Name ANS. AP Statistics LSRL "by hand"

Given the following table of data perform a complete regression analysis.

1. Draw a scatter plot of the data. Comment on what you see.
2. Compute r. Comment on what the value of r tells you.
3. Compute the LSRL.
4. In context to the problem explain the meaning of the slope and the intercept.
5. Draw a residual plot of fits vs residuals. Comment on what you see.
6. Find SSE and SSM.
7. Compute R^2. Comment on what the value of R^2 tells you.
8. Make a prediction for the number of calories in a burger with 40 grams of fat.

As you use formulas and the lists in your calculator, copy the list entries on the table below. The heading of each column should show the formula you used in creating that list. Use as many columns as necessary.

Below is a table of fat vs. calories for a random sample of fast food hamburgers.

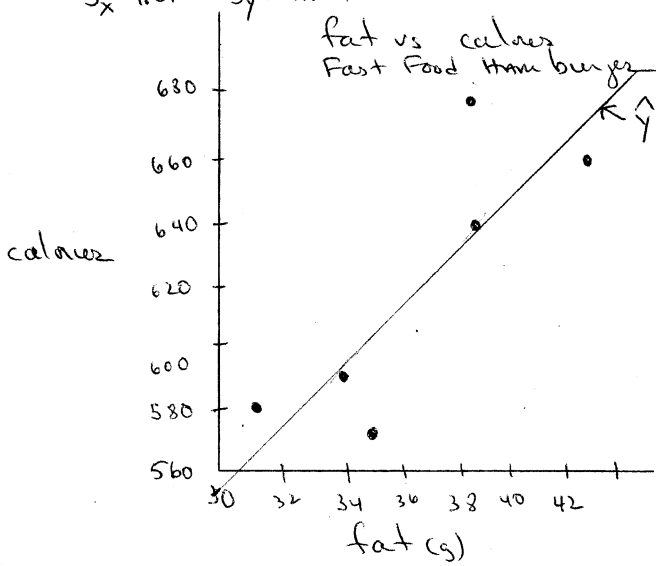
Fat (g) x	Calories y	$\frac{x-\bar{x}}{s_x}$	$\frac{y-\bar{y}}{s_y}$	$\left(\frac{x-\bar{x}}{s_x}\right)\left(\frac{y-\bar{y}}{s_y}\right)$	$\hat{y}$	$y-\hat{y}$	$y-\bar{y}$		
31	580	-1.353	-.8688	1.172	567.84	12.154	-40		
34	590	-.6566	-.6516	.4278	594.66	-4.668	-30		
35	570	-.4246	-1.086	.4611	603.61	-33.61	-50		
39	640	.5034	.4344	.218	639.37	.62837	20		
39	680	.5034	1.3032	.656	639.37	40.628	60		
43	660	1.4136	.8688	1.2437	675.13	-15.13	40		

$\bar{x} = 36.83$ $\bar{y} = 620$

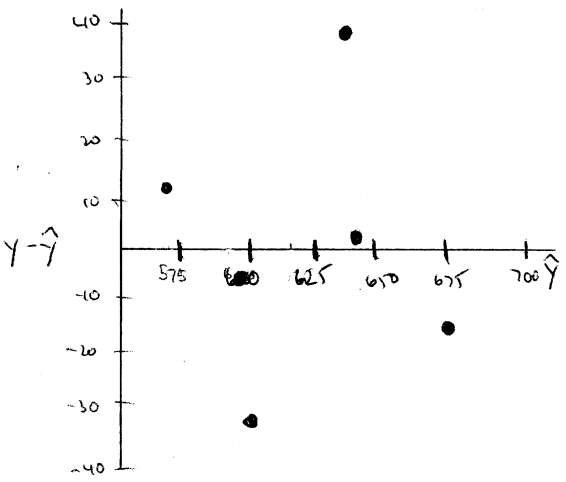
$s_x = 4.31$ $s_y = 46.04$

$\Sigma = 4.1827$

$\Sigma(y-\hat{y})^2 = 3179.17$ $\Sigma(y-\bar{y})^2 = 10600$



moderate, positive, linear trend between fat & calories



Random? as random as 5 points can be.? so the model chosen, linear, appears to be appropriate.

$$r = \frac{\sum\left[\left(\frac{x-\bar{x}}{s_x}\right)\left(\frac{y-\bar{y}}{s_y}\right)\right]}{n-1} = \frac{4.1827}{5} = .836$$

shows that there is a strong, positive, linear relation between fat and calories.

LSRL: $b_1 = .836\left(\frac{46.04}{4.31}\right) = 8.93$

$b_0 = 290.88$

$620 = 8.93(36.83) + b_0$

$290.88 = b_0$

$\hat{y} = 8.93x + 290.88$

$\widehat{\text{calories}} = 8.93\,\text{fat} + 290.88$

slope: For every increase in 1 gram of fat the # of calories will increase by 8.93.

intercept: a hamburger with 0 grams of fat will have 290.88 calories. Fat free hamburger? possible?

$SSE = \sum(y-\hat{y})^2 = 3179.17$

$SSM = \sum(y-\bar{y})^2 = 10600$

$R^2 = \frac{SSM-SSE}{SSM} = .70 = r^2 = (.836)^2$

70% of the variation in calories can be explained by the LSRL of fat content and calories.

$\hat{y}(40) = 648.31$ calories

a burger with 40g fat will have approx. 648.31 calories.