Geometric Sequences ~ 1.3

RECALL: ARITHMETIC Sequences:

$t_n = t_1 + (n-1)\cdot d$

- t_n: The term that we want/know
- t_1: 1st term
- $(n-1)$: what term we are on
- d: common difference

General: $t_n = 3n + 8$ (put the t_1 & d in and simplify)

Geometric:

1, 4, 16, 64, ... (×4 ×4 ×4) mult by 4

Common ratio

125, 25, 5, 1, $\frac{1}{5}$, ... (÷5 ÷5) mult by $\frac{1}{5}$

$= \frac{25}{125} = \frac{1}{5}$

$\frac{1}{5} = \frac{1}{5}$

Ex 1 3, 6, 12, 24, ...

$t_1 = 3$

$r = 2$

$t_1 = 3$

$t_2 = 3 \cdot 2^1 = 6$

$t_3 = 3 \cdot 2^2 = 12$

$t_4 = 3 \cdot 2^3 = 24$

$\vdots$

$t_{30} = 3 \cdot 2^{29}$

$\vdots$

$t_n = t_1 \cdot r^{n-1}$

So:

Geometric Sequences

$t_n = t_1 \cdot r^{(n-1)}$

- t_n: term we want
- t_1: 1st term
- r: common Ratio
- $(n-1)$: exponent

Ex: 10, 20, 40, 80, ...

$t_n = t_1 \cdot r^{n-1}$

$t_1 = 10$
$r = 2$

(a) $t_{11} = 10 \cdot 2^{10}$

$= 10 \cdot 1024 = 10240$

(b) General term, t_n
↳ means put in t_1 and r, but leave n as n

$t_n = t_1 \cdot r^{n-1}$

$t_n = 10 \cdot 2^{n-1}$

Ex $t_3 = 54$

$t_6 = -1458$

find: t_1, t_2, t_3 and r

method 1

54, ___, ___, -1458

t_3 r t_4 r t_5 r t_6

$-1458 = 54 \cdot r \cdot r \cdot r$

$\frac{-1458}{54} = \frac{54r^3}{54}$

$r^3 = -27$

$r = -3$

t_1, t_2, t_3

$t_3 = t_1 \cdot r^2$

$\downarrow$

$54 = t_1 \cdot (-3)^2$

$\frac{54}{9} = \frac{t_1 \cdot 9}{9}$

$t_1 = 6$

$t_2 = -18$

$t_3 = 54$

Method 2

$t_6 = t_1 \cdot r^5 \longrightarrow$

$t_3 = t_1 \cdot r^2 \longrightarrow$

$\frac{-1458 = t_1 \cdot r^5}{54 = t_1 \cdot r^2}$ divide

$-27 = r^3$

$r = -3$

If $t_1 = 1$ and $t_6 = 32$, find r

$$t_n = t_1 \cdot r^{n-1}$$

$$32 = (1) \cdot r^5$$

$$32 = r^5$$

$$r = 2$$