Simultaneous Equations - Solutions (Credit)

1) 2010 Paper 1 Q7

(a) (2, 7)
x, y

$y = mx + c$
$7 = 2m + c$ ✓

(b) (4, 17)
x, y

$y = mx + c$
$17 = 4m + c$ ✓

(2 KU)

(c) (Hence means using answers from a & b)

$7 = 2m + c$ ①
$14 = 4m + c$ ② ✓ (method)

② - ①

$7 = 2m$
$m = 7/2$ ✓

sub. $m = 7/2$ into ①

$7 = 2m + c$
$7 = 2 \times 7/2 + c$
$7 = 7 + c$
$c = 0$ ✓

(4 RE)

Answer: $m = 7/2$, $c = 0$.

(d) gradient (m) = $7/2$. ✓

(2) 2009 Paper 1 Q9

(a) Keyword: Perimeter ⇒ add edges.

$5x + 2y + x = 42$ ✓

$6x + 2y = 42$ ✓ (2KU)

(b) $PR = QR + 2$ ✓

$5x = 2y + 2$ ✓ (2 RE)

$5x - 2y = 2$

(c) $6x + 2y = 42$ ①

$5x - 2y = 2$ ② ✓method

① + ② $11x = 44$

$x = 4$ ✓

sub. $x = 4$ into ①

$6x + 2y = 42$

$6 \times 4 + 2y = 42$ (3)

$24 + 2y = 42$

$2y = 18$

$y = 9$ ✓

check in ②:

$5x - 2y = 2$

$5 \times 4 - 2 \times 9 = 20 - 18 = 2$ ✓

° Answers: $x = 4, \ y = 9$

(3) 2008 Paper 2 Q.4

(a) 60 coins altogether: $x + y = 60$ ✓

(b) total value: $0.5x + 0.2y = 17.40$ ✓ (2KU)

(units ⇒ all £)

(c)

$$x + y = 60 \quad (1) \quad \Rightarrow \quad x + y = 60 \quad (1) \checkmark$$
$$0.5x + 0.2y = 17.40 \quad (2) \quad \times 2 \Rightarrow \quad x + 0.4y = 34.80 \quad (3)$$

(1) - (3) $0.6y = 25.2$

$y = 25.2 \div 0.6$

$y = 42$.

sub. $y = 42$ into (1)

$x + y = 60$

$x + 42 = 60$ (3RE)

$x = 18$ ✓

Check in (2): $0.5x + 0.2y = 17.40$

$0.5 \times 18 + 0.2 \times 42 = 9 + 8.4 = 17.40$ ✓.

Answer: There are 18 50p coins in the piggy bank. ✓

Note: The question only asks for how many 50p coins there are so if we had eliminated the 'y' we would have got the answer straight away.

(4) 2007 Paper 1 Q.11

(a) $x \Rightarrow$ standard seats

$y \Rightarrow$ deluxe seats.

300 seats altogether $\Rightarrow$ $\underline{x + y = 300}$. ✓

(b) Standard (x) = £4 each

Deluxe (y) = £6 each.

Total cost = 1380 $\Rightarrow$ $\underline{4x + 6y = 1380}$ ✓✓ (3kU)

(c) $x + y = 300$ ① $\times 6 \Rightarrow$ $6x + 6y = 1800$ ③

$4x + 6y = 1380$ ② $\Rightarrow$ $4x + 6y = 1380$ ②

✓method

③ − ② $2x = 420$

$\underline{x = 210}$ ✓

sub. $x = 210$ into ①

$x + y = 300$

$210 + y = 300$

$\underline{y = 90}$ ✓ (3RE)

check in ②: $4x + 6y = 1380$

$4 \times 210 + 6 \times 90 = 840 + 540 = 1380$ ✓.

*Answer: There are 210 standard seats and 90 deluxe seats.

(5) 2006 Paper 1 Q.9

Keywords / Information: 20 games altogether.
: wins x, loses y.
: £5 to win, £2 to lose.

(a) $x + y = 20$ ✓ (1KU)

(b) $5x + 2y = 79$ ✓✓ (2RE)

(c) $x + y = 20$ ① $\times 2 \Rightarrow$ $2x + 2y = 40$ ③ ✓
$5x + 2y = 79$ ② $5x + 2y = 79$ ②

② − ③ $3x = 39$
$x = 13$ ✓ (3RE)

Answer: Euan wins 13 games. ✓

note: the question does not ask how many games Euan loses so there is no need to work out y. If you do work out y, make sure your answer is very clear.

(6) 2004 Paper 1 Q.8

(a) $x,\ y,\ x+y,\ x+2y,\ 2x+3y \ldots$ (add previous 2 terms)

so $\underline{2x + 3y = 5}$.

(b) $y,\ x,\ y+x,\ y+2x,\ 2y+3x,\ 3y+5x$

so: $\underline{3y+5x = 17} \Rightarrow 5x + 3y = 17$

(c) $2x + 3y = 5$ ①

$5x + 3y = 17$ ②

② − ① $\quad 3x = 12$

$\underline{x = 4}$

sub. $x = 4$ into ①

$2x + 3y = 5$

$2\times4 + 3y = 5$

$8 + 3y = 5$

$3y = -3$

$\underline{y = -1}$

check in ②: $5x + 3y = 17$

$5\times4 + 3\times-1 = 20 - 3 = 17$ ✓

Answer: $\underline{\underline{x = 4,\ y = -1}}$.

(7) 2003 Paper 1 Q7

(a) let n = no of nights, b = no of breakfasts.

$3n + 2b = 145$ ✓

(b) $5n + 3b = 240$ ✓ (2KU)

(c) $3n + 2b = 145$ (1) $\times 3 \Rightarrow$ $9n + 6b = 435$ (3)

$5n + 3b = 240$ (2) $\times 2 \Rightarrow$ $10n + 6b = 480$ (4) ✓ method

(4) − (3) $n = 45$

sub b $n = 45$, into (1)

$3n + 2b = 145$

$3 \times 45 + 2b = 145$

$135 + 2b = 145$

$2b = 10$

$b = 5$. ✓

(3RE)

•check in (2):

$5n + 3b = 240$

$5 \times 45 + 5 \times 3 = 225 + 15 = 240$ ✓

Answer: The cost of one breakfast is £5. ✓

(8) 2002 Paper 1 Q.13

Let p be cost of a peach

Let g be cost of a grapefruit.

(a) $4p + 3g = 1.30$ ①

(b) $2p + 4g = 1.20$ ②

(c) ② $\times 2 \Rightarrow$ $4p + 8g = 2.40$ ③

$4p + 3g = 1.30$ ①

③ − ① $5g = 1.10$

$g = 0.22$

sub $g = 0.22$ into ②

$2p + 4g = 1.20$

$2p + 4 \times 0.22 = 1.20$

$2p + 0.88 = 1.20$

$2p = 0.32$

$p = 0.16$

check in ①:

$4p + 3g = 1.30$

$4 \times 0.16 + 3 \times 0.22 = 0.64 + 0.66 = 1.30$ ✓

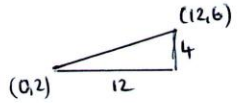
Answer: 3 peaches + 2 grapefruits $= 3 \times 0.16 + 2 \times 0.22$

$= 0.48 + 0.44$

$= £0.92$

(9) 2001 Paper 2 Q.4

(a) Keywords: Equation of line: $y = mx + c$



$c = 2$, $m = \frac{4}{12} = \frac{1}{3}$ ✓ ✓

Equation is: $y = \frac{1}{3}x + 2$ (×3)

$3y = x + 6$ ✓ (rearrange)

$3y - x = 6$ (3ku)

(b) keywords: cut across ⇒ point of intersection ⇒ sim. eqns.

$3y - x = 6$ ① ×5 ⇒ $15y - 5x = 30$ ③

$4y + 5x = 46$ ② ⇒ $4y + 5x = 46$ ②

✓ method

③ + ② $19y = 76$

$y = 4$ ✓

sub $y = 4$ into ①

$3y - x = 6$

$3 \times 4 - x = 6$

$12 - x = 6$ (4RE)

$-x = -6$

$x = 6$ ✓

• check in ②: $4y + 5x = 46$

$4 \times 4 + 5 \times 6 = 16 + 30 = 46$ (✓)

Answer: (6, 4) ✓ are the coordinates of the point where the pipes cross.

(10) 2000 Paper 2 Q5

Keywords: rectangle, length, breadth, perimeter ⇒ add edges.

(a) $2l + 2b = 260$ ① ✓ (1KU)

(b) $5l + 8b = 770$ ② ✓ (2RE)

(c) ① × 4 ⇒ $8l + 8b = 1040$ ③

$5l + 8b = 770$ ② ✓ method

③ − ②

$3l = 270$

$l = 90$ ✓

Sub. $l = 90$ into ①

$2l + 2b = 260$

$2 \times 90 + 2b = 260$ (3 RE)

$180 + 2b = 260$

$2b = 80$

$b = 40$ ✓

• check in ②:

$5l + 8b = 770$

$5 \times 90 + 8 \times 40 = 450 + 320 = 770$ (✓)

Answer: length = 90 cm

breadth = 40 cm.