# One Mean

Parameter: $\mu$

Point estimate: $\bar{x}$

**Conditions for Distributional Approximation**

1. Independent observations
2. Nearly normal population OR Large sample size ($n > 30$)

## Hypothesis Test

**Hypotheses**

$H_0: \mu = \mu_0$

$H_a$: ① $\mu < \mu_0$

② $\mu \neq \mu_0$

③ $\mu > \mu_0$

**Test Statistic Random Variable (Assuming $H_0$ true)**

$$T = \frac{\bar{X} - \mu_0}{S/\sqrt{n}} \sim t_{n-1}$$

**Observed Test Statistic**

$$t_{obs} = \frac{\bar{x}_{obs} - \mu_0}{s_{obs}/\sqrt{n}}$$

**P-value**

① $P(\bar{X} \leq \bar{x}_{obs}) = P(T \leq t_{obs})$

② $2P(|\bar{X}| \geq |\bar{x}_{obs}|) = P(|T| \geq |t_{obs}|)$

③ $P(\bar{X} \geq \bar{x}_{obs}) = P(T \geq t_{obs})$

## Confidence Interval

**Formula for CI**

$$\bar{x}_{obs} \pm \left[ t^*_{df} \times \frac{s_{obs}}{\sqrt{n}} \right]$$