

03/31/07 CIVL-558 Earthquake And Wind Engineering - CJ Roberts

Homework Assignment #2

2.1) Shown below are data representing the frequency of earthquake occurrences in California. Use these data to perform the following tasks;

a.) Develop a table showing N, the number of earthquakes per year having a Richter magnitude M or greater. Plot N versus M using a semilog scale. Obtain a recurrence formula of form $\text{Log}(N) = a + bM$. Plot the formula with the data.

Table 2.1.a.1 - Earthquake Data for California, 100 Year Interval

<u>ΔM</u> Magnitude Interval	<u>N', Number of Earthquakes</u>
4.75 - 5.25	250
5.25 - 5.75	140
5.75 - 6.25	80
6.25 - 6.75	40
6.75 - 7.25	19
7.25 - 7.75	8
7.75 - 8.25	2
8.25 - 8.75	1

Compile Table 2.1.a.2 using the total number of events "N" from table 1.1.a.1 with a magnitude "M" or greater and divide the number by 100.

Table 2.1.a.2
Number "N" of Earthquakes of Richter Magnitude "M" or greater per year

M	N
4.75	5.40
5.25	2.90
5.75	1.50
6.25	0.70
6.75	0.30
7.25	0.11
7.75	0.03
8.25	0.01

Use the method of least squares and the spreadsheet data in Table 2.1.a.3 to obtain a recurrence formula of form $\text{Log}(N) = a + bM$. Plot the data and results on Figure 2.1.a.

$$a = 4.61 \quad b = -0.78 \quad \underline{\underline{\log N = 4.60 - 0.78M}}$$

Table 2.1.a.3
Numerical analysis of Table 2.1.a.2 Data & Recurrence Formula results

Log(N/yr)	M*Log(N/yr)	M ²	N/yr. Recurrence Formula Results
0.73	3.48	22.56	7.84
0.46	2.43	27.56	3.19
0.18	1.01	33.06	1.30
-0.15	-0.97	39.06	0.53
-0.52	-3.53	45.56	0.21
-0.96	-6.95	52.56	0.09
-1.52	-11.80	60.06	0.04
-2.00	-16.50	68.06	0.01