*Summer 2020 Paper 1 Q1*

**1** The first five terms of an arithmetic sequence are

1 4 7 10 13

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

.....

**(Total for Question 1 is 2 marks)**

*Summer 2019 Paper 3 Q16*

**2** 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.

.....

**(Total for Question 2 is 3 marks)**

*Autumn 2017 Paper 2 Q23*

**3** S is a geometric sequence.

(a) 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)**

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

**(2)**

**(Total for Question 3 is 5 marks)**

*Summer 2017 Paper 2 Q22*

**4** 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.

.....

**(Total for Question 4 is 3 marks)**

*Summer 2018 Paper 3 Q16*

**5** 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

(a) Find the 6th term of the sequence.

.....

**(4)**

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

0 2 6 12 20

(b) Find an expression, in terms of $n$, for the $n$th term of this sequence.

.....

**(2)**

**(Total for Question 5 is 6 marks)**

*Summer 2020 Paper 2 Q16*

**6** Here are the first five terms of a quadratic sequence.

10 21 38 61 90

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

.....

**(Total for Question 6 is 3 marks)**

*Summer 2020 Paper 2 Q19*

**7** A hot air balloon is descending.
The height of the balloon $n$ minutes after it starts to descend is $h_n$ metres.

The height of the balloon ($n$ +1) minutes after it starts to descend, $h_{n+1}$ metres, is given by

$$h_{n+1} = K \times h_n + 20 \quad \text{where } K \text{ is a constant.}$$

The balloon starts to descend from a height of 1200 metres at 09 15
At 09 16 the height of the balloon is 1040 metres.

Work out the height of the balloon at 09 18

..... m

**(Total for Question 7 is 4 marks)**

*Summer 2021 Paper 3 Q5*

**8** The first four terms of a Fibonacci sequence are

$a \qquad 2a \qquad 3a \qquad 5a$

The sum of the first five terms of this sequence is 228

Work out the value of $a$.

.....

**(Total for Question 8 is 3 marks)**

*Summer 2021 Paper 3 Q19*

**9** At the start of year $n$, the number of animals in a population is $P_n$

At the start of the following year, the number of animals in the population is $P_{n+1}$ where

$$P_{n+1} = kP_n$$

At the start of 2017 the number of animals in the population was 4000
At the start of 2019 the number of animals in the population was 3610

Find the value of the constant $k$.

.....

**(Total for Question 9 is 3 marks)**

*Autumn 2018 Paper 3 Q13*

**10** The number of animals in a population at the start of year $t$ is $P_t$
The number of animals at the start of year 1 is 400

Given that

$$P_{t+1} = 1.01P_t$$

work out the number of animals at the start of year 3

.....

**(Total for Question 10 is 2 marks)**

*Autumn 2019 Paper 2 Q6*

**11** The $n$th term of a sequence is $2n^2 - 1$

The $n$th term of a different sequence is $40 - n^2$

Show that there is only one number that is in both of these sequences.

**(Total for Question 11 is 3 marks)**

*Autumn 2019 Paper 2 Q22*

**12** The number of rabbits on a farm at the end of month $n$ is $P_n$
The number of rabbits at the end of the next month is given by $P_{n+1} = 1.2P_n - 50$

At the end of March there are 200 rabbits on the farm.

(a) Work out how many rabbits there will be on the farm at the end of June.

.....

**(3)**

(b) Considering your results in part (a), suggest what will happen to the number of rabbits on the farm after a long time.

.....

.....

**(1)**

**(Total for Question 12 is 4 marks)**

*Autumn 2019 Paper 3 Q20*

**13** Here are the first five terms of a sequence.

$$-1 \qquad 0 \qquad 3 \qquad 8 \qquad 15$$

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

.....

**(Total for Question 13 is 2 marks)**

*Autumn 2022 Paper 1 Q23*

**14** Here are the first five terms of a geometric sequence.

$$\sqrt{5} \qquad 10 \qquad 20\sqrt{5} \qquad 200 \qquad 400\sqrt{5}$$

(a) Work out the next term of the sequence.

.....

**(2)**

The 4th term of a different geometric sequence is $\frac{5\sqrt{2}}{4}$

The 6th term of this sequence is $\frac{5\sqrt{2}}{8}$

Given that the terms of this sequence are all positive,

(b) work out the first term of this sequence.
You must show all your working.

.....

**(3)**

**(Total for Question 14 is 5 marks)**

*Autumn 2022 Paper 2 Q3*

**15** Here are the first five terms of an arithmetic sequence.

7 13 19 25 31

(a) Find an expression, in terms of $n$, for the $n$th term of this sequence.

.....

**(2)**

The $n$th term of a different sequence is $8 - 6n$

(b) Is $-58$ a term of this sequence?
You must show how you get your answer.

**(2)**

**(Total for Question 15 is 4 marks)**

*Autumn 2022 Paper 2 Q12*

**16** The number of insects in a population at the start of the year $n$ is $P_n$

The number of insects in the population at the start of year $(n + 1)$ is $P_{n+1}$ where

$$P_{n+1} = kP_n$$

Given that $k$ has a constant value of 1.13

(a) find out how many years it takes for the number of insects in the population to double. You must show how you get your answer.

.....

**(2)**

The value of $k$ actually increases year on year from its value of 1.13 in year 1

(b) How does this affect your answer to part (a)?

.....

.....

.....

**(1)**

**(Total for Question 16 is 3 marks)**

*Summer 2022 Paper 3 Q20*

**17** The profit made by a shop increases each year.

The profit made by the shop in year $n$ is £$P_n$

Given that the profit made by the shop in the next year is £$P_{n+1}$ then

$$P_{n+1} = aP_n + 800 \text{ where } a \text{ is a constant.}$$

The table shows the profit made by the shop in 2018 and in 2019

| **Year** | 2018 | 2019 |
|---|---|---|
| **Profit** | £24 000 | £29 600 |

Work out the profit predicted to be made by the shop in 2021

£.....

**(Total for Question 17 is 4 marks)**