Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- the negative reciprocal of 4

$$= -\tfrac{1}{4}$$

2.2

- the negative reciprocal of $-\frac{2}{3}$: turn it over and change the sign

$$= \tfrac{3}{2}$$

2.3

- perpendicular gradient $= -\frac{1}{2}$
- substitute $(4, 3)$: $3 = -\frac{1}{2}(4) + c = -2 + c$, so $c = 5$

$$\mathbf{y = -\tfrac{1}{2}x + 5}$$

2.4

- $5y = -2x + 1$, so the gradient is $-\dfrac{2}{5}$
- perpendicular gradient $= -1 \div \left(-\dfrac{2}{5}\right) = \mathbf{\dfrac{5}{2}}$

2.5

- $4 \times (-4) = -16$, not -1, so **no**

3.1

(a)

- $\dfrac{10-2}{5-1} = \dfrac{8}{4}$

$$= \mathbf{2}$$

(b)

- the midpoint of AB is $\left(\dfrac{1+5}{2},\ \dfrac{2+10}{2}\right) = (3,\ 6)$
- the perpendicular gradient is $-\frac{1}{2}$
- substitute $(3, 6)$: $6 = -\frac{3}{2} + c$, so $c = 7.5$

$$\mathbf{y = -\tfrac{1}{2}x + 7.5}$$

3.2

- rearrange the second: $3y = -x + 9$, so $y = -\frac{1}{3}x + 3$
- the gradients are 3 and $-\frac{1}{3}$

$$3 \times \left(-\tfrac{1}{3}\right) = -1, \text{ so the lines are } \textbf{perpendicular}$$

3.3

- $ky = 2x + 7$ has gradient $\dfrac{2}{k}$; perpendicular means $4 \times \dfrac{2}{k} = -1$

$$k = \mathbf{-8}$$

3.4

- gradient of the joining line $= \dfrac{9-1}{4-0} = 2$, so the perpendicular gradient is $-\dfrac{1}{2}$
- $y = -\dfrac{1}{2}x + c$ through $(3, -2)$: $-2 = -1.5 + c$, so $c = -0.5$

$$\boldsymbol{y = -\frac{1}{2}x - \frac{1}{2}}$$

3.5

(a)

- perpendicular gradient $= -\dfrac{1}{2}$; through $(2, 5)$: $y = -\dfrac{1}{2}x + 6$
- meet: $2x - 3 = -\dfrac{1}{2}x + 6$, so $2.5x = 9$ and $x = 3.6$
- $y = 2(3.6) - 3 = 4.2$: N is $(\mathbf{3.6},\ \mathbf{4.2})$

(b)

- $AN = \sqrt{(3.6-2)^2 + (4.2-5)^2} = \sqrt{2.56 + 0.64} = \sqrt{3.2}$

$$= \mathbf{1.79}$$