Linear Sequences

A linear sequence is a sequence where consecutive terms have a common difference. They can be increasing or decreasing.

Examples

1) $\overset{2}{3}, \overset{4}{5}, \overset{6}{7}, \overset{8}{9}, \ldots\ldots$ diff $= 2$

Finding a formula for n^{th} term

n^{th} term $= 2n + 1$

10^{th} term $= 2 \times 10 + 1 = 21$

25^{th} term $= 2 \times 25 + 1 = 51$

If the sequence is increasing each term by 2 the n^{th} term will have $2n$ in it. This generates the $2\times$ table and we look to see what adjustment is required to align with the sequence.

2) $\overset{4}{1}, \overset{8}{5}, \overset{12}{9}, \overset{16}{13}, \overset{20}{17}, \ldots$ diff $= 4$

n^{th} term $= 4n - 3$

10^{th} term $= 4(10) - 3 = 37$

25^{th} term $= 4(25) - 3 = 97$

Exercise Find n^{th} term, 10^{th} term, 25^{th} term

1) $8, 11, 14, 17, \ldots$

n^{th} term $= 3n+5$, 10^{th} term $= 35$ 25^{th} term $= 80$

2) 10, 11, 12, 13, ...

n^{th} term $= n+9$, 10^{th} term $= 19$, 25^{th} term $= 34$

3) 5, 10, 15, 20, ...

n^{th} term $= 5n$ 10^{th} term $= 50$ 25^{th} term $= 125$

4) 2, 9, 16, 23, 30, ...

n^{th} term $= 7n-5$, 10^{th} term $= 65$, 25^{th} term $= 170$

5) −4, −1, 2, 5, ...

n^{th} term $= 3n-7$, 10^{th} term $= 23$, 25^{th} term $= 68$

Decreasing Linear Sequences

Ex 1 11, 9, 7, 5, ... diff $= -2$

n^{th} term $= 13 - 2n$

10^{th} term $= 13 - 2(10) = -7$

25^{th} term $= 13 - 2(25) = -37$

If the difference is −2, meaning the sequence is decreasing, then the n^{th} term will involve $-2n$. By looking at the first term we can spot the adjustment required. Basically we add 2 more to the first term to find the adjustment

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Ex2 $\quad 93, 89, 85, 81, \ldots \quad$ diff $= -4$

n^{th} term $= 97 - 4n$

10^{th} term $= 97 - 40 = 57$

25^{th} term $= 97 - 100 = -3$

Exercise

1) $40, 37, 34, 31, \ldots$

n^{th} term $= 43 - 3n$ $\quad$ 10^{th} term $= 43 - 30 = 13$ $\quad$ 25^{th} term $= 43 - 75 = -32$

2) $93, 83, 73, 63, \ldots$

n^{th} term $= 103 - 10n$ $\quad$ 10^{th} term $= 103 - 100 = 3$ $\quad$ 25^{th} term $= 103 - 250 = -147$

3) $31, 29, 27, 25, \ldots$

n^{th} term $= 33 - 2n$ $\quad$ 10^{th} term $= 33 - 20 = 13$ $\quad$ 25^{th} term $= 33 - 50 = -17$

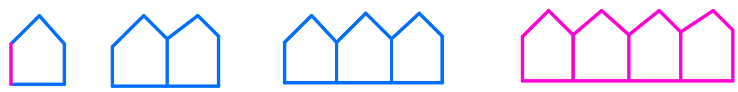
4) $54, 48, 42, 36, \ldots$

n^{th} term $= 60 - 6n$ $\quad$ 10^{th} term $= 60 - 60 = 0$ $\quad$ 25^{th} term $= 60 - 150 = -90$

5) $-6, -8, -10, -12, \ldots$

n^{th} term $= -4 - 2n$ $\quad$ 10^{th} term $= -4 - 20 = -24$ $\quad$ 25^{th} term $= -4 - 50 = -54$

Linear Sequences Involving Patterns



5   9   13   17

n^{th} term $= 4n + 1$