

Name: _____

GCSE (1 – 9)

Quadratic Sequences

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1. Write down the next two terms in the following quadratic sequence.

$$\begin{array}{cccccc} 9, & 13, & 19, & 27, & \dots & 37 & 49 \\ & 4 & & 6 & & 8 & & 10 & & 12 \\ & 2 & & 2 & & 2 & & 2 & & \end{array}$$

..... 37, 49 (2)

2. Write down the next two terms in the following quadratic sequence.

$$\begin{array}{cccccc} -5, & 0, & 9, & 22, & \dots & 39 & 60 \\ & 5 & & 9 & & 13 & & 17 & & 21 \\ & 4 & & 4 & & 4 & & 4 & & \end{array}$$

..... 39, 60 (2)

3. The n th term of a sequence is

$$2n^2 + 4n - 1$$

Work out the 10th term of the sequence

$$\begin{aligned} 2(10)^2 + 4(10) - 1 \\ 2(100) + 40 - 1 \\ 200 + 40 - 1 \end{aligned}$$

$$\dots 239 \dots (2)$$

4. The n th term of a sequence is

$$n^2 + 2n$$

Work out the first 5 terms in the sequence

$$\begin{aligned} (1)^2 + 2(1) &= 3 \\ (2)^2 + 2(2) &= 8 \\ (3)^2 + 2(3) &= 15 \\ (4)^2 + 2(4) &= 24 \\ (5)^2 + 2(5) &= 35 \end{aligned}$$

$$3, 8, 15, 24, 35 \dots (2)$$

5. Work out the formula for the n th term of the quadratic sequence:

$$\begin{array}{cccc}
 & & 5, & 11, & 19, & 29, \dots \\
 & & & 6 & 8 & 10 \\
 & & & & 2 & 2 \\
 n^2 & & 1 & 4 & 9 & 16 \\
 3n+1 & & 4 & 7 & 10 & 13
 \end{array}$$

$$n^2 + 3n + 1 \quad (4)$$

6. Work out the formula for the n th term of the quadratic sequence:

$$\begin{array}{cccc}
 & & 2, & 10, & 22, & 38, \dots \\
 & & & 8 & 12 & 16 \\
 & & & & 4 & 4 \\
 2n^2 & & 2 & 8 & 18 & 32 \\
 2n-2 & & 0 & 2 & 4 & 6
 \end{array}$$

$$2n^2 + 2n - 2 \quad (4)$$

7. Work out the formula for the n th term of the quadratic sequence:

$$\begin{array}{cccc}
 & & 15, & 19, & 25, & 33\dots \\
 & & & 4 & 6 & 8 \\
 & & & & 2 & 2 \\
 n^2 & 1 & 4 & 9 & 16 \\
 n+13 & 14 & 15 & 16 & 17
 \end{array}$$

$$\dots\dots\dots n^2 + n + 13 \dots\dots\dots (4)$$

8. Work out the formula for the n th term of the quadratic sequence:

$$\begin{array}{cccc}
 & & 2, & 10, & 24, & 44\dots \\
 & & & 8 & 14 & 20 \\
 & & & & 6 & 6 \\
 3n^2 & 3 & 12 & 27 & 48 \\
 -n & -1 & -2 & -3 & -4
 \end{array}$$

$$\dots\dots\dots 3n^2 - n \dots\dots\dots (4)$$

9. Work out the formula for the nth term of the quadratic sequence:

$$\begin{array}{cccccc}
 & & 19, & 15, & 9, & 1... \\
 & & -4 & -6 & -8 & \\
 & & & -2 & -2 & \\
 -n^2 & & -1 & -4 & -9 & -16 \\
 -n+21 & & 20 & 19 & 18 & 17
 \end{array}$$

$$\underline{\underline{-n^2 - n + 21}} \quad (4)$$

10. Work out the formula for the nth term of the quadratic sequence:

$$\begin{array}{cccccc}
 & & -2, & -1, & 1, & 4... \\
 & & -1 & 2 & 3 & \\
 & & & 1 & 1 & \\
 \frac{1}{2}n^2 & & \frac{1}{2} & 2 & \frac{9}{2} & 8 \\
 & & -\frac{5}{2} & -3 & -\frac{7}{2} & -4 \\
 -\frac{1}{2}n - 2 & & & & &
 \end{array}$$

$$\underline{\underline{\frac{1}{2}n^2 - \frac{1}{2}n - 2}} \quad (4)$$

11. A quadratic sequence starts:

6, 10, 16, 24...

a) Show that the n th term is $n^2 + n + 4$

	6	10	16	24
		4	6	8
			2	2
n^2	1	4	9	16
$n + 4$	5	6	7	8

$$\dots\dots\dots n^2 + n + 4 \dots\dots\dots (4)$$

b) Hence find the term that has value 136

$$n^2 + n + 4 = 136$$

$$n^2 + n - 132 = 0$$

$$(n + 12)(n - 11) = 0$$

$$n = -12 \quad \underline{\underline{n = 11}}$$

$$\dots\dots\dots 11^{\text{th}} \dots\dots\dots (2)$$

12. A quadratic sequence starts:

$$-8, 2, 16, 34\dots$$

a) Show that the n th term is $2n^2 + 4n - 14$

	-8	2	16	34
		10	14	18
		4	4	-
$2n^2$	2	8	18	32
$4n - 14$	-10	-6	-2	2

$$\dots\dots\dots 2n^2 + 4n - 14 \dots\dots\dots (4)$$

b) Hence find the term that has value 272

$$2n^2 + 4n - 14 = 272$$

$$n^2 + 2n - 7 = 136$$

$$n^2 + 2n - 143 = 0$$

$$(n + 13)(n - 11) = 0$$

$$n = -13 \quad \underline{\underline{n = 11}}$$

$$\dots\dots\dots 11^{\text{th}} \text{ term} \dots\dots\dots (2)$$