Let a random X with unknown $F(x)$. We are interested in the value of a parameter θ determined by $F(x)$.
In particular we want to test the null hypothesis $H_0: \theta = \theta_0$ against the alternative hyp $H_1: \theta \neq \theta_0$

1) From a random sample $\{X_1, \dots, X_n\}$ construct an appropriate statistic $T(X_1, \dots, X_n)$

2) Calculate the null sampling distribution $G_0(x) \equiv P[T \leq x \mid \substack{F = F_0 \\ \theta = \theta_0}]$

3) If the measurement $T(x_1, \dots, x_n)$ $\begin{cases} \notin C: \text{accept (or fail to reject) } H_0 \\ \in C: \text{reject } H_0 \end{cases}$ where $C \subseteq \mathbb{R}$: appropriate critical region

4) But how should we define C?
Define the C such that $\overbrace{\underbrace{P[\text{reject } H_0 \mid H_0 \text{ true}]}_{\text{Type-I error}}}^{\text{size of hypothesis test}} \leq \underbrace{\alpha}_{\text{significance level}} \in (0, 1)$ $\Longrightarrow$
- 1-sided test ($T > c$): $1 - G_0(T) \leq \alpha \Rightarrow \boxed{c \equiv G_0^{-1}(1-\alpha)}$
- 2-sided test ($|T| > c$): $1 - G_0(c) + G_0(-c) \equiv \alpha \Rightarrow$ for symmetric G_0 $\boxed{c \equiv G_0^{-1}(1 - \alpha/2)}$

5) (If possible) Among various appropriate statistics $\{(T^1, G_0^1), (T^2, G_0^2), \dots\}$ choose the one with max $\overbrace{1 - P\underbrace{[\text{Accept } H_0 \mid H_1 \text{ true}]}_{\text{type II error}}}^{\text{power}}$

6) In some cases: Reject H_0 when $T > c$ $\Longrightarrow$ Then we can define $\underbrace{p \equiv 1 - G_0(T)}_{\text{p-value}}$ $\xrightarrow{G_0(c) \equiv 1-\alpha}$ Reject H_0 when $p < \alpha$