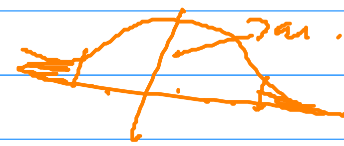
12/11/21 **Testing of Hypothesis**

- If we test whether the population mean has a specified value $\mu_0$, then the null hypothesis would be expressed as $H_0: \mu = \mu_0$
- The alternative hypothesis may be formulated suitably as anyone of the following:
- (i) $H_1: \mu \neq \mu_0$ (two- sided alternative) $\mu \neq \mu_0$



- (ii) $H_1: \mu > \mu_0$ (one-sided (right) alternative) $>$
- (iii) $H_1: \mu < \mu_0$ (one-sided (left) alternative) $<$

| Types of test | Level | of | significance |
|---|---|---|---|
| | 1% | 5% | 10% |
| Two tailed test | 2.58 | 1.96 | 1.645 |
| One tailed test | 2.33 | 1.645 | 1.28 |

## TYPE I: TEST OF SIGNIFICANCE OF SINGLE MEAN (POPULATION VARIANCE IS KNOWN)

- Formulate: $H_0$ : null hypothesis
- $H_0$: μ= a specific value
- $H_1$: μ≠ a specific value
- Choose α=0.05(5%) or 0.01(1%) level of significance.
- Test statistic is $Z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$\bar{x}$ → sample mean.
$\mu$ → population mean
$\sigma$ → S D of popl
$n$

- Compare the computed value of z with table value at α% level.
- If |z|<1.96 $H_0$ is accepted at 5% level otherwise rejected.
- If |z|<2.58 $H_0$ is accepted at 1% level otherwise rejected.

Problem.

1) A company producing LED bulbs finds that mean life span of the population of its bulbs is 2000 hours with a standard derivation of 150 hours. A sample of 100 bulbs randomly chosen is found to have the mean life span of 1950 hours. Test, at 5% level of significance, whether the mean life span of the bulbs is significantly different from 2000 hours.

Gn Sample Size $n = 100$

SD of population. $\sigma = 150$

population mean $\mu = 2000$

Sample mean. $\bar{x} = 1950$

level of significance = 5%

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

Formulate Hypothesis

null hyp: $H_0 : \mu = 2000$ (mean life span of the bulb is not significantly different from 2000 hours)

$H_1 : \mu \neq 2000$ (significantly different)

(two tail test)

Calculate Test Statistic

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{1950 - 2000}{150/\sqrt{100}}$$

$$= -3.3$$

$|z| = 3.3$

Conclusion :-

$z_{tab}$ (5% + two tail) = 1.96

$|z| = 3.3 > 1.96$ ($z_{tab}$)

$H_0$ is rejected.

mean life span of bulbs is significantly different from 2000 hrs.

2. A sample of 900 members is found to have a mean 3.5 cm. Can it be reasonably regarded as a simple sample from a large population whose mean is 3.38 cm and SD 2.4 cm.

Sln

$n = 900$

Sample mean $\bar{x} = 3.5$

$\mu = 3.38$ $\alpha = 5\%$

$\sigma = 2.4$

$H_0 : \mu = 3.38$

$H_1 : \mu \neq 3.38$ (two tail)

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{3.5 - 3.38}{2.4/\sqrt{900}} = 1.5$$

$|z| = 1.5$

$z_{table}$ (5% two tail) $= 1.96$

$|z| = 1.5 < 1.96$

$H_0$ is accepted.

conclis: ___

3. a survey of 40 senior citizens selected at random showed that they watched TV on an average of 24 hours per week with SD of 10 hours. Test the hypothesis $H_0$: $\mu=30$ versus H1: $\mu<30$ at $\alpha=0.05$ level.

Sample

Ans $n = 40$ $\bar{x} = 24$ $s = 10$

$H_0 : \mu = 30$

$\alpha = 0.05 = 5\%$

$H_1 : \mu < 30$ (one tail)

Note:- popln. SD is not known.

$$z = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{24 - 30}{10/\sqrt{40}}$$

$$= -3.79$$

$$|z| = 3.79$$

$z_{tab}$ ( $5\%$ + onetail) $= 1.645$

$|z| = 3.79 > 1.645$

$H_1$ is rejected.

Conclusion: