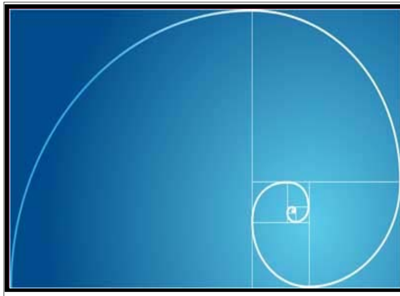
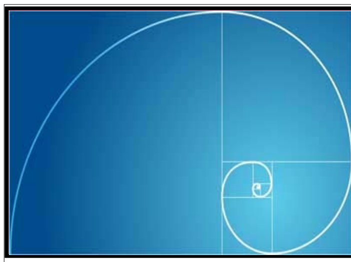


Unit 6: Sequences and Series

6.3 Geometric Sequences

Geometric Sequences - an ordered list of numbers where the next number in the sequence is determined by multiplying the previous number by a **common ratio**

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



Ex.) Bacteria reproduce by splitting in two so that one cell gives rise to 2, then 4, then 8 cells, and so on, producing a geometric sequence. Suppose there were 9 bacteria originally present in a bacteria sample.

a) State the values for t_1 and r in the geometric sequence.

$t_1 = 9$
$r = 2$

9, 18, 36, ...

b) Determine the general term to the geometric sequence.

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

$$\boxed{t_n = 9(2)^{n-1}}$$

Ex.) You have a photo that measures 25 cm. The smallest size a certain photocopier can reduce a photo is 67% (0.67) of the original. To the nearest tenth of a centimetre, what is the shortest possible length of the photograph after 5 reductions?

$t_1 = 25$

$r = 0.67$

$25, 16.75, 11.2225, \ldots$

t_1: original size

t_2: 1st reduction

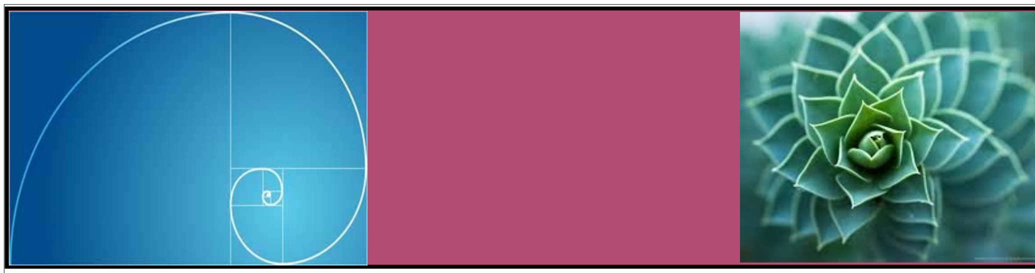
⋮

t_6: 5 reductions

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

$t_6 = 25 \cdot (0.67)^{6-1}$

$\boxed{t_6 = 3.4\text{cm}}$



Ex.) In a geometric sequence, the third term is 54 and the sixth term is -1458. Determine the values of t_1 and r, and list the first three terms of the sequence.

$\div r \quad \div r \quad \times r \quad \times r \quad \times r$

$\underline{6}, \underline{-18}, \underline{54}, \underline{\quad}, \underline{\quad}, \underline{-1458}.$

$54 \times r \times r \times r = -1458$

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

$\sqrt[3]{r^3} = \sqrt[3]{-27}$

$\boxed{t_1 = 6} \quad \boxed{r = -3}$

Ex.) A town's population of 10 000 increases 2.5% every year. Determine the general term created by this geometric pattern.

0.025

$t_1 = 10\,000$

$r = 1.025$

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

$\boxed{t_n = 10000(1.025)^{n-1}}$

Ex.) Same town but decreases 2.5 %/year.

97.5% stay.

$t_1 = 10\,000$

$r = 0.975$

$\boxed{t_n = 10000(0.975)^{n-1}}$

Pg. 39 # 1-6, 9, 10, 12, 17.