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Geometric Sequences

| Past Paper Question | C2 Edexcel January 2013

Q3(a)(b)

A company predicts a yearly profit of £120 000 in the year 2013. The company predicts that the yearly profit will rise each year by 5%. The predicted yearly profit forms a geometric sequence with common ratio 1.05

(a) Show that the predicted profit in the year 2016 is £138 915

$$\begin{aligned}\text{Predicted profit} &= 120\,000 (1.05)^3 \\ &= \pounds 138\,915\end{aligned}$$

$$a, ar, ar^2, ar^3, \dots$$

$$u_n = ar^{n-1}$$

(b) Find the first year in which the yearly predicted profit exceeds £200 000

$$\begin{array}{l|l|l} u_n > 200\,000 & \therefore (n-1) > \frac{\log(5/3)}{\log 1.05} & \therefore \text{year} = 2013 + 11 \\ \therefore 120\,000 (1.05)^{n-1} > 200\,000 & \therefore n > \frac{\log(5/3)}{\log 1.05} + 1 & = 2024 \\ \therefore (1.05)^{n-1} > 5/3 & \therefore n > 11.46\dots & \\ \therefore \log(1.05)^{n-1} > \log(5/3) & \therefore \text{least } n = 12 & \end{array}$$

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