(4) $$t = \frac{\text{Log. A} - \text{Log. P}}{\text{Log. } (1+r)}$$

(5) Also the interest, $= A - P = P\{(1+r)^t - 1\}$

II.—To find the *amount* and *present value* of an *Annuity* or *periodical payment* for a given time, at a given rate per cent. Compound Interest.

Let p = Annual or periodic payment.
A = Amount of the annuity or periodic payment increased at compound interest to the end of the time.
v = the present value of the annuity.
$R = (1+r)$ = the amount of $1 for one period.
And t = the number of years or periods of payment.

(6) Then $A = p\left(\frac{R^t - 1}{R - 1}\right)$ whence Log. A = Log. p + Log. $(R^t - 1)$ − Log. r

(7) and $v = \frac{p(R^t - 1)}{R^t(R-1)} = \frac{1}{R^t}$ A, whence Log. v = Log. p + Log. $(R^t - 1)$ − Log. r − t Log. R

(8) ∴ also $A = vR^t$ and Log. A = Log. v + t Log. R

(9) Transposing $\text{Log. R} = \frac{\text{Log. A} - \text{Log. } v}{t}$

(10) (From 6) Transposing, $p = \frac{A\,r}{R^t - 1}$ whence Log. p = Log. A r − Log. $(R^t - 1)$

(11) $$t = \frac{\text{Log. } (A\,r + p) - \text{Log. } p}{\text{Log. R}}$$

Formula, Table VII.

A = Annuity or yearly Instalments.
S = Sinking Fund.
M = Cost of Management.
t = Time or number of years or terms.
r = Interest on $1.00 for 1 year or term.
$R = (1 \times r)$ amount of $1.00 for 1 term.
C = $100 (or amount borrowed).

Then $A = M + \frac{C\,R^t\,r}{R^t - 1}$

EXAMPLE.—What Annuity or yearly Instalment will repay $100 in 10 years, Cost of Management being 1%. and Interest 6%.

$$A = 1 + \frac{100 \times 1{\cdot}06^{10} + {\cdot}06}{1{\cdot}06^{10} - 1}$$

Log. $(1{\cdot}06^{10})$ ·0253058653 × 10 =	·2530586
+ Log. 100 × 06 =	·7781513
	1·0312099
Less Log. $1{\cdot}06^{10}$ = ·2530586 = 1·79085 − 1 = ·79085 Log. =	$\bar{1}{\cdot}8980969$
Log. 13·59 =	1·1331130

∴ A = 1 + 13·59 = 14·59.