

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  $3k + 5t - 44 = 0$

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?

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(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?

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

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(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?

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

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(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?

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Tania Ahmed



1. Solve these simultaneous equations by elimination:

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

$\times 2: 6x + 2y = 34$  — (3)

$(3) 7x + 2y - 6x - 2y = 38 - 34$

$x = 4$  ✓

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)

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

$17z = -136$  ✓

$z = -8$  ✓

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)

$(3) 16p - 6q - 15p + 6q = 80 - 78$

$p = 2$  ✓

Sub  $p = 2$  into (2)

$(5 \times 2) - 2q = 26$  ✓

$-2q = 16$

$q = -8$  ✓

$p = 2, q = -8$  ✓

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

$\times 5: 50e + 15f + 10 = 0$  — (3)

$\times 3: 27e + 15f - 36 = 0$  — (4)

$(3) 50e + 15f - 27e - 15f + 10 + 36 = 0$

$23e + 46 = 0$

$23e = -46$

$e = -2$  ✓

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)

$(3) + (1) 10a + 5b + 6a - 5b = 70 + 10$

$16a = 80$  ✓

$a = 5$  ✓

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)

$(3) - (2) 33h - 6k - 7h + 6k = 285 - 51$

$26h = 234$  ✓

$h = 9$  ✓

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)

$(3) - (4) 12c + 21d - 12c + 16d = -9 - 28$

$37d = 37$  ✓

$d = 1$  ✓

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)

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

$31t - 217 = 0$

$31t = 217$  ✓

$t = 7$  ✓

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 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

(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)

$$8 + 108 = y$$

$$y = 116$$

(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  $y$

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

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

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

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

$\text{--- (4)}$   $24x + 15y - 24x - 56y = 44.25 - 83.2$

$$-41y = -38.95$$

$$y = 0.95$$

$\therefore$  pencil cost 95 cents

(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  $y$

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

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

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

$\text{--- (3)}$   $2x + 2y - 4x - 2y = 188 - 300$

$$-2x = -112$$

$$x = 56$$

(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)

$$17 + y + y = 41$$

$$17 + 2y = 41$$

$$2y = 24$$

$$y = 12$$

$y = 12$  into (1)

$$x = 17 + 12 = 29$$

(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  $n$

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

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

$\text{--- (2)} \times 6$   $60b + 78n = 1782$  --- (3)

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

$\text{--- (4)}$   $60b + 130n - 60b - 78n = 2970 - 1782$

$$52n = 1188$$

$$n = 22.85$$

Sub  $n = 22.85$  into (1)

$$10b + (8 \times 22.85) = 372$$

$$10b + 182.8 = 372$$

$$10b = 189.2$$

$$b = 18.92$$

Sub  $b = 18.92$  and  $n = 22.85$  into (1)

$$7(18.92) + 10(22.85) = 330.44 + 228.5 = 558.94$$

Alice is 29, while her brother is 12.