1. The population of Bangor is growing each year. At the end of 1996, the population was 40 000. At the end of 1998, the population was 44 100. Assuming that these annual figures follow a geometric progression, calculate

   (a) the population of Bangor at the end of 1997;

   (b) the population of Bangor at the end of 1992.

   (Total 4 marks)

2. The tuition fees for the first three years of high school are given in the table below.

Year	Tuition fees (in dollars)
1	2000
2	2500
3	3125

   These tuition fees form a geometric sequence.

   (a) Find the common ratio, r, for this sequence.

   (b) If fees continue to rise at the same rate, calculate (to the nearest dollar) the total cost of tuition fees for the first six years of high school.

   (Total 4 marks)

3. Ann and John go to a swimming pool.
   They both swim the first length of the pool in 2 minutes.
   The time John takes to swim a length is 6 seconds more than he took to swim the previous length.
   The time Ann takes to swim a length is 1.05 times that she took to swim the previous length.

   (a) (i) Find the time John takes to swim the third length.

   (ii) Show that Ann takes 2.205 minutes to swim the third length.

   (3)

   (b) Find the time taken for Ann to swim a total of 10 lengths of the pool.

   (3)
   (Total 6 marks)

4. Consider the geometric sequence 8, a, 2,… for which the common ratio is $\dfrac{1}{2}$.

    (a) Find the value of a.

    (b) Find the value of the eighth term.

    (c) Find the sum of the first twelve terms.

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(Total 6 marks)

</div>

5. A National Lottery is offering prizes in a new competition. The winner may choose one of the following.

    Option one: $1000 each week for 10 weeks.

    Option two: $250 in the first week, $450 in the second week, $650 in the third week, increasing by $200 each week for a total of 10 weeks.

    Option three: $10 in the first week, $20 in the second week, $40 in the third week continuing to double for a total of 10 weeks.

    (a) Calculate the amount you receive in the tenth week, if you select

        (i)   **option two**;

        (ii)   **option three**.

<div align="right">

(6)

</div>

    (b) What is the total amount you receive if you select **option two**?

<div align="right">

(2)

</div>

    (c) Which option has the greatest total value? Justify your answer by showing all appropriate calculations.

<div align="right">

(4)

(Total 12 marks)

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6. The annual fees paid to a school for the school years 2000, 2001 and 2002 increase as a geometric progression. The table below shows the fee structure.

Year	Fees (USD)
2000	8000.00
2001	8320.00
2002	8652.80

(a) Calculate the common ratio for the increasing sequence of fees.

(2)

In parts (b) and (c) give your answer correct to 2 decimal places.

The fees continue to increase in the same ratio.

(b) Find the fees paid for 2006.

(2)

A student attends the school for eight years, starting in 2000.

(c) Find the **total** fees paid for these eight years.

(2)
(Total 6 marks)

7. The population of big cats in Africa is increasing at a rate of 5 % per year. At the beginning of 2004 the population was 10 000.

(a) Write down the population of big cats at the beginning of 2005.

(1)

(b) Find the population of big cats at the beginning of 2010.

(2)

(c) Find the number of years, from the beginning of 2004, it will take the population of big cats to exceed 50 000.

(3)
(Total 6 marks)

8. A geometric sequence has 1024 as its first term and 128 as its fourth term.

(a) Show that the common ratio is $\frac{1}{2}$.

(2)

(b) Find the value of the eleventh term.

(2)

(c) Find the sum of the first eight terms.

(3)

(d) Find the number of terms in the sequence for which the **sum** first exceeds 2047.968.

(3)
(Total 10 marks)

9. The seventh term, u_7, of a geometric sequence is 108. The eighth term, u_8, of the sequence is 36.

(a) Write down the common ratio of the sequence.

(1)

(b) Find u_1.

(2)

The sum of the first k terms in the sequence is 118 096.

(c) Find the value of k.

(3)
(Total 6 marks)

10. Consider the geometric sequence 16, 8, *a*, 2, *b*, …

    (a)   Write down the common ratio.

                                                  (1)

    (b)   Write down the value of

            (i)   *a*;

            (ii)   *b*.

                                                  (2)

    (c)   The sum of the first *n* terms is 31.9375. Find the value of *n*.

                                              (3)
                                      (Total 6 marks)

11. Annie is starting her first job. She will earn a salary of $26000 in the first year and her salary will increase by 3% every year.

    (a)   Calculate how much Annie will earn in her 5$^{\text{th}}$ year of work.

                                              (3)

    Annie spends $24800 of her earnings in her first year of work. For the next few years, inflation will cause Annie's living expenses to rise by 5% per year.

    (b)   (i)   Calculate the number of years it will be before Annie is spending more than she earns.

            (ii)   By how much will Annie's spending be greater than her earnings in that year?

                                            (6)
                                      (Total 9 marks)

12. **Throughout this question *all* the numerical answers must be given correct to the nearest whole number.**

Park School started in January 2000 with 100 students. Every full year, there is an increase of 6 % in the number of students.

(a) Find the number of students attending Park School in

   (i) January 2001;

   (ii) January 2003.

(4)

(b) Show that the number of students attending Park School in January 2007 is 150.

(2)

Grove School had 110 students in January 2000. Every full year, the number of students is 10 more than in the previous year.

(c) Find the number of students attending Grove School in January 2003.

(2)

(d) Find the year in which the number of students attending Grove School will be first 60 % **more than** in January 2000.

(4)

Each January, one of these two schools, the one that has more students, is given extra money to spend on sports equipment.

(e) (i) Decide which school gets the money in 2007. Justify your answer.

   (ii) Find the first year in which Park School will be given this extra money.

(5)
(Total 17 marks)