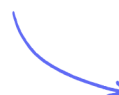


Sequences

Introduction to Sequences / Types of Sequences / nth Terms of Linear Sequences / Quadratic Sequences

Easy (10 questions)	/18
Medium (18 questions)	/63
Hard (14 questions)	/75
Total Marks	/156

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Easy Questions

- 1 The n th term of a number sequence is $n^2 + 1$

Write down the first three terms of the sequence.

(2 marks)

- 2 A sequence is defined using this term-to-term rule.

$$u_{n+1} = \sqrt{2u_n + 15}$$

If $u_1 = 5$, find u_2

(1 mark)

- 3 This expression can be used to generate a sequence of numbers.

$$n^2 - n + 11$$

i) Work out the first three terms of this sequence.

[2]

ii) Show that this expression does not only generate prime numbers.

[2]

(4 marks)

4 (a) A geometric progression starts 4 16

Work out the next term.

(1 mark)

(b) A Fibonacci-type sequence starts 3 -8

The sequence is continued by adding the previous two terms. Work out the next **two** terms.

(2 marks)

5 The first three terms of a geometric progression are $\frac{2}{3}$ $\frac{4}{9}$ $\frac{8}{27}$

Choose the **fourth** term.

A. $\frac{10}{81}$

B. $\frac{14}{81}$

C. $\frac{16}{81}$

D. $\frac{32}{81}$

(1 mark)

6 The next term of a sequence is made by adding the previous two terms.

Which of these sequences follows this rule?

A. -9, 2, -7, -5, -12

B. -3, 5, -2, 3, 1

C. 0, -3, -3, 0, -3

D. -1, -1, -2, -3, 1

(1 mark)

7 Write the next term in each of these sequences.

i) 1, 1, 2, 3, 5, 8

[1]

ii) 2, 4, 8, 16, 32, 64

[1]

(2 marks)

8 Write an expression for the n th term of the sequence below.

15 12 9 6

(2 marks)

9 Here is a sequence of numbers.

7, 5, 3, 1, -1, ...

Find the next term in this sequence.

(1 mark)

10 These are the first five terms in a sequence.

8 11 14 17 20

Find the next term.

(1 mark)

Medium Questions

1 (a) Here are the first 5 terms of an arithmetic sequence.

3 9 15 21 27

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) Ben says that 150 is in the sequence.

Is Ben right?

You must explain your answer.

(1 mark)

2 (a) Here are the first four terms of an arithmetic sequence.

3 10 17 24

Find, in terms of n , an expression for the n th term of this arithmetic sequence.

(2 marks)

(b) Is 150 a term of this sequence?

You must explain how you get your answer.

(2 marks)

3 (a) Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

Write down an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) Is 86 a term in the sequence?

You must give a reason for your answer.

(1 mark)

4 (a) Here are the first four terms of an arithmetic sequence.

11 17 23 29

Find, in terms of n , an expression for the n th term of this arithmetic sequence.

(2 marks)

(b) Is 121 a term of this arithmetic sequence?
You must explain your answer.

(2 marks)

5 (a) Here are the first four terms of an arithmetic sequence.

6 10 14 18

Write an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) The n th term of a different arithmetic sequence is $3n + 5$

Is 108 a term of this sequence?

Show how you get your answer.

(2 marks)

6 (a) Here are the first five terms of an arithmetic sequence.

4 9 14 19 24

Find, in terms of n , an expression for the n th term of this sequence.

(2 marks)

(b) Here are the first five terms of a different sequence.

2 2 0 -4 -10

An expression for the n th term of this sequence is $3n - n^2$

Write down, in terms of n , an expression for the n th term of a sequence whose first five terms are

4 4 0 -8 -20

(1 mark)

7 (a) Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,

the next term in the sequence is the sum of the two previous terms.

Find the 9th term of this sequence.

(1 mark)

(b) The first three terms of a different Fibonacci sequence are

a b $a + b$

Show that the 6th term of this sequence is $3a + 5b$

(2 marks)

(c) Given that the 3rd term is 7 and the 6th term is 29,

find the value of a and the value of b .

(3 marks)

8 Here are the first 5 terms of a quadratic sequence.

1 3 7 13 21

Find an expression, in terms of n , for the n th term of this quadratic sequence.

(3 marks)

9 (a) Find the n th term of each of these sequences.

16, 19, 22, 25, 28, ...

(2 marks)

(b) 1, 3, 9, 27, 81, ...

(2 marks)

- 10 (a)** The first five terms of a sequence are 4, 9, 16, 25, 36,
Find the 10th term.

(1 mark)

- (b)** Find the n th term.

(1 mark)

- 11** Here are the first six terms of a quadratic sequence.

-1 5 15 29 47 69

Find an expression, in terms of n , for the n th term of this sequence.

(3 marks)

- 12 (a)** A sunflower grows at a rate of 4 cm each day.

How many days does it take to grow from a height of 80 cm to more than 1.06 m?

(3 marks)

- (b)** If the sunflower grows at a faster rate, how would this affect your answer to part **(a)**?

(1 mark)

- 13** Here are the first four terms of a sequence.

$\frac{1}{2}$	$\frac{4}{3}$	$\frac{9}{4}$	$\frac{16}{5}$
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Find the n th term of this sequence.

(2 marks)

14 Here are the first four terms of a sequence of fractions.

$$\frac{1}{1} \quad \frac{2}{3} \quad \frac{3}{5} \quad \frac{4}{7}$$

The numerators of the fractions form the sequence of whole numbers 1 2 3 4 ...

The denominators of the fractions form the sequence of odd numbers 1 3 5 7 ...

Write down an expression, in terms of n , for the n th term of this sequence of fractions.

(2 marks)

15 (a) Here are the first five terms of a number sequence S .

$$10 \quad 16 \quad 22 \quad 28 \quad 34$$

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) The n th term of a sequence T is given by $n^2 - 3$

There are numbers that are terms in both the sequence S and the sequence T .

Find one of these numbers.

(2 marks)

16 (a) Here are the first four terms of an arithmetic sequence.

6 10 14 18

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) Write down an expression, in terms of n , for the $(n + 1)$ th term of this sequence.

(1 mark)

17 (a) Here are the first five terms of a number sequence.

7 11 15 19 23

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) The n th term of a different number sequence is given by $80 - 2n$

Write down the first 3 terms of this sequence.

(2 marks)

(c) Yuen says there are no numbers that are in both of the sequences.

Yuen is correct.

Explain why.

(1 mark)

18 (a) Here are the first five terms of an arithmetic sequence.

8 17 26 35 44

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) The n th term of a different sequence is $20 - 8n$

Is -38 a term in this sequence?

You must show how you get your answer.

(2 marks)

Hard Questions

1 (a) The n th term of a sequence is $an^2 + bn$.

Write down an expression, in terms of a and b , for the 3rd term.

(1 mark)

(b) The 3rd term of this sequence is 21 and the 6th term is 96.

Find the value of a and the value of b
You must show all your working.

(4 marks)

2 (a) Here are the first five terms of an arithmetic sequence.

2 5 8 11 14

Write down an expression, in terms of n , for the n th term of this sequence.

(2 marks)

(b) Is 299 a term of this sequence?

You must give a reason for your answer.

(2 marks)

(c) Write down an expression, in terms of n , for the $(n + 1)$ th term of this sequence.

(1 mark)

3 Here are the first five terms of a sequence.

4 11 22 37 56

Find an expression, in terms of n , for the n th term of this sequence.

(3 marks)

4 (a) The n th term of a sequence is given by $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is -2

The 4th term of the sequence is 12

Find the 6th term of the sequence.

(4 marks)

(b) Here are the first five terms of a different quadratic sequence.

0 2 6 12 20

Find an expression, in terms of n , for the n th term of this sequence.

(2 marks)

5 (a) Find the n th term of each sequence.

4, 8, 12, 16, 20,

(1 mark)

(b) 11, 20, 35, 56, 83,

(2 marks)

6 (a) S is a geometric sequence.

Given that $(\sqrt{x} - 1)$, 1 and $(\sqrt{x} + 1)$ are the first three terms of S , find the value of x .
You must show all your working.

(3 marks)

(b) Show that the 5th term of S is $7 + 5\sqrt{2}$

(2 marks)

- 7 (a)** Louis and Robert are investigating the growth in the population of a type of bacteria. They have two flasks A and B.

At the start of day 1, there are 1000 bacteria in flask A.

The population of bacteria grows exponentially at the rate of 50% per day.

Show that the population of bacteria in flask A at the start of each day forms a geometric progression.

(2 marks)

- (b)** The population of bacteria in flask A at the start of the 10th day is k times the population of bacteria in flask A at the start of the 6th day.

Find the value of k .

(2 marks)

- (c)** At the start of day 1 there are 1000 bacteria in flask B.

The population of bacteria in flask B grows exponentially at the rate of 30% per day.

Sketch a graph to compare the size of the population of bacteria in flask A and in flask B.

(1 mark)

8 (a) The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	3	4	5	6	7	
B	0	1	4	9	16	
C	-3	-3	-1	3	9	

Complete the table for the 6th term of each sequence.

(2 marks)

(b) Write down the n th term of sequence A.

(1 mark)

(c) i) Find the n th term of sequence B.

[1]

ii) Find the value of n when the n th term of sequence B is 8281.

[3]

(4 marks)

(d) i) Find the n th term of sequence C in its simplest form.

[2]

ii) Find the 8th term of sequence C.

[1]

(3 marks)

(e) The n th term of another sequence D is $\left(-\frac{1}{2}\right)^{n-1}$.

Complete the table for the first four terms of sequence D.

Sequence	1st term	2nd term	3rd term	4th term
D				

(3 marks)

- 9 (a)** In all the following sequences, after the first two terms, the rule is to add the previous two terms to find the next term.

Write down the next two terms in this sequence.

1 1 2 3 5 8 13

(1 mark)

- (b)** Write down the first two terms of this sequence.

..... 3 11 14

(2 marks)

- (c)** i) Find the value of d and the value of e . $2 \quad d \quad e \quad 10$

[3]

- ii) Find the value of x , the value of y and the value of z .

-33 x y z 18

[5]

(8 marks)

10 A sequence is defined using this term-to-term rule,

$$u_{n+1} = ku_n + r$$

where k and r are constants.

Given that $u_2 = 41$, $u_3 = 206$ and $u_4 = 1031$, find the value of k and the value of r .

$k = \dots\dots\dots$

$r = \dots\dots\dots$

(5 marks)

11 (a) Here is a sequence.

3	$3\sqrt{5}$	15	$15\sqrt{5}$
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Work out the next term.

(1 mark)

(b) Find the n th term.

(3 marks)

12 A sequence is defined by the rule $u_{n+1} = 5u_n - 15$

If $u_3 = 6$, calculate

i) u_5

$u_5 = \dots\dots\dots$ [3]

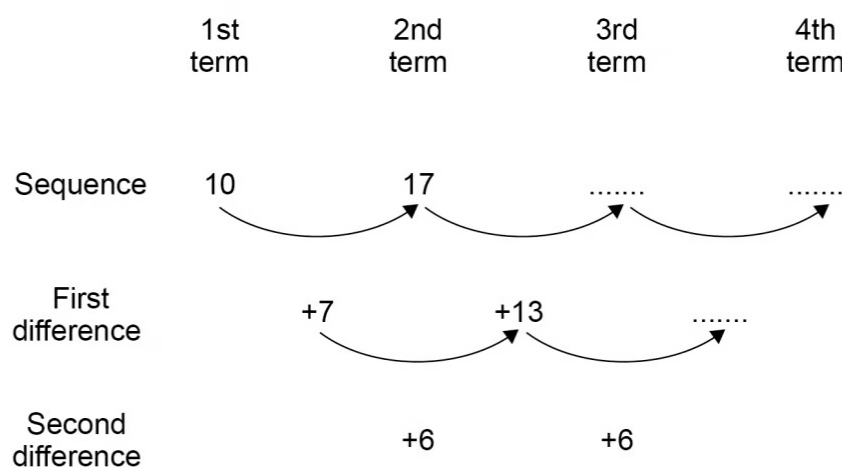
ii) u_2

$u_2 = \dots\dots\dots$ [3]

(3 marks)

13 The first two terms of a quadratic sequence are 10 and 17

Here is some information about the sequence.



Work out an expression for the n th term of the sequence.

(4 marks)

- 14** Theo starts with savings of £18
James starts with no savings.

Each week from now,

Theo will save £4.50 and James will save £4

In how many weeks will Theo and James have savings in the ratio 15 : 8 ?

(3 marks)