IB Questionbank Mathematical Studies 3rd edition

Geometric Sequences

71 min
68 marks

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

(a) Find the value of a.

(b) Find the value of the eighth term.

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

(Total 6 marks)

2. 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)

3. A geometric sequence has all its terms positive. The first term is 7 and the third term is 28.

(a) Find the common ratio.

(b) Find the sum of the first 14 terms.

(Total 6 marks)

4. 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)

5. 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)

6. A geometric sequence has second term 12 and fifth term 324.

(a) Calculate the value of the common ratio.

(4)

(b) Calculate the 10^{th} term of this sequence.

(3)

(c) The k^{th} term is the first term that is greater than 2000. Find the value of k.

(3)

(Total 10 marks)

7. Two students Ann and Ben play a game. Each time Ann passes GO she receives \$15. Each time Ben passes GO he receives 8% of the amount he already has. Both students start with \$100.

(a) How much money will Ann have after she has passed GO 10 times?

(b) How much money will Ben have after he passes GO 10 times?

(c) How many times will the students have to pass GO for Ben to have more money than Ann?

(Total 6 marks)

8. 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)

9. 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**.

(6)

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

(2)

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

(4)

(Total 12 marks)

10. A basketball is dropped vertically. It reaches a height of 2 m on the first bounce. The height of each subsequent bounce is 90% of the previous bounce.

(a) What height does it reach on the 8th bounce?

(2)

(b) What is the total vertical distance travelled by the ball between the first and sixth time the ball hits the ground?

(4)

(Total 6 marks)