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Binomial Expansion

| Past Paper Question | C2 Edexcel January 2012 Q3

- (a) Find the first 4 terms of the binomial expansion, in ascending powers of x , of $\left(1 + \frac{x}{4}\right)^8$ giving each term in its simplest form.

$$(a+b)^n \equiv {}^n C_0 a^n b^0 + {}^n C_1 a^{n-1} b^1 + {}^n C_2 a^{n-2} b^2 + {}^n C_3 a^{n-3} b^3 + \dots$$

$$\left(1 + \frac{x}{4}\right)^8 \equiv {}^8 C_0 (1)^8 \left(\frac{x}{4}\right)^0 + {}^8 C_1 (1)^7 \left(\frac{x}{4}\right)^1 + {}^8 C_2 (1)^6 \left(\frac{x}{4}\right)^2 + {}^8 C_3 (1)^5 \left(\frac{x}{4}\right)^3 + \dots$$

$$\equiv 1 + 8\left(\frac{x}{4}\right) + \frac{28x^2}{16} + 56\left(\frac{x^3}{64}\right) + \dots$$

$$\equiv 1 + 2x + \frac{7}{4}x^2 + \frac{7}{8}x^3 + \dots$$

- (b) Use your expansion to estimate the value of $(1.025)^8$, giving your answer to 4 decimal places.

$$1 + \frac{x}{4} = 1.025$$

$$\therefore \frac{x}{4} = 0.025 \Rightarrow x = 0.1$$

$$\therefore (1.025)^8 \approx 1 + 2(0.1) + \frac{7}{4}(0.1)^2 + \frac{7}{8}(0.1)^3$$

$$\approx 1.218375$$

$$\approx 1.2184 \text{ (4 dp)}$$

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