1 An investor puts £4000 in an account. Every month thereafter she deposits another £200. How much money in total will she have invested at the start of **a** the 10th month and **b** the mth month?

2 Carol starts a new job on a salary of £20 000. She is given an annual wage rise of £500 at the end of every year until she reaches her maximum salary of £25 000. Find the total amount she earns (assuming no other rises), **a** in the first 10 years, **b** over 15 years and **c** state one reason why this may be an unsuitable model.

3 James decides to save some money during the six-week holiday. He saves 1p on the first day, 2p on the second, 3p on the third and so on.

a How much will he have at the end of the holiday (42 days)?

b If he carried on, how long would it be before he has saved £100?

4 A population of ants is growing at a rate of 10% a year. If there were 200 ants in the initial population, write down the number of ants after:

a 1 year **b** 2 years **c** 3 years **d** 10 years.

Problem-solving

This is a geometric sequence. $a = 200$ and $r = 1.1$

5 A motorcycle has four gears. The maximum speed in bottom gear is 40 km h^{-1} and the maximum speed in top gear is 120 km h^{-1}. Given that the maximum speeds in each successive gear form a geometric progression, calculate, in km h^{-1} to one decimal place, the maximum speeds in the two intermediate gears.

6 A car depreciates in value by 15% a year. After 3 years it is worth £11 054.25.

a What was the car's initial price?

b When will the car's value first be less than £5000?

Problem-solving

Use your answer to part **a** to write an inequality, then solve it using logarithms.

7 A salesman is paid commission of £10 per week for each life insurance policy that he has sold. Each week he sells one new policy so that he is paid £10 commission in the first week, £20 commission in the second week, £30 commission in the third week and so on.

a Find his total commission in the first year of 52 weeks. **(2 marks)**

b In the second year the commission increases to £11 per week on new policies sold, although it remains at £10 per week for policies sold in the first year. He continues to sell one policy per week. Show that he is paid £542 in the second week of his second year. **(3 marks)**

c Find the total commission paid to him in the second year. **(2 marks)**

8 Prospectors are drilling for oil. The cost of drilling to a depth of 50 m is £500. To drill a further 50 m costs £640 and, hence, the total cost of drilling to a depth of 100 m is £1140. Each subsequent extra depth of 50 m costs £140 more to drill than the previous 50 m.

a Show that the cost of drilling to a depth of 500 m is £11 300. **(3 marks)**

b The total sum of money available for drilling is £76 000. Find, to the nearest 50 m, the greatest depth that can be drilled. **(3 marks)**

9 Each year, for 40 years, Anne will pay money into a savings scheme. In the first year she pays in £500. Her payments then increase by £50 each year, so that she pays in £550 in the second year, £600 in the third year, and so on.

a Find the amount that Anne will pay in the 40th year. **(2 marks)**

b Find the total amount that Anne will pay in over the 40 years. **(3 marks)**

c Over the same 40 years, Brian will also pay money into the savings scheme. In the first year he pays in £890 and his payments then increase by £d each year. Given that Brian and Anne will pay in exactly the same amount over the 40 years, find the value of d. **(4 marks)**

1 **a** £5800 **b** £(3800 + 200m)

2 **a** £222 500 **b** £347 500

c It is unlikely her salary will rise by the same amount each year.

3 **a** £9.03 **b** 141 days

4 **a** 220 **b** 242 **c** 266 **d** 519

5 57.7, 83.2

6 **a** £18 000 **b** after 7.88 years

7 **a** £13 780

b Let a denote term of first year and u denote term of second year

$u_{52} = 10 + 51(10) = 520$

$u_1 = 520 + 11$

$u_2 = 531 + 11 = 542$

c £42 198

8 **a** 500 m is 10 terms,

$S_{10} = \frac{10}{2}(1000 + 9(140)) = 11\,300$

b 1500 m

9 **a** £2450 **b** £59 000 **c** $d = 30$