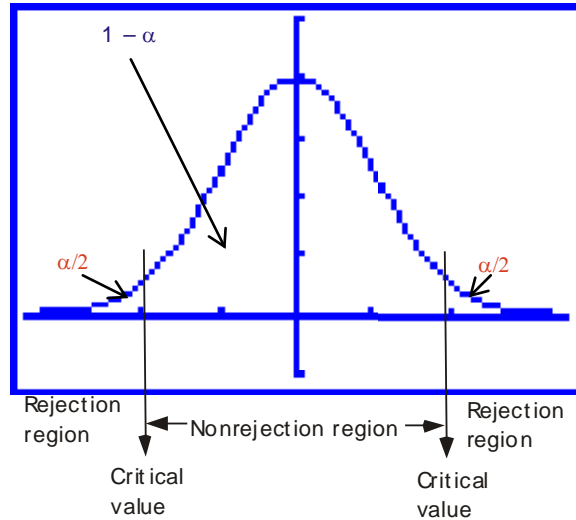# Hypothesis Testing About the Mean: General Info & Critical Values for a Z Test

This graph and chart below assumes a two-tailed test; otherwise the entire area α is in the right or left tail (which changes the critical values in the chart).

Set of Hypotheses	$H_0 : \mu = \mu_0$ $H_1 : \mu \neq \mu_0$	$H_0 : \mu \geq \mu_0$ $H_1 : \mu < \mu_0$	$H_0 : \mu \leq \mu_0$ $H_1 : \mu > \mu_0$
Level of significance	**Two-tailed Critical Values**	**Left-tailed Critical Value**	**Right-tailed Critical Value**
$\alpha = 0.10$	± 1.645	-1.28	$+1.28$
$\alpha = 0.05$	± 1.96	-1.645	$+1.645$
$\alpha = 0.01$	± 2.575	-2.33	$+2.33$

The number α is the **level of significance** chosen by the researcher in advance of the hypothesis test; $1 - \alpha$ is the confidence level for a confidence interval (which corresponds to a 2-tailed hypothesis test). Rejecting the null hypothesis when it is true (a Type I error) should be rare, and the probability of a Type I error is given by this α.

The **p-value** for a hypothesis test is the actual probability of getting the sample mean value or a more extreme value in the direction of the alternative hypothesis if the null hypothesis is true; p is the actual area under the curve to the right (in a right-tailed test), to the left (in a left-tailed test) or to the left and right (in a two-tailed test) of the **test statistic**.

There are at least 3 hypothesis test approaches:

(1) Use α, comparing the test value with the critical value(s). [Traditional 5-step process]

(2) Compare p and α; Reject H_0 if $p \leq \alpha$.

(3) Just use p.

p-value > 0.1	Little or no evidence against H_0
$0.05 <$ p-value < 0.1	Some evidence against H_0
$0.01 <$ p-value < 0.05	Moderate evidence against H_0
$0.001 <$ p-value < 0.01	Strong evidence against H_0
p-value < 0.001	Very strong evidence against H_0