

GCSE Maths: Geometric sequences (Higher): answers

GCSE Maths - Sequences and nth Term - Higher - Lesson 11.7

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch11-sequences/higher/geometric-sequences/

Exercise 11G Geometric sequences Non-calculator

1 Write down the next two terms of each sequence.

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

Answer: 162, 486

(b) 1000, 100, 10, 1, ...

Answer: 0.1, 0.01

(c) 4, 12, 36, 108, ...

Answer: 324, 972

(d) 6, 3, 1.5, ...

Answer: 0.75, 0.375

(e) 8, 12, 18, 27, ...

Answer: 40.5, 60.75

(f) 2, 10, 50, ...

Answer: 250, 1250

2 Write down the common ratio of each geometric sequence.

(a) 3, 6, 12, 24, ...

Answer: $r = 2$

(b) 2, 10, 50, ...

Answer: $r = 5$

(c) 162, 54, 18, 6, ...

Answer: $r = \frac{1}{3}$

(d) 4, 6, 9, ...

Answer: $r = 1.5$

(e) 1, 4, 16, 64, ...

Answer: $r = 4$

(f) 64, 16, 4, 1, ...

Answer: $r = \frac{1}{4}$

3 Say whether each sequence is arithmetic or geometric, and describe the rule.

(a) 4, 8, 12, 16, ...

Answer: Arithmetic: add 4

(b) 4, 8, 16, 32, ...

Answer: Geometric: multiply by 2

(c) 90, 30, 10, ...

Answer: Geometric: divide by 3

(d) 90, 60, 30, 0, ...

Answer: Arithmetic: subtract 30

(e) 7, 21, 63, ...

Answer: Geometric: multiply by 3

(f) 7, 14, 21, 28, ...

Answer: Arithmetic: add 7

4 Write down the first four terms of the sequence with each n th term.

(a) 2^n

Answer: 2, 4, 8, 16

(b) 5^n

Answer: 5, 25, 125, 625

(c) 10^n

Answer: 10, 100, 1000, 10000

(d) $(\frac{1}{2})^n$

Answer: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$

5 Work out the term asked for.

(a) n th term 2^n : the 8th term

Answer: 256

(b) n th term 3^n : the 6th term

Answer: 729

(c) n th term 10^n : the 5th term

Answer: 100000

(d) n th term $(\frac{1}{2})^n$: the 4th term

Answer: $\frac{1}{16}$

- 6 A scientist starts with 50 bacteria. The number doubles every hour. Term 1 is the start, term 2 is after 1 hour, and so on. How many bacteria are there after 6 hours?

Answer: 3200 bacteria

- 7 A ball is dropped from a height of 160 cm. Each time it bounces back up to half its previous height. How high does it bounce on the 4th bounce?

Answer: 10 cm

- 8 A phone is worth £500 when new. After 1 year it is worth £400, after 2 years £320. Each year its value is multiplied by the same number. What is its value after 4 years?

Answer: £204.8

- 9 Liam says, "The sequence 1, 2, 4, 7, 11 is geometric because it goes up so fast." Is he right? Explain.

Answer: No. The differences 1, 2, 3, 4 and the ratios 2, 2, 1.75, 1.57... are not constant, so it is neither arithmetic nor geometric.

- 10 Show that the sequence 3, 12, 48, 192, ... is geometric and find the 7th term.

Answer: 12288

- 11 The n th term of one sequence is $2n$ and the n th term of another sequence is 2^n . Compare the 10th terms of the two sequences. What does this show about geometric sequences?

Answer: $2n$ gives 20 but 2^n gives 1024. Geometric sequences grow much faster than arithmetic ones.

- 12 Find the n th term of each geometric sequence.

- (a) 5, 10, 20, 40, ...

Answer: $5 \times 2^{n-1}$

- (b) 3, 6, 12, 24, ...

Answer: $3 \times 2^{n-1}$

- (c) 81, 27, 9, 3, ...

Answer: $81 \times \left(\frac{1}{3}\right)^{n-1}$

- (d) 16, 24, 36, 54, ...

Answer: $16 \times \left(\frac{3}{2}\right)^{n-1}$

- 13 Find the n th term of the geometric sequence, using the two terms given.

- (a) The 2nd term is 6 and the 5th term is 162

Answer: $2 \times 3^{n-1}$

- (b) The 1st term is 4 and the 3rd term is 36

Answer: $4 \times 3^{n-1}$

- (c) The 3rd term is 12 and the 4th term is 6

Answer: $48 \times \left(\frac{1}{2}\right)^{n-1}$

- (d) The 2nd term is 20 and the 4th term is 5

Answer: $40 \times \left(\frac{1}{2}\right)^{n-1}$

- 14 Each sequence is geometric with a surd as the common ratio. Find the next two terms.

- (a) $2, 2\sqrt{3}, 6, 6\sqrt{3}, \dots$

Answer: $18, 18\sqrt{3}$

- (b) $1, \sqrt{2}, 2, 2\sqrt{2}, \dots$

Answer: $4, 4\sqrt{2}$

- (c) $\sqrt{3}, 3, 3\sqrt{3}, \dots$

Answer: $9, 9\sqrt{3}$

- (d) $2\sqrt{3}, 6, 6\sqrt{3}, 18, \dots$

Answer: $18\sqrt{3}, 54$

- (e) $5, 5\sqrt{5}, \dots$

Answer: $25, 25\sqrt{5}$

- 15 Write down the first five terms of the sequence with n th term $(\sqrt{2})^n$.

Answer: $\sqrt{2}, 2, 2\sqrt{2}, 4, 4\sqrt{2}$

- 16 The first term of a geometric sequence is 3 and the third term is 12. All the terms are positive. Find the common ratio, and then the 5th term.

Answer: $r = 2$; 5th term = 48

- 17 The numbers 4, x and 9 are the first three terms of a geometric sequence. Show that $x = 6$ (given that x is positive).

Answer: $x = 6$