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$\bar{x} = 77.625$

$\bar{y} = 3.2125$

$\hat{u}_i = y_i - \hat{y}_i$

$\hat{y}_i = 0.5681 + 0.0341 x_i$

		$(x_i - \bar{x})^2$
0.0836	0.00699	213.89
0.3767	0.1419	37.64
-0.2279	0.0519	0.1406
0.1698	0.0288	11.3906
0.0852	0.0043	57.8906
0.1256	0.0158	6.8906
-0.4256	0.1811	6.8906
0.0629	0.0039	153.1406
		511.875

$$\hat{\beta}_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2} = \frac{17.4375}{511.875} = 0.0341$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = \frac{2.8+3.4+3+3.5+3.6+3+2.7+3.7}{8} - 0.0341\left[\frac{60+54+75+78+84+72+63+79}{8}\right]$$

$$= 3.2125 - 0.0341(77.625)$$

$$= 0.5681$$

$$\hat{y}_i = 0.5681 + 0.0341 x_i$$

$$\sum_{i=1}^{8} y_i - \hat{y}_i = 0.0039 \approx 0$$

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$$\sigma^2 = var(\hat{u}_i) = \frac{\sum \hat{u}_i^2}{n-2} = \frac{0.4346}{8-2} = 0.0725$$

$$var(\hat{\beta}_1) = \frac{\sigma^2}{\sum x_i^2} = \frac{\sigma^2}{\sum (x_i - \bar{x})^2} = \frac{0.0725}{911.876} = 0.0007946$$

$$var(\hat{\beta}_0) = \frac{\sum X_i^2}{n \sum x_i^2} \sigma^2 = \frac{(48717)(0.0725)}{(n)(911.876)} = 0.8625$$

$$\hat{Y}_i = -8.8 + 0.895 X_i$$

$n = 10$

$\bar{x} = 20$ 100
$\bar{y} = 9.1$ 144
196
256
324
484
576
676
784
800
4440

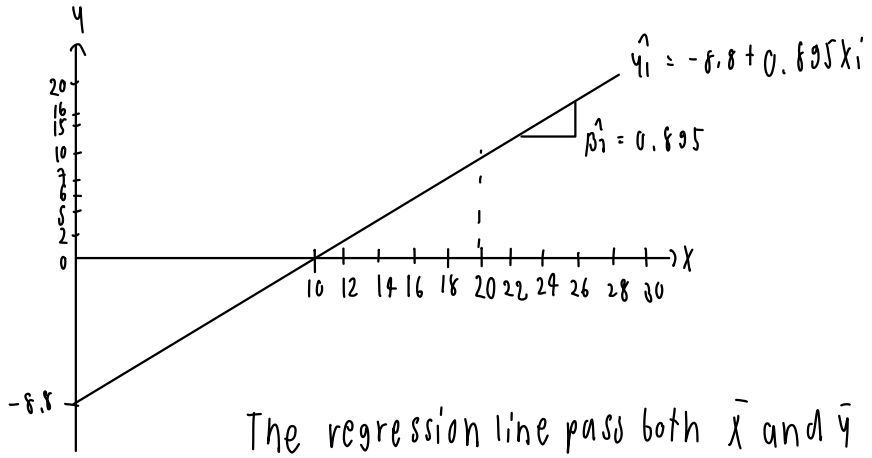
$(x_i - \bar{x})$	$(y_i - \bar{y})$	$(x_i - \bar{x})(y_i - \bar{y})$	$(x_i - \bar{x})^2$	$y_i - \hat{y}$	$\hat{u}_i^2$
-10	-8.1	81	100	-0.15	0.0225
-8	-7.1	56.8	64	0.06	0.0036
-6	-4.1	24.6	36	1.27	1.6129
-4	-3.1	12.4	16	0.48	0.2304
-2	-2.1	4.2	4	-0.31	0.0961
2	0.9	1.8	4	-0.89	0.7921
4	0.9	3.6	16	-2.68	7.1824
6	5.9	35.4	36	0.53	0.2809
8	6.9	55.2	64	-0.26	0.0676
10	10.9	109	100	1.95	3.8025
			440		14.091

$$\hat{\beta}_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2} = \frac{394}{440} = 0.895$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = 9.1 - 0.895(20)$$
$$= 9.1 - 17.9$$
$$= -8.8$$

$$\hat{y_i} = \hat{\beta_0} + \hat{\beta_1} x_i$$
$$= -8.8 + 0.895 x_i$$

$$\sum_{i=1}^{10} y_i - \hat{y}_i = -0.15 + 0.06 + 1.27 + 0.48 - 0.37 - 0.89 - 2.68 + 0.53 - 0.26 + 1.95$$
$$= 0$$



The regression line pass both $\bar{x}$ and $\bar{y}$

$$\hat{y_i} = -8.8 + 0.895(16) = 5.52$$

$$\sigma^2 = var(\hat{u}_i) = \frac{\sum_{i=1}^{10} \hat{u}_i^2}{n-2} = \frac{14.047}{10-2} = 1.7674$$

$$var(\hat{\beta_1}) = \frac{\sigma^2}{\sum x_i^2} = \frac{\sigma^2}{\sum (x_i - \bar{x})^2} = \frac{3.1025}{440} = 0.00705$$

$$var(\hat{\beta_0}) = \frac{\sum x_i^2}{n \sum x_i^2} (\sigma^2) = \frac{440(3.1025)}{10(440)} = 3.1025$$

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FOC w.r.t. to β_1 and get

$$\frac{\partial \left(\Sigma_i (y_i - \beta_1 x_i - u_i)^2 \right.}{\partial \beta_1} \rightarrow 0 = \Sigma_i \, 2(-x_i)(y_i - \beta_i - u_i)$$