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.

\[9, 13, 19, 27, \ldots, 37, 49\]

\[2, 2, 2, 2\]

\[37, 49\] (2)

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

\[ -5, 0, 9, 22, \ldots, 39, 60\]

\[4, 4, 4, 4\]

\[39, 60\] (2)
3. The nth term of a sequence is 

\[ 2n^2 + 4n - 1 \]

Work out the 10th term of the sequence

\[ 2(10)^2 + 4(10) - 1 \]
\[ 2(100) + 40 - 1 \]
\[ 200 + 40 - 1 \]

...39.... (2)

4. The nth term of a sequence is 

\[ n^2 + 2n \]

Work out the first 5 terms in the sequence

\[ (1)^2 + 2(1) = 3 \]
\[ (2)^2 + 2(2) = 8 \]
\[ (3)^2 + 2(3) = 15 \]
\[ (4)^2 + 2(4) = 24 \]
\[ (5)^2 + 2(5) = 35 \]

3, 8, 15, 24, 35 (2)
5. Work out the formula for the nth term of the quadratic sequence:

\[ 5, 11, 19, 29... \]
\[ 6, 8, 10 \]
\[ 2, 2 \]
\[ \begin{array}{c}
 1 \\
 4 \\
 9 \\
 16 \\
\end{array} \]
\[ 3n + 1, 4, 7, 10, 13 \]

\[ n^2 + 3n + ... \] (4)

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

\[ 2, 10, 22, 38... \]
\[ 8, 12, 16 \]
\[ 4, 4 \]
\[ \begin{array}{c}
 2 \\
 8 \\
 18 \\
 32 \\
\end{array} \]
\[ 2n - 2, 0, 2, 4, 6 \]

\[ 2n^2 + 2n - 2 \] (4)
7. Work out the formula for the nth term of the quadratic sequence:

\[ 15, 19, 25, 33... \]
\[ 4 \quad 6 \quad 8 \]
\[ 2 \quad 2 \]
\[ n^2 \quad 1 \quad 4 \quad 9 \quad 16 \]
\[ n+13 \quad 14 \quad 15 \quad 16 \quad 17 \]

\[ n^2 + n + 13 \quad (4) \]

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

\[ 2, 10, 24, 44... \]
\[ 8 \quad 14 \quad 20 \]
\[ 6 \quad 6 \]
\[ 3n^2 \quad 3 \quad 12 \quad 27 \quad 48 \]
\[ -n \quad -1 \quad -2 \quad -3 \quad -4 \]

\[ 3n^2 - n \quad (4) \]
9. Work out the formula for the nth term of the quadratic sequence:

\[ 19, 15, 9, 1... \]

\[
\begin{array}{cccc}
-4 & -6 & -8 \\
-2 & -2 \\
-1 & -4 & -9 & -16 \\
-1 & 2 & 19 & 18 & 17 \\
\end{array}
\]

\[
-\frac{n^2}{2} - n + 21 \tag{4}
\]

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

\[-2, -1, 1, 4... \]

\[
\begin{array}{cccc}
-1 & 2 & 3 \\
1 & 1 \\
\frac{1}{2} n^2 & \frac{1}{2} & 3 & 9 \frac{1}{2} & 8 \\
-3 & -3 & -3 & -4 \\
\end{array}
\]

\[-\frac{1}{2} n - 2 \]

\[
\frac{1}{2} n^2 - \frac{1}{2} n - 2 \tag{4}
\]
11. A quadratic sequence starts:

\[6, 10, 16, 24...\]

a) Show that the \(n^{th}\) term is  \(n^2 + n + 4\)

\[
\begin{array}{cccc}
6 & 10 & 16 & 24 \\
4 & 6 & 8 & 10 \\
1 & 4 & 9 & 16 \\
5 & 6 & 7 & 8 \\
\end{array}
\]

\[n^2 + n + 4 \quad (4)\]

b) Hence find the term that has value 136

\[n^2 + n + 4 = 136\]

\[n^2 + n - 132 = 0\]

\[(n + 12)(n - 11) = 0\]

\[n = -12 \quad n = 11\]

\[\underline{\quad \quad (2)}\]
12. A quadratic sequence starts:

\[-8, 2, 16, 34...\]

a) Show that the nth term is \(2n^2 + 4n - 14\)

\[
\begin{array}{cccc}
-8 & 2 & 16 & 34 \\
10 & 14 & 18 & \ \\
4 & 4 & \ \\
2n^2 & 2 & 8 & 18 & 32 \\
4n - 14 & -16 & -6 & -2 & 2 \\
\end{array}
\]

\[
2n^2 + 4n - 14 \quad (4)
\]

b) Hence find the term that has value 272

\[
2n^2 + 4n - 14 = 272
\]

\[
n^2 + 2n - 7 = 136
\]

\[
n^2 + 2n - 143 = 0
\]

\[
(n + 13)(n - 11) = 0
\]

\[
n = -13 \quad \text{or} \quad n = 11
\]

\[
\text{11th term} \quad (2)
\]