03/31/07 CIVL-558 Earthquake And Wind Engineering - CJ Roberts
Homework Assignment #2

2.1) cont.

b.) Plot on semilog paper the return period, 1/N, of earthquakes having magnitude M or greater. Obtain and plot with the data a formula for the return period in the form Log (1/N) = a + b*M.

To obtain the recurrence formula for Log (1/N) = a + b*M the power of the spreadsheet regression analysis was utiliized. Data and the formuls for the return period plotted on Figure 1.1.b.

Table 2.1.b.1
Numerical analysis of Table 2.1.a.3 Data & Recurrence Formula results

N/yr	1/N	Log(1/N)	1/N Recurrence Formula Results
5.40	0.19	-0.73	0.12759
2.90	0.34	-0.46	0.31377
1.50	0.67	-0.18	0.77158
0.70	1.43	0.15	1.8974
0.30	3.33	0.52	4.66591
0.11	9.09	0.96	11.4739
0.03	33.33	1.52	28.2156
0.01	100.00	2.00	69.3849

Regression Output:		
Constant	-4.60654	= b
Std Err of Y Est	0.13482	
R Squared	0.98328	
No. of Observations	8	
Degrees of Freedom	6	
X Coefficient(s)	0.78155	
Std Err of Coef.	0.04161	

Formula for the return period:

$$\log 1/N = -4.60 + 0.78M$$

c.) Based on the data from part a & b, over the next five years what is the chance that an earthquake comparible in magnitude to San Francisco 1906 will occur somewhere in California? Over the next 50 years?

Using Poisson's Distribution Formula solve for the probability of one or more events P(n) = 1 - e^(ut)

Find N for the San Francisco Earthquake Mag., M = 8.2
(Use recurrence formula from 2.1.a.)

N = 0.0158

Years =	5	P(n) =	7.6%
Years =	50	P(n) =	54.5%