2. A machine fills packets with an average weight of 500g. A sample of 100 packets has mean 495 g. The population standard deviation is 20 gm. Test at 1% level of significance whether the machine is filling packets correctly -

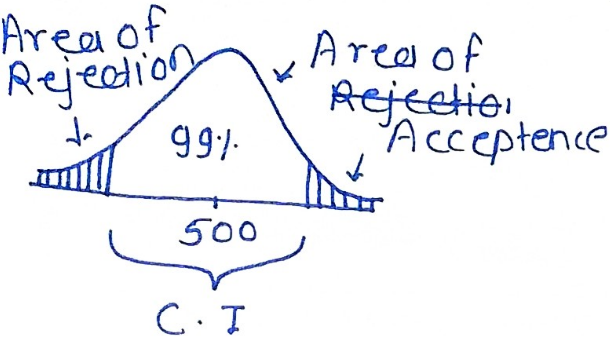
→ **Given** : $n = 100$, $\mu = 500$, $\bar{x} = 495$, $\sigma = 20$

$\alpha = 1\%$ C.I $= 1 - 1\% = 99\% = 0.99$

Null hypothesis = $H_0 = \mu = 500$

Alternate hypothesis = $H_1 = \mu \neq 500$

Decission Boundary -



Area under the rejection

$Z = 1 - 0.5\%$

$= 1 - 0.0005$

$= 0.995$

Predicated Z - value $= \pm 2.58$

Statistical Analysis

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

$$= \frac{495 - 500}{20/\sqrt{100}}$$

$$= \frac{-5}{\cancel{20}/10} \quad 2.5$$

Z value $= -2.5$

$$\boxed{-2.58 > -2.5 < 2.58}$$

Conclusion :

The z value is lies between ± 2.58. It's mean we accept the null hypothesis. Means, machine fills is packets correctly.

Q.1] The average height of student in a college is believed to be 165 cm. A random sample of 64 students has mean height of 168 cm. The population standard deviation is 12 cm. AT 5% level of significance, test whether the average height differes from 165 cm.

→ <u>Given</u> = $\mu = 165$ cm . $\bar{x} = 168$. $\sigma = 12$ cm

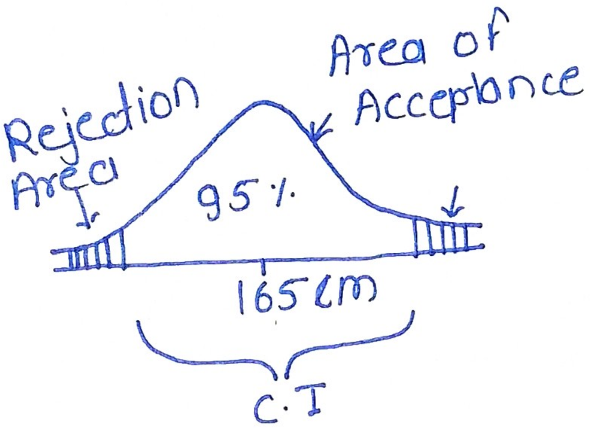
$\alpha = 5\%$ C.I = $1 - \alpha = 1 - 5\% = 95\% = 0.95$

$n = 64$

Null Hypothesis = H_0 = $\mu = 165$ cm

Alternate Hypothesis = $H_1 = \mu \neq 165$ cm

* <u>Decision Boundary</u>



Area Under Rejection

$= 1 - 2.5\%$

$= 1 - 0.025$

$= 0.9750$

Predicated Z value $= \pm 1.96$ (Z table)

* <u>statistical Analysis</u>

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

$= \dfrac{168 - 165}{12/\sqrt{64}}$

$= \dfrac{\cancel{3}}{\cancel{3}\cancel{12}/\cancel{8}2}$

Z value. $= 2.00$

$2 > 1.96$

<u>Conclusion</u> =

The value is greater than 1.96 it's mean we reject null hypothesis.

Means the average is height is always greater than <u>165</u> cm

Q.3 The average marks in mathematics are assumed to be 70 marks. A random sample of 49 students showns a mean of 74 marks. The population standard deviation is ~~74~~ 14.
At 5% significance level, test whether the average marks are ~~marks~~ different from 70.

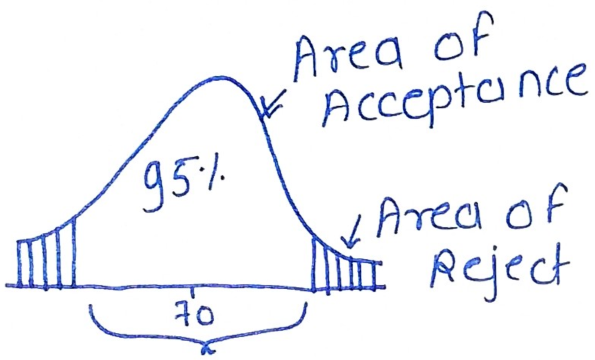
→ Given = $\mu = 70$, $\bar{x} = 74$, $n = 49$, $\sigma = 14$.

$\alpha = 5\%$ C.I = 95% = 0.95

Null Hypothesis : $H_0 = \mu = 70$

Alternate Hypothesis = $H_1 = \mu \neq 70$

Decision Boundary.



Area Under Rejection-

= 1 - 2.5% = 1 - 0.025

= 0.9750

= ± 1.96 (z. table)

Statistical Analysis

$$z\text{-value} = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{74 - 70}{14/\sqrt{49}}$$

$$= \frac{\cancel{4}\,2}{\cancel{2}\cancel{14}/\cancel{7}}$$

z - value = 2.00

Conclusion =

The calculate z value (2 > 1.96) is greater than 1.96. It's means we reject the null hypothesis. The average marks are greater than 70 marks

Q.4 The mean diameter of bolts produced by a factory is 10 mm. A random sample of 36 bolts has a mean diameter of 9.7 mm. A population standard deviation is 0.9 mm. At 5% level of significance. Test whether the mean diameter differs from 10 mm.

→ <u>Given</u> -

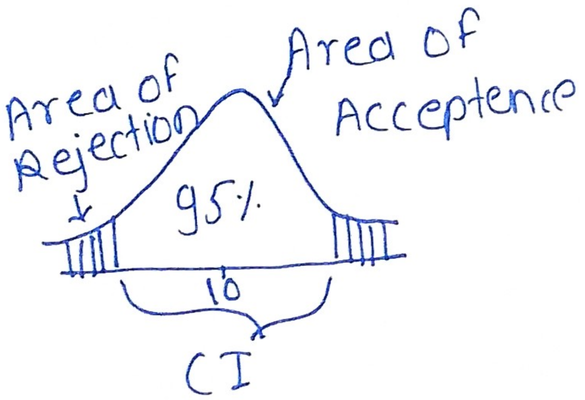
$n = 36, \ \bar{x} = 9.7, \ \mu = 10, \ \sigma = 0.9$

$\alpha = 5\%$ $\quad C.I = 1 - \alpha = 1 - 5\% = 95\% = 0.95$

Null hypothesis : $H_0 = 10$ mm

Alternate hypothesis : $H_1 \neq 10$ mm

Decision Boundary



Area under the rejection

$= 1 - \cancel{0.95}\ 0.025$

$= 0.9750$

$= \pm 1.96$

Statistical Analysis

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

$$= \frac{9.7 - 10}{0.9/\sqrt{36}}$$

$$= \frac{-0.3}{0.9/6}$$

$$= \frac{0.3}{0.15}$$

$$Z\text{-value} = -2$$

Conclusion

$-2 > -1.96$

It means we reject the null hypothesis.

The average diameter is less than 10 mm

Q. ~~8~~5: Mean = μ = 250
Sample mean : $\bar{x}$ = 255
Population SD : σ : 30
Sample size = (n) = 100
Siginificance = (α) = 5 % → C.I = 95 % = 0.95

→ Null Hypothesis = H_0 = $\mu = 250$
Alternate Hypothesis = H_1 = $\mu \neq 250$

~~Stati~~
Critical value at two tail = ± 1.96

<u>Statistical</u> <u>Analysis</u> =

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

$= \dfrac{255 - 250}{\cancel{30}^{3} / \cancel{10}}$

$= 5/3$

$= 1.66$

$1.96 > 1.66 > -1.96$

It means we failed to reject Null hypothesis.