

INTRODUCTORY STATISTICS TEST NUMBER 7

Question 1: (25 points)

A labour economist studied the durations of the most recent strikes in the vehicles and construction industries to see whether strikes in the two industries are equally difficult to settle. To achieve approximate normality and equal variances, the economist worked with the logarithms (to the base 10) of the duration data (expressed in days). In the vehicle industry there were 13 strikes having a mean log-duration of 0.593 and a standard deviation of log-duration of 0.294. In the construction industry there were 15 strikes with a mean log-duration was 0.973 and a standard deviation of log-duration of 0.349. The economist believes that it is reasonable to treat the data as constituting independent random samples.

- a) Construct and interpret a 90 percent confidence interval for the difference in the mean log-durations of strikes in the two industries.
- b) Test whether the strikes in the two industries have the same log-durations, controlling the α risk at 0.10. State the alternatives, the decision rule, the value of the test statistic and the conclusion.
- c) Test the economist's assumption that the log-durations of strikes in the two industries have the same variance controlling the α risk at 0.10. State the alternatives, the decision rule, the value of the test statistic and the conclusion.

Question 2: (25 points)

To see if there was any dependency between the type of professional job held and one's religious affiliation, a random sample of 638 individuals belonging to a national organization of doctors, lawyers and engineers were chosen in a 1968 study. The results were as follows:

	Doctors	Lawyers	Engineers
Protestant	64	110	152
Catholic	60	86	78
Jewish	57	21	10

Test at the 5 percent level of significance the hypothesis that the profession of individuals in this organization and their religious affiliation are independent. Repeat at the 1 percent level.

Question 3: (25 points)

An industrial machine has a 1.5-meter hydraulic hose that ruptures occasionally. The manufacturer has recorded the location of these ruptures for 25 ruptured hoses. These locations, measured in meters from the pump end of the hose, are

1.32	1.07	1.37	1.19	0.13
1.14	1.21	1.16	1.43	0.97
0.33	1.36	0.64	1.42	1.12
1.46	1.27	0.27	0.80	0.08
1.46	1.37	0.75	0.38	1.22

Test whether the probability distribution of the rupture locations is uniform with lowest value $a = 0$ and highest value $b = 1.5$.

Question 4: (25 points)

A study was done on the accuracy of newspaper advertisements by five types of food stores in a southeastern city. On each of four days, items were randomly selected from the advertisements for each type of store and the actual price was compared to the advertised price. Each of the stores in the city was classified as one of the following types: national, regional chain A, regional chain B, regional chain C, or independent. Values in the table below represent the numbers of items that were correctly and incorrectly priced.

Store Type	Number Correctly Priced	Number Incorrectly Priced
National Chain	89	10
Regional Chain A	53	14
Regional Chain B	45	12
Regional Chain C	38	13
Independent	40	7

a) Determine whether these data provide sufficient evidence to conclude that the proportion of correctly priced items differs in at least two types of stores. Use $\alpha = .10$.

b) Use a 95% confidence interval to estimate the proportion of correctly priced items in the stores in the national chain category.