(a) 相關係數 $r = \dfrac{S_{XY}}{\sqrt{S_{XX}}\sqrt{S_{YY}}} = \dfrac{\sum_{i=1}^{n} X_i Y_i - \dfrac{(\sum_{i=1}^{n} X_i)(\sum_{i=1}^{n} Y_i)}{n}}{\sqrt{\sum_{i=1}^{n} X_i^2 - \dfrac{(\sum_{i=1}^{n} X_i)^2}{n}}\sqrt{\sum_{i=1}^{n} Y_i^2 - \dfrac{(\sum_{i=1}^{n} Y_i)^2}{n}}}$

X_i	Y_i	X_i^2	Y_i^2	X_iY_i
40	83	1600	6889	3320
30	60	900	3600	1800
70	138	4900	19044	9660
90	180	8100	32400	16200
50	97	2500	9409	4850
60	118	3600	13924	7080
70	145	4900	21025	10150
40	79	1600	6241	3160
80	158	6400	24964	12640
70	142	4900	20164	9940
Total 600	1200	39400	157660	78800.

$= \dfrac{78800 - \dfrac{600 \times 1200}{10}}{\sqrt{39400 - \dfrac{600^2}{10}}\sqrt{157660 - \dfrac{1200^2}{10}}} = 0.9978.$

($r > 0$，表正相關).

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

$H_1 = \beta_1 \neq 0.$

拒絕 H_0 if $|T| > t_{\alpha/2}(n-2).$

$|T| = \left|\dfrac{r\sqrt{n-2}}{\sqrt{1-r^2}}\right| = \left|\dfrac{0.9978\sqrt{10-2}}{\sqrt{1-0.9978^2}}\right| = \left|\dfrac{2.822}{0.066}\right| = 42.75.$

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

從 $\underset{42.75}{|T|} > \underset{2.306}{t_{\alpha/2}(n-2)}$.，在 $\alpha = 0.05$ 下，拒絕 H_0. ⇒ 有線性相關

(c) $\hat{\beta}_1 = \dfrac{S_{XY}}{S_{XX}} = \dfrac{\sum_{i=1}^{n} X_i Y_i - \dfrac{(\sum_{i=1}^{n} X_i)(\sum_{i=1}^{n} Y_i)}{n}}{\sum_{i=1}^{n} X_i^2 - \dfrac{(\sum_{i=1}^{n} X_i)^2}{n}} = \dfrac{78800 - \dfrac{600 \times 1200}{10}}{39400 - \dfrac{600^2}{10}} = 2$

$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1 \bar{X} = \dfrac{1200}{10} - 2 \times \dfrac{600}{10}$

$= 0$

⇒ 方程式 $= \hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i = 2X_i$ #