

Q1. Henry takes out a bank loan that has an interest rate of 4.02% per annum. The initial amount that he borrows is £17000. He pays back £3000 per year.

- (a) Set up a recurrence relation to show the amount that is still owed each year
- (b) How much will Henry still owe after 4 years?

Q2. An endangered species of snake living on a small island off the coast of Africa is decreasing in numbers at a rate of 15% each year. Scientists are breeding snakes in an effort to rescue the species. It is planned to release 180 snakes into the wild each year and scientists estimate that the safety of the species will be guaranteed if the population eventually settles at somewhere between 1000 and 1500.

- (a) Set up a recurrence relation to describe this situation.
- (b) Will the safety of the population be guaranteed?

Q3. $u_{n+1} = 0.6u_n + 10$ $u_2 = 52$.

- (a) Find u_0 .
- (b) Explain why this sequence has a limit and find the value of this limit.

Q4. The recurrence relations $u_{n+1} = 0.8u_n + 12$ and $v_{n+1} = av_n + 18$ have the same limit. Find the value of a .

Q5. A recurrence relation is defined by $u_{n+1} = pu_n + q$, where $-1 < p < 1$ and $u_0 = 12$.

- (a) If $u_1 = 15$ and $u_2 = 16$, find the values of p and q
- (b) Find the limit of this recurrence relation as $n \rightarrow \infty$

Q6. A gardener feeds her trees weekly with Bioforce, 'the wonder plant food'. It is known that in a week the amount of plant food in the tree falls by 25%.

a) The trees contain no Bioforce to begin with and the gardener applies 1g every Saturday. Bioforce is only effective when there is continuously more than 2g of it in the tree. Calculate how many weekly feeds will be necessary before the Bioforce becomes effective.

b)

(i) Write down the recurrence relation for the amount of Bioforce in the tree immediately after feeding.

(ii) If the level of Bioforce in the tree exceeds 5g, it will cause leaf burn. Is it safe to continue feeding the trees at this rate indefinitely?