Solutions

11 Simultaneous Equations

1. a) Let cost of 1 nights stay = £ n
   Let cost of 1 breakfast = £ b

   $3n + 2b = 145$ … (1)

   b) $5n + 3b = 240$ … (2)

   c) Solve simultaneously to find b, eliminate n

   (1) × 5 and (2) × 3 then subtract:

   b = £5

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2. a) $9b + 16w = 2520$ … (1)

   b) $13b + 12w = 2640$ … (2)

   c) Solve to find w and b (1) × 3 and (2) × 4

   then subtract to get b = £1.20 and w = 90p

   Final design costs $11b + 14w$ = £25.80

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3. a) $4p + 3g = 130$ … (1)

   b) $2p + 4g = 120$ … (2)

   c) solve (2) × 2 then subtract: g = 22p, p = 16p

   hence, 3 peaches + 2 grapefruit cost: 92 pence

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4. a) $2x + 3y = 580$ … (1)

   b) $x + y = 250$ … (2)

   c) eliminate y to find x (2) × 3 and subtract

   x = 170 So **170 tickets sold to members**.

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5. a) $4x + 5y = 1550$ … (1)

   b) $2x + 7y = 1450$ … (2)

   c) Solve to find x and y (2) × 2 and subtract

   to get y = £1.50 and x = £2.00

   8 patterned and 1 plain will cost $8x + 1y$ = £17.50

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6. a) Gradient = $\frac{6-2}{12-0} \rightarrow \frac{4}{12} \rightarrow \frac{1}{3}$, y-intercept = 2

   Equation is: $y = \frac{1}{3}x + 2 \rightarrow 3y = x + 6$

   which can be re-arranged to: $3y - x = 6$

   b) Solve simultaneously: $3y - x = 6$ ......(1)
   $4y + 5x = 46$ ......(2)

   multiply (1) by 5 and add giving y = 4
   substitute into (1) giving x = 6
   Co-ordinates are: (6, 4)

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7. a) $2l + 2b = 260$ … (1)

   b) $5l + 8b = 770$ … (2)

   c) (1) × 4 then subtract gives:

   l = 90cms; b = 40 cms

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8. a) Cost of 2 children (13 & 15) = 2x
   Cost of 3 children (under 10) = 3y
   Cost of adult = £8
   Total paid = £19

   Hence: $2x + 3y + 8 = 19$ or $2x + 3y = 11$

   b) $4x + y + 8 = 15$ or $4x + y = 7$

   c) Solve simultaneously:

   $2x + 3y = 11$ …(1)

   $4x + y = 7$ …(2)

   (1) × 2 and subtract, giving $y = 3$ and $x = 1$

   (i) single ticket for 14 year old = £ 1

   (ii) single ticket for 7 year old child = £ 3

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9. a) $3x + 2y = 38$ … (1)

   b) $2x + 5y = 51$ … (2)

   (1) × 2 and (2) × 3 and subtract: y = 7 and x = 8

   Ht. cylinder = 8 cm, Ht. cuboid = 7 cm.

10.
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            20
        16      4
     5      11     -7
  -2     7      4      -11
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   a) number on shaded brick is 20

   b)
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              -3
      p + 2q - 5    q - 8
   p + q      q - 5      -3
 p        q        -5        2
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   So, from diagram: p + 2q -5 + q – 8 = -3
   or p + 3q = 10

   c) Using the same idea, 2q – p = 5

   Solve simultaneously:
   p + 3q = 10 … (1)
   – p + 2q = 5 ….(2)

   adding: q = 3, p = 1

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11. a) 3x + 4y = 65

   b) 5x + 7y = 112

   c) Solve simultaneously: x = 7; y = 11

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12. a) 25 tiles

   b) Form two equations – using 1st & 2nd arrangements
   1 = 2 + a + b   a + b = -1
   5 = 8 + 2a + b   2a + b = -3
   Solve to get a = -2, b = 1

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13. a) 3.5 and 4.6

   b) Using 1st & 2nd rods   1.1 = A + b
   1.4 = A + 4b
   solving gives: b = 0.1 and A = 1

   $$h = 1 + 0.1n^2$$
