Simultaneous Equations from Worded Problems

ANSWERS

1

A notebook and 2 pens cost £5.
Three notebooks and 2 pens cost £11.
Find the cost of each.

Let n = the cost of a notebook, p = the cost of a pen, in £.

(1) $n + 2p = 5$
(2) $3n + 2p = 11$

(2) − (1)
$2n = 6$
$n = 3$
(1) $3 + 2p = 5$
$2p = 2$
$p = 1$

Answer Notebook £3, pen £1

2

Two numbers add to 31.
Their difference is 7.
Find the two numbers.

Let a = the larger number, b = the smaller number.

(1) $a + b = 31$
(2) $a - b = 7$
(1) + (2)
$2a = 38$
$a = 19$
(2) $19 - b = 7$
$-b = -12$
$b = 12$

Answer The numbers are 19 and 12.

3

2 adult and 3 child tickets cost £31.
1 adult and 2 child tickets cost £18.
Find the cost of each ticket.

Let a = the cost of an adult ticket, c = the cost of a child ticket, in £.

(1) $2a + 3c = 31$
(2) $a + 2c = 18$
(2) × 2
(3) $2a + 4c = 36$
(3) − (1)
$c = 5$
(2) $a + 10 = 18$
$a = 8$

Answer Adult £8, child £5.

4

A theatre sells 120 tickets.
Stalls tickets cost £15 and balcony tickets cost £10. It takes £1550. How many of each does it sell?

Let s = the number of stalls tickets,
b = the number of balcony tickets

(1) $s + b = 120$
(2) $15s + 10b = 1550$
(1) × 10
(3) $10s + 10b = 1200$
(2) − (3)
$5s = 350$
$s = 70$
(1) $70 + b = 120$
$b = 50$

Answer 70 stalls, 50 balcony

5

3 mugs and 2 plates cost £27. 2 mugs and 5 plates cost £29. Find the cost of each.

Let m = a mug, p = a plate, in £

(1) $3m + 2p = 27$
(2) $2m + 5p = 29$
(1) × 2
(3) $6m + 4p = 54$
(2) × 3
(4) $6m + 15p = 87$
(4) − (3)
$11p = 33$
$p = 3$
(1) $3m + 6 = 27$
$3m = 21$
$m = 7$

Answer Mug £7, plate £3

6

A café sells 40 drinks. Coffees cost £3 and waters cost £1. It takes £86.
Ola writes $c + w = 86$.
Explain her mistake. Then find how many coffees and how many waters the café sells.

$c + w$ counts drinks, but 86 is money.
$c + w = 40$ and $3c + w = 86$.
Subtract: $2c = 46$.

Answer 23 coffees and 17 waters.

7

A gym charges a joining fee and then the same amount each month. 3 months cost £65 in total. 7 months cost £125 in total. Find the joining fee and the monthly charge.

Let j = the joining fee, m = the monthly charge, in £

(1) $j + 3m = 65$
(2) $j + 7m = 125$
(2) − (1)
$4m = 60$
$m = 15$
(1) $j + 45 = 65$
$j = 20$

Answer Joining fee £20, £15 a month.

8

A rectangle has a perimeter of 34 cm. Its length is 5 cm more than its width. Find the length and the width.

Let a = the length, b = the width, in cm

(1) $2a + 2b = 34$
(2) $a - b = 5$
(2) × 2
(3) $2a - 2b = 10$
(1) + (3)
$4a = 44$
$a = 11$
(2) $11 - b = 5$
$-b = -6$
$b = 6$

Answer Length 11 cm, width 6 cm.

Simultaneous Equations from Worded Problems *further practice*

ANSWERS

9

Twice one number plus 3 times another is 29. Five times the first minus the second is 13. Find the two numbers.

Let a = the first number, b = the second

(1) $2a + \boxed{3b} = 29$
(2) $5a - \boxed{b} = 13$
(2) × 3
(3) $15a - \boxed{3b} = 39$
(1) + (3)
$17a = 68$
$a = 4$
(1) $8 + 3b = 29$
$3b = 21$
$b = 7$

Answer *4 and 7*

10

4 bananas and 3 apples cost £2.30. 2 bananas and 5 apples cost £2.20. Find the cost of each, in pence.

Let b = a banana, a = an apple, in pence

(1) $\boxed{4b} + 3a = 230$
(2) $\boxed{2b} + 5a = 220$
(2) × 2
(3) $\boxed{4b} + 10a = 440$
(3) − (1)
$7a = 210$
$a = 30$
(2) $2b + 150 = 220$
$2b = 70$
$b = 35$

Answer *Banana 35p, apple 30p*

11

A taxi charges a fixed amount plus the same amount for each mile. 4 miles cost £10.60. 9 miles cost £19.10. Find the fixed charge and the cost of a mile.

Let f = the fixed charge, m = a mile, in pence

(1) $\boxed{f} + 4m = 1060$
(2) $\boxed{f} + 9m = 1910$
(2) − (1)
$5m = 850$
$m = 170$
(1) $f + 680 = 1060$
$f = 380$

Answer *£3.80 and £1.70 a mile*

12

A minibus carries 16 people and a car carries 4. 9 vehicles carry 84 people, all full. How many minibuses are there?

Let m = the number of minibuses, c = the number of cars

(1) $m + \boxed{c} = 9$
(2) $16m + \boxed{4c} = 84$
(1) × 4
(3) $4m + \boxed{4c} = 36$
(2) − (3)
$12m = 48$
$m = 4$
(1) $4 + c = 9$
$c = 5$

Answer *4 minibuses*

13

A shop sells 30 bags of flour, small bags at £2 and large bags at £5. Tia says it took £100. Show that Tia must be wrong.

s + g = 30 and 2s + 5g = 100. (1) × 2, then (2) − (3): 3g = 40, so g = 13⅓. A number of bags must be whole.

Answer *It would sell 13⅓ large bags*

14

In a quiz, 3 hard and 4 easy questions score 20 points in total. 5 hard and 3 easy score 26. Find each score.

Let h = a hard question, e = an easy one, in points

(1) $\boxed{3h} + 4e = 20$
(2) $\boxed{5h} + 3e = 26$
(1) × 5
(3) $\boxed{15h} + 20e = 100$
(2) × 3
(4) $\boxed{15h} + 9e = 78$
(3) − (4)
$11e = 22$
$e = 2$
(1) $3h + 8 = 20$
$3h = 12$
$h = 4$

Answer *Hard 4, easy 2*

15

Write a story that fits $c + d = 12$ and $2c + 5d = 39$. Then solve it.

For example. 12 cakes and drinks, cakes at £2 and drinks at £5, cost £39. 7 cakes and 5 drinks.

Answer *c = 7, d = 5*

16

Mo writes $c + d = 10$ and $2c + 2d = 20$ for a story. Explain why he cannot find c and d.

The second is the first times 2, so it is the same fact. c = 3, d = 7 and c = 4, d = 6 both fit. He needs two different facts.

Answer *The same fact twice*