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
0.301029996	0	0	0	0	0.09061905
0.698970004	1	0.698970004	1	1	0.488559067
1.278753601	2	2.557507202	2	4	1.635210772
1.698970004	3	5.096910013	3	9	2.886499076
2.178976947	4	8.715907789	4	16	4.747940537
2.672097858	5	13.36048929	5	25	7.140106962
3.156851901	6	18.94111142	6	36	9.965713925
3.654369091	7	25.58058364	7	49	13.35441345
4.11180007	8	32.89440006	8	64	16.9068993
4.614163911	9	41.5269532	9	81	21.28997336
5.04540513	10	50.45405135	10	100	25.4611297

$\Sigma y = 29.41133046$

$\Sigma x = 55$

$\Sigma xy = 199.8268839$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.9620485$

$\Sigma y = a_0 n + a_1 \Sigma x$

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

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

$199.8268839 = a_0(55) + a_1(385)$ — — ②

solving eqn ① and eqn ②

$$29.4113046 = 11a_0 + 55a_1$$

$$199.8268839 = 55a_0 + 385a_1$$

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

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

$$a_0 = 0.27511$$

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

$$a_1 = \frac{(11 \times 199.8268835) - (29.41133046 \times 55)}{(11 \times 385) - (58 \times 55)}$$

$$a_1 = 0.47973$$

$a_0 = \log \alpha$

$0.27511 = \log \alpha$

$\alpha = 1.8841$

$a_1 = \log \beta$

$0.47973 = \log \beta$

$\beta = 3.0181$

$$\alpha = 1.8841$$

$$\beta = 3.0181$$

Correlation Co-efficient

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

$$R = \frac{(11 \times 199.8268839) - 55(29.41133046)}{\sqrt{(11 \times 385 - 55^2) \times [11 \times 103.9620485 - (29.4133046)^2]}}$$

$$R = 0.9998448312$$

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

$$= 0.9996896864$$

For manual method

$R = 0.99984448312$

$R^2 = 0.99968968864$

For matlab;

$R = 0.9998$

$R^2 = 0.9997$

For excel,

$R = 0.99984483235763$

$R^2 = 0.9996896887922257$

(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.

t(hr)	d(m)	ln(d)	ln(d)sim	ln(d)simerror	ln(d)merror
0	2	0.693147	0.633465	-5.523089	-5.463407
1	5	1.609438	1.738083	-4.418471	-4.547116
2	19	2.944439	2.842701	-3.313853	-3.212115
3	50	3.912023	3.947318	-2.209235	-2.244531
4	151	5.01728	5.051936	-1.104618	-1.139274
5	470	6.152733	6.156554	0.000000	-0.003821
6	1435	7.26892	7.261171	1.104618	1.112366
7	4512	8.414496	8.365789	2.209235	2.257942
8	12936	9.467769	9.470407	3.313853	3.311216
9	41125	10.62437	10.57502	4.418471	4.467818
10	111021	11.61747	11.67964	5.523089	5.460921
	dmean	ln(d)mean		sum	sum
	15611.45	6.156554		134.2198329	134.261496
				R	Rsquared
				0.99984483	0.99968969

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99984483
R Square	0.99968969
Adjusted R Squ	0.99965521
Standard Erro	0.06803826
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	134.219833	134.219833	28994.1419	4.2259E-17
Residual	9	0.04166285	0.00462921		
Total	10	134.261496			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	0.63346515	0.03837876	16.5056196	4.9026E-08	0.54664637	0.720284	0.546646	0.720284
X Variable 1	1.10461772	0.00648719	170.276663	4.2259E-17	1.08994266	1.119293	1.089943	1.119293