Transition - Geometric Progressions Self-Assessed Exercise

Jan 05

5 The first three terms of a geometric progression are 4, 2, 1.

Find the twentieth term, expressing your answer as a power of 2.

Find also the sum to infinity of this progression. [5]

Jun 05

11 There is a flowerhead at the end of each stem of an oleander plant. The next year, each flowerhead is replaced by three stems and flowerheads, as shown in Fig. 11.

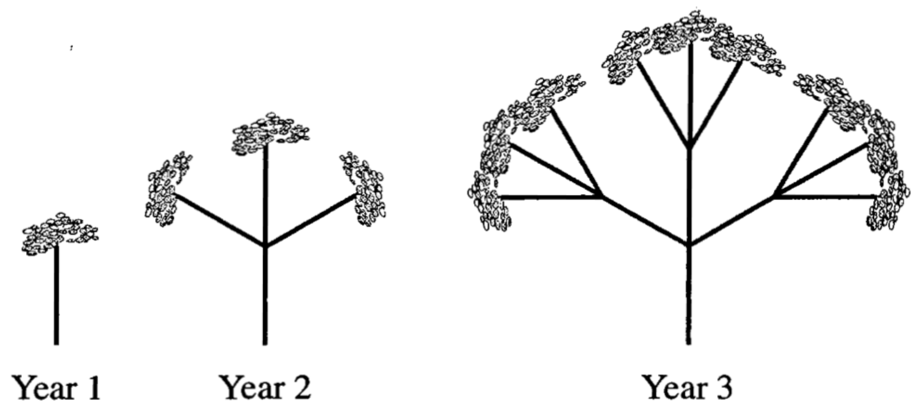

Fig. 11

(i) How many flowerheads are there in year 5? [1]

(ii) How many flowerheads are there in year n? [1]

(iii) As shown in Fig. 11, the total number of stems in year 2 is 4, (that is, 1 old one and 3 new ones). Similarly, the total number of stems in year 3 is 13, (that is, $1 + 3 + 9$).

Show that the total number of stems in year n is given by $\dfrac{3^n - 1}{2}$. [2]

(iv) Kitty's oleander has a total of 364 stems. Find

(A) its age, [2]

(B) how many flowerheads it has. [1]

Jun 06

2 The first term of a geometric series is 8. The sum to infinity of the series is 10.

Find the common ratio. [3]

Jan 07

2 A geometric progression has 6 as its first term. Its sum to infinity is 5.

Calculate its common ratio. [3]

Jun 07

(b) In another game, played with an ordinary fair die and counters, Betty needs to throw a six to start.

The probability P_n of Betty starting on her nth throw is given by

$$P_n = \frac{1}{6} \times \left(\frac{5}{6}\right)^{n-1}.$$

(i) Calculate P_4. Give your answer as a fraction. [2]

(ii) The values $P_1, P_2, P_3, \ldots$ form an infinite geometric progression. State the first term and the common ratio of this progression.

Hence show that $P_1 + P_2 + P_3 + \ldots = 1$. [3]

Jan 08

8 The second term of a geometric progression is 18 and the fourth term is 2. The common ratio is positive. Find the sum to infinity of this progression. [5]

Jun 08

2 The first term of a geometric series is 5.4 and the common ratio is 0.1.

(i) Find the fourth term of the series. [1]

(ii) Find the sum to infinity of the series. [2]

Jan 09

8 The terms of a sequence are given by

$$u_1 = 192,$$
$$u_{n+1} = -\tfrac{1}{2}u_n.$$

(i) Find the third term of this sequence and state what type of sequence it is. **[2]**

(ii) Show that the series $u_1 + u_2 + u_3 + \ldots$ converges and find its sum to infinity. **[3]**

Jun 09

(ii) In a 'Double Your Money' quiz game, contestants get £5 for answering the first question correctly, then a further £10 for the second question, then a further £20 for the third, and so on doubling the amount for each question until they get a question wrong and are out of the game.

(*A*) Gary received £75 from the game. How many questions did he get right? **[1]**

(*B*) Bethan answered 9 questions correctly. How much did she receive from the game? **[2]**

(*C*) State a formula for the total amount received by a contestant who answers n questions correctly. [1]

Jan 10

(ii) Find the sum to infinity of the geometric progression which begins

$$5 \qquad 2 \qquad 0.8 \qquad \ldots .$$ **[2]**