SIMULTANEOUS EQUATIONS

18. Solve the following simultaneous equations by an algebraic (not graphical) method. Show all your working.

$$2x + 3y = 4 \quad (1)$$
$$3x + 4y = 8 \quad (2)$$

(1) × 3 $\quad 6x + 9y = 12 \quad (3)$

(2) × 2 $\quad 6x + 8y = 16 \quad (4)$

(3) − (4) $\quad 1y = -4$

$\therefore y = -4$

Substitute y in (1) $\quad 2x + 3 \times -4 = 4$

$2x - 12 = 4$

$2x = 4 + 12$

$2x = 16$

$x = \frac{16}{2} = 8$

Check

(1) $2 \times 8 + 3 \times -4$

$16 - 12 = 4$ ✓

(2) $3 \times 8 + 4 \times -4$

$24 - 16 = 8$ ✓

$\therefore x = 8, y = -4$

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21. Solve the following simultaneous equations by an algebraic (not graphical) method. Show all your working.

$$4x + 2y = 17 \quad (1)$$
$$5x + 3y = 23 \quad (2)$$

(1) × 5 $\quad 20x + 10y = 85 \quad (3)$

(2) × 4 $\quad 20x + 12y = 92 \quad (4)$

(3) − (4) $\quad -2y = -7$

$y = \frac{-7}{-2} = 3.5$

Substitute in (1) $\quad 4x + 2 \times 3.5 = 17$

$4x + 7 = 17$

$4x = 17 - 7$

$4x = 10$

$x = \frac{10}{4} = 2.5 \quad \therefore x = 2.5, y = 3.5$

[4]

$$\begin{array}{r} 17 \\ \times 5 \\ \hline 85 \\ \hline 3 \end{array}$$

18. Solve the simultaneous equations below by an algebraic (not graphical) method. Show all your working.

$$3x + 4y = -6 \quad (1)$$
$$5x + 3y = 1 \quad (2)$$

(1) × 5 $\quad 15x + 20y = -30 \quad (3)$

(2) × 3 $\quad 15x + 9y = 3 \quad (4)$

(3) − (4) $\quad 11y = -33$

$y = \frac{-33}{11} \quad y = -3$

Substitute in (2) $\quad 5x + 3 \times -3 = 1$

$5x - 9 = 1$

$5x = 1 + 9$

$5x = 10$

$x = 2$

$\therefore x = 2, y = -3$

[4]

20. Solve the following simultaneous equations by an algebraic (not graphical) method. Show all your working.

$$5x + 2y = 10 \quad (1)$$
$$2x + 3y = -7 \quad (2)$$

(1) × 2 $\quad 10x + 4y = 20 \quad (3)$

(2) × 5 $\quad 10x + 15y = -35 \quad (4)$

$20 - -35$

$20 + 35 = 55$

(3) − (4) $\quad -11y = 55$

$y = \frac{55}{-11} = -5$

Substitute in (1) $\quad 5x + 2 \times -5 = 10$

$5x - 10 = 10$

$5x = 10 + 10$

$5x = 20$

$x = \frac{20}{5}$

$x = 4 \quad \therefore x = 4, y = -5$

[4]

11. Solve the following simultaneous equations by an algebraic (not graphical) method.

Show all your working.

$$3x + 4y = 1 \quad (1)$$
$$5x - 4y = 23 \quad (2)$$

(1)+(2) $8x = 24$

$x = \frac{24}{8} = 3$

(1) × 5 $\quad 15x + 20y = 5 \quad (3)$

(2) × 3 $\quad 15x - 12y = 69 \quad (4)$

$20y - -12y$

$20y + 12y$

$32y$

(3) − (4) $\quad 32y = -64$

$y = \frac{-64}{32} = -2$

Substitute in (1) $\quad 3x + 4 \times -2 = 1$

$3x - 8 = 1$

$3x = 1 + 8$

$3x = 9$

$x = \frac{9}{3} = 3 \qquad$ So $x = 3, y = -2$

[3]

21. Solve the following simultaneous equations by an algebraic (not graphical) method.

$$3x - 2y = 16 \quad (1)$$
$$1x + 3y = -2 \quad (2)$$

(1) × 1 $\quad 3x - 2y = 16 \quad (3)$

(2) × 3 $\quad 3x + 9y = -6 \quad (4)$

(3) − (4) $\quad -11y = 22$

$y = \frac{22}{-11} = -2$

Substitute in (2) $\quad x + 3 \times -2 = -2$

$x - 6 = -2$

$x = -2 + 6$

$x = 4 \qquad$ So $x = 4, y = -2$

[4]

From (2) $\quad x = -2 - 3y \quad (3)$

In (1) $\quad 3(-2 - 3y) - 2y = 16$

$-6 - 9y - 2y = 16$

$-11y = 16 + 6$

$-11y = 22 \Rightarrow y = \frac{22}{-11} = -2$

19. Solve the following simultaneous equations by an algebraic (not graphical) method. Show all your working.

$$3x - 4y = 22 \quad (1)$$
$$2x + 3y = -8 \quad (2)$$

(1) × 2 $\quad 6x - 8y = 44 \quad (3)$

(2) × 3 $\quad 6x + 9y = -24 \quad (4)$

(3) − (4) $\quad -17y = 68$

$y = \frac{68}{-17} = -4$

in (1) $\quad 3x - 4 \times -4 = 22$

$3x + 16 = 22$

$3x = 22 - 16$

$3x = 6 \qquad x = 2$

$\therefore x = 2, y = -4$

[4]

24. Solve the following simultaneous equations by an algebraic (not graphical) method. **Show all your working.**

$$4x - 3y = 9 \quad (1)$$
$$6x - 5y = 5 \quad (2)$$

× (1) 6 $\quad 24x - 18y = 54 \quad (3)$

(2) × 4 $\quad 24x - 20y = 20 \quad (4)$

$-18y - -20y$

$-18y + 20y$

$+2y$

(3) − (4) $\quad +2y = 34$

$y = \frac{34}{2} = 17$

Sub in (1) $\quad 4x - 3 \times 17 = 9$

$4x - 51 = 9$

$4x = 9 + 51$

$4x = 60$

$x = \frac{60}{4} = 15 \qquad$ So $x = 15, y = 17$

[4]

$17 \times 3 = 51$