t x	d ay	log d (y)	y(x)	x^2	y^2
0	2	0.30103	0	0	0.0906 19
1	5	0.69897	0.69897	1	0.488559
2	19				
3	50	1.278754	2.557507	4	1.635211
4	151	1.69897	5.09691	9	2.886499
5	470	2.175777	8.715928	16	4.747941
6	1435	2.672098	13.36049	25	7.140107
7	4512	3.156852	18.94111	36	9.965714
8	12936	3.654369	25.58058	49	13.13441
9	41125	4.1118	32.8944	64	16.9096
10	111021	4.614126	41.52692	81	21.25997
		5.043404	50.43405	100	25.46511
55	171726	29.41135	199.5269	385	103.962

$29.41133 = 11a_0 + 55a_1$ ——— (1)

$199.8269 = 55a_0 + 385a_1$ ——— (2)

$29.41133 - 5a_1 = 11a_0$

$a_0 = \dfrac{29.41133 - 55a_1}{11}$ ——— (3)

Sub eqn 3 into 2 we have

$199.8269 = 85\left(\dfrac{29.41133 - 55a_1}{11}\right) + 385a_1$

$199.52692 = 5(29.41133 - 55a_1) + 385a_1$

$199.52692 = 142.05662 - 275a_1 + 385a_1$

$199.8269 - 147.05665 = 385a_1 - 275a_1$

$52.77025 = 110a_1$

$a_1 = \dfrac{52.77025}{110}$

$\cdot\ a_1 = 0.4797$

But a_0, it would be

$$a_0 = \frac{29.41133 - 55(0.4797)}{11}$$

$$a_0 = 0.2752$$

$a_0 = \log \alpha$

$\alpha = \log^{-1} a_0$

$\alpha = \log^{-1} 0.2752$

$\alpha = 1.8845$

$a_1 = \log \beta$

$\beta = \log^{-1} a_1$

$\beta = \log^{-1} 0.4797$

$\beta = 3.0179$

Correlation coefficient $R = \dfrac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{(N\Sigma x^2 - \Sigma x)^2 (N\Sigma y^2 - \Sigma y)^2}}$

$$R = \frac{(11 \times 199.8209) - (55 \times 29.41133)}{\sqrt{[(11 \times 385) - 55]^2 \, [(11 \times 103.962) - 29.41133]^2}}$$

$R = 0.9998460887$

$R^2 = (0.998460887)^2$

$R^2 = 0.9996922011$

$R = 0.9998$

The above answer shows that $R^2 < R$ because the value of the square of the correlation coefficient is less than the actual value of the correlation coefficient

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Assignment 6

Solution

t (hr)	d(m)
0	2
1	5
2	19
3	50
4	151
5	470
6	1435
7	4512
8	12936
9	41125
10	111021

$d = \alpha\beta^t$

$\log d = \log\alpha + \log\beta^t$ (taking the log of both sides)

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

where

$y = a_0 + a_1 x$

$a_1 = \log\beta$, $x = t$, $a_0 = \log\alpha$, $y = \log d$

$yx = a_0 x + a_1 x^2$

$\Sigma y = n a_0 + a_1 \Sigma x$ ——— (1)

$\Sigma xy = a_0 \Sigma x + a_1 \Sigma x^2$ ——— (2)

where $n = 11$

From the table,

$\Sigma x = 55$

$\Sigma y = 29.413$

$\Sigma xy = 199.8269$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.962$