Solutions to Problems

Problem 1.1

For $y = a + bx$, $y = 4$ when $x = 0$, hence $a = 4$. When x increases by 4, y increases by $4b$, hence $b = 5$ and $y = 4 + 5x$.

Problem 1.2 The plus sign indicates that y increases as x increases.

Problem 1.3 A quadratic equation with roots α and β is $(x - \alpha)(x - \beta)$, and so in this problem $(\alpha + \beta) = 6$ and $\alpha\beta = 4$.

To obtain α^4 and β^4, use

$$(\alpha + \beta)^4 = (\alpha^2 + 2\alpha\beta + \beta^2)^2$$

$$= \alpha^4 + \beta^4 + 4\alpha^3\beta + 6\alpha^2\beta^2 + 4\alpha\beta^3$$

$$= \alpha^4 + \beta^4 + 4\alpha\beta(\alpha + \beta)^2 - 2\alpha^2\beta^2,$$

giving

$$\alpha^4 + \beta^4 = (\alpha + \beta)^4 - 4\alpha\beta(\alpha + \beta)^2 + 2\alpha^2\beta^2 = 752.$$

Problem 1.4

$$\mathbf{a}.\mathbf{b} = 4 \times 5 \times \cos 70^\circ = 6.84\text{cm}^2.$$

Problem 1.5

$$|\ \mathbf{a} \times \mathbf{b}\ | = 4 \times 5 \times \sin 70^\circ = 18.79\text{cm}^2.$$