

1. Solve these simultaneous equations by elimination:

(a) $7x + 2y = 38$ and $3x + y = 17$

(c) $4y + 5z = -16$ and $y - 3z = 30$

(e) $8p - 3q = 40$ and $5p - 2q = 26$

(g) $10e + 3f + 2 = 0$ and $9e + 5f - 12 = 0$

(b) $6a - 5b = 10$ and $2a + b = 14$

(d) $11h - 2k = 95$ and $7h - 6k = 51$

(f) $4c + 7d = -3$ and $3c - 4d = 7$

(h) $5k - 2l - 1 = 0$ and $3k + 5l - 44 = 0$

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1. Solve these simultaneous equations by elimination:

(a) $7x + 2y = 38$ and $3x + y = 17$

$\times 2: 14x + 4y = 76$ — (2)

\ominus $7x + 2y - 6x - 2y = 38 - 34$
 $x = 4$ ✓

Sub $x=4$ into (1)

$(3 \times 4) + y = 17$

$12 + y = 17$

$y = 5$

$x = 4, y = 5$ ✓

(c) $4y + 5z = -16$ and $2y - 3z = 30$

$\times 4: 4y - 12z = 120$ — (3)

\ominus $4y + 5z - 4y + 12z = -16 - 120$
 $17z = -136$
 $z = -8$ ✓

Sub $z = -8$ into (2)

$y - (3 \times -8) = 30$

$y + 24 = 30$

$y = 6$

$z = -8, y = 6$

(e) $8p - 3q = 40$ and $5p - 2q = 26$

$\times 2: 16p - 6q = 80$ — (3)

$\times 3: 15p - 6q = 78$ — (4)

\ominus $16p - 6q - 15p + 6q = 80 - 78$
 $p = 2$ ✓

Sub $p=2$ into (2)

$(5 \times 2) - 2q = 26$ ✓

$10 - 2q = 26$

$q = -8$ ✓

$p = 2, q = -8$ ✓

(g) $10e + 3f + 2 = 0$ and $29e + 5f - 12 = 0$

$\times 5: 50e + 15f + 10 = 0$ — (3)

$\times 3: 27e + 15f - 36 = 0$ — (4)

\ominus $50e + 15f - 27e + 15f + 10 + 36 = 0$
 $23e + 46 = 0$
 $23e = -46$
 $e = -2$ ✓

Sub $e = -2$ into (2)

$(9 \times -2) + 5f - 12 = 0$

$-18 + 5f - 12 = 0$

$-30 + 5f = 0$ ✓

$5f = 30$

$e = -2$
 $f = 6$

(b) $6a - 5b = 10$ and $2a + b = 14$

$\times 5: 10a + 5b = 70$ — (3)

\oplus $10a + 5b + 6a - 5b = 70 + 10$

$16a = 80$ ✓

$a = 5$ ✓

Sub $a = 5$ into (2)

$(2 \times 5) + b = 14$

$b = 4$

$a = 5, b = 4$ ✓

(d) $11h - 2k = 95$ and $7h - 6k = 51$

$\times 3: 33h - 6k = 285$ — (3)

\ominus $33h - 6k - 7h + 6k = 285 - 57$

$26h = 228$ ✓

$h = 9$

Sub $h = 9$ into (2)

$(7 \times 9) - 6k = 51$

$-6k = -12$ ✓

$k = 2$

$h = 9, k = 2$

(f) $4c + 7d = -3$ and $3c - 4d = 7$

$\times 3: 12c + 21d = -9$ — (3)

$\times 4: 12c - 16d = 28$ — (4)

\ominus $12c - 16d - 12c - 21d = 28 - -9$
 $-37d = 37$ ✓

$d = -1$ ✓

Sub $d = -1$ into (2)

$3c - (4 \times -1) = 7$

$3c + 4 = 7$ ✓

$3c = 3$ ✓

$c = 1, d = -1$

(h) $5k - 2t - 1 = 0$ and $3k + 5t - 44 = 0$

$\times 3: 15k - 6t - 3 = 0$ — (3)

$\times 5: 15k + 25t - 220 = 0$ — (4)

\ominus $15k + 25t - 18k + 6t - 220 + 3 = 0$
 $31t - 217 = 0$

$31t = 217$ ✓

$t = 7$ ✓

Sub $t = 7$ into (2)

$3k + (5 \times 7) - 44 = 0$

$3k + 35 - 44 = 0$

$3k - 9 = 0$

$3k = 9$

$t = 7$
 $k = 3$ ✓

1. Form a pair of simultaneous equations and solve them to answer these problems:

- (a) Gordana and Kate together invested \$2000 in a new business. If Gordana invested 3 times as much as Kate, how much did each invest?

Let money invested by Gordana be x
 " " " " Kate be y

$$x + y = 2000 \quad \text{--- (1)}$$

$$x = 3y \quad \text{--- (2)}$$

Sub (2) into (1)

$3y + y = 2000$	$x = 1500$
$4y = 2000$	$y = 500$
$y = 500$	

Sub $y = 500$ into (2)

$$x = 3 \times 500 = 1500$$

\therefore Gordana invested \$1500
 Kate \$500

- (c) 3 books and 7 pencils cost \$10.40, while 8 books and 5 pencils cost \$14.75. How much is each pencil?

Let price of book be x
 " " pencils be y

$$3x + 7y = 10.40 \quad \text{--- (1)}$$

$$8x + 5y = 14.75 \quad \text{--- (2)}$$

① $\times 8$: $24x + 56y = 83.2$ --- (3)

② $\times 3$: $24x + 15y = 44.25$ --- (4)

③ - ④: $24x + 56y - 24x - 15y = 83.2 - 44.25$

$$41y = 38.95$$

$$y = 0.95$$

\therefore pencil cost 95 cents.

- (e) Alice is 17 years older than her brother. Their combined ages total 41 years. How old are Alice and her brother?

Let Alice age be x
 " Alice's brother be y

$$17 + y = x \quad \text{--- (1)}$$

$$x + y = 41 \quad \text{--- (2)}$$

Sub (1) into (2)

$$17 + y + y = 41$$

$$17 + 2y = 41$$

$$2y = 24$$

$$y = 12$$

Sub $y = 12$ into (1)

$$x = 17 + 12 = 29$$

\therefore Alice is 29, while her brother is 12.

- (b) Stephen scored 224 runs in a cricket match. In the second innings he scored 8 more runs than he scored in the first innings. How many runs did Stephen score in each innings?

Let first innings be x . 2nd innings y

$$x + y = 224 \quad \text{--- (1)}$$

$$8 + x = y \quad \text{--- (2)}$$

Sub (2) into (1)

$$x + 8 + x = 224$$

$$2x + 8 = 224$$

$$2x = 216$$

$$x = 108$$

Sub $x = 108$ into (2)

$$8 + 108 = y$$

$$y = 116$$

- (d) There are both sheep and emus in a paddock. Altogether there are 94 heads and 300 legs.

How many sheep are in the paddock?

Let no of sheep be x
 Let no of emus be y

$$4x + 2y = 300 \quad \text{--- (1)}$$

$$x + y = 94 \quad \text{--- (2)}$$

① $\times 2$: $2x + 2y = 188$ --- (3)

③ - ②: $2x + 2y - x - y = 188 - 94$

$$x + y = 94$$

$$-2x = -172$$

- (f) 10 bolts and 8 nuts weigh 372 grams, while 6 bolts and 13 nuts weigh 297 grams. What would be the combined weight of 7 bolts and 10 nuts?

Let weight of bolts be b
 Let weight of nuts be n

$$10b + 8n = 372 \quad \text{--- (1)}$$

$$6b + 13n = 297 \quad \text{--- (2)}$$

① $\times 6$: $60b + 48n = 2232$ --- (3)

② $\times 10$: $60b + 130n = 2970$ --- (4)

④ - ③: $60b + 130n - 60b - 48n = 2970 - 2232$

$$82n = 738$$

$$n = 9$$

Sub $n = 9$ into (1)

$$10b + (8 \times 9) = 372$$

$$10b + 72 = 372$$

$$10b = 300$$

$$b = 30$$

\therefore 7 bolts and 10 nuts weigh $(7 \times 30) + (10 \times 9) = 210 + 90 = 300$ grams.