

1. Solve these simultaneous equations by elimination:

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

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

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

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

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

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

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

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



Tania Ahmed



1. Solve these simultaneous equations by elimination:

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

$\times 2: 14x + 4y = 76$  — (3)

$\ominus$  (3)  $7x + 2y - 6x - 2y = 38 - 76$

$x = 4$  ✓

Sub  $x = 4$  into (2)

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

$12 + y = 17$

$y = 5$  ✓

$x = 4, y = 5$  ✓

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

$\times 4: 4y - 12z = 120$  — (3)

$\ominus$  (3)  $4y + 5z - 4y + 12z = -16 - 120$

$17z = -136$  ✓

$z = -8$  ✓

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)

$\ominus$  (4)  $16p - 6q - 15p + 6q = 80 - 78$

$p = 2$  ✓

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)

$\ominus$  (4)  $50e + 15f - 27e + 15f - 10 + 36 = 0$

$23e + 46 = 0$

$23e = -46$

$e = -2$  ✓

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)

$\ominus$  (3)  $10a + 5b + 6a - 5b = 70 + 10$

$16a = 80$  ✓

$a = 5$  ✓

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)

$\ominus$  (3)  $33h - 6k - 7h + 6k = 285 - 57$

$26h = 234$  ✓

$h = 9$

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)

$\ominus$  (4)  $12c - 16d - 12c - 21d = 28 - -9$

$-37d = 37$  ✓

$d = -1$  ✓

Sub  $d = -1$  into (2)

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

$3c + 4 = 7$  ✓

$3c = 3$  ✓

$c = 1, d = -1$

(h)  $15k - 2t - 1 = 0$  and  $3k + 5t - 44 = 0$

$\times 3: 15k - 6t - 3 = 0$  — (3)

$\times 5: 15k + 25t - 220 = 0$  — (4)

$\ominus$  (4)  $15k + 25t - 15k + 6t - 220 + 3 = 0$

$31t - 217 = 0$

$31t = 217$  ✓

$t = 7$  ✓

Sub  $t = 7$  into (2)

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

$3k + 35 - 44 = 0$

$3k - 9 = 0$  ✓

$3k = 9$

$t = 7$   
 $k = 3$

# PROBLEM SOLVING — SIMULTANEOUS EQUATIONS Questions

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  $x$   
 " " " " Kate  $y$

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

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

Sub (2) into (1)

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

Sub  $y = 500$  into (2)

$$x = 3 \times 500$$

$$= 1500$$

∴ 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?  M

Let price of book be  $x$   
 " " pencils  $y$

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

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

$\times 8$ :  $24x + 56y = 83.2 \quad \text{--- (3)}$

$\times 3$ :  $24x + 15y = 44.25 \quad \text{--- (4)}$

$-(4)$   $24x + 15y - 24x - 56y = 44.25 - 83.2$   
 $-41y = -38.95$   
 $y = 0.95$

∴ pencils 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 (2)  $17 + y + y = 41$

$17 + 2y = 41$

$2y = 24$

$y = 12$

$y = 12$  into (1)

$x = 17 + 12$   
 $= 29$

∴ 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)

$x + 8 + x = 224$  ∴ in the 1st + innings

$2x + 8 = 224$  he scored 108

$2x = 216$   $x = 108$  runs, while in the

$x = 108$  because he scored

Sub  $x = 108$  into (2)  $116 =$

$8 + 108 = y$

$y = 116$

(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  $y$

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

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

$\times 2$   $2x + 2y = 188 \quad \text{--- (3)}$

$(1) - (3)$   $2x + 2y - 2x - 2y = 300 - 188$   
 $-2y = -112$

Sub  $x = 56$  into (2)  $y = 38$

(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  $n$

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

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

$\times 6$   $60b + 48n = 2232 \quad \text{--- (3)}$

$\times 10$   $60b + 130n = 2970 \quad \text{--- (4)}$

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

$82n = 738$

$n = 9$   $10b + 10n =$

Sub  $n = 9$  into (1)  $(10 \times 9) + (10 \times 30) =$

$10b + (8 \times 9) = 372$   $= 263g$

$10b + 72 = 372$   $= 363 \text{ grams}$

$10b = 300$

$b = 30$