

## Special Sequences (including Geometric and Fibonacci)

### Starter

1. (Review of last lesson) Find the next two terms in the sequence 5, 56, 137, 254, 413.

**Working:**

5	56	137	254	413	
	51	81	117	159	
		30	36	42	
			6	6	

*1st differences are different  
2nd differences are different  
3rd differences are equal*

The third difference are constant so we can continue them.

5	56	137	254	413	620	881
	51	81	117	159	207	261
		30	36	42	48	54
			6	6	6	

$$42 + 6 = 48$$

$$48 + 6 = 54$$

$$159 + 48 = 207$$

$$207 + 54 = 261$$

$$413 + 207 = 620$$

$$620 + 261 = 881$$

The next 2 terms are 218 and 326.

**E.g. 1** Decide if these sequences are geometric sequences. If it is, write down the common ratio.

(a) 7, 21, 63, 189

(b) 10, 20, 30, 40

**Working:**

(a)

$$\frac{2\text{nd term}}{1\text{st term}} = \frac{21}{7} = 3$$

$$\frac{3\text{rd term}}{2\text{nd term}} = \frac{63}{21} = 3$$

$$\frac{4\text{th term}}{3\text{rd term}} = \frac{189}{63} = 3$$

Since the values are all the same, the sequence is a geometric sequence.

The common ratio,  $r$ , is 3.

(b)

$$\frac{2\text{nd term}}{1\text{st term}} = \frac{20}{10} = 2$$

$$\frac{3\text{rd term}}{2\text{nd term}} = \frac{30}{20} = 1.5$$

Since the values are not the same, the sequence is not a geometric sequence.

**E.g. 2** Find the 6th term of the sequence 2, 10, 50, 250.

**Working:**

$$\frac{10}{2} = \frac{50}{10} = \frac{250}{50} = 5 \text{ so the sequence is geometric}$$

$$5\text{th term} = 250 \times 5 = 1250$$

$$6\text{th term} = 1250 \times 5 = 6250$$

**E.g. 3** Write down the next 5 terms of these **Fibonacci** sequences: (a) 2, 5 (b)  $a, b$

**Working:**

(a) 3rd term =  $2 + 5 = 7$   
4th term =  $5 + 7 = 12$   
5th term =  $7 + 12 = 19$   
6th term =  $12 + 19 = 31$   
7th term =  $19 + 31 = 50$

(b) 3rd term =  $a + b$   
4th term =  $b + (a + b) = a + 2b$   
5th term =  $(a + b) + (a + 2b) = 2a + 3b$   
6th term =  $(a + 2b) + (2a + 3b) = 3a + 5b$   
7th term =  $(2a + 3b) + (3a + 5b) = 5a + 8b$

**Video:** [Fibonacci sequences](#)  
**Video:** [Geometric progressions](#)

[Solutions to Starter and E.g.s](#)

### Exercise

9-1 class textbook:	p386 M12.7 Qu 1-14
A*-G class textbook:	No exercise
9-1 homework book:	p130 M12.7 Qu 1-12
A*-G homework book:	No exercise

[Homework book answers \(only available during a lockdown\)](#)