1. Suppose that 10 volunteers have taken an intelligence test; the results obtained are 65, 78, 88, 55, 48, 95, 66, 57, 79, 81. The average score of the entire population is 75 in the same test. Is there any significant difference (with a significance level of 95%) between the sample and population means, assuming that the variance of the population is not known.

2. Comparing two independent sample means, taken from two populations with unknown variance. The following data shows the heights of individuals of two different countries with unknown population variances. Is there any significant difference b/n the average heights of two groups
   Sample 1: 175   168   168   190   156   181   182   175   174   179
   Sample 2: 185   169   173   173   188   186   175   174   179   180

3. The Edison Electric Institute has published figures on the number of kilowatt hours used annually by various home appliances. It is claimed that a vacuum cleaner uses an average of 46 kilowatt hours per year. If a random sample of 12 homes included in a planned study indicates that vacuum cleaners use an average of 42 kilowatt hours per year with a standard deviation of 11.9 kilowatt hours, does this suggest at the 0.05 level of significance that vacuum cleaners use, on average, less than 46 kilowatt hours annually? Assume the population of kilowatt hours to be normal.

4. A random sample of 64 bags of white cheddar popcorn weighed, on average, 5.23 ounces with a standard deviation of 0.24 ounce. Test the hypothesis that $\mu = 5.5$ ounces against the alternative hypothesis, $\mu < 5.5$ ounces, at the 0.05 level of significance.

5. A manufacturer claims that the average tensile strength of thread A exceeds the average tensile strength of thread B by at least 12 kilograms. To test this claim, 50 pieces of each type of thread were tested under similar conditions. Type A thread had an average tensile strength of 86.7 kilograms with a standard deviation of 6.28 kilograms, while type B thread had an average tensile strength of 77.8 kilograms with a standard deviation of 5.61 kilograms. Test the manufacturer's claim using a 0.05 level of significance.

6. The following data represent the running times of films produced by two motion-picture companies:

Company	Time (minutes)						
1	102	86	98	109	92		
2	81	165	97	134	92	87	114

   Test the hypothesis that the average running time of films produced by company 2 exceeds the average running time of films produced by company 1 by 10 minutes against the one-sided alternative that the difference is less than 10 minutes. Use a 0.1 level of significance and assume the distributions of times to be approximately normal with unequal variances.

7. It is claimed that automobiles are driven on average more than 20,000 kilometres per year. To test this claim, 100 randomly selected automobile owners are asked to keep a record of the kilometres they travel. Would you agree with this claim if the random sample showed an average of 23,500 kilometres and a standard deviation of 3900 kilometres?

8. According to a dietary study, high sodium intake may be related to ulcers, stomach cancer, and migraine headaches. The human requirement for salt is only 220 milligrams per day, which is surpassed in most single servings of ready-to-eat cereals. If a random sample of 20 similar servings of a certain cereal has a mean sodium content of 244 milligrams and a standard deviation of 24.5 milligrams, does this suggest at the 0.05 level of significance that the average sodium content for a single serving of such cereal is greater than 220 milligrams? Assume the distribution of sodium contents to be normal.

9. A machine is supposed to mix peanuts, hazelnuts, cashews, and pecans in the ratio 5:2:2:1. A can containing 500 of these mixed nuts was found to have 269 peanuts, 112 hazelnuts, 74 cashews, and 45 pecans. At the 0.05 level of significance, test the hypothesis that the machine is mixing the nuts in the ratio 5:2:2:1.

10. In an experiment to study the dependence of hypertension on smoking habits, the following data were taken on 180 individuals:

	Non-smokers	Moderate Smokers	Heavy Smokers
Hypertension	21	36	30
No hypertension	48	26	19

Test the hypothesis that the presence or absence of hypertension is independent of smoking habits. Use a 0.05 level of significance.

11. A random sample of 90 adults is classified according to gender and the number of hours of television watched during a week:

	Gender	
	Male	Female
Over 25 hours	15	29
Under 25 hours	27	19

Use a 0.01 level of significance and test the hypothesis that the time spent watching television is independent of whether the viewer is male or female.

12. A manufacturer of car batteries claims that the life of the company's batteries is approximately normally distributed with a standard deviation equal to 0.9 year. If a random sample of 10 of these batteries has a standard deviation of 1.2 years, do you think that $\sigma > 0.9$ year? Use a 0.05 level of significance.

13. A study is conducted to compare the lengths of time required by men and women to assemble a certain product. Past experience indicates that the distribution of times for both men and women is approximately normal but the variance of the times for women is less than that for men. A random sample of times for 11 men and 14 women produced the following data: Test the hypothesis that $\sigma_1^2 = \sigma_2^2$ against the alternative that $\sigma_1^2 > \sigma_2^2$.

14. An experiment was conducted to compare the alcohol content of soy sauce on two different production lines. Production was monitored eight times a day. The data are shown here.
Production line 1: 0.48 0.39 0.42 0.52 0.40 0.48 0.52 0.52
Production line 2: 0.38 0.37 0.39 0.41 0.38 0.39 0.40 0.39
Assume both populations are normal. It is suspected that production line 1 is not producing as consistently as production line 2 in terms of alcohol content. Test the hypothesis that $\sigma_1 = \sigma_2$ against the alternative that $\sigma_1 \neq \sigma_2$.

15. The following table shows the salaries of randomly selected individuals from four large metropolitan areas. At $\alpha = 0.05$, can you conclude that the mean salary is different in at least one of the areas?

Pittsburgh	Dallas	Chicago	Minneapolis
27,800	30,000	32,000	30,000
28,000	33,900	35,800	40,000
25,500	29,750	28,000	35,000
29,150	25,000	38,900	33,000
30,295	34,055	27,245	29,805

16. In an organization, a random sample of 100 employees were selected whose educational level and their employment status was observed. Examine whether the employment status depends on their level of education at 10% level of significance.

Employment status	Level of education		
	Primary	Secondary	Graduates
Assistants	15	14	5
Clerical	12	18	8
Supervisors	8	8	12

Answer:

1,3,8 – T test one mean

2,6- T test two means

4,7- Z test one mean

5- Z test two means

9-chi square goodness of fit,

10,11,16 -chi square independence

12- chi square one variance

13,14- F test.

15-Anova