Sequences

18 The first four terms of a sequence are

$T_1 = 1^2 \qquad T_2 = 1^2 + 2^2 \qquad T_3 = 1^2 + 2^2 + 3^2 \qquad T_4 = 1^2 + 2^2 + 3^2 + 4^2$.

(a) The nth term is given by $T_n = \dfrac{1}{6} n(n + 1)(2n + 1)$.

Work out the value of T_{23}.

Answer(a) T_{23} = ... [2]

(b) A new sequence is formed as follows.

$U_1 = T_2 - T_1 \qquad U_2 = T_3 - T_2 \qquad U_3 = T_4 - T_3 \qquad \text{.......}$

(i) Find the values of U_1 and U_2.

Answer(b)(i) U_1 = ... and U_2 = ... [2]

(ii) Write down a formula for the nth term, U_n

Answer(b)(ii) U_n = ... [1]

(c) The first four terms of another sequence are

$V_1 = 2^2 \qquad V_2 = 2^2 + 4^2 \qquad V_3 = 2^2 + 4^2 + 6^2 \qquad V_4 = 2^2 + 4^2 + 6^2 + 8^2$.

By comparing this sequence with the one in **part (a)**, find a formula for the nth term, V_n .

Answer(c) V_n = ... [2]

9   A sequence is given by $u_1 = \sqrt{1}$, $u_2 = \sqrt{3}$, $u_3 = \sqrt{5}$, $u_4 = \sqrt{7}$, ...

(a) Find a formula for u_n, the nth term.

Answer(a) $u_n =$ .... [2]

(b) Find u_{29}

Answer(b) $u_{29} =$ .... [1]

3   The first five terms of a sequence are shown below.

$$13 \qquad 9 \qquad 5 \qquad 1 \qquad -3$$

Find the nth term of this sequence.

Answer .... [2]

9 Find the nth term in each of the following sequences.

(a) $\dfrac{1}{3}, \quad \dfrac{2}{4}, \quad \dfrac{3}{5}, \quad \dfrac{4}{6}, \quad \dfrac{5}{7},$

Answer(a) .... [1]

(b) 0,   3,   8,   15,   24, ...

Answer(b) .... [2]

20   32   25   18   11   4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

Answer(a) .... [1]

(b) the nth term,

Answer(b) .... [2]

(c) which term is equal to −332.

Answer(c) .... [2]

11 **(a)** Here are the first three terms of a sequence.

$$U_1 = 1^3 \qquad\qquad U_2 = 1^3 + 2^3 \qquad\qquad U_3 = 1^3 + 2^3 + 3^3$$

The nth term is given by $U_n = \frac{1}{4}n^2(n+1)^2$.

Work out the value of U_{39} .

Answer(a) U_{39} = ... [2]

(b) Here are the first three terms of another sequence.

$$V_1 = 2^3 \qquad\qquad V_2 = 2^3 + 4^3 \qquad\qquad V_3 = 2^3 + 4^3 + 6^3$$

By comparing this sequence with the sequence in **part (a)**, find a formula for the n th term, V_n .

Answer(b) V_n = ... [1]

11 Find the nth term of each sequence.

(a) 4, 8, 12, 16, 20, ...

Answer(a) .... [1]

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

Answer(b) .... [2]

8 5, 11, 21, 35, 53, ...

Find the nth term of this sequence.

Answer .... [2]

5   These are the first five terms of a sequence.

$$13 \qquad 8 \qquad 3 \qquad -2 \qquad -7$$

Find the nth term of this sequence.

Answer .... [2]

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20   The nth term of a sequence is $an^2 + bn$.

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

.... [1]

(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.

$a =$ ....

$b =$ .... [4]

15   7,   5,   3,   1,   − 1,   …

     (a) Find the next term in this sequence.

                                                .... [1]

     (b) Find the nth term of the sequence.

                                                .... [2]

18 Find the nth term of each of these sequences.

     (a)   16,   19,   22,   25,   28,   …

                                                [2]

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

                                                .... [2]

19 Find the *n*th term of each sequence.

(a) 7, 13, 19, 25, 31, …

.... [2]

(b) 9, 16, 25, 36, 49, …

.... [2]

3 Here is a sequence.

a,   13,   9,   3,   −5,   −15, b,   …

Find the value of a and the value of b.

$a =$ ....

$b =$ .... [2]