

Section 1: Simultaneous equations

Solutions to Exercise level 3

$$1. \quad \left. \begin{aligned} 4x + 2\left(\frac{1}{2}x\right) + 2y &= 100 \\ x^2 - \left(\frac{1}{2}x\right)y &= 279 \end{aligned} \right\} \Rightarrow \left. \begin{aligned} 5x + 2y &= 100 \\ x^2 - \frac{1}{2}xy &= 279 \end{aligned} \right\}$$

$$\Rightarrow x^2 - \frac{1}{2}x(50 - \frac{5}{2}x) = 279$$

$$\Rightarrow 9x^2 - 100x - 1116 = 0$$

$$\Rightarrow (x - 18)(9x + 62) = 0$$

$$\Rightarrow x = 18, y = 5$$

So the lawn is 18 m square
and the flowerbed is 9 m by 5 m.

$$2. \quad \left. \begin{aligned} \frac{1}{2}x(h-2) &= 60 \\ x + (h-2) + h &= 40 \end{aligned} \right\} \Rightarrow \left. \begin{aligned} \frac{1}{2}x(h-2) &= 60 \\ x + 2h &= 42 \end{aligned} \right\}$$

$$\Rightarrow x = 42 - 2h = 2(21 - h)$$

$$\Rightarrow \frac{1}{2} \times 2(21 - h)(h - 2) = 60$$

$$\Rightarrow -h^2 + 23h - 42 = 60$$

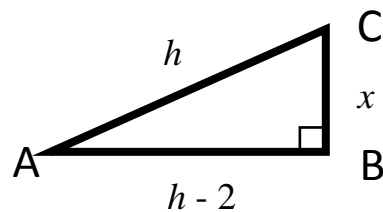
$$\Rightarrow h^2 - 23h + 102 = 0$$

$$\Rightarrow (h - 17)(h - 6) = 0$$

$$\Rightarrow h = 17, x = 8 \text{ or } h = 6, x = 30$$

h cannot be less than x , so $h = 17$ and $x = 8$

So the triangle has AB length 15 m, BC length 8 m and AC 17 m



$$3. \quad A = 2(30x) + 2(30y) + xy$$

$$= 60x + 60y + xy$$

$$V = 30xy$$

$$V = 45000 \Rightarrow y = \frac{1500}{x}$$

$$A = 6300 \Rightarrow 60x + 60\left(\frac{1500}{x}\right) + x\left(\frac{1500}{x}\right) = 6300$$

$$\Rightarrow x^2 - 80x + 1500 = 0$$

$$\Rightarrow (x - 50)(x - 30) = 0$$

$$\Rightarrow x = 50, y = 30 \text{ or } x = 30, y = 50$$

So the dimensions of the tank are 50 cm x 30 cm x 30 cm.