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Type-11 Example-1

In a sample of 19 adolescents who served as the subjects in an immunologic study, one variable of interest was the diameter of skin test reaction to an antigen. The sample mean and standard deviation were 21 and 11 mm. Erythematic, respectively. Can it be concluded from these data that the population mean is less than 30?

Solution: By given n=19, Sample mean $\bar{x}$=21, standard deviation of the sample S=11,

Is $population\ mean\ \mu < 30?\ Here\ we\ take\ population\ mean\ \mu = 30$

Since problem is of one tailed test we use following hypothesis

H_0: μ= 30

H_1: μ< 30

∵ Sample size is small and standard deviation of the population is not given

Therefore we use small ample test i.e.t-test

Therefore We use the formula

$t = \frac{\bar{x}-\mu}{s/\sqrt{n-1}} = \frac{21-30}{11/\sqrt{18}}$=-3.4713 and $v = n - 1$=18

$\therefore |t| = 3.4713$

$t_v(\alpha) = t_{18}(5\%)$=1.734

$|t| > t_v(\alpha)$

∴H_0 is rejected therefore H_1 accepted

μ< 30

∴ **We can conclude that Population mean is less than30**

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Type-11 Example-2

The following are the systolic blood pressure of 10 patients undergoing during therapy for hypertension 183, 152, 178, 194, 163, 144, 114, 178, 118, 158, Can we conclude on the basis of these data that the population mean is less than 165?

Solution: By given n=10, Sample mean $\bar{x}$=158.2, standard deviation of sample S=25.5218,

Is $population\ mean\ \mu < 165?\ Here\ we\ take\ population\ mean\ \mu = 165$

Since problem is of one tailed test we use following hypothesis

H_0: μ= 165

H_1: μ< 165

∵ Sample size is small and standard deviation of the population is not given

Therefore we use small sample test i.e.t-test

Therefore We use the formula

$t = \frac{\bar{x}-\mu}{s/\sqrt{n-1}} = \frac{158.2-165}{25.5218/\sqrt{9}}$=-0.7993 and $v = n - 1$=10-1=9

$\therefore |t| = 0.7993$

$t_v(\alpha) = t_9(5\%)$=1.833

$|t| < t_v(\alpha)$

∴H_0 is accepted

μ= 30

∴ **We cannot conclude that Population mean is less than165**

1) Mr. GANGARAM reported data on eight cases of umbilical cord prolapsed. The maternal ages were 25, 28, 17, 26, 27, 22, 25, & 30 we wish to know if we may conclude that the mean age of the population from which sample may be presumed to have been drawn is greater than 20 years

2) A sample of 25 freshman nursing students made a mean score of 77 on a test designed to measure attitudes towards the dying patient. The sample standard deviation was 10. Do these provide sufficient evidence, to indicate, at 5% LOS that the population mean is less than 80?

3) Following a week-long hospital supervisory training program. 16 assistance hospital administrators made a mean score of 74 on a test administrated as a part of the evaluation

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of training program. The sample S.D. was 12. Can it be conclude from these data that the population mean is greater than 70?

4) The following are the intraocular pressure value recorded for a sample of 21 elder subjects 14.5, 12.0, 14, 16.1, 12, 17.5, 14.1, 12.9, 17.9, 12, 16.4, 24.2, 12.2, 14.4, 17, 10, 18.5, 20.8, 16.2, 14.9, &19.6. Can we conclude from these data that the mean of the population from which the sample was drawn is greater than 14?

Type-12 Example-1

A nurse researcher wished to know if graduates of baccalaureate nursing program and graduate of associate degree nursing programs **differ** with respect to mean score on a personality inventory. A sample of 50 associate graduates and a sample of 60 baccalaureate graduates yield the following means and standard deviations

Sample	$\overline{x}$	S
A	52.5	10.5
B	49.6	11.2

On the basis of these data what should the researcher concluded

Solution: By given For First sample n_1=50, Sample mean $\overline{x_1} = 52.5$, Sample standard deviation S_1=10.5,

For Second sample n_2=60, Sample mean$\overline{x_2} = 49.6$, Sample standard deviation S_2=11.2,

and Question is $\mu_1 \neq \mu_2$?

Since problem is of two tailed test we use following hypothesis

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

∵ Sample size is large and standard deviations of the population are not given but standard deviations of samples are given

We use large sample test i.e. z-test

Therefore We use the formula

$$z = \frac{\overline{x_1}-\overline{x_2}}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}} = \frac{52.5-49.6}{\sqrt{\frac{10.5^2}{50}+\frac{11.2^2}{60}}} = 1.3992$$

$\therefore |z| = 1.3992$

$z_\alpha = z_{5\%} = 1.96$

$|z| < z_\alpha$

∴H_0 is accepted

$\mu_1 = \mu_2$

∴ **We can conclude that there is no significant difference between two population mean**

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We cannot conclude that graduates of baccalaureate nursing program and graduate of associate degree nursing programs **differ** with respect to mean score on a personality inventor

Type-12 Example-2

A researcher was interested in knowing if preterm infant with late metabolic acidosis and preterm infant without the condition **differ** with respect to urine level of certain chemical. The mean levels, standard deviation and sample sizes for the samples studied were as follows

Sample	N	$\overline{x}$	S
With condition	35	8.5	3.5
Without condition	40	4.8	3.6

What should the researchers have concluded on the basis of these data

Solution: By given For First sample n_1=35, Sample mean $\overline{x_1} = 8.5$, Sample standard deviation S_1=3.5,

For Second sample n_2=40, Sample mean $\overline{x_2} = 4.8$, Sample standard deviation S_2=3.6,

And Question is$\mu_1 \neq \mu_2$?

Since problem is of two tailed test we use following hypothesis

H0: $\mu_1 = \mu_2$

H1: $\mu_1 \neq \mu_2$

∵ Sample size is large and standard deviations of the population are not given but standard deviations of samples are given

We use large sample test i.e. z-test

Therefore We use the formula

$$z = \frac{\overline{x_1}-\overline{x_2}}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}} = \frac{8.5-4.8}{\sqrt{\frac{3.5^2}{35}+\frac{3.6^2}{40}}} = \mathbf{4.506836}$$

∴ $|z|$ =**4.506836**

$z_\alpha = z_{5\%}$=**1.96**

$|z| > z_\alpha$

∴H0 is rejected ∴H1 is accepted

$\mu_1 \neq \mu_2$

∴ **We can conclude that there is significant difference between two population mean**

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A researcher conclude that preterm infant with late metabolic acidosis and preterm infant without the condition **differ** with respect to urine level of certain chemical

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Type-12 Example-3

Intelligence test was given to two groups of boys and girls of the **same** age group of the **same** college and the following results were obtained

Sample	Size	Mean	S.D.
Boys	100	73	10
Girls	60	75	8

Examine whether the **difference between the means is significant** or not?

Solution: By given For First sample n_1=100, Sample mean $\overline{x_1} = 73$, Sample standard deviation S_1=10,

For Second sample n_2=60, Sample mean $\overline{x_2} = 75$, Sample standard deviation S_2=8,

And Question is $\overline{x_1} = \overline{x_2}$?

Since problem is of two tailed test we use following hypothesis

H_0: $\overline{x_1} = \overline{x_2}$

H_1: $\overline{x_1} \neq \overline{x_2}$

∵ Both Sample size are large and standard deviations of the population are not given but standard deviations of samples are given

We use large sample test i.e. z-test

Since two samples are drawn from same population and standard deviation of the population not given so we use the formula

$$z = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{s_1^2}{n_2} + \frac{s_2^2}{n_1}}} = \frac{73-75}{\sqrt{\frac{10^2}{60} + \frac{8^2}{100}}} = -1.3169$$

$\therefore |z| = 1.3169$

$z_\alpha = z_{5\%} = 1.96$

$|z| < z_\alpha$

∴H_0 is accepted

$\overline{x_1} = \overline{x_2}$

∴ **We can conclude that there is no significant difference between two Sample mean**

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Type-12 Example-4

Test the significance of the difference between mean of two samples drawn two normal populations with **same** S.D. using the following data

Sample	size	Mean	S.D.
Sample-1	100	61	4
Sample-2	200	63	6

Solution: By given For First sample n_1=100, Sample mean $\overline{x_1} = 61$, Sample standard deviation S_1=4,

For Second sample n_2=200, Sample mean $\overline{x_2} = 63$, Sample standard deviation S_2=6,

And Question is $\overline{x_1} \neq \overline{x_2}$?

Since problem is of two tailed test we use following hypothesis

H_0: $\overline{x_1} = \overline{x_2}$

H_1: $\overline{x_1} \neq \overline{x_2}$

∵ Both Sample size are large and standard deviations of the population are not given but standard deviations of samples are given

We use large sample test i.e. z-test

Since two samples are drawn from two different population same standard deviation which is not given.Therefore we use the formula

$$z = \frac{\overline{x_1}-\overline{x_2}}{\sqrt{\frac{s_1^2}{n_2}+\frac{s_2^2}{n_1}}} = \frac{61-63}{\sqrt{\frac{4^2}{200}+\frac{6^2}{100}}} = -3.0151$$

$\therefore |z| = 3.0151$

$z_\alpha = z_{5\%} = 1.96$

$|z| > z_\alpha$

∴H_0 is rejected ∴H1 is accepted

$\overline{x_1} \neq \overline{x_2}$

∴ **We can conclude that there is significant difference between two sample mean**

1) The mean & S.D. of a sample of size 400 are 250 & 40 respectively. Those of another sample of size 400 are 220 & 55. Test at 1% LOS whether the means of the two populations from which the samples have been drawn **are equal**?

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2) The means of two samples of 1000 & 2000 items are 170 & 169 cm respectively Can the samples be regarded as drawn from the **same population** with standard deviationn10 at 5% LOS

3) 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 samples have been drawn from the **same population** with S.D. 4?
