X_i	Y_i	X_i^2	Y_i^2	X_iY_i
70	83	4900	6889	5810
80	88	6400	7744	7040
67	73	4489	5329	4891
54	72	2916	5184	3888
88	80	7744	6400	7040
64	67	4096	4489	4288
54	56	2916	3136	3024
73	81	5329	6561	5913
90	87	8100	7569	7830
74	79.	5476	6241	5846
Total 714	766	52366	59542	55570.

(a) $\hat{\beta}_1 = \dfrac{S_{XY}}{S_{XX}} = \dfrac{\sum_{i=1}^{n} X_iY_i - \frac{(\sum_{i=1}^{n} X_i)(\sum_{i=1}^{n} Y_i)}{n}}{\sum_{i=1}^{n} X_i^2 - \frac{(\sum_{i=1}^{n} X_i)^2}{n}}$

$$= \frac{55570 - \frac{(714 \times 766)}{10}}{52366 - \frac{714^2}{10}} = 0.633$$

$\hat{\beta}_0 = \bar{Y}_i - \hat{\beta}_1 \bar{X}_i = 76.6 - 0.633 \times 71.4 = 31.4.$

$\Rightarrow$ 方程為 $\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i = 31.4 + 0.633 X_i$ #

(b). $H_0 = \beta_1 = 0.$

$H_1 = \beta_1 \neq 0$

拒絕 H_0 if $T > t_{\alpha/2}(n-2).$

$T = \left|\dfrac{r\sqrt{n-2}}{\sqrt{1-r^2}}\right| = \left|\dfrac{0.801 \times \sqrt{8}}{\sqrt{1-0.801^2}}\right| = 3.78.$

$r = \dfrac{S_{XY}}{\sqrt{S_{XX}}\sqrt{S_{YY}}} = \dfrac{55570 - \frac{(714)(766)}{10}}{\sqrt{52366 - \frac{714^2}{10}}\sqrt{59542 - \frac{766^2}{10}}} = 0.801$

$t_{\alpha/2}(n-2) = t_{0.025}(8) = 2.306.$

從 $\underset{3.78}{T} > \underset{2.306.}{t_{\alpha/2}(n-2)}$，在 $\alpha = 0.05$ 之下拒絕 H_0，具線性相關.

(c) σ^2 估計值 $= MSE = \dfrac{SSE}{n-2.} = \dfrac{S_{YY} - \hat{\beta}_1^2 S_{XX}}{\cancel{n-2}\ n-2} = \dfrac{866.4 - 0.633^2 \times 1386.4}{8} = 38.861$ #.

(d) $\left[\hat{\beta}_1 - t_{\alpha/2}(n-2)\sqrt{MSE/S_{XX}},\ \hat{\beta}_1 + t_{\alpha/2}(n-2)\sqrt{MSE/S_{XX}}\right]$

$= \left[0.633 - 2.306\sqrt{38.861/1386.4},\ \overset{0.633}{\cancel{0.61}} + 2.306\sqrt{38.861/1386.4}\right].$

$= [0.248,\ 1.018]$ 為 β_1 之 95% C.I #