Working: To eliminate y

The 1st equation is multiplied by 2 so that the coefficient of y is 6

The 2nd equation is multiplied by 3 so that the coefficient of y is -6

$$\begin{array}{ll} & 2x + 3y = 5 \\ & 5x - 2y = -16 \\ \times 2 & 4x + 6y = 10 \\ \times 3 & 15x - 6y = -48 \\ \text{Add} & 19x = -38 \\ & x = -2 \\ & -4 + 3y = 5 \\ & 3y = 9 \\ & y = 3 \\ & x = -2, y = 3 \end{array}$$

The rest of the working is exactly as before

E.g. 2 Solve the simultaneous equations $2x + 7y = 17$ and $5x + 3y = -1$.

Working: To eliminate x

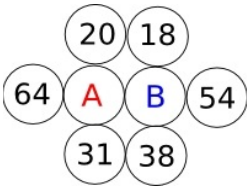
The 1st equation is multiplied by 5 so that the coefficient of x is 10

The 2nd equation is multiplied by 2 so that the coefficient of x is also 10

$$\begin{array}{ll} & 2x + 7y = 17 \\ & 5x + 3y = -1 \\ \times 5 & 10x + 35y = 85 \\ \times 2 & 10x + 6y = -2 \\ \text{Sub} & 29y = 87 \\ & y = 3 \\ & 2x + 21 = 17 \\ & 2x = -4 \\ & x = -2 \\ & x = -2, y = 3 \end{array}$$

The rest of the working is exactly as before

E.g. 3* Ali (A) and Baba (B) are shown surrounded by six thieves. The thieves' ages are given. Ali's age is the average of his four nearest neighbours', and so is Baba's. How old is Ali?



Working:

$$A = \frac{20 + 64 + 31 + B}{4} \qquad 4A - B = 115$$

$$B = \frac{18 + 54 + 38 + A}{4} \qquad -A + 4B = 110$$

Multiply the 1st equation by 4: $16A - 4B = 460$

Different signs so add: $15A = 570$

$A = 38$

Ali is 38 years old

Video A: Solving simultaneous equations algebraically
Video B: Solving simultaneous equations algebraically

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p381 M12.4 Qu 10-24
A*-G class textbook:	p346 M12.4 Qu 10-24
9-1 homework book:	p128 M12.4 Qu 1-12
A*-G homework book:	p96 M12.4 Qu 1-12

Homework book answers (only available during a lockdown)