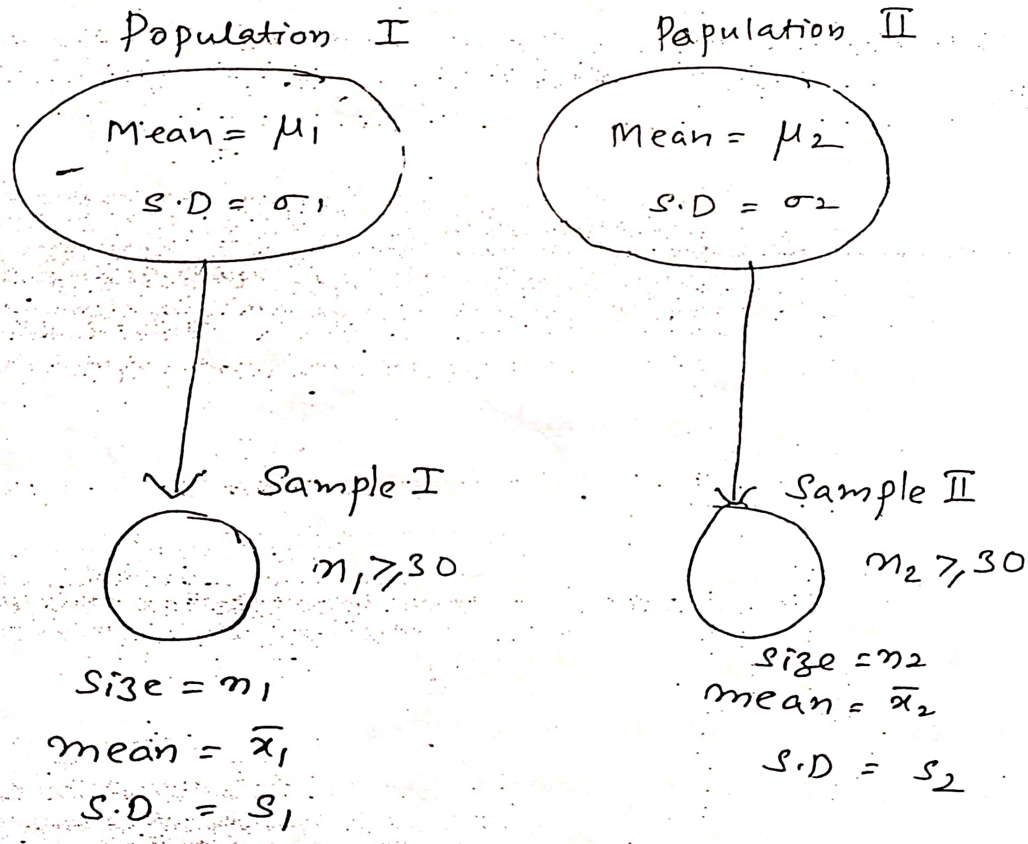
I. **Describe the testing of difference between two Population Means based on Large Samples**

Nov 2003 | April 2004 | April 2001 | April 2005 ......

Sol: It often happens that samples are from two different Sources and it is required to know whether in their means there is a significant difference, also whether the difference is due to chance, whether the samples belong to the same population.

To investigate such differences the distribution of diffences between the sample means is used.

Consider two Large samples are obtained for study.



Since these are Large Samples $(n_1 \geq 30)$ $(n_2 \geq 30)$
The following steps should be taken in testing the Significance of difference between means.

I NULL HYPOTHESIS (H_0)

There is no significance difference between the two sample means

$H_0: \mu_1 = \mu_2$.

ALTERNATIVE HYPOTHESES (H_1)

H_1: There is a significant difference between two sample means

$\mu_1 \neq \mu_2$ (TT 'z' test

or $\mu_1 > \mu_2$ (RT 'z' test)

or $\mu_1 < \mu_2$ (LT 'z' test)

II Computation Test Statistic (C.T.S)

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \sim \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

if σ_1, σ_2 are not available use s_1 & s_2

III Level of significance (L.O.S)

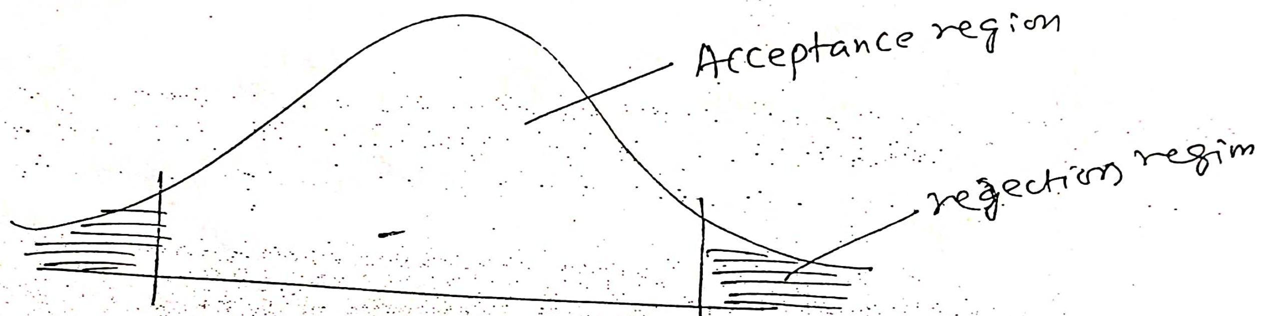
α = 1% or 5% or 10%.

IV critical value

Following are the critical values for z test at different levels of significance

(α) L.O.S	Two Tail	Right tail	Left Tail
1%	± 2.58	2.33	-2.33
5%	± 1.96	1.645	-1.645
10%	± 1.645	1.28	-1.28

V Decision



if z statistic lies in Acceptance region Accept H_0. otherwise reject H_0.

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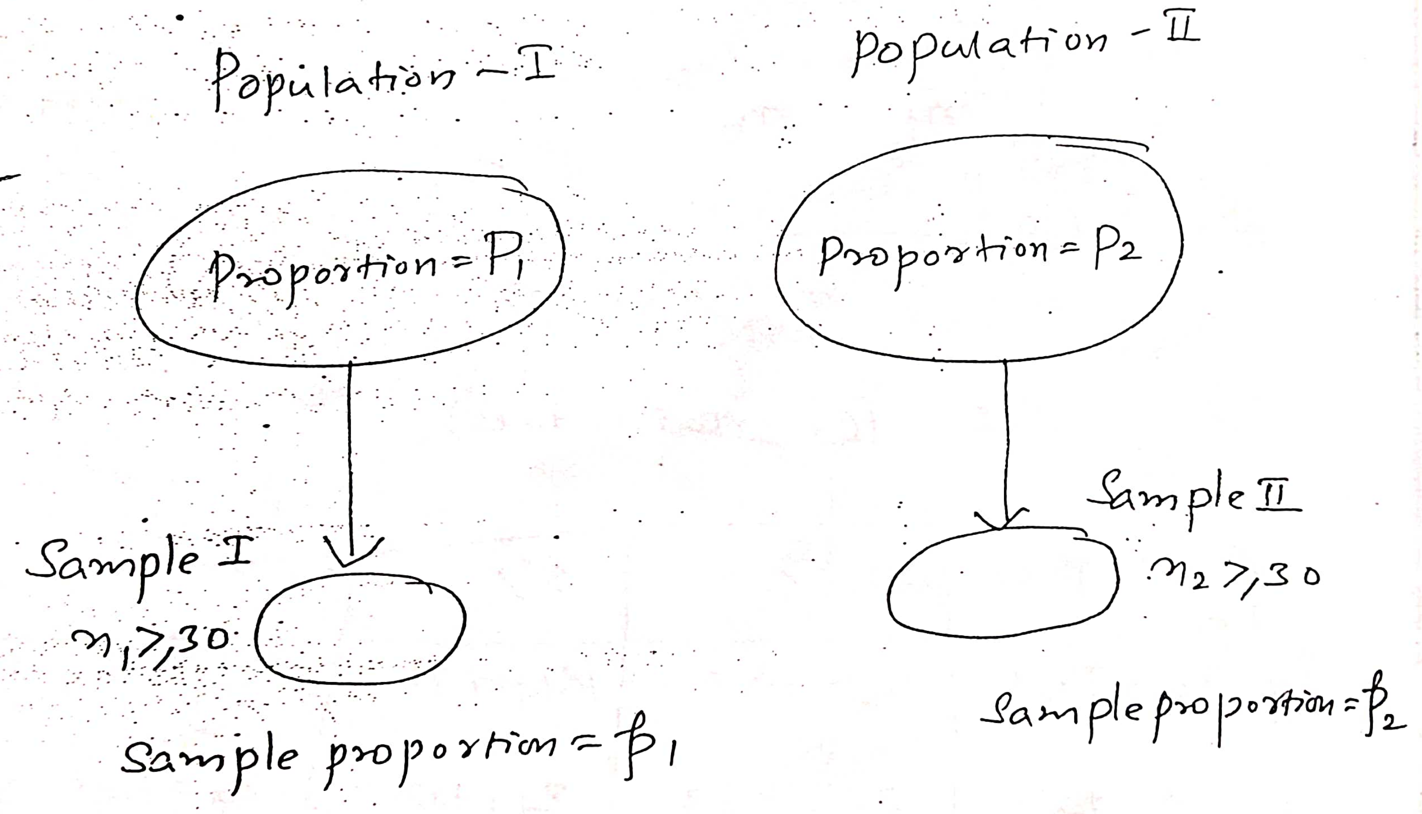
II

Describe the procedure for testing the equality of two population proportions

MAY 2008 | April 2007 | NOV 2005 | NOV 2002 .....

There may be cases where two samples have been taken from distinct materials or different populations. The question that may arise here is whether the difference in the two proportions disclosed by the two samples is significant or the observed difference is due to fluctuations of sampling.

To investigate such differences the distribution of differences between the two sample proportions is used.



Since these are large samples $n_1 \geq 30$, $n_2 \geq 30$

The following steps should be used:

I

NULL HYPOTHESIS (H_0) There is no significance difference between the two sample proportions

$H_0: P_1 = P_2$

Alternative Hypothesis (H_1)

H_1: There a significant difference between two sample proportions

$(P_1 \neq P_2)$ (TT 'z' test)

or $P_1 > P_2$ (RT 'z' test)

or $P_1 < P_2$ (LT 'z' test)

II Computation of Test statistic (CTS)

$$Z = \frac{p_1 - p_2}{\sqrt{\frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}}}$$

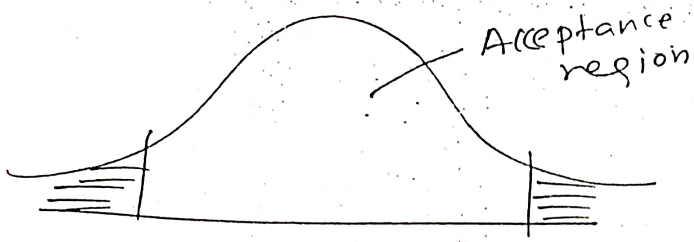
III L.O.S

α = 1% or 5% or 10%.

IV C.V. (critical values)

Test	1%	5%	10%
Two Tail	$\lvert Z_\alpha \rvert = 2.58$	$\lvert Z_\alpha \rvert = 1.96$	$\lvert Z_\alpha \rvert = 1.645$
Rt tail	$Z_\alpha = 2.33$	$Z_\alpha = 1.645$	$Z_\alpha = 1.28$
Lt tail	$Z_\alpha = -2.33$	$Z_\alpha = -1.645$	$Z_\alpha = -1.28$

V Decision



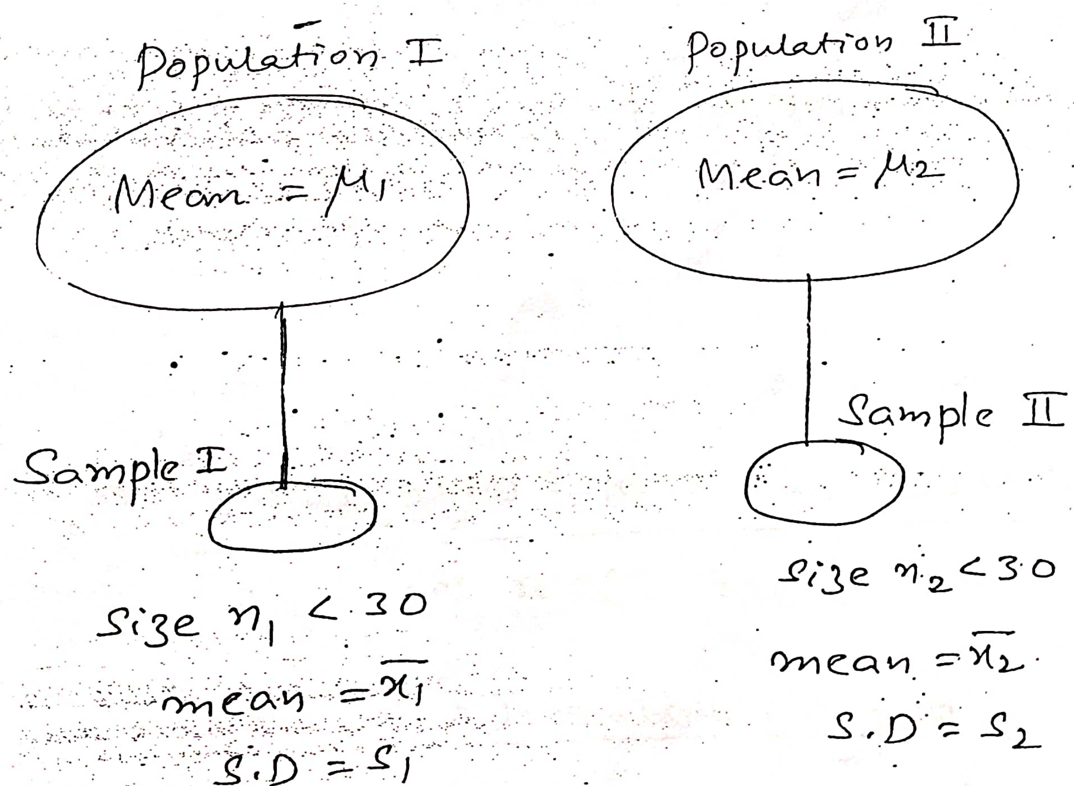
if Z lies in Acceptance region Accept H_0 otherwise reject H_0.

III

Describe the test of difference of two means based on two small samples

NOV 2004

Sol: Consider the samples have been collected with sizes less than 30 (small samples) ie Two independent samples. we wish to test whether the difference between the two means is significant



Testing Procedure

I

Null Hypothesis (H_0) : There is no significant difference between two sample means

$H_0: \mu_1 = \mu_2$

Alternative Hypothesis (H_1) : There is a ~~significant~~ significant difference between two sample means

$H_1: \mu_1 \neq \mu_2$ (TT t test)

or $\mu_1 > \mu_2$ (RT t test)

or $\mu_1 < \mu_2$ (LT t test)

II **Computation of Test Statistic** (C.T.S)

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2\left(\frac{n_1+n_2}{n_1 n_2}\right)}}$$

$$s^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1+n_2-2}$$

III **Level of significance** (L.O.S)

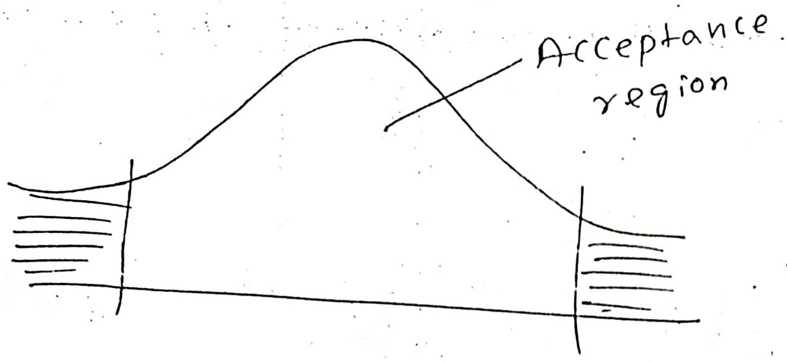
$\alpha = 1\%$ or 5% or 10%

IV **Critical value** (C.V)

$df = n_1 + n_2 - 2$

Find t_α value at n_1+n_2-2 df

V Decision



if t lies in acceptance region Accept H_0 otherwise reject H_0.