Nature of Test	Level of Significance 1%	5%	10%
Two tailed test (Z_α)	2.58	1.96	1.645
one tailed test (Z_α)	2.33	1.645	1.28 (right)
	-2.33	-1.645	-1.28 (left)

Test of significance of Large samples:

Test for single mean:

Null Hypothesis $H_0 : \mu = \mu_0$.

Test Statistics, $Z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$ (or) $Z = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}$

1. A sample of 900 members is found to have a mean of 3.4 cm and S.D 2.61 cms. Is the sample from a large population of mean 3.25 cm and S.D 2.61 cms. If the population is normal and its mean is unknown find the 95% confidence limits of true mean.

$n = 900$, $\bar{x} = 3.4$, $s = 2.61$, $\mu = 3.25$, $\sigma = 2.61$

Null Hypothesis H_0: Assume that the sample is drawn from the population with $\mu = 3.25$

$H_0 : \mu = 3.25$

Alternative Hypothesis H_1:

$H_1 : \mu \neq 3.25$ [Apply two tailed test]

Level of Significance:

Level of significance $\alpha = 5\% = 0.05$

Test statistic: $Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{3.4 - 3.25}{2.61/\sqrt{900}}$

$= 1.724$

Critical value:

Critical value at 5% is $Z_\alpha = 1.96$.

Conclusion:- Since, $|Z| = 1.724 < 1.96 = Z_\alpha$

H_0 is accepted at 5% level of significance

∴ The sample is taken from population whose mean is 3.25cm

Confidence limits :-

$$Z_\alpha = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$\mu = \bar{x} \pm Z_\alpha \frac{\sigma}{\sqrt{n}}$$

$$= 3.4 \pm 1.96 \left(\frac{2.61}{\sqrt{900}}\right) = 3.4 \pm 0.17$$

ie) $3.23 < \mu < 3.57$

2. A random sample of 200 employees at a large corporation showed this average to be 42.8 years with S.D of 6.89 years. Test the hypothesis $H_0: \mu = 40$, $H_1: \mu > 40$ at $\alpha = 0.01$ level of significance

Solution:-

Given: $n = 200$, $\bar{x} = 42.8$, $\mu = 40$, $\sigma = 6.89$

Null Hypothesis:- $H_0: \mu = 40$

Alternative Hypothesis: $H_1: \mu > 40$ [one tail test - right]

Test Statistic:-

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{158-160}{6/\sqrt{100}}$$

$$= 3.33$$

Critical Value:-

Critical value at 1% level of significance [2 tailed] is

$Z_\alpha = 2.58$

Conclusion:-

Since $|Z| = 3.33 > 2.58 = Z_\alpha$

Null Hypothesis $H_0 : \mu = 160$ is rejected at 1% level of significance.

∴ The mean height of the college students in the city is 160 cms is not true.

Confidence limit:-

$$\mu = \bar{x} \pm Z_\alpha \frac{\sigma}{\sqrt{n}}$$

$$= 158 \pm 2.58 \frac{6}{\sqrt{100}}$$

$$= 158 \pm 1.548$$

$$= 156.452 , 159.548$$

ie) $156.452 \nless \mu \nless 159.548$, here $\mu = 160$ does not lie in the interval.