Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

- gradient $\dfrac{8}{6} = \mathbf{\dfrac{4}{3}}$
- length $\sqrt{36+64} = \mathbf{10}$

2.2

- gradient of the line $-\dfrac{3}{4}$, perpendicular $\dfrac{4}{3}$
- $y + 1 = \dfrac{4}{3}(x - 2)$
- $\mathbf{4x - 3y = 11}$

2.3

- $(x+4)^2 - 16 + (y-1)^2 - 1 - 8 = 0$
- centre $(\mathbf{-4}, \mathbf{1})$; radius $\mathbf{5}$

3.1

- $r^2 = 3^2 + 4^2 = 25$
- $\mathbf{(x-2)^2 + (y+3)^2 = 25}$

3.2

(a)

- $m_{AB} = -\dfrac{4}{6} = -\dfrac{2}{3}$; $m_{BC} = \dfrac{3}{2}$
- product $= -1$, so $AB \perp BC$

(b)

- $AB = \sqrt{52}$, $BC = \sqrt{13}$
- area $= \frac{1}{2}\sqrt{52}\sqrt{13} = \frac{1}{2}\sqrt{676} = \mathbf{13}$

3.3

(a) $4^2 + 2^2 = 20$ ✓

(b)

- gradient of radius $\dfrac{4-2}{5-1} = \dfrac{1}{2}$
- tangent gradient -2: $y - 4 = -2(x - 5)$
- $\mathbf{y = -2x + 14}$

(c)

- $Q = (7, 0)$
- $PQ = \sqrt{2^2 + 4^2} = \mathbf{2\sqrt{5}}$

(d)

- $(x-1)^2 + (x+k-2)^2 = 20 \Rightarrow 2x^2 + (2k-6)x + (k^2 - 4k - 15) = 0$
- $(2k-6)^2 - 8(k^2 - 4k - 15) > 0 \Rightarrow k^2 - 2k - 39 < 0$
- $\mathbf{1 - 2\sqrt{10} < k < 1 + 2\sqrt{10}}$