

Subscript Notation for Sequences (H)

Starter

1. (Review of last lesson)

Find a formula for the n th term for these linear sequences:

(a) 7, 16, 25, 34

(b) -5, -12, -19, -26

Working: (a) Term-to-term rule: $16 - 7 = 9 \Rightarrow 9n$
Term before the first: $7 - 9 = -2$
 $\therefore n$ th term = $9n - 2$

(b) Term-to-term rule: $-12 - (-5) = -12 + 5 = -7 \Rightarrow -7n$
Term before the first: $-5 - (-7) = -5 + 7 = 2$
 $\therefore n$ th term = $2 - 7n$

2. (Review of last lesson)

Find the 11th term for the sequence whose n th term is given by $17n + 5$

Working: The 11th term is found when $n = 11$
11th term = $17 \times 11 + 5 = 187 + 5 = 192$

E.g. 1 Find the first 4 terms in the sequence defined by $u_1 = 4$, $u_{n+1} = u_n + 3$

Working: $u_1 = 4$
 $u_2 = u_1 + 3 = 4 + 3 = 7$
 $u_3 = u_2 + 3 = 7 + 3 = 10$
 $u_4 = u_3 + 3 = 10 + 3 = 13$
The first 4 terms are 4, 7, 10, 13

N.B. After finding the first few terms and seeing that it is a linear sequence, we could calculate a formula for the n th term:

Term-to-term rule: $7 - 4 = 3 \Rightarrow 3n$
Term before the first: $4 - 3 = 1$
 $\therefore n$ th term, $u_n = 3n + 1$

E.g. 2 Write down the first four terms of the sequences with the following definitions:

(a) $u_1 = 2, u_{n+1} = u_n + 9$

(b) $u_1 = 13, u_{n+1} = u_n - 5$

(c) $u_1 = 5, u_{n+1} = 2u_n + 3$

Working: (a) $u_1 = 2$
 $u_2 = u_1 + 9 = 2 + 9 = 11$
 $u_3 = u_2 + 9 = 11 + 9 = 20$
 $u_4 = u_3 + 9 = 20 + 9 = 29$
The first 4 terms are 2, 11, 20, 29

(b) $u_1 = 13$
 $u_2 = u_1 - 5 = 13 - 5 = 8$
 $u_3 = u_2 - 5 = 8 - 5 = 3$
 $u_4 = u_3 - 5 = 3 - 5 = -2$
The first 4 terms are 13, 8, 3, -2

(c) $u_1 = 5$
 $u_2 = 2u_1 + 3 = 2 \times 5 + 3 = 13$
 $u_3 = 2u_2 + 3 = 2 \times 13 + 3 = 29$
 $u_4 = 2u_3 + 3 = 2 \times 29 + 3 = 61$
The first 4 terms are 5, 13, 29, 61

E.g. 3 Let $u_{n+1} = 3u_n + 1$. If $u_3 = 16$, find u_1 .

Working: We first need to find u_2 so we write the iterative formula for u_2 and u_3
 $u_3 = 3u_2 + 1$
Replace u_3 by 16: $16 = 3u_2 + 1$
Solve: $15 = 3u_2$
 $u_2 = 5$
Repeat the process to find u_1 :
Replace u_2 by 5: $5 = 3u_1 + 1$
Solve: $4 = 3u_1$
 $u_1 = \frac{4}{3}$

E.g. 4 Let $u_{n+1} = u_n + 7$. If $u_4 = 8$, find: (a) u_8 (b) u_1

Working: (a) $u_4 = 8$
 $u_5 = u_4 + 7 = 8 + 7 = 15$
 $u_6 = u_5 + 7 = 15 + 7 = 22$
 $u_7 = u_6 + 7 = 22 + 7 = 29$
 $u_8 = u_7 + 7 = 29 + 7 = 36$

(b) $u_4 = 8$
 $u_4 = u_3 + 7 \Rightarrow 8 = u_3 + 7 \quad \therefore u_3 = 1$
 $u_3 = u_2 + 7 \Rightarrow 1 = u_2 + 7 \quad \therefore u_2 = -6$
 $u_2 = u_1 + 7 \Rightarrow -6 = u_1 + 7 \quad \therefore u_1 = -13$

E.g. 5 Let $w_{n+1} = 2w_n + 5$. If $w_3 = 31$, find: (a) w_6 (b) w_1

Working:

(a) $w_3 = 31$
 $w_4 = 2w_3 + 5 = 2 \times 31 + 5 = 67$
 $w_5 = 2w_4 + 5 = 2 \times 67 + 5 = 139$
 $w_6 = 2w_5 + 5 = 2 \times 139 + 5 = 283$

(b) $w_3 = 31$
 $w_3 = 2w_2 + 5 \Rightarrow 31 = 2w_2 + 5 \Rightarrow 26 = 2w_2 \therefore w_2 = 13$
 $w_2 = 2w_1 + 5 \Rightarrow 13 = 2w_1 + 5 \Rightarrow 8 = 2w_1 \therefore w_1 = 4$

Video: [Iteration](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p392 E12.1 Qu 1-8
A*-G class textbook:	No exercise
9-1 homework book:	p133 E12.1 Qu 1-10
A*-G homework book:	No exercise

[Homework book answers \(only available during a lockdown\)](#)