Hypothesis testing is a procedure, based on sample evidence and probability, used to test statements regarding a characteristic of one or more populations.

Null Hypothesis: The *null hypothesis*, denoted H_0 , is a statement to be tested. The null hypothesis is a statement of no change, no effect or no difference and is assumed true until evidence indicates otherwise.

Alternative Hypothesis: The *alternative hypothesis*, denoted H_1 , is a statement that we are trying to find evidence to support.

Three ways to set up the null and alternative hypotheses

1. Equal versus not equal hypothesis (two-tailed test)

 H_0 : parameter = some value

 H_1 : parameter \neq some value

2. Equal versus less than (left-tailed test)

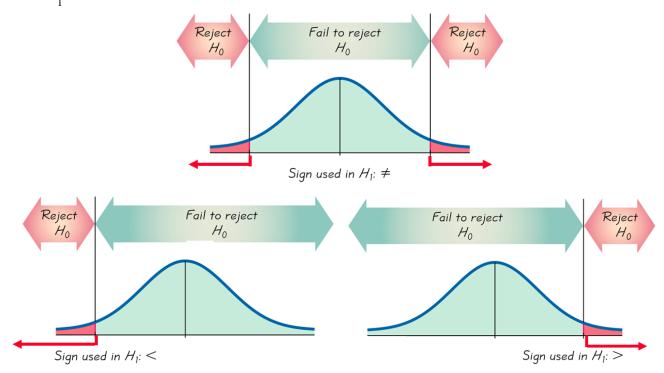
 H_0 : parameter = some value

 H_1 : parameter < some value

3. Equal versus greater than (right-tailed test)

 H_0 : parameter = some value

 H_1 : parameter > some value



If **P-value** $< \alpha$, reject the null hypothesis

If P-value $> \alpha$, fail to reject H_0 .

Two-Tailed	Left–Tailed	Right–Tailed
$H_1: p \neq p_0$	$H_1 : p < p_0$	$H_1: p > p_0$
$z_0 < -z_{\alpha/2}$ or $z_0 > z_{\alpha/2}$	$z_0 < -z_\alpha$	$z_0 > z_{\alpha}$
Reject the null hypothesis	Reject the null hypothesis	Reject the null hypothesis
The sum of the area in the tails is the P-value $- z_0 $	The area left of z_0 is the P -value z_0	The area right of z_0 is the P -value z_0
$H_1: \mu \neq \mu_0$	$H_1: \mu < \mu_0$	$H_1: \mu > \mu_0$
$ t_0 < -t_{\alpha/2} or t_0 > t_{\alpha/2} $	$t_0 < -t_{\alpha}$	$t_0 > t_{\alpha}$
Reject the null hypothesis	Reject the null hypothesis	Reject the null hypothesis
Critical Region 7 Region $-t_{\alpha/2}$ $t_{\alpha/2}$	Critical Region $-t_{\alpha}$	Critical Region t_{α}
$H_1: \sigma \neq \sigma_0$	$H_1: \sigma < \sigma_0$	$H_1: \sigma > \sigma_0$
$\chi_0^2 < \chi_{1-\alpha/2}^2$ or $\chi_0^2 > \chi_{\alpha/2}^2$ Reject the null hypothesis	$\chi_0^2 < \chi_{1-\alpha/2}^2$ Reject the null hypothesis	$\chi_0^2 > \chi_{\alpha/2}^2$ Reject the null hypothesis
Critical Region $\chi_{1-\frac{\alpha}{2}}^{2} \qquad \chi_{\frac{\alpha}{2}}^{2}$ (critical value) (critical value)	Critical Region $\chi^{2}_{1-\alpha}$ (critical value) $P\text{-value} = P(\chi^{2} < \chi^{2}_{0})$ χ^{2}_{0}	Critical Region χ^{2}_{α} (critical value) $P\text{-value} = P(\chi^{2} > \chi^{2}_{0})$ χ^{2}_{0}