Linear Simultaneous Equations

Practice Worksheet (Problem Solving)

I Do

Solve the simultaneous equations.
Show clear algebraic working.

$$3x + 2y = 14$$

$$5x - 3y = 17$$

$x =$ .....

$y =$ .....

(Total for Question is 4 marks)

We Do

Solve the simultaneous equations.
Show clear algebraic working.

$$4x + 3y = 18$$

$$2x - 5y = -4$$

$x =$ .....

$y =$ .....

(Total for Question is 4 marks)

Video walkthrough

You Do 1

Solve the simultaneous equations.
Show clear algebraic working.

$$5x + 2y = 22$$
$$3x - 4y = 8$$

$x =$ .....

$y =$ .....

(Total for Question is 3 marks)

You Do 2

Solve the simultaneous equations.
Show clear algebraic working.

$$2x + 5y = 1$$
$$3x - 2y = 11$$

$x =$ .....

$y =$ .....

(Total for Question is 4 marks)

You Do 3

Solve the simultaneous equations.
Show clear algebraic working.

$$4x + 3y = -2$$
$$5x - 2y = 9$$

$x =$ .....

$y =$ .....

(Total for Question is 4 marks)

Challenge 1

The total cost of 4 adult tickets and 3 child tickets is £51.
The total cost of 2 adult tickets and 5 child tickets is £43.

Work out the cost of an adult ticket and the cost of a child ticket.
Show clear algebraic working.

Adult ticket: £.....

Child ticket: £.....

(Total for Question is 5 marks)

Challenge 2

Solve the simultaneous equations.
Show clear algebraic working.

$$\frac{x}{2} + \frac{2y}{5} = 4$$

$$\frac{3x}{4} - \frac{y}{5} = 2$$

$x =$ .....

$y =$ .....

(Total for Question is 5 marks)

Extreme Challenge

Solve the simultaneous equations.
Show clear algebraic working.

$$2(x + 3) - 3(y - 1) = 11$$
$$4(x - 2) + 5(y + 2) = 28$$

$x =$ .....

$y =$ .....

(Total for Question is 5 marks)

Answers & Worked Solutions

I Do
Let (1) be $3x + 2y = 14$
Let (2) be $5x - 3y = 17$
Multiply (1) by 3: $9x + 6y = 42$
Multiply (2) by 2: $10x - 6y = 34$
Add the two new equations to eliminate y:
$19x = 76$
Divide by 19: $\mathbf{x = 4}$
Substitute $x = 4$ into (1):
$3(4) + 2y = 14$
$12 + 2y = 14$
$2y = 2 \implies \mathbf{y = 1}$

We Do
(1) $4x + 3y = 18$
(2) $2x - 5y = -4$
Multiply (2) by 2 to match the x coefficients:
$4x - 10y = -8$
Subtract this new equation from (1):
$4x - 4x + 3y - (-10y) = 18 - (-8)$
$13y = 26 \implies \mathbf{y = 2}$
Substitute $y = 2$ into (1):
$4x + 3(2) = 18$
$4x + 6 = 18$
$4x = 12 \implies \mathbf{x = 3}$

You Do 1
(1) $5x + 2y = 22$
(2) $3x - 4y = 8$
Multiply (1) by 2: $10x + 4y = 44$
Add this to (2) to eliminate y:
$13x = 52 \implies \mathbf{x = 4}$
Substitute $x = 4$ into (1):
$5(4) + 2y = 22 \implies 20 + 2y = 22 \implies 2y = 2 \implies \mathbf{y = 1}$

You Do 2
(1) $2x + 5y = 1$
(2) $3x - 2y = 11$
Multiply (1) by 2: $4x + 10y = 2$
Multiply (2) by 5: $15x - 10y = 55$
Add the equations:
$19x = 57 \implies \mathbf{x = 3}$
Substitute $x = 3$ into (1):
$2(3) + 5y = 1 \implies 6 + 5y = 1 \implies 5y = -5 \implies \mathbf{y = -1}$

You Do 3

(1) $4x + 3y = -2$
(2) $5x - 2y = 9$
Multiply (1) by 2: $8x + 6y = -4$
Multiply (2) by 3: $15x - 6y = 27$
Add the equations:
$23x = 23 \implies \mathbf{x = 1}$
Substitute $x = 1$ into (1):
$4(1) + 3y = -2 \implies 4 + 3y = -2 \implies 3y = -6 \implies \mathbf{y = -2}$

Challenge 1

Let a be the cost of an adult ticket and c be the cost of a child ticket.
(1) $4a + 3c = 51$
(2) $2a + 5c = 43$
Multiply (2) by 2: $4a + 10c = 86$
Subtract (1) from this new equation:
$4a - 4a + 10c - 3c = 86 - 51$
$7c = 35 \implies \mathbf{c = 5}$ (Child ticket is £5)
Substitute $c = 5$ into (1):
$4a + 3(5) = 51 \implies 4a + 15 = 51 \implies 4a = 36 \implies \mathbf{a = 9}$ (Adult ticket is £9)

Challenge 2

First, eliminate the fractions.
(1) $\frac{x}{2} + \frac{2y}{5} = 4$. Multiply by 10 (LCM of 2 and 5):
$5x + 4y = 40$
(2) $\frac{3x}{4} - \frac{y}{5} = 2$. Multiply by 20 (LCM of 4 and 5):
$15x - 4y = 40$
Now solve the new system:
$5x + 4y = 40$
$15x - 4y = 40$
Add the equations together:
$20x = 80 \implies \mathbf{x = 4}$
Substitute $x = 4$ into $5x + 4y = 40$:
$5(4) + 4y = 40 \implies 20 + 4y = 40 \implies 4y = 20 \implies \mathbf{y = 5}$

Extreme Challenge

First, expand and simplify both equations into the standard $ax + by = c$ form.

Equation (1): $2(x + 3) - 3(y - 1) = 11$

$2x + 6 - 3y + 3 = 11$

$2x - 3y + 9 = 11 \implies 2x - 3y = 2$

Equation (2): $4(x - 2) + 5(y + 2) = 28$

$4x - 8 + 5y + 10 = 28$

$4x + 5y + 2 = 28 \implies 4x + 5y = 26$

Now solve the system:

(1) $2x - 3y = 2$

(2) $4x + 5y = 26$

Multiply (1) by 2: $4x - 6y = 4$

Subtract this from (2):

$4x - 4x + 5y - (-6y) = 26 - 4$

$11y = 22 \implies \mathbf{y = 2}$

Substitute $y = 2$ into (1):

$2x - 3(2) = 2 \implies 2x - 6 = 2 \implies 2x = 8 \implies \mathbf{x = 4}$