UNIT-4

TESTING HYPOTHESIS

LARGE SAMPLE TEST

TEST 1

TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN SAMPLE PROPORTION AND POPULATION PROPORTION

1. Experience has shown that 20% of a manufactured product is of top quality. In one day's production of 400 articles only 50 are of top quality. Show that either the production of the day chosen was not a representative sample or the hypothesis of 20% was wrong. Based on the particular day's production, find also the 95% confidence limits for the % of top quality product.
2. A dice is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the dice cannot be regarded as an unbiased one.
3. The fatality rate of typhoid patients is believed to be 17.26%. In a certain year 640 patients suffering from typhoid were treated in metropolitan hospital and only 63 patients died. Can you consider the hospital is efficient?
4. A salesman in a departmental store claim that at most 60% of the shoppers showed that 35 of them left without making a purchase. A random sample of 50 shoppers showed that 35 of them left without making purchase. Are these sample results consistent with the claim of the sales man? Use a Level of significance of 5%.
5. In a sample of 1000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in the state at 1% level of significance?

TEST 2

TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN TWO SAMPLE PROPORTIONS

1. A random sample of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same against that they are not at 5% LOS?
2. A sample of 300 spare parts produced by a machine contained 48 defectives. Another sample of 100 spare parts produced by another machine contained 24 defectives. Can you conclude that the first machine is better than the second?
3. In a large city A, 20% of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5 % of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant?
4. Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is a significant decrease in the consumption of tea after the increase in duty.
5. 15.5% of a random sample of 1600 undergraduates was smokers, whereas 20% of a random sample of 900 post graduates was smokers in a state. Can we conclude that less number of undergraduate is smokers than the post graduates?

TEST 3

TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN SAMPLE MEAN AND POPULATION MEAN

1. A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population, the mean height is 165cm and the SD is 10cm?
2. A random sample of 100 students gave a mean weight of 58 kg and an SD of 4 kg. Find the 95% and 99% confidence limits of mean of the population.

3. The mean breaking strength of the cables supplied by a manufactured is 1800, with an SD of 100. By a new technique in the manufacturing process, it is claimed that the breaking strength of the cable has increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850. Can we support the claim at 1% LOS?
4. An IQ test was given to a large group of boys in the age group of 18 to 20 years, who scored an average of 62.5 marks. The same test was given to a fresh group of 100 boys of the same age group. They scored an average of 64.5 marks with an SD 12.5 marks. Can we conclude that the fresh groups of boys have better IQ?

TEST 4

TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN TWO SAMPLE MEANS

1. In a random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the sample have been drawn from the same population with SD 4?
2. Test significance of the difference between the means of the samples drawn from two normal populations with the same SD using the following data.

	SAMPLE SIZE	MEAN	SD
I	100	61	4
II	200	63	6

3. A simple sample of heights of 6400 English men has a mean of 170 cm and an SD of 6.4 cm, while a simple sample of heights of 1600 Americans has a mean of 172cm and an SD of 6.3cm. Do the data indicate that Americans are on the average taller than the Englishmen?
4. The average marks scored by 32 boys are 72 with an SD of 8, while that for 36 girls is 70 with an SD of 6. Test at 1% LOS whether the boys performs better than girls.

TEST7

CHI-SQUARE TEST

1. The following table gives the number of air-craft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week.

DAY	MON	TUE	WED	THURS	FRI	SAT
NO. OF ACCIDENTS	15	19	13	12	16	15

2. The following table shows the distribution of digits in the numbers chosen at random from a telephone directory:

Digits	0	1	2	3	4	5	6	7	8	9	Total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10,000

3. The following data show defective articles produced by 4 machines

MACHINE	A	B	C	D
Production time	1	1	2	3
Number of defective	12	30	63	98

Do the data indicate a significant difference in the performance of the machine?

4. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory?
5. A survey of 320 families with 5 children each revealed the following distributions:

No. of boys	5	4	3	2	1	0
No. of girls	0	1	2	3	4	5
No. of families	14	56	110	88	40	12

Is this result consistent with the hypothesis that males and female births are equally probable?

6. Fit a Poisson distribution to the following data and test the goodness of fit

X	0	1	2	3	4	5	6
f	275	72	30	7	5	2	1

TEST 8
CHI-SQUARE TEST-INDEPENDENCE OF ATTRIBUTES

1. The following data are collected on two characters

	SMOKERS	NON-SMOKERS
LITERATES	83	57
ILLITERATES	45	68

Based on this, can you say that there is no relation between smoking and literacy?

2. A total number of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them 1872 were men and rest were women. 2257 individuals were in favor of the proposal and 917 were opposed to it. 243 men were undecided and 443 women are opposed to the proposal. Do you justify or contradict the hypothesis that there is no association between sex and attitude?
3. The following table gives for a sample of married women, the level of education and the marriage adjustment score.

Level of	Marriage adjustment				
Education	VERY LOW	LOW	HIGH	VERY HIGH	
COLLEGE	24	97	62	58	241
HIGH SCHOOL	22	28	30	41	121
MIDDLE SCHOOL	32	10	11	20	73
	78	135	103	119	435

Can you conclude from the above data that the higher the level of education, the greater is the degree of adjustment in marriage?

Small sample-t-test
Test-9
TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN SAMPLE MEAN AND POPULATION MEAN

1. Tests made on the breaking strength of 10 pieces of a metal wire gave the results 578,572, 570,568,572,570,570,572,596 and 584 kg. Test if the mean breaking strength of the wire can be assumed as 577kg.
2. The heights of 10 males of a given locality are found to be 175, 168, 155, 170, 152, 170, 175, 160, 160 and 165 cms. Based on this sample, find 95% confidence limits for the height of males in that locality.
3. A machinist is expected to make engine parts with axle diameter of 1.75 cm. A random sample of 10 parts shows a mean diameter 1.85 cm, with a SD of 0.1 cm. On the basis of this sample, would you say that the work of the machinist isinferior?
4. A certain injection administered to each of 12 patients resulted in the following increases of blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the injection will be in general accompanied by an increase in BP?
5. The mean life time of a sample of 25 bulbs is found as 1550 hours with a SD of 120 hours. The company manufacturing bulbs claims that the average life of their bulbs is 1600 hours. Is the claim acceptable at 5% LOS?

Test-10
TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN TWO SAMPLE MEANS
INDEPENDENT AND DEPENDENT (PAIRED t-test) SAMPLES

1. Two independent samples of sizes 8 and 7 contained the following values:

Sample 1	19	17	15	21	16	18	16	14
Sample 2	15	14	15	19	15	18	16	-

Is the difference between the sample means significant?

2. The biological values of protein from cow's milk and buffalo's milk at a certain level. Examine

if the average values of proteins in the two samples significantly differ.

Cow's milk	1.82	2.02	1.88	1.61	1.81	1.54
Buffalo's milk	2	1.83	1.86	2.03	2.19	1.88

3. Samples of two types of electric bulbs were tested for length of life and the following data were obtained

	SAMPLE SIZE	MEAN	SD
I	8	1034 hours	36 hours
II	7	1036 hours	40 hours

Is the difference in the means sufficient to warrant that type I bulb are superior to type II bulbs?

4. The mean height and the SD height of 8 randomly chosen soldiers are 166.9 cm and 8.29 cm respectively. The corresponding values of 6 randomly chosen sailors are 170.3 cm and 8.50 cm respectively. Based on this data can we conclude that soldiers are in general, shorter than sailors?
5. The following data relate to the marks obtained by 11 students in two tests, one held at the beginning of the year and the other at the end of the year after intensive coaching. Do the data indicate that the students have benefitted by coaching?

Test 1	19	23	16	24	17	18	20	18	21	19	20
Test 2	17	24	20	24	20	22	20	20	18	22	19

Test-11

F-test

TEST OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN POPULATION VARAINCES

1. Two independent samples of 8 and 7 items respectively had the following values of the variables.

Sample 1	9	11	13	11	15	9	12	14
Sample 2	10	12	10	14	9	8	10	-

Do the two estimates of population variance differ significantly at 5% LOS?

2. A sample of size 13 gave an estimated population variance of 3 while another sample of size 15 gave an estimate of 2.5. Could both samples be from population with same variance?
3. The nicotine contents in two random sample of tobacco are given below:

Sample 1	21	24	25	2	27	-
Sample 2	22	27	28	30	31	36

Can you say that the two samples come from the same normal population?

4. In one sample of 10 observations the sum of the squares of the deviations of the sample values from the sample mean was 120 and in another sample of 12 observations it was 314. Test whether this difference is significant at 5% LOS.