* Hypothesis test for single popln. mean μ; If σ is Known use Z-test:-

There are two methods for Hypothesis test:-

i) Traditional / Critical-value approach.

ii) P-Value Method.

1) Traditional / C.V Method for H.T for single mean μ; σ is Known (Z-test)

* Steps of Traditional Method:-

1) State $H_0: \mu = \mu_0$

$H_1: \mu \neq \mu_0$

or $\mu > \mu_0$

or $\mu < \mu_0$

& recognize test (Two-tail; Right-tail; Left-Tail).

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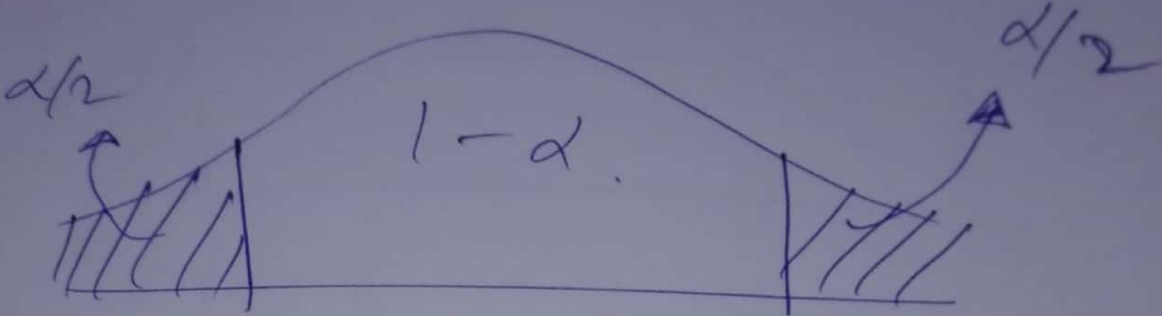
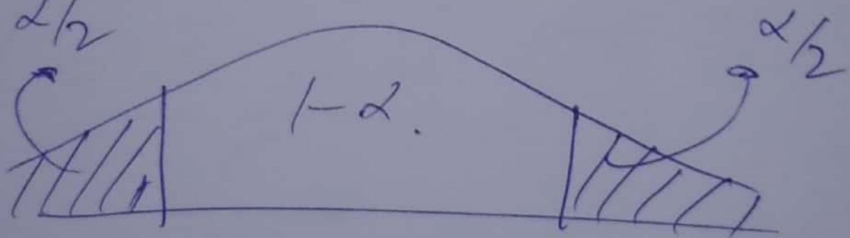
2) Find C.V's:-

Two - tail test:-



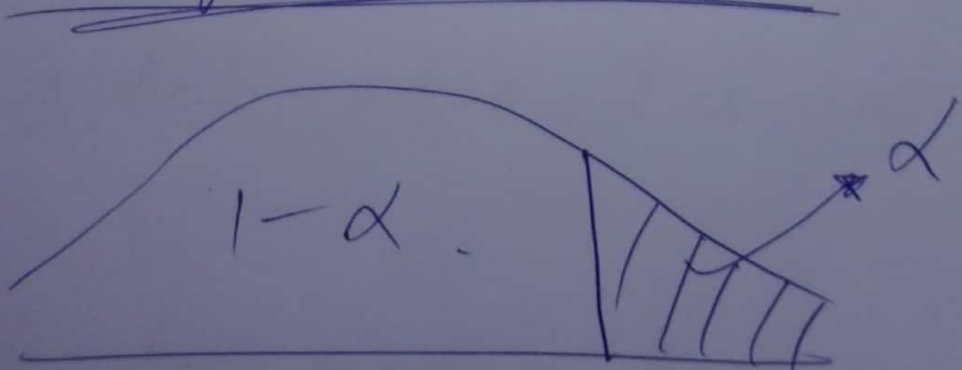
C.V = $-Z_{\alpha/2}$ C.V = $Z_{\alpha/2}$

or



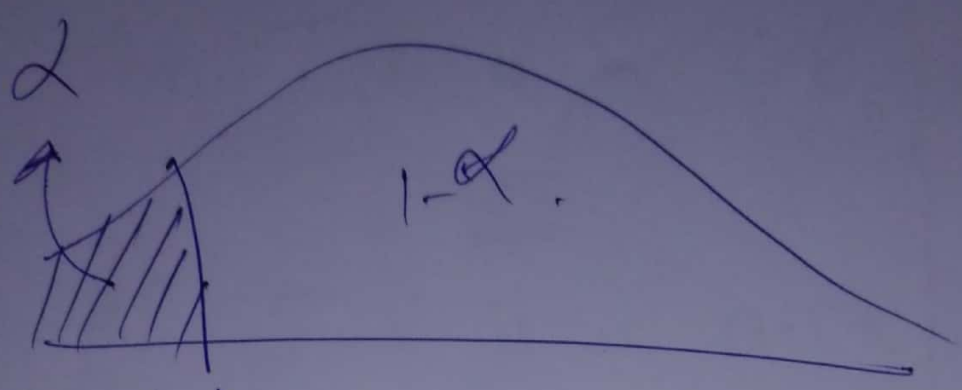
$-Z$ Z

Right - tail test:-



$Z = C.V$

Left - Tail Test



$C \cdot V = -Z$

3) find Test-value :- (Z-test as σ is known)

$$\Rightarrow \boxed{Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}}$$

4) Make Decission :-

i) test-value lies in C.R.

or

ii) test-value lies in N.C.R.

5) Result:-

If T.V is in C.R; Reject H_0

or

If T.V is in N.C.R ; Accept H_0

Conditions | Results

for referance of traditional Method

Problem : Do examples 8.3, 8.4, 8.5 on pg # 414 of (Elementary Statistics Book)

2) P-Value Method for H.T; for single mean μ; σ is Known (Z-test) :-

Steps for P-Value Method:-

1) State H_0 & H_1 & find the type of test ; 2-tail; R-tail; L-Tail.

2) Find Test-Value:-

$$\boxed{Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}}$$

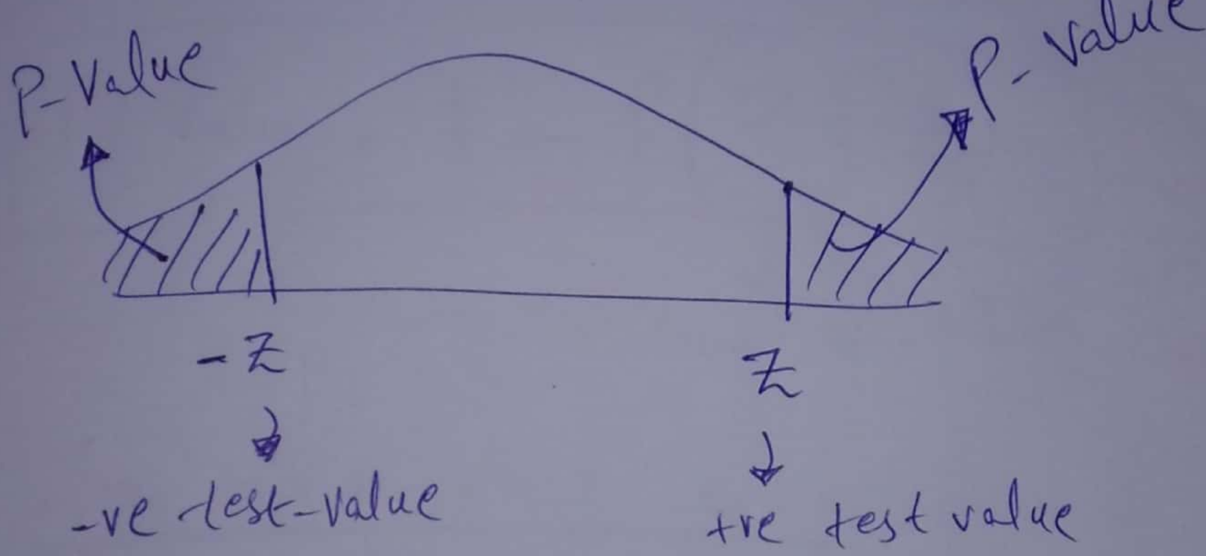
3) Find P-Value:-

To find P-Value; Draw figure the shaded Region area represents P-value. If the test value (z)

If the test-value (z) separates now, critical & non-critical regions.

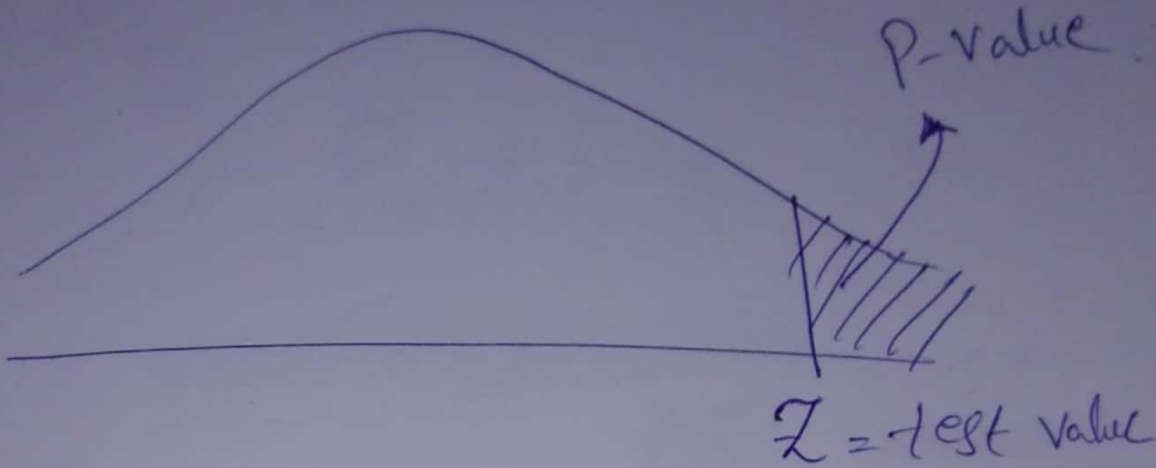
3) Find P-Value:-

If two-tail Test:-



$$\Rightarrow \boxed{P\text{-Value} = P(Z < -z) + P(Z > z)}$$

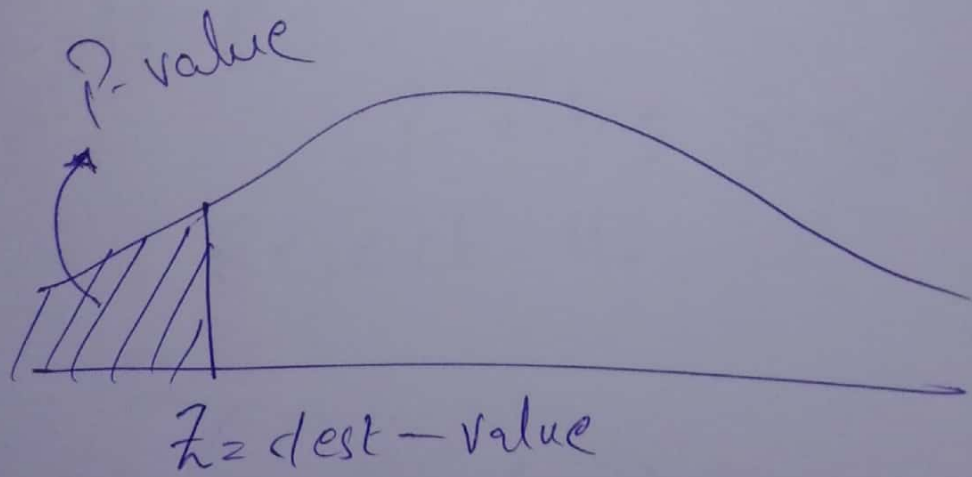
for Right-tail test:-



$$\Rightarrow \boxed{P\text{-Value} = 1 - P(Z < z)}$$

from z-table.

for left-tail Test:-



$$\Rightarrow \boxed{P\text{-Value} = P(Z < z)}$$

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4) Make Decission:-

Check either;

$$P\_value \leq \alpha$$

~~Reject H_0.~~ or

$$P\text{-}value > \alpha$$

~~Accept H_0.~~

5) Resut:-

1) If;

$$P\text{-}value \leq \alpha$$

Reject H_0.

or

2) If $P\_value > \alpha$.

Accept H_0.

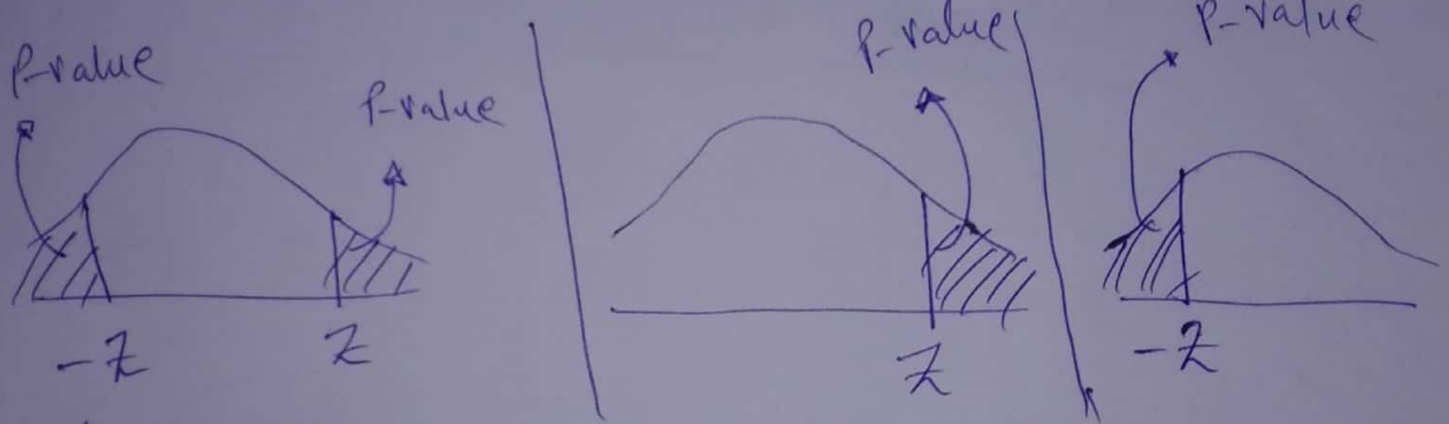
Short summary (P-Value)

1) H_0 ; H_1 ?

2) test-value:

$$\boxed{Z = \bar{X} - \mu \Big/ \sigma/\sqrt{n}}$$

3) Find P-Value:



NOTE:
all Z-values are test values not C.V's.

4) P-value $\leq \alpha$ or P-value $> \alpha$

5) Reject H_0 or Accept H_0

for referance problem see figure 9.7
& do examples: 9.8, 9.9, 9.8
Book: Introductory Statistics ; Pg # 376

Q. DATA:-

$\mu < 80 \rightarrow$ claim

$n = 36$; $\bar{X} = 75$;

$\alpha = 0.10$; $\sigma = 19.2$

Is there enough evidance to support the claim.?

Use P-value Method:-

1) $H_0 : \mu = 80$

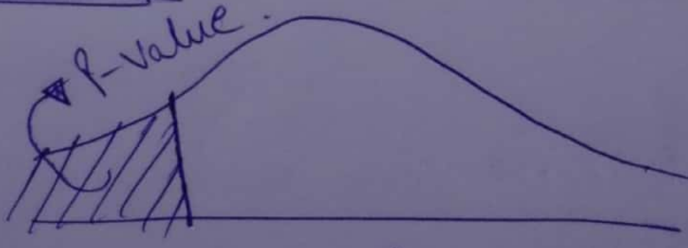
$H_1 : \mu < 80 \longrightarrow$ L.T. test

2) Test - Values:- ($\because$ σ is known Z - test)

$$\boxed{Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = -1.56}$$

$\longrightarrow$ -ve for L. tail Test

3) Find P- Value:-



$Z = -1.56$

P- Value $= P(Z < -1.56) = 0.0594$

4) Make Decissions:-

P-value $= 0.0594$

$\alpha = 0.10$

$\Rightarrow$ P-value $< \alpha$

$0.0594 < 0.10$

5) Result:-

As P-value $< \alpha$; Reject H_o.

Q 2) Data:-

Claim: $\mu > 5700$

$n = 36$; $\bar{X} = 5950$; $\sigma = 659$

$\alpha = 0.05$

Is there evidance to support the claim.? Use P-value Method.

1) $H_o : \mu = 5700$

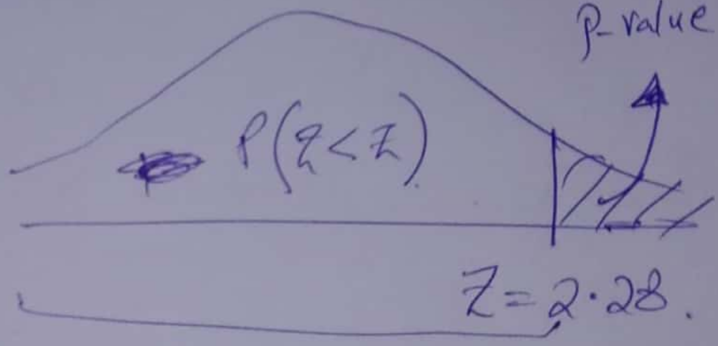
$H_1 : \mu > 5700 \rightarrow$ R. tail Test (claim)

2) Test - Value:- (∴ σ is known Z - test)

$$\boxed{Z = \frac{5950 - 5700}{\frac{659}{\sqrt{36}}} = 2.28}$$

→ +ve b/c R. tail test.

3) Find P- Value:-



$\Rightarrow$ P- Value =

$1 - P(Z < 2.28)$

$= 1 - 0.9887$

$\Rightarrow$ $\boxed{\text{P- Value} = 0.0113}$

4) Decision Making:-

P- Value $\quad \alpha$.

$0.0113 < 0.05$

5) Result:-

Reject Ho

Q3) DATA:-

Claim : $\mu = 8$.

$n = 32$; $\bar{X} = 8.2$; $\sigma = 0.6$

$\alpha = 0.05$

use P-Value. Is there enough evidance to support the claim?

1) $H_0 : \mu = 8 \longrightarrow$ claim

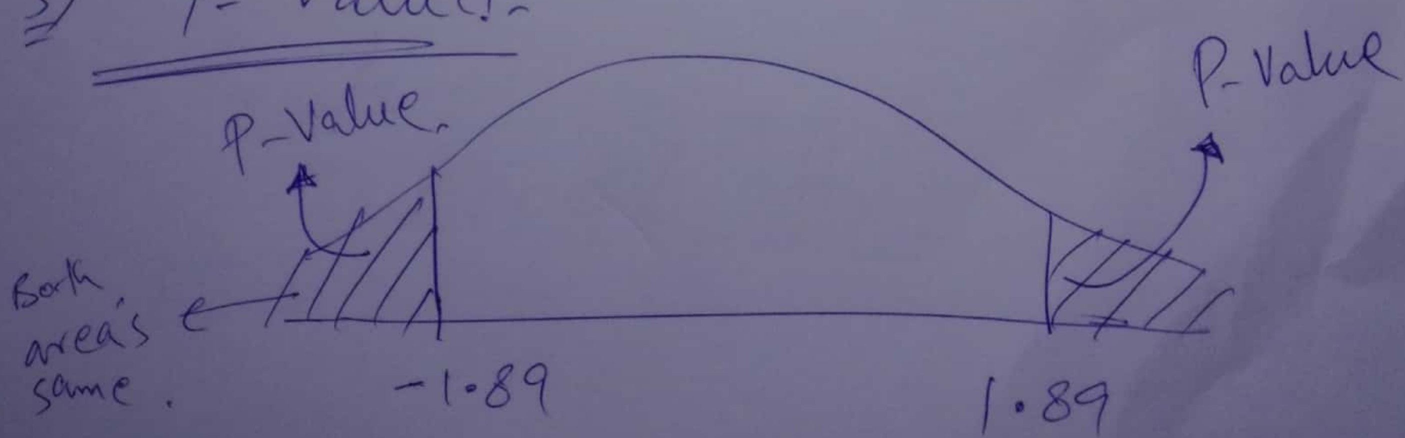
$H_1 : \mu \neq 8 \longrightarrow$ Two tail test

2) test value's:- ($\pm Z$).

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \pm 1.89$$

$\Rightarrow$ $\boxed{Z = -1.89}$; $\boxed{Z = 1.89}$

3) P-Value:-



Compute any one:-

$$P(Z < -1.89) = P\text{-Value}$$

or

$$1 - P(Z < 1.89) = P\text{-Value}.$$

$\Rightarrow$ $\boxed{P(Z < -1.89) = 0.0294.}$

$\Rightarrow$ P- Value $= 2(0.0294)$

$\boxed{P\text{- Value} = 0.0588.}$

4) Decission Making:-

P-Value $> \alpha$

$0.0588 > 0.05$

5) Result:-

Accept H_o.