The log of a no. is the power which the base must be raised by to get the no.

$\log_{\square} \square$

$3^2 = 9 \Leftrightarrow 2 = \log_3 9$

power, Base

$$\boxed{b^n = a \Leftrightarrow n = \log_b a}$$

$3^{\square} = 9$ $\log_3 9 = 2$

$3^{\square} = 81$ $\log_3 81 = 4$

Example 5

Find the number of terms in the geometric sequence $81, 27, 9, \ldots \frac{1}{27}$.

T_1 ... T_8

$81, 27, 9, 3, 1, 1/3, 1/9, 1/27$

$\times\frac{1}{3}$

8 terms

$\boxed{T_n = ar^{n-1}}$

$T_n = \frac{1}{27}$

$n = ?$

$a = 81$

$r = \frac{1}{3}$

use logs

$b^n = a \Leftrightarrow n = \log_b a$

$(81)\left(\frac{1}{3}\right)^{n-1} = \frac{1}{27}$

$\left(\frac{1}{3}\right)^{\boxed{n-1}} = \frac{1}{2187}$

$n - 1 = \log_{\boxed{\frac{1}{3}}} \boxed{\frac{1}{2187}}$

$n - 1 = 7$

$n = 8$

Use of logs

€100 Present value

3% A.E.R.

How long till value €1000

$$F = P(1+i)^t$$

$$1000 = 100(1 \cdot 03)^t$$

$$10 = 1 \cdot 03^t$$

$$t = \log_{1 \cdot 03} 10$$

$t \simeq 78$ years

20. The value, A, of an investment is given by $A = P(1 + i)^t$ where P is the sum on deposit, t the number of years and i the rate of interest, expressed as a decimal.
Given that over a 10 year period €2500 on deposit amounted to €3047, calculate the rate of interest (correct to 1 place of decimals).

$A =$ €3047
$P =$ €2500
$t = 10$
$i = ?$

$$3047 = 2500(1+i)^{10}$$

$$\frac{3047}{2500} = (1+i)^{10}$$

$$\sqrt[10]{\frac{3047}{2500}} = 1 + i$$

$$i = \sqrt[10]{\frac{3047}{2500}} - 1$$

$$= 0 \cdot 01998$$

$$= 1 \cdot 998\%$$

$$\approx 2\%$$