Sequences

$a_n = \{1, 2, 3, 4, 5, 6, 7, \ldots\}$

continue the pattern you see.

a_3 = "3rd term of the sequence"

$a_3 = 3$

Ex $b_n = \{2, 4, 6, 8, 10, \ldots\}$

$b_5 = 10$

5th term of the sequence.

Some sequences have nice general term/formula.

$$b_n = 2n$$

$$b_{101} = 2(101) = 202$$

Ex $O_n = \{1, 3, 5, 7, 9, 11, \ldots\}$

$O_n = 2n+1$ if we start at $n=0$

or

$O_n = 2n-1$ if we start at $n=1$.

Ex $X_n = \{-2, 4, -6, 8, -10, 12 \ldots\}$

$$X_n = (-1)^n 2n$$

Ex no general term.

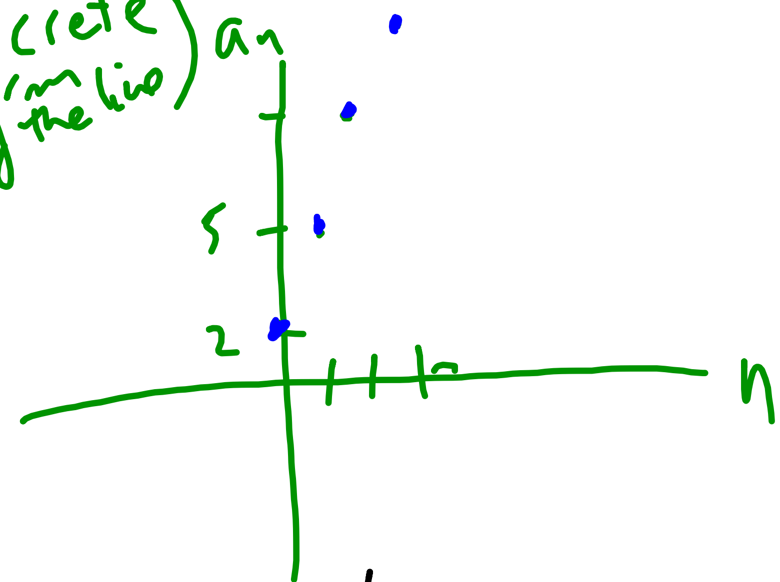
Conway Sequence:

"Read aloud" sequence

1, 11, 21, 1211, 111221, 312211

Arithmetic sequences (lines)
and
Geometric sequences. (exponentials)

$a_n = 3n + 2$ (discrete form of the line)



6 terms:

$a_0 = 2$
$a_1 = 5$
$a_2 = 8$
$a_3 = 11$
$a_4 = 14$
$a_5 = 17$

d is the common difference (slope).

$$\boxed{\begin{gathered} a_n = 5 + 3(n-1) \\ a_n = 3n + 2 \end{gathered}}$$

$a_n = a_1 + d(n-1)$

Geometric Sequences (exponential)

$$a_n = 3\left(\frac{1}{2}\right)^n$$

$a_1 = \frac{3}{2}$

$a_2 = \frac{3}{4}$

$a_3 = \frac{3}{8}$

$a_4 = \frac{3}{16}$

$a_5 = \frac{3}{32}$

$\frac{a_2}{a_1} = \frac{3}{4} \cdot \frac{2}{3} = \frac{1}{2}$

$\frac{a_5}{a_4} = \frac{3}{32} \cdot \frac{16}{3} = \frac{1}{2}$

$a_0 = 3$

$$\boxed{\begin{aligned} a_n &= a_0 r^n \\ a_n &= a_1 r^{n-1} \end{aligned}}$$

<u>book</u>: $a_n = a_1 r^{n-1}$

Recursively defined sequences.

Ex Fibonacci:

$$X_n = X_{n-1} + X_{n-2}$$

note: the rule to generate X_n is given by knowing previous

$X_1 = 1, X_2 = 1, X_3 = 2, X_4 = 3, X_5 = 5$

Ex $X_1 = 3$ $\quad X_n = 2X_{n-1} + 2$

$X_2 = 2(3)+2 = 8$ $\quad X_5 = 78$

$X_3 = 2(8)+2 = 18$ $\quad X_6 = 158$

$X_4 = 2(18)+2 = 38$

$X_n =$

6