

1 The term independent of x in the expansion of $\left(2x + \frac{k}{x}\right)^6$, where k is a constant, is 540.

(i) Find the value of k .

[3]

$${}^6C_3 (2x)^3 \left(\frac{k}{x}\right)^3 = 160k^3 = 540 \rightarrow k^3 = \frac{540}{160} \rightarrow k = \frac{3}{2} \neq$$

(ii) For this value of k , find the coefficient of x^2 in the expansion.

[2]

$$\left(2x + \frac{3}{2x}\right)^6$$

$${}^6C_4 (2x)^4 \left(\frac{3}{2x}\right)^2 = 15 \times 16 \times \frac{9}{4} x^2 = 540 x^2$$

$$\text{answer} = 540 \neq$$

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- 2 The line $4y = x + c$, where c is a constant, is a tangent to the curve $y^2 = x + 3$ at the point P on the curve.

(i) Find the value of c .

[3]

$$\text{line } x = 4y - c \qquad \text{curve: } x = y^2 - 3$$

$$y^2 - 3 = 4y - c \rightarrow y^2 - 4y + (c - 3) = 0$$

$$b^2 - 4ac = 0 \rightarrow (-4)^2 - 4(1)(c - 3) = 0 \rightarrow 16 - 4c + 12 = 0 \rightarrow c = 7 \quad \#$$

(ii) Find the coordinates of P .

[2]

$$4y - 7 = y^2 - 3 \rightarrow y^2 - 4y + 4 = 0 \rightarrow (y - 2)^2 = 0 \rightarrow y = 2$$

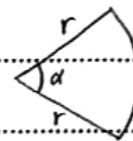
$$\rightarrow x = 1$$

$$\rightarrow P(1, 2) \quad \#$$

- 3 A sector of a circle of radius r cm has an area of A cm². Express the perimeter of the sector in terms of r and A .

[4]

$$A = \frac{1}{2} r^2 \alpha \rightarrow \alpha = \frac{2A}{r^2}$$



$$P = r + r + r\alpha = 2r + r\left(\frac{2A}{r^2}\right)$$

$$\rightarrow P = 2r + \frac{2A}{r} \quad \#$$

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