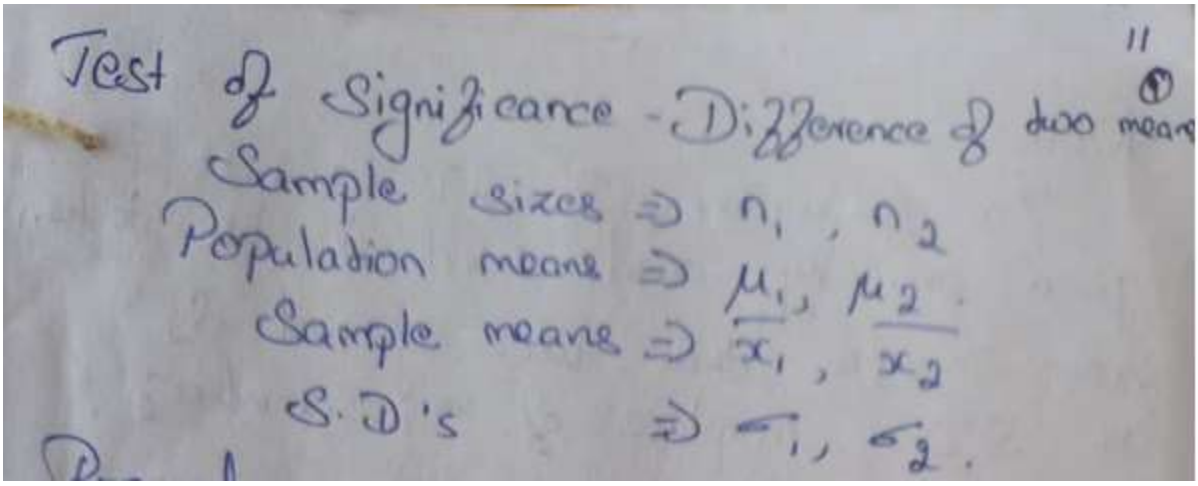
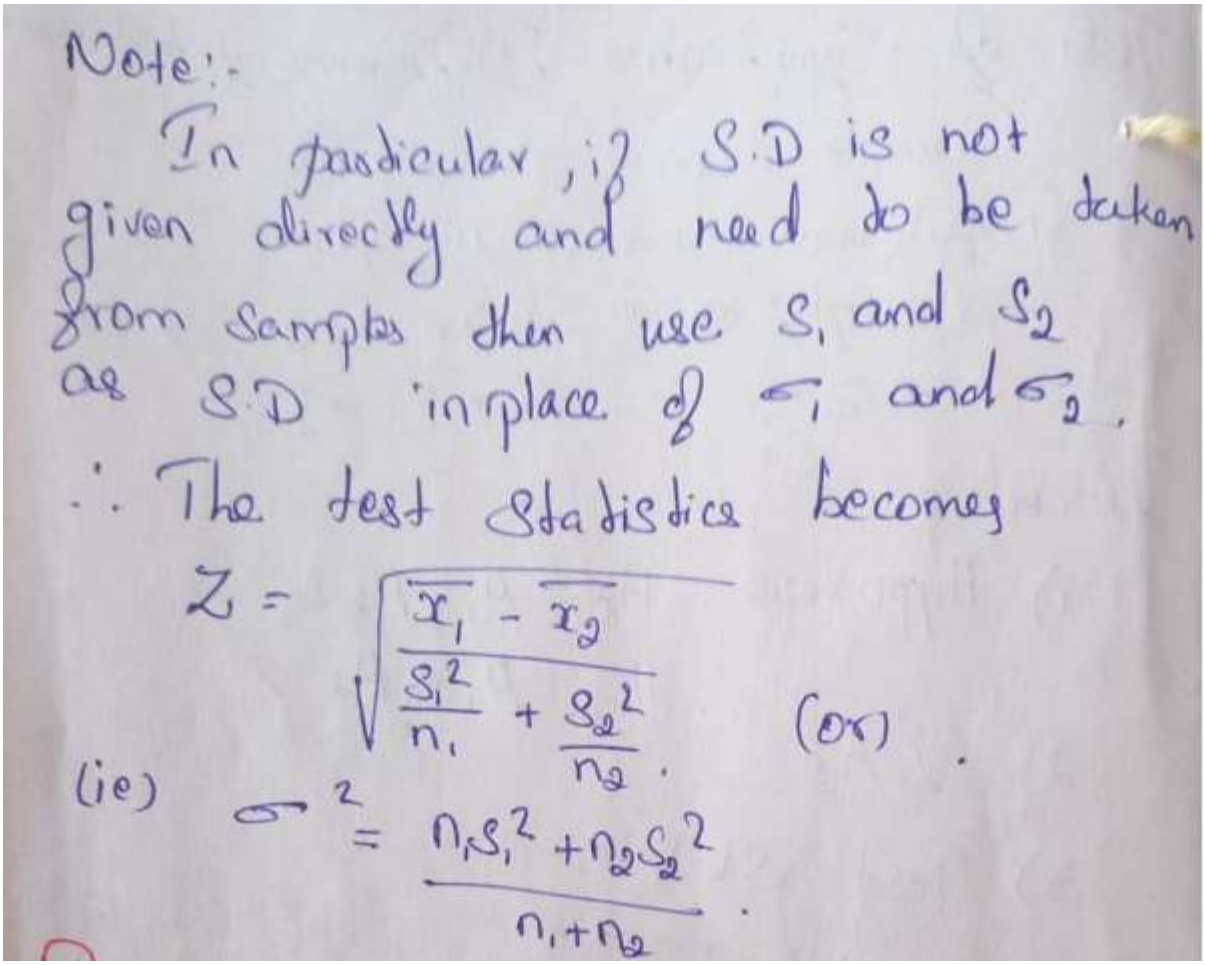
Topic: 1.3 – Large sample test -difference of means





Problems.

1). The means of 2 large samples 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D 2.5 inches.

$n_1 = 1000$ $n_2 = 2000$

$\bar{x}_1 = 67.5$ inches $\bar{x}_2 = 68$ inches

Population S.D $\sigma = 2.5$ inches

$\sigma_1 = \sigma_2 = \sigma$.

$H_0 : \mu_1 = \mu_2$.

$H_1 : \mu_1 \neq \mu_2$.

LOS : $\alpha = 5\%$.

Test Statistics.

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma^2}{n_1} + \frac{\sigma^2}{n_2}}}$$

$$= \frac{67.5 - 68}{\sqrt{(2.5)^2 \left(\frac{1}{1000} + \frac{1}{2000}\right)}}$$

$= \frac{-0.5}{0.0968} = -5.16.$

$|z| = 5.16$: Critical value $|z_\alpha| = 1.96$

Conclusion.

C.V	TV
5.16	> 1.96

$\therefore H_0$ is rejected.

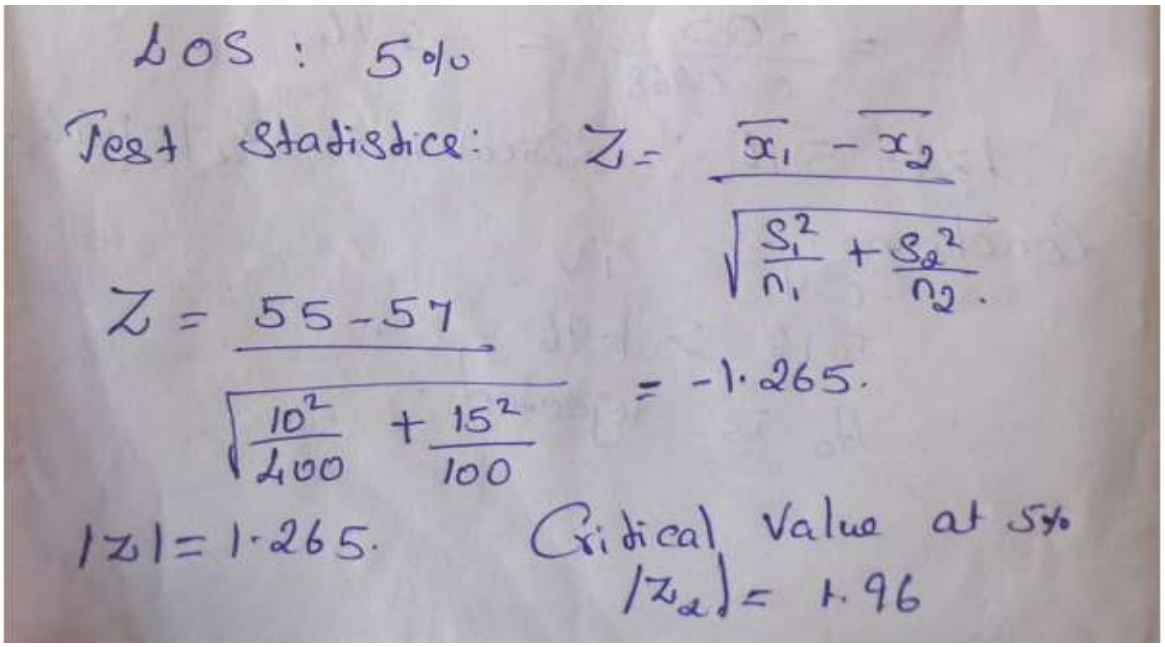
2. Sample of students were drawn from two universities and from the weight is kilogram. The means and SD are calculated. Test the significance of the difference between the means of two samples.

	Mean	S.D	Sample size
University A	55	10	400
University B	57	15	100.

Soln:- $\bar{x}_1 = 55$ $\bar{x}_2 = 57.$

$S_1 = 10$ $S_2 = 15$

$n_1 = 400$ $n_1 = 100.$

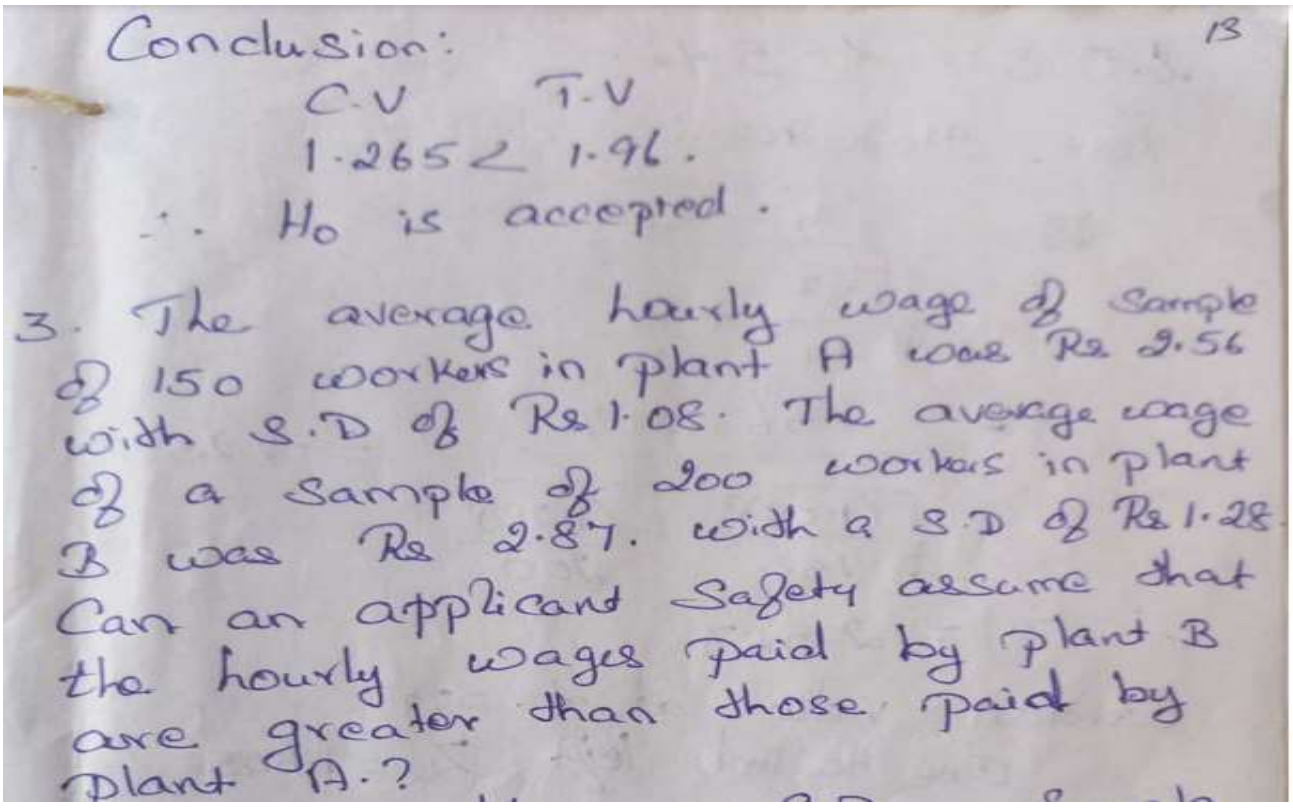


LOS : 5%

Test Statistics: $Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$

$Z = \frac{55 - 57}{\sqrt{\frac{10^2}{400} + \frac{15^2}{100}}} = -1.265.$

$|z| = 1.265.$ Critical Value at 5% $|z_\alpha| = 1.96$



Conclusion: 13

C.V T.V

$1.265 < 1.96.$

$\therefore$ H_0 is accepted.

3. The average hourly wage of sample of 150 workers in plant A was Rs 2.56 with S.D of Rs 1.08. The average wage of a sample of 200 workers in plant B was Rs 2.87. with a S.D of Rs 1.28. Can an applicant safely assume that the hourly wages paid by plant B are greater than those paid by plant A.?

		Mean	S.D	Sample
Plant	A	2.56	1.08	150
Plant	B	2.87	1.28	200

$\therefore \bar{x}_1 = 2.56 \quad S_1 = 1.08 \quad n_1 = 150$

$\bar{x}_2 = 2.87 \quad S_2 = 1.28 \quad n_2 = 200$

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 < \mu_2$ (One tailed left)

L.O.S :- $\alpha = 5\%$.

Test Statistics

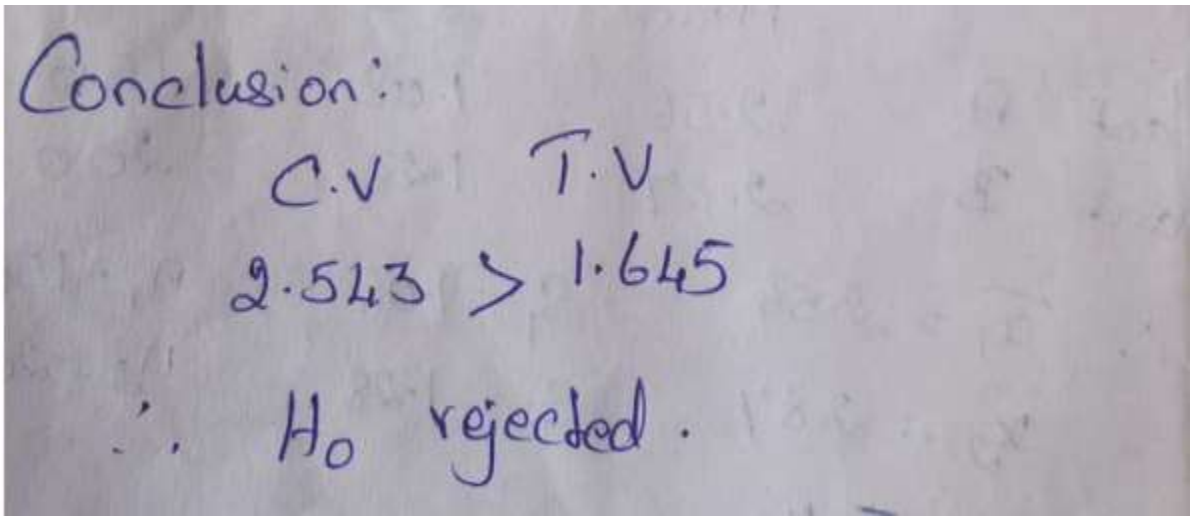
$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$= \frac{2.56 - 2.87}{\sqrt{\frac{(1.08)^2}{150} - \frac{(1.28)^2}{200}}} = -2.453$$

$\therefore |Z| = 2.543$

Critical value at $\alpha = 5\%$

One tailed left $Z_\alpha = 1.645$


Conclusion:
C.V
T.V
2.543 > 1.645
∴ H_0 rejected.