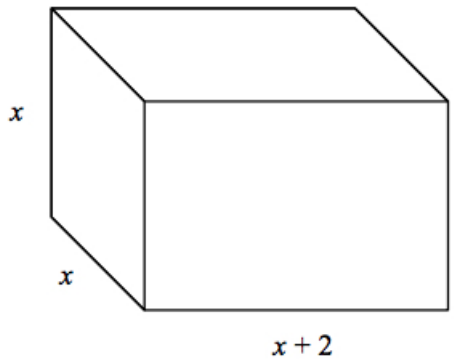
# Dr Oliver Mathematics
# Length, Area, and Volume: Part 1

1. A square prism has sides of length $x$ cm, $x$ cm, and $(x + 2)$ cm, as shown below. (6)




The surface area of the prism is 78 cm$^2$.

Find the volume of the prism.

**Solution**

$$\text{Surface area} = 2 \times \text{square} + 4 \times \text{rectangle} \Rightarrow 78 = 2x^2 + 4x(x + 2)$$
$$\Rightarrow 78 = 2x^2 + (4x^2 + 8x)$$
$$\Rightarrow 78 = 6x^2 + 8x$$
$$\Rightarrow 6x^2 + 8x - 78 = 0$$
$$\Rightarrow 2(3x^2 + 4x - 39) = 0$$

add to: $+4$
multiply to: $(+3) \times (-39) = -117$ $\Big\}$ $+13, -9$

$$\Rightarrow 2(3x^2 + 13x - 9x - 39) = 0$$
$$\Rightarrow 2[x(3x + 13) - 3(3x + 13)] = 0$$
$$\Rightarrow 2(x - 3)(3x + 13) = 0$$
$$\Rightarrow x - 3 = 0 \text{ or } 3x + 13 = 0$$
$$\Rightarrow x = 3 \text{ or } x = -4\tfrac{1}{3}.$$

Now, $x \neq -4\frac{1}{3}$ (why?) so $x = 3$.

Finally,

$$\begin{aligned} \text{volume} &= 3 \times 3 \times (3 + 2) \\ &= 3 \times 3 \times 5 \\ &= \underline{\underline{45 \text{ cm}^3}}. \end{aligned}$$