

Modelling

Examples

1. Bruce starts a new company. In year 1 his profits will be £20 000. He predicts his profits to increase by £5000 each year, so that his profits in year 2 are modelled to be £25 000, in year 3, £30 000 and so on. He predicts this will continue until he reaches annual profits of £100 000. He then models his annual profits to remain at £100 000.

- a) Calculate the profits for Bruce's business in the first 20 years.
- b) State one reason why this may not be a suitable model.
- c) Bruce's financial advisor says the yearly profits are likely to increase by 5% per annum. Using this model, calculate the profits for Bruce's business in the first 20 years.

2. A piece of A4 paper is folded in half repeatedly. The thickness of the A4 paper is 0.5 mm.

- (a) Work out the thickness of the paper after four folds.
- (b) Work out the thickness of the paper after 20 folds.
- (c) State one reason why this might be an unrealistic model.

Test Your Understanding

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. (1)
- (b) Find the first year in which the yearly predicted profit exceeds £200 000. (5)
- (c) Find the total predicted profit for the years 2013 to 2023 inclusive, giving your answer to the nearest pound. (3)

ExtensionAEA 2007 Q5

The figure shows part of a sequence S_1, S_2, S_3, \dots , of model snowflakes. The first term S_1 consist of a single square of side a . To obtain S_2 , the middle third of each edge is replaced with a new square, of side $\frac{a}{3}$, as shown. Subsequent terms are added by replacing the middle third of each external edge of a new square formed in the previous snowflake, by a square $\frac{1}{3}$ of the size, as illustrated by S_3 .

- a) Deduce that to form S_4 , 36 new squares of side $\frac{a}{27}$ must be added to S_3 .
- b) Show that the perimeters of S_2 and S_3 are $\frac{20a}{3}$ and $\frac{28a}{3}$ respectively.
- c) Find the perimeter of S_n .

