www.m4ths.com – C2 – Geometric Sequences/Series

(1) State which of the following are geometric sequences giving a reason for your answer.

(a) $2, 5, 8, 11...$

(b) $1, 3, 9, 27...$

(c) $0.5, 0.25, 0.125, 0.625...$

(d) $-2, 4, -8, 16...$

(e) $25ab, 5a^2b^2, a^3b^3, 0.2a^4b^4...$

(2) Find the common ratio for each of the following geometric sequences and write down the next two terms.

(a) $2, 6, 18, 54...$

(b) $80, 40, 20, 10...$

(c) $-3, 12, -48, 192...$

(d) $\frac{1}{5}, \frac{4}{15}, \frac{16}{45}, \frac{64}{135}$

(e) $t, 2t^3, 4t^5, 8t^7...$

(3) Find the 7th and 12th terms in each of the sequences below:

(a) First term: $a = 4$
Ratio: $r = 2$

(b) First term: $a = 0.5$
Ratio: $r = -3$

(4) Find the 9th and 14th terms in each of the sequences below:

(a) $5, 15, 45, 135...$

(b) $8, -4, 2, -1...$

(c) $35, 7, 1.4, 0.28$

(5) Find the 1st term of the geometric sequence with 2nd term 9 and 5th term $\frac{243}{8}$.

(6) A geometric sequence with a positive ratio has 3rd term 18 & 7th term 1458. Find the value of the 10th term.

(7) A geometric sequence has the first 3 terms $2, 2k, 9k+5...$,
Given that $k > 0$, find:

(a) The value of k.

(b) The 7th term of the sequence

(8) A geometric sequence has the first 3 terms $2p, \frac{1}{2}, p^{-4}...$

(a) Find the value of p

(b) Write down the *nth* term for the sequence.

(c) Find the value of $a_8 - a_6$.

(9) A ball is dropped from a height of 5m above the floor. After bouncing once it reaches a height of 4m above the floor. The height reached by the ball after each subsequent bounce forms a geometric sequence.

(a) Find maximum the height above the floor the ball reaches after the 3rd bounce?

(b) Find the minimum number of times the ball will bounce before the maximum height reached above the floor is less than 1.18m.

(10) Find the sum of the first 8 terms for each geometric series

(a) 1st term $a = 4$ ratio $r = 0.1$

(b) 1st term $a = 0.4$ ratio $r = -3$

(c) 1st term $a = -5$ ratio $r = -0.3$

(11) Find the sum of the first 10 terms for each geometric series:

(a) $2 + 6 + 18, +54 + ...$

(b) $5 + 10 + 20 + 40 + ...$

(c) $8 - 2 + 0.5 - 0.125 + ...$

(12) Show that the sum of the first n terms of a geometric series with first term a and common ratio r is:

$$S_n = \frac{a\left(1 - r^n\right)}{1 - r}$$

(13) Evaluate the following:

(a) $\sum_{r=1}^{6} 3^r$

(b) $\sum_{r=1}^{8} 2 \times 0.5^r$

(c) $\sum_{r=1}^{9} 2^{r-1}$

(d) $\sum_{r=0}^{11} (2^r + 1)$

(14) Find the least value of n such that the sum of the first n terms of the geometric series $2 + \frac{5}{2} + \frac{25}{8} + \frac{125}{32} + ...$ exceeds 65.

(15) Fred starts a new job. He is paid £32000 in his first year and each year he works for the company he is paid 9% more than the previous year.

(a) Find how much Fred is paid in the 5th year.

(b) Find how much Fred earns in total by the end of the 12th year working for the company.

(16) Find the sum to infinity of the following geometric series:

(a) $4 + 2 + 1 + 0.5 + ...$

(b) $-10 + 2 - 0.4 + 0.08 + ...$

(c) $2p + \frac{1}{2} + p^{-4}...$

(17) Evaluate $\sum_{r=1}^{\infty} 3 \times (0.5)^r$

(18) A geometric series has first term 3.15 and the sum to infinity is 14.2. Find the ratio of the series as an exact fraction.

(19) Peter is doing his Maths homework. It takes him 4 minutes to do the 1st question and each subsequent question takes him 8% less time than the question before.

(a) Find out how long it takes him to complete the 12th question.

(b) Find out how long it takes him to complete the first 20 questions.

Give your answers to the nearest second.

(20) Sue pays £250 into a savings account each year that pays a fixed rate of 3.7% interest.

Find the total amount in the account, to the nearest penny, at the end of the 14th year.