Stat 311: HW on Regression, not due, solutions to be posted before final

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The data in `tensile.csv` comes from Problem 10 in Section 15.7 in the text. Read the text there for background information. Download this file (from our class HW site) and load its data into R via
`tensile <- read.csv("tensile.csv",header=T)`
Make sure the file `tensile.csv` resides in the directory from which you start R.

1. Plot the tensile strength against the curing time, labeling the axes appropriately, i.e.,
   `plot(tensile[,1],tensile[,2],xlab="days",ylab="tensile strength")`

   Do the points appear to follow a simple linear regression model?

2. What is n, the number of plotted points?

3. Make a similar plot of log(tensile strength) against 1/days, labeling the axes correspondingly. Does this plot suggest a simple linear regression model of $y = \log(\text{tensile strength})$ in relation to $x = 1/\text{days}$? For the following let `x <- 1/tensile[,1]` and `y <- log(tensile[,2])`. You can add a fitted regression line to this plot via `abline(lsfit(x,y))`

4. Looking at this last plot, does it suggest that there would be much improvement in tensile strength when using more than 28 days curing time?

5. Find $\sum(x_i-\bar{x})(y_i-\bar{y})$ simply by using `sum((x-mean(x))*(y-mean(y)))`
   and similarly find $\sum(x_i-\bar{x})^2$, where the summations are over $i = 1,\ldots,n$.

6. Find the least squares estimates `beta1.hat` $=\hat{\beta}_1$ and `beta0.hat` $=\hat{\beta}_0$.
   Compare the results with `lsfit(x,y)$coef`.

7. Find the vector `y.hat` $=$ `beta0.hat` $+$ `beta1.hat` $*$ `x` $= (\hat{y}(x_1),\ldots,\hat{y}(x_n))$ of fitted or predicted values for $x_1,\ldots,x_n$, get the vector of residuals $r_i = y_i - \hat{y}(x_i), i = 1,\ldots,n$.
   Compare these with `lsfit(x,y)$resid`. Calculate SS_E and MS_E from these residuals.

8. Get a 95% confidence interval for the slope parameter β_1 in this transformed variables regression situation. Should the hypothesis $H_0 : \beta_1 = 0$ be rejected at level $\alpha = 0.05$?

9. Get a 95% confidence interval for the mean $\mu_y(x = 1/28)$.

10. Transform back the last interval into a corresponding one for tensile strength at 28 days.