<u>IB Math Studies 1   BELL WORK</u>

$u_n = u_1 r^{n-1}$

1) Find the first term of the geometric sequence 2, 6, 18, 54, ... which exceeds 10 000.

9th term

13122

$u_n = 2(3)^{n-1}$

$10000 = 2(3)^{n-1}$

$5000 = 3^{n-1}$

$\frac{\log 5000}{\log 3} = n-1$

$\log_3 5000 = n-1$

$7.75 = n-1$

$n = 8.75$

2) Find the first term of the geometric sequence

$4, 4\sqrt{3}, 12, 12\sqrt{3}, \ldots$ which exceeds 4800.

$u_n = u_1 r^{n-1}$

$u_1 = 4$

$r = \sqrt{3}$

$\frac{4800}{4} = \frac{\cancel{4}}{\cancel{4}}(\sqrt{3})^{n-1}$

$1200 = (\sqrt{3})^{n-1}$

$\log_{\sqrt{3}} 1200 = n-1$

$12.99 = n-1$

$13.99 = n$

14^{th} term

$4(\sqrt{3})^{14-1}$

$5050.66 \approx 5050$

Back to 5 D notes...

A geometric sequence has $u_2 = -6$ and $u_5 = 162$. Find its general term.

$$u_n = u_1 r^{n-1}$$

$$-6 = u_1 r^1 \qquad 162 = u_1 r^4$$

$$\frac{162}{-6} = \frac{\cancel{u_1} r^4}{\cancel{u_1} r^1}$$

$$-27 = r^3 \qquad r = -3$$

$$u_n = 2(-3)^{n-1}$$

GEOMETRIC SEQUENCE PROBLEMS

Problems of **growth and decay** involve repeated multiplications by a constant number. We can therefore model the situations using geometric sequences.

The initial population of rabbits on a farm was 50.
The population increased by 7% each week. 0.07

a How many rabbits were present after:

  i 15 weeks **ii** 30 weeks?

b How long would it take for the population to reach 500?

$r = 1.07$ $u_1 = 50$

$u_n = 50(1.07)^{n-1}$

b) $\frac{500}{50} = \frac{50(1.07)^{n-1}}{50}$

$10 = 1.07^{n-1}$

$\log_{1.07} 10 = n - 1$

$n \approx 35.03$

36 weeks

a) i) 128.93

$= 128$ rabbits

ii) 355 rabbits