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16/Eng06/007
ENG 382

Given $d = \alpha \beta^{t}$ —— ①

Comparing equ (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(cm)	x^2	Y^2
0.301029996	0	0	0	0	0.09061905
0.698970004	1	0.69897004	1	1	0.48855906
1.278753601	2	2.597507202	2	4	1.635210772
1.698970004	3	50.96910013	3	9	2.886499076
2.178976947	4	8.715907789	4	16	4.747940537
2.67209758	5	13.36048929	5	25	7.14010 6982
3.1568519091	6	18.9411141	6	36	9.965713925
3.654369091	7	25.58058364	7	49	13.3544 1345
4.111800007	8	32.8944006	8	64	16.9068993
4.614165911	9	41.5269532	9	81	21.28997336
5.045405135	10	50.45405135	10	100	25.45611297

$\sum Y = 29.41133046$

$\sum x = 55$

$\sum xY = 199.8268839$

$\sum x^2 = 385$

$\sum Y^2 = 103.9620485$

$\sum Y = a_0 N + a_1 \sum x$

$29.41133046 = a_0(11) + a_1(55)$ —— ①

$\sum xY = a_0 \sum x_1 + a_1 \sum x^2$

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

$29.41133046 = 11a_0 + 55a_1$

$199.8268839 = 55a_0 + 385a_1$

$$a_0 = \frac{\begin{vmatrix} 29.41133046 & 55 \\ 199.8268839 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

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

$= 0.27511$

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

$a_0 = \log \alpha$ $\qquad$ $a_1 = \log \beta$

$0.27511 = \log \alpha$ $\qquad$ $0.47973 = \log \beta$

$\alpha = 1.8841$ $\qquad$ $\beta = 3.0184$

Correlation Co-efficient

$$R = \frac{N \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[(N \Sigma x^2 - (\Sigma x^2)][N \Sigma x^2 - (\Sigma y)^2]}}$$

$$R = \frac{(11 \times 199.8268839) - (55 \times 29.41133046)}{\sqrt{(11 \times 385 - 55^2) \times [(11 \times 103.9620488) - (29.41133046^2)}}$$

$= 0.9998448312$

R Square $= (0.9998498312)^2 = 0.9996896864$

For manual method

$R = 0.9998448312$

$R^2 = 0.9996896864$

For Matlab

$R = 0.9998$

$R^2 = 0.9997$

For Excel

$R = 0.99984483235763$

$R^2 = 0.99968968792257$

d. From the
used to solu
and its squ
$R^2 < R$ (i.
the correla
than the
correlatio

d. From the 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