1. A chemical engineer desiring to study the evaporation rate of water from brine evaporation beds obtained data on the number of inches of evaporation in each of 55 July days spread over 4 years. The data are given in the following stem and leaf plot, which shows that smallest data value was .02 inches, and the largest .56 inches. (20%)

.0	2, 6
.1	1, 4
.2	1, 1, 1, 3, 3, 4, 5, 5, 5, 6, 9
.3	0, 0, 2, 2, 2, 3, 3, 3, 3, 4, 4, 5, 5, 5, 6, 6, 7, 8, 9
.4	0, 1, 2, 2, 2, 3, 4, 4, 4, 5, 5, 5, 6, 7, 8, 8, 8, 9, 9
.5	2, 5, 6

Find the

(a) sample mean;

(b) sample median;

(c) sample standard deviation of these data.

(d) Do the data appear to be approximately normal?

(e) What percentage of data values are within 1 standard deviation of the mean?

2. The following data represent the relationship between the number of alignment errors and the number of missing rivets for 10 different aircraft. (20%)

Number of Missing Rivets = x	13	15	10	22	30	7	25	16	20	15
Number of Alignment Errors = y	7	7	5	12	15	2	13	9	11	8

(a) Estimate the regression coefficients.

(b) Test the hypotheses that $\alpha = 1$.

(c) Estimate the expected number of alignment errors of a plane having 24 missing rivets.

(d) Compute a 90 percent confidence interval estimate for quantity in (c).

3. Test the hypothesis, at the 0.05 level of significance, that the yearly number of earthquakes felt on a certain island has mean 52 if the readings for the last 8 years are 46, 62, 60, 58, 47, 50, 59, 49. Assume an underlying Poisson distribution and give an explanation to justify this assumption. (10%)

4. A random sample of 500 families was classified by region and income (in units of $1000). The following data resulted.

Income	South	North
0-10	42	53
10-20	55	90
20-30	47	88
>30	36	89

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Determine the p-value of the test that a family's income and region are independent. (10%)

5. To ascertain whether a certain die was fair, 1,000 rolles of the die were recorded, with the following results.

Outcome	Number of Occurrences
1	158
2	172
3	164
4	181
5	160
6	165

Test the hypothesis that the die is fair (that is, $p_i = 1/6$, $i = 1, \ldots, 6$) at he 5 percent level of significance. Use the chi-square approximation. (10%)

6. Determine the maximum likelihood estimator of θ when $X_1, \ldots, X_n$ is a sample with density function (10%)

$$f(x) = \tfrac{1}{2} e^{-|x-\theta|}, \quad -\infty < x < \infty$$

7. Control charts for $\overline{X}$ and S are maintained on the shear strength of spot welds. After 30 subgroups of size 4, $\sum \overline{X_i} = 12{,}660$ and $\sum S_i = 500$. Assume that the process is in control. (20%)

(a) What are the $\overline{X}$-control limits?

(b) What are the S-control limits?

(c) Estimate the standard deviation for the process.

(d) If the minimum specification for this weld is 400 pounds, what percentage of the welds will not meet the minimum specification?