Practical Simultaneous Equations Problems

Starter

1. **(Review of last lesson)**
Solve the simultaneous equations $3x + 2y = 7$ and $2x - 3y = -4$.

Working: To eliminate x

The 1st equation is multiplied by 3 so that the coefficient of x is 6

The 2nd equation is multiplied by 2 so that the coefficient of x is also 6

$$\begin{array}{ll} & 3x + 2y = 7 \\ & \underline{2x - 3y = -4} \\ \times 2 & 6x + 4y = 14 \\ \times 3 & \underline{6x - 9y = -12} \\ \text{Sub} & 13y = 26 \\ & y = 2 \\ & 3x + 4 = 7 \\ & 3x = 3 \\ & x = 1 \\ & x = 1, y = 2 \end{array}$$

The rest of the working is exactly as before

N.B. Sum of two numbers = addition.
Difference of two numbers = subtraction.

2. The sum of two numbers, a and b, is 35 and the difference is 17.
(a) Write two equations involving a and b.
(b) Solve the equations to find the two numbers.

Working: (a) Sum of 2 numbers is 35: $a + b = 35$
Difference of 2 numbers is 17: $a - b = 17$

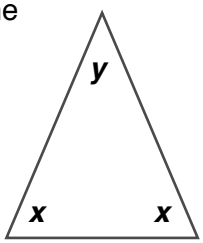
(b) Add the two equations to eliminate b: $2a = 52$
$a = 26$
Subst. $26 + b = 35$
$b = 9$
The two numbers are 9 and 26.

You do not need to solve the equations formed.

E.g. 1 Twice one number plus the other number add up to 12. The sum of the two numbers is 7. Find the numbers.

Working: Twice one number plus the other number add up to 12: $2x + y = 12$
The sum of the two numbers is 7: $x + y = 7$

E.g. 2 In the given triangle, angle x is 9° greater than angle y. Find the angles of the triangle.



Working: Angle x is 9° greater than angle y: $x = y + 9$
Sum of angles is 180°: $2x + y = 180$
In the correct form: $x - y = 9$
$2x + y = 180$

E.g. 3 The cost of 2 cups and 3 plates is £18. The cost of 5 cups and 1 plate is £19. How much is a cup and how much is a plate?

Working:
The cost of 2 cups and 3 plates is £18: $2c + 3p = 18$
The cost of 5 cups and 1 plate is £19: $5c + 1p = 19$

E.g. 4 Adult tickets for a concert are £5 and children's tickets are £3. The amount of money from ticket sales was £103. If 29 people attended the concert, calculate how many adults and how many children attended.

Working:
If a adults attended the concert, they would have paid $5a$
So the amount of money from ticket sales was £103: $5a + 3c = 103$
29 people attended the concert: $a + c = 29$

E.g. 5 The line $y = mx + c$ passes through the points $(2, 5)$ and $(4, 13)$. Find m and c.

Working:
$(2, 5)$ means $x = 2$ and $y = 5$: $2m + c = 5$
$(4, 13)$ means $x = 4$ and $y = 13$: $4m + c = 13$

Video: Worded simultaneous equations

Solutions to Starter and E.g.s

Exercise
Form ***and*** solve the equations.

9-1 class textbook:	p383 M12.5 Qu 1-12
A*-G class textbook:	p347 M12.5 Qu 1-12
9-1 homework book:	p128 M12.5 Qu 1-11
A*-G homework book:	p97 M12.5 Qu 1-8

Homework book answers (only available during a lockdown)