

# Hypothesis Testing Overview



Hypothesis testing---explain in the format of writtern in exam

Sure! Here's a concise and clear **exam-style answer** for the topic of **Hypothesis Testing**:

## Hypothesis Testing

### Definition:

Hypothesis testing is a statistical method used to make decisions or inferences about population parameters based on sample data. It helps to determine whether there is enough evidence to reject a given assumption (hypothesis) about a population.

## Steps in Hypothesis Testing:

### 1. Formulate Hypotheses:

- **Null Hypothesis ( $H_0$ ):** Assumes no effect or no difference.  
Example:  $H_0: \mu = \mu_0$  (population mean is equal to a specific value)
- **Alternative Hypothesis ( $H_1$  or  $H_a$ ):** Represents what we want to prove.  
Example:  $H_1: \mu \neq \mu_0$

### 2. Select Significance Level ( $\alpha$ ):

Common values: 0.05, 0.01. It represents the probability of rejecting the null hypothesis when it is actually true.

### 3. Choose the Appropriate Test Statistic:

Depends on sample size, data type, and whether population standard deviation is known.  
Examples: Z-test, t-test, chi-square test, etc.

### 4. Determine the Critical Value or p-value:

This helps to decide whether to reject  $H_0$ .

### 5. Make the Decision:

- If  $p\text{-value} < \alpha \rightarrow$  Reject  $H_0$
- If  $p\text{-value} \geq \alpha \rightarrow$  Do not reject  $H_0$

### 6. Draw a Conclusion:

Based on the decision, conclude whether there is enough evidence to support  $H_1$ .

## Example:

Suppose a company claims that the average life of its bulbs is 1000 hours. A sample of 30 bulbs shows a mean life of 980 hours with a standard deviation of 50 hours. At  $\alpha = 0.05$ , is the company's claim valid?

- $H_0: \mu = 1000$
  - $H_1: \mu \neq 1000$
  - Test statistic:  $t = (980 - 1000) / (50 / \sqrt{30})$
  - Compare with critical t-value for  $\alpha = 0.05$  and  $df = 29$
  - Based on result, conclude whether to reject or not reject  $H_0$ .
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Let me know if you'd like the above with a worked-out numerical example.