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Type-9 Example-1

A simple random sample of **16** adult had drawn from a certain population yield a mean weight of 63 kg. Assume that weight in the population is **approximately normally distributed with a variance of 49**. Does the samples date provide sufficient evidence for us to conclude that a mean weight for the population is **less** than 70?

Solution: - By Given Sample Size, n=16, Sample Mean $\overline{x} = 63$,

Population Mean $\mu < 70$?, but in actual solving problem take $\mu=70$, and

Variance of the population is $\sigma^2=49$ i.e. $\sigma=7$

Since problem is of one tailed test we use following hypothesis

H_0: $\mu= 70$

H_1: $\mu< 70$

∵ Sample size is small but standard deviation of the population is given

Therefore we use large sample test i.e. z-test

Therefore We use the formula

$$z = \frac{\overline{x}-\mu}{\sigma/\sqrt{n}} = \frac{63-70}{7/\sqrt{16}} = -4$$

$\therefore |z| = 4$

$z_\alpha = z_{5\%=1.645}$

$|z| > z_\alpha$

$\therefore H_0$ is rejected therefore H_1 is accepted

$\mu< 70$

$\therefore$ **We can conclude that Population mean is less than 70**

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Type-9 Example-2

Suppose it is known that the I.Q. of a certain **population** of adults is approximately normally distributed with a S.D. of **15**. A simple random sample of **25** adults drawn from this population had a mean **I.Q.** score of 105. **On the basis of these data can we conclude that the mean I.Q. score for the population is not 100?**

Solution: - By Given Sample Size, n=25, Sample Mean $\overline{x} = 105$,

Population Mean μ$\neq$ 100?, μ=100, and Standard deviation of the population is σ=15

Since problem is of two tailed test we use following hypothesis

H_0: μ$=$ 100

H_1: μ$\neq$ 100

$\because$ Sample size is small but standard deviation of the population is given

Therefore we use large sample test i.e. use z-test

Therefore We use the formula

$$z = \frac{\overline{x}-\mu}{\sigma/\sqrt{n}} = \frac{105-100}{15/\sqrt{25}} = 1.67$$

$\therefore |z| = 1.67$

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

$|z| < z_\alpha$

$\therefore H_0$ is accepted

μ$=$ 100

$\therefore$ **We can conclude that Population mean is 100**

Home Work

A random sample of 16 emergency reports was selected from the files of an ambulance service. **The mean time required for ambulance to reach there is 12 in normally distributed population with variance of 9**. Can we conclude at .05 LOS that the population mean is **greater** than 10 minutes (Z= 4)

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Type-10 Exampl-1

The following data are the oxygen uptake (milliners) during inoculation of a random sample of **14** cell suspensions 14, 14.1, 13.2, 11.2, 14, 14.1, 12.2, 11.1, 13.7, 13.2, 16, 12.8, 14.4, 12.9, Do these data provide sufficient evidence at the 5% LOS that the population mean is not 12 ml?

Solution: - By Given Sample Size, n=14, Sample Mean $\overline{x} = 13.35$,

Standard deviation of sample is S=1.247140

Population Mean μ≠ 12?, but in actual solving problem take μ=12,

Since problem is of two tailed test we use following hypothesis

H_0: μ= 12

H_1: μ≠ 12

∵ 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

$t = \frac{\overline{x}-\mu}{s/\sqrt{n-1}} = \frac{13.35-12}{1.24714/\sqrt{13}}$=**3.902925** **and** $v = n - 1$**=14-1=13**

$\therefore |t| = \mathbf{3.902925}$

$t_v(\alpha) = t_{13}(5\%)$**=2.16**

$|t| > t_v(\alpha)$

∴H_0 is rejected therefore H_1 is accepted

μ≠ 12

∴ **We can conclude that Population mean is not equal to 12**

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Type-10 Exampl-2

Test made on breaking strength of 9 pieces of a metal gave the following results:

588, 572, 570, 568, 572, 570, 572, 596, & 584 Test if mean breaking strength of wire can be assumed as 577?

Solution: - By Given Sample Size, n=9, Sample Mean $\bar{x} = 576.8889$,

Standard deviation of sample is S=9.3386

Population Mean μ= 577?, but in actual solving problem take μ=577,

Since problem is of two tailed test we use following hypothesis

H_0: μ= 577

H_1: μ≠ 577

∵ 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

$t = \frac{\bar{x}-\mu}{s/\sqrt{n-1}} = \frac{576.8889-577}{9.3386/\sqrt{8}}$=-0.0336   and $v = n - 1 = 9 - 1 = 8$

$\therefore |t| = 0.0336$

$t_v(\alpha) = t_8(5\%)$=2.306

$|t| < t_v(\alpha)$

∴H_0 is accepted

μ= 577

∴ **We can conclude that Population mean is equal to 577**

3) A machinist is expected to make engine parts with axel diameters of 1.75 cm. a random sample of 10 parts shows a mean diameter of 1.85 cm. with S.D. of .1 cm. On the basis of this sample, would you say that the work of machinist is inferior? (t = 3)

4) A random sample of 9 boys had the following **I.Q.** 70, 120, 110, 101, 83, 95, 98, 107, 100.Does these support the assumption of population I.Q. of 100?