

M358K: November 30th, 2020.

Problem 7.4.

Assume the two-tailed test.

$$\alpha = 0.01$$

(a) $n = 26$, $t = 2.485$

$$TS \sim t(df = 25)$$

$$P[TS > 2.485] = 0.01$$

\Rightarrow p-value (since it's a two-tailed test)

is 0.02

\Rightarrow @ the 0.01 significance level
we fail to reject

(b) $n = 18$, $t = 0.5$

$$TS \sim t(df = 17)$$

$$P[TS > 0.5] > 0.25$$

\Rightarrow p-value is $> 0.5 \Rightarrow$ fail to reject

Using R: $2 * pt(-0.5, df = 17) = 0.6234852$

Problem 7.12.

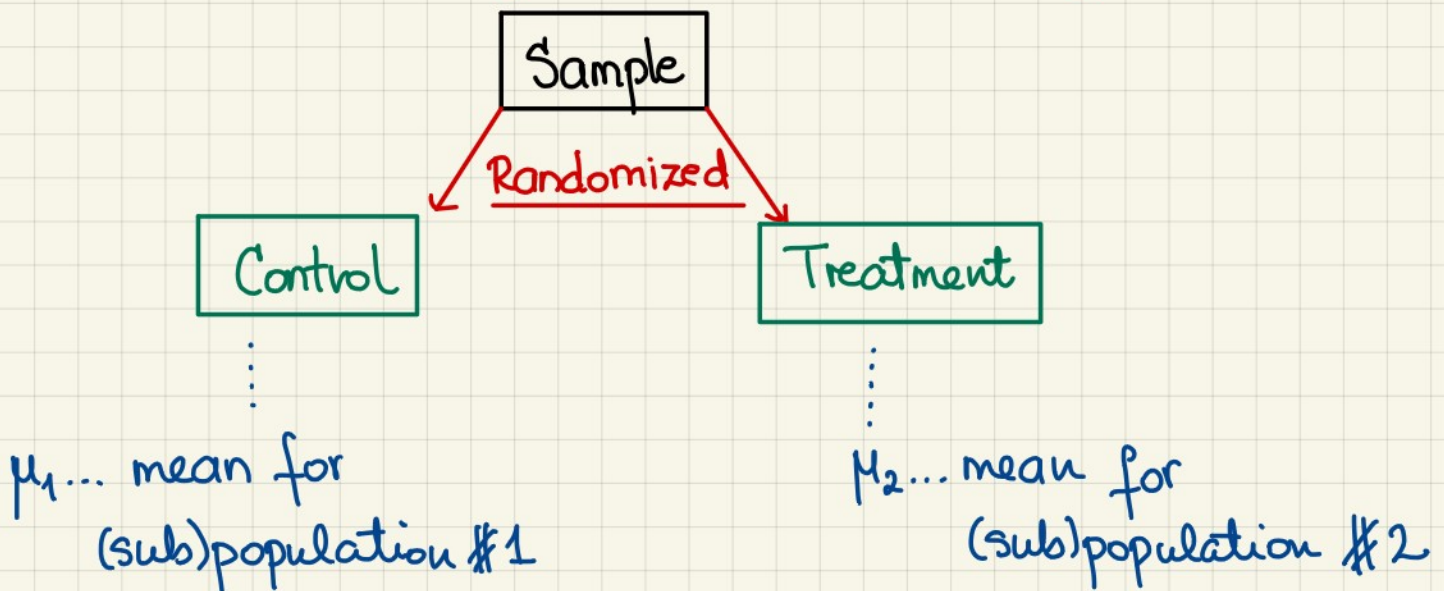
(a) $H_0: \mu = 35$ vs. $H_a: \mu \neq 35$

Statistical Inference for Two Means.

Inspiration.

Think about an experiment for testing whether a new drug works better than an existing drug.

"Old Drug" vs. "New Drug"



Goals:

- a confidence interval for $\mu_1 - \mu_2$
- hypothesis testing

Interested in $\mu_1 - \mu_2$

\Rightarrow We must take a closer look @ $\bar{X}_1 - \bar{X}_2$
a random variable

Assumptions:

- both population dist'ns are normal
- the two samples are independent

\Rightarrow for both $i=1,2$:

$\bar{X}_i \sim \text{Normal}(\text{mean} = \mu_i, \text{var} = \frac{\sigma_i^2}{n_i})$ w/ n_i ... sample size

$$\bar{X}_1 - \bar{X}_2 \sim \text{Normal}(\text{mean} = \mu_1 - \mu_2, \text{var} = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2})$$

Goals: • confidence intervals with the sample standard deviations instead of the σ 's

w/ $df = \min(n_1, n_2) - 1$

• For hypothesis testing, our null is always

$$H_0: \mu_1 = \mu_2$$

Under the null, the observed value of the TS is

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - 0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$