

## Linear Relation Notes

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A linear recurrence relation has the format

$$U_{n+1} = m U_n + c$$

$m$  = a constant known as a multiplier

$c$  = a constant

$U_{n+1}$  = next term in the sequence.

Note that it is not enough just to know the recurrence relation; we have to know the first term in the sequence. Different starting points gives different sequences for the same recurrence relations.

1. If the multiplier ( $m$ ) has modulus (magnitude) less than 1 then the sequence will converge to a number as  $n$  tends to infinity.
2. To work out this limiting number, ( $L$ ) say, we solve the following linear recurrence relation.

$$L = m \cdot L + c$$

$$L - m \cdot L = c$$

$$L \cdot (1 - m) = c$$

$$L = \frac{c}{(1 - m)} \quad \text{where} \quad |m| < 1$$