Given $d = \alpha \beta^t$ — — ①

Comparing eqt ① to ~~~~ $y = mx + c$

$\log D = \log \alpha + t \log \beta$

where; $a_0 = \log \alpha$

$a_1 = \log \beta$

	$y = \log d$	$t = x$	xy	$d(m)$	x^2	y^2
1	0.301029996	0	0	0	0	0.09061905
2	0.6989700004	1	0.6989700004	1	1	0.4885590067
3	1.278753601	2	2.557507202	2	4	1.635210772
4	1.6989700004	3	5.096910013	3	9	2.886499076
5	2.178976947	4	8.715907789	4	16	4.747940537
6	2.672097858	5	13.36048929	5	25	7.140106962
7	3.156851909	6	18.94111142	6	36	9.965713925
8	3.654369091	7	25.58058364	7	49	13.35441345
9	4.11180007	8	32.89440006	8	64	16.9068993
10	4.614163911	9	41.5269532	9	81	21.28997336
11	5.045405135	10	50.45405135	10	100	25.4611297

$\Sigma y = 29.41133046$

$\Sigma x = 55$

$\Sigma xy = 199.8268839$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.9620485$

$\Sigma y^2 = a_0 N + a_1 \Sigma x$

$29.41133046 = a_0(11) + a_1(55)$

$\Sigma xy = a_0 \Sigma x_1 + a_1 \Sigma x^2$

$1998268839 = a_0(55) + a_1(385)$ — — ②

solving eqt (1) and eqt (2)

$$29.41133046 = 11a_0 + 55a_1$$

$$199.8268839 = 55a_0 + 385a_1$$

$$a_0 = \frac{\begin{vmatrix} 29.41133046 & 55 \\ 199.5268839 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$= \frac{(29.41133046)(385) - (55)(199.8268839)}{(11 \times 385) - (55 \times 55)}$$

$$a_0 = 0.27511$$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.41133046 \\ 55 & 199.8268835 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$a_1 = \frac{(11 \times 199.8268835) - (29.41133046 \times 55)}{(11 \times 385) - (55 \times 55)}$$

$$a_1 = 0.47973$$

$a_0 = \log \alpha$

$0.27511 = \log \alpha$

$\alpha = 1.8841$

$a_1 = \log \beta$

$0.47973 = \log \beta$

$\beta = 3.0181$

$$\alpha = 1.8841$$

$$\beta = 3.0181$$

(d) Correlation Co-efficient

$$R = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X^2)(N\Sigma X^2 - (\Sigma Y)^2)}}$$

$$R = \frac{(11 \times 199.8268839) - 55(29.41133046)}{\sqrt{(11 \times 385 - 55^2) \times [11 \times 103.9620485 - (29.41133046)^2]}}$$

$$R = 0.9998448312$$

$$R_{square} = (0.999844312)^2$$

$$= 0.9996896864$$

Scanned with CamScanner

For manual method

$R = 0.999844831 2$

$R^2 = 0.99968968 64$

For mat lab;

$R = 0.9998$

$R^2 = 0.9997$

For excel,

$R = 0.99984483235763$

$R^2 = 0.999689688792257$

(d) From observation for all the methods used to solve the correlation coefficient and its square, it can be seen that $R^2 < R$ i.e the value of the square of the correlation coefficient is lesser than the actual value of the correlation coefficient.