BHT_Steps

Friday, 4 July 2025 9:54 PM

Summary of hypothesis testing :-

1. State the hypotheses:
2. choose a significance level (α)
3. Collect and analyze data :-
   Collect a sample from the population and calculate the relevent sampl statistics (e.g; sample mean, sample standard deviation)
4. Calculate Test statistics
5. Determine the p-value or/and critical value
6. Take a decision

Eample 1:

Scenario:- A factory claims that the average weight of a product is 500 grams. We want to test if the average weight is significantly different from 500 grams.

Solution: step 1 - state hypotheses

Null hypothesis (H_0) : $\mu = 500$ (the population mean)

Alternative hypothesis(H_1): $\mu \neq 500$ (two tailed test)

Two tailed test because H_1 includes all other values, bothe below and above the value 500 grams in H_0

Step: 2 choose a significance level

Let the significance level α be 0.05.

Step 3: Collect and analyse data

Let we select 30 sample and find the average weight to be 505 grams. Let the population standard deviation is 10.

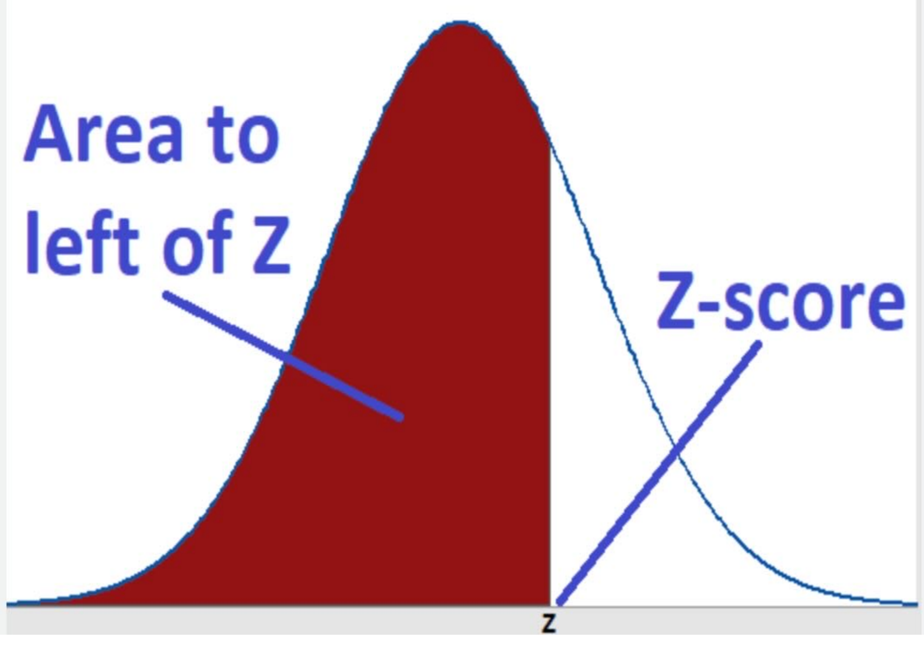
Step 4: calculate test statislics:

The Z-statistics for mean

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{505 - 500}{10/\sqrt{30}}$$

$$\boxed{Z \approx 2.74}$$

Step 5: Determine p-value and critical value



From the Z-score table, the cummulative probability for $Z = 2.74 = 0.9969$

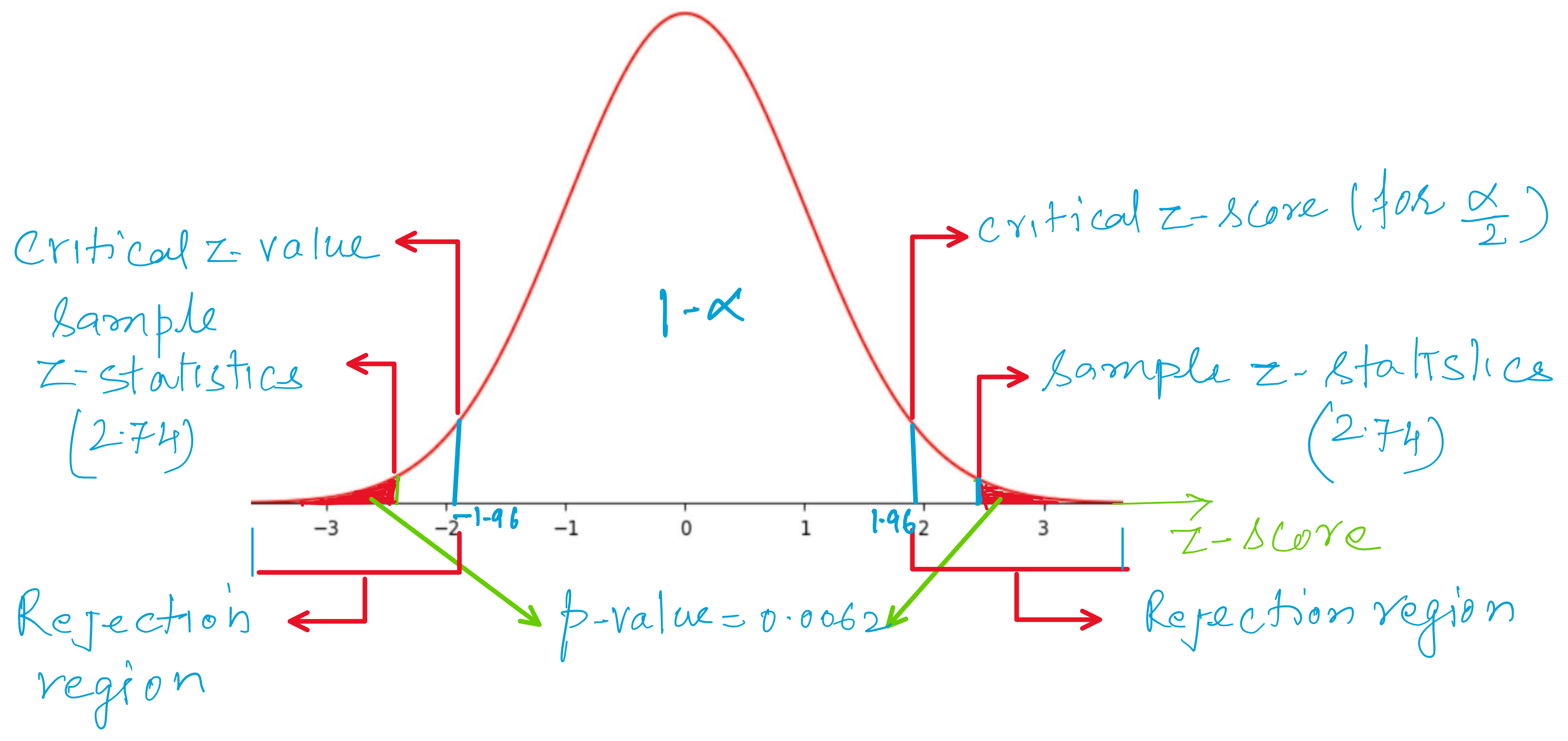
The area in the upper tail beyond this z-value is

$$1 - 0.9969 = 0.0031$$

Since it is a two-tailed test, the total p-value is

$$2 \times 0.0031 = 0.0062$$

For $\alpha = 0.05$, the critical value $= \alpha/2 = 0.025$ of the total probability of both side. The critical Z-value corresponds to 0.025 is is ± 1.96 (from z-score table)



Step 6 : Descision:

compare the p-value with the significance level ($\alpha = 0.05$)

$0.0062 < 0.05$, so reject the null hypothesis, meaning that there is significant evidence to conclude that the mean weight is different from 500 gram.

OR

The calculated Z-statistics (2.74) is greater than the critical Z-value, the null hypothesis is rejected.