1 A family have taken out a mortgage for £50 000 on a house. The interest charged on this sum is 6.5% per annum. They have agreed to pay back £4500 each year. How much will the family owe after
   (a) 3 years
   (b) 5 years?

2 An industrial complex has requested permission to dump 40 units per week of chemical waste into a sea loch. It is estimated that the natural action of the sea will remove 20% of the waste per week. How many units of chemical waste will there be in the loch after
   (a) 2 weeks
   (b) 4 weeks?

3 A warehouse restocks by ordering 5% of the existing stock at the beginning of each month. During each month 1000 items are distributed from the warehouse. If the existing stock is 5000 items, will the warehouse ever run out of stock?

4 Sea lice are affecting the salmon on a fish farm. It is estimated that each year 40% of the population will die if no cure can be found. Each year the farm is restocked with 100 salmon. If the original salmon population was 400 find the remaining population after
   (a) 2 years
   (b) 5 years

5 Tom is given £50 on his thirteenth birthday and £25 on each birthday after. He invests each of these gifts in a building society which pays interest at a rate of 4% per annum.
   (a) Find a recurrence relation for the amount in his building society.
   (b) Calculate the expected balance in the account on his eighteenth birthday.

6 A car designer has calculated that petrol evaporates from a tank at a rate of 5% per week. The tank was initially filled with 35 litres of petrol. If she adds 1.5 litres each week
   (a) find a recurrence relation for the volume of petrol in the tank
   (b) calculate the volume of petrol in the tank after 5 weeks.

7 The air pressure in the front tyre of a mountain bike was 50 p.s.i. Each week 15% of the air pressure was lost but then air was pumped in to raise the pressure by 2 p.s.i. The manufacturer recommends that the air pressure within the tyre should not drop below 30 p.s.i.
   (a) Find a recurrence relation for the air pressure in the tyre.
   (b) Calculate the air pressure in the tyre after 3 weeks.
   (c) Does the pressure ever fall below the manufacturer's recommendation?

8 The population of mice at a breeding centre rises at a rate of 8% per month. Each month 100 mice are sold to pet shops. The initial population was 500.
   (a) Find a recurrence relation for the number of mice at the centre.
   (b) How many mice are there in the centre after 4 months?
   (c) How long will it take before the centre runs out of mice?

9 A job advertisement offers a starting salary of £25 000 with an annual percentage increase of 4% plus an annual increment of £2000.
   (a) Find a recurrence relation for the total annual salary.
   (b) Calculate the expected salary 8 years after starting.