SEQUENCES

Note Title 19/01/2010

'Next term' rules

Examples

① 3, 7, 11, 15, 19, 23

Rule: 'add 4'

② 2, 6, 18, 54, 162, 486

Rule: 'multiply by 3'

③ 4, 5, 7, 10, 14, 19, 25

Rule: 'add one more each time ie, +1, +2, +3 ...'

Sometimes the rule depends on the previous two numbers

④ 2, 5, 7, 12, 19, 31, 50

Rule: 'add the previous two numbers'

⑤ 1, 2, 5, 12, 29, 70, 169

Rule: 'double the previous number and add the one before'

⑥ 6, 7, 19, 33, 71, 137, 279

Rule: "double previous, take 5; double previous, add 5 (alternately)"

OR Rule: "add the previous number to twice the one before that"

[TWO DIFFERENT rules for the same sequence.]

'Next term' rules have a disadvantage: if we wanted to find the 100th term, we need to work out the previous 99 terms first.

"nth term" rules

Examples Find the first 5 terms and the 100th term of each sequence:

① n^{th} term $= 3n - 2$

Term number (n)	1st	2nd	3rd	4th	5th	...	100th
Term	1	4	7	10	13	...	298

② n^{th} term $= n^2 + n$

Term number (n)	1	2	3	4	5	...	100
Term	2	6	12	20	30	...	10100

linear sequences have the same gap between each pair of terms.

Their n^{th} term rule is always $an + b$

The gap between terms is equal to a

The "0th term" (if there was one) is equal to b.

Examples

① Find the n^{th} term of each of the following sequences:

(a) 5, 8, 11, 14, 17, ...

gap = 3 "0^{th} term" = 2

n^{th} term = $3n + 2$

(b) 2, 7, 12, 17, 22, ...

gap = 5, "0^{th} term" = -3

n^{th} term = $5n + -3$

$= 5n - 3$

(c) 27, 23, 19, 15, 11, ...

gap = -4 "0^{th} term" = 31

n^{th} term = $-4n + 31$

We can write this as n^{th} term = $31 - 4n$ which looks neater.