Steps in Hypothesis Testing (One Mean)

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State the Null Hypothesis and Alternative Hypothesis

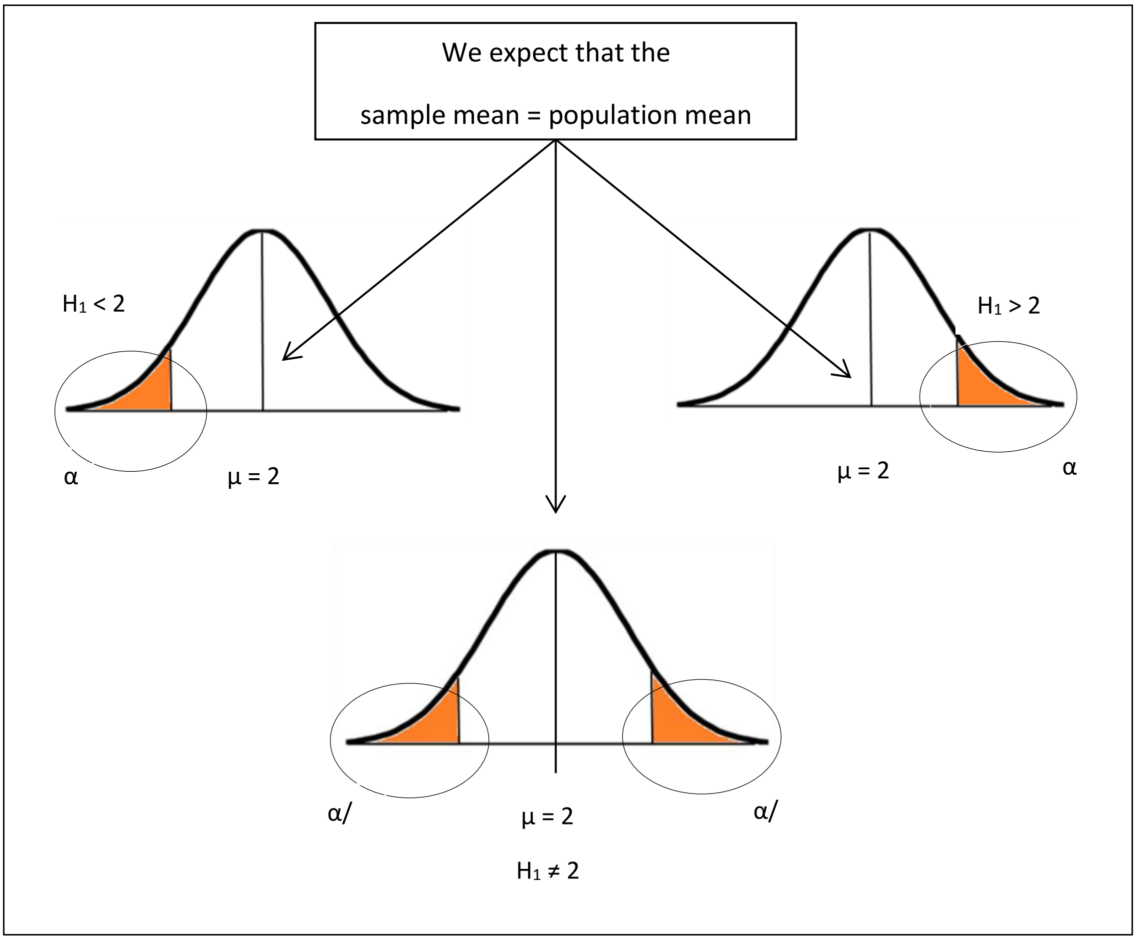
We begin by stating the value of a population mean in a null hypothesis. For example, we state that the null hypothesis that students in Universiti Teknologi MARA Cawangan Pulau Pinang, Malaysia study with an average of 2 hours per day. We will test whether the value stated in the null hypothesis is likely to be true. Keep in mind that the only reason we are testing the null hypothesis is because we think it is wrong. We may have reason to believe that students study more than 2 hours or less than 2 hours per day. We also can state that the value in null hypothesis is not equal to 2 hours.

Table 1. Hypothesis

Null Hypothesis	Alternative Hypothesis
	$\mathrm{H}_1 > 2$
$\mathrm{H}_0 = 2$	$\mathrm{H}_1 < 2$
	$\mathrm{H}_1 \neq 2$

The Level of Significance (α)

The alternative hypothesis determines whether to place the level of significance in one or both tails of a sampling distribution. Figure 1 show that the alternative hypothesis is used to determine which tail or tails to place the level of significance for a hypothesis test.



.Figure 1. The Alternative Hypothesis (H_1) Determines to Place the α

Compute the Test Statisic

For hypothesis testing of one population mean, we use z-test and t-test. The z-test is used when σ is known and t-test is used when σ is unknown.

Table 2. Test Statistic

t-test	z-test
$t_{cal} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$	$z_{cal} = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$

The t value or z value we get from the data is labeled as t_{cal} or z_{cal}.

Acceptance and Rejection Regions

The location of Acceptance and Rejection regions are shown in Figure 2. We can get the critical value from the Statistical Table.

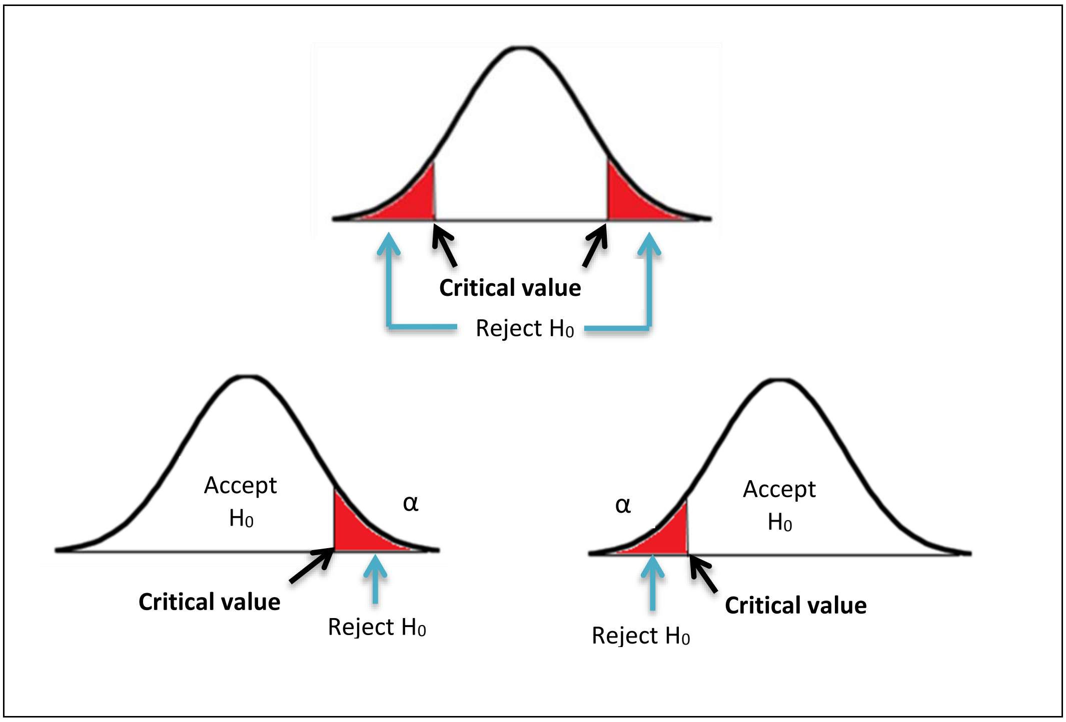


Figure 2. Acceptance/Rejection Region

Conclusion about H_0

If t_{cal} or z_{cal} falls in the critical region (the shaded region), reject H_0. Otherwise, we cannot reject H_0. We also can use the p-value method. Statistical software such as SPSS and Minitab software give an output by providing a p-value. If the p-value obtained from the output is less than α, then reject H_0 and Accept H_1.

For an example,

Given that: n = 10, $\bar{x}$ = 2.5, s = 1.056

- **State the H_0 and H_1:**

  $H_0 = 2$

  $H_1 > 2$

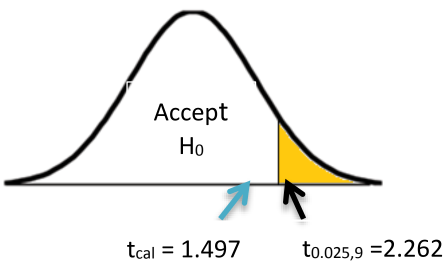
- **Specify the significance level, α**

  Alpha, $\alpha = 0.05$

- **Obtain the t_{cal}:**

$$t_{cal} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{2.5 - 2}{1.056/\sqrt{10}} = 1.497$$

Acceptance and Rejection Regions



Critical value: $\alpha = 0.05$, n = 10

$t_{\alpha/2,\, n-1} = t_{0.025,\, 9} = 2.262$ (from Table t)

Conclusion about H_0

Since $t_{cal} = 1.497$ not falls in the shaded region, do not reject H_0. Thus, the null hypothesis ($H_0 = 2$) is accepted.

References:

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