

A S S I G N M E N T 4

Due date: 26 April

1. If you are purchasing small lots of a manufactured computer component and it is very costly to test a single item, it may be desirable to test a sample of items from the lot rather than every item in the lot. Suppose a lot contains ten items. You decide to sample four items and reject the lot (i.e. return it to the manufacturer) if you observe one or more defective items. What is the probability that you will accept the lot when it actually contains four defective items?

2. The specifications for a certain kind of ribbon call for a mean breaking strength of 185 kg. If five pieces randomly selected different rolls have breaking strengths of 171.6, 191.8, 178.3, 184.9, and 189.1 kg, test the null hypothesis $\mu = 185$ kg against the alternative hypothesis $\mu < 185$ kg at the 0.05 significance level.

3. Following are the weights of 12 randomly chosen patients when they began a weight-reducing diet and two weeks later:

Patient	1	2	3	4	5	6	7	8	9	10	11	12
Before	212	193	241	218	205	216	215	198	200	233	258	186
After	195	185	225	199	194	193	205	176	188	224	240	174

We are now interested in all patients.

- (a) Is the mean loss in weight significantly greater than 10 at the 0.05 significance level?
 - (b) Construct a 95% confidence interval for the proportion of patients who lost 15 or more in weight.
4. Independent random samples of students from the Mathematics department and other departments produced the following scores for an IQ test:

Department	Scores										
Mathematics	85	75	83	87	80	79	88	94	87	82	
Others	78	84	81	78	76	83	79	75	85	81	

Use the 0.05 level of significance to test the claim that students from other departments had a lower average than those from the Mathematics department had, assuming that the two population variances are different.

5. A study was conducted to investigate whether that oat bran cereal helps to lower serum cholesterol in hypercholesterolemic males. Fourteen such individuals were randomly placed on a diet which included either oat bran or corn flakes; after two weeks, their low-density lipoprotein (LDL) cholesterol levels were recorded. Each man was then switched to the alternative diet. After a second two week period, the LDL cholesterol level of each individual was again recorded:

Subject	1	2	3	4	5	6	7	8	9	10
Corn flakes	4.61	6.42	5.40	4.54	3.98	3.82	5.01	4.34	3.80	4.56
Subject	11	12	13	14						
Corn flakes	5.35	3.89	2.25	4.24						
Subject	1	2	3	4	5	6	7	8	9	10
Oat bran	3.84	5.57	5.85	4.80	3.68	2.96	4.41	3.72	3.49	3.84
Subject	11	12	13	14						
Oat bran	5.26	3.73	1.84	4.14						

What do you conclude at the 0.05 significance level?

6. Suppose that you wish to compare the characteristics of tuberculosis meningitis in patients infected with the human immunodeficiency virus and those who are not infected. In particular, you would like to determine whether the two populations have the same mean age. A sample of 37 infected patients has mean age 27.9 years and standard deviation 15.6 years; a sample of 19 patients who are not infected has mean age 38.8 years and standard deviation 15.9 years. Assuming that the standard deviations of the two populations are the same, test at the 0.05 significance level whether the two populations have the same mean.
7. A foundry produces steel castings used in the automotive industry. We wish to test the hypothesis that the proportion of defectives from this process is 10% at the 0.05 significance level. In a random sample of 250 castings, 41 were found to be defective. What is the conclusion of the test? Construct a 99% confidence interval for the proportion.