Hypothesis Testing

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Hypothesis Testing :

↓

Statement about population

To conduct Hypothesis Testing we have 4 steps :

① step 1 : Define Hypothesis

(1) : Null Hypothesis (H_0) :

(2) Alternative Hypothesis (H_1/H_a) :

② Step 2 :- Define level of significance (α) (Confidence about Null Hypothesis)

③ Step 3 :- Conduct the Test statistic

④ Step 4 :- Interpretations / Result

Example-1:

A principal at a certain school claims that the students in his school are above average intelligence. A random sample of thirty students IQ scores have a mean score of 112.5. Is there sufficient evidence to support the principal's claim? The mean population IQ is 100 with a standard deviation of 15.

$\mu > 100$

~~H_0~~ : $\mu \leq 100$ The students are below average

H_1 : $\mu > 100$ The students

$H_0 : \mu = 100$ | $H_0 : \mu \leq 100$ | $H_0 : \mu \geq 100$

$H_1 : \mu \neq 100$ | $H_1 : \mu > 100$ | $H_1 : \mu < 100$

Two tailed test | method test

Blood glucose levels for obese patients have a mean of 100 with a standard deviation of 15. A researcher thinks that a diet high in raw corn starch will have a positive or negative effect on blood glucose levels. A sample of 30 patients who have tried the raw corn starch diet have a mean glucose level of 140.
Test the hypothesis that the raw corn starch had an effect.

In [ ]:

We want to test if it takes fewer than 45 minutes to teach a lesson plan. State the null and alternative hypotheses. Fill in the correct symbol (=, ≠, ≥, <, ≤, >) for the null and alternative hypotheses.

- H0: μ __ 45
- Ha:μ __ 45

On a state driver's test, about 40% pass the test on the first try. We want to test if more than 40% pass on the first try. Fill in the correct symbol (=, ≠, ≥, <, ≤, >) for the null and alternative hypotheses.

- H0: p __ 0.40
- Ha: p __ 0.40

Step 2 :- Decide Significance level (α). (0.05 | 5%)

Errors in Hypothesis Testing :

	Accept H_0	Reject H_0
H_0 is True	✓	Type-I error
H_0 is False	Type-II	✓

Type-I : Rejecting the H_0 when it is true (α) = P(Rejecting H_0 | H_0 is true)

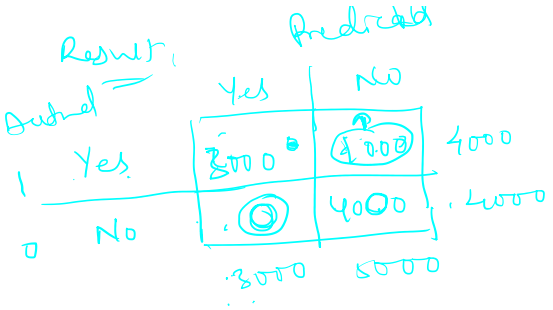
Type-II : Accepting the H_0 when it is false (β) = P(Accepting H_0 | H_0 is False)

15-20 (Ind) P

Y
N
Y

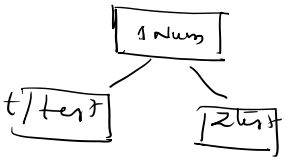
Result : Predicted

Yes | No



Step 3: Test statistic

① t-test
② z-test
③ χ^2-test
} → Numerical



t-test

① $n \leq 30$

② Unknown population standard dev

$\sigma \neq$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}$$ ~ degrees of freedom

$s/\sqrt{n-1}$ → Standard Error

Z-test

① $n > 30$

② σ is known

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

$\sigma/\sqrt{n}$ → Standard error