Two Sample T-Tests

AP Statistics
Comparing Two Means

- A 2-Sample T-test is used to compare two means from two different populations.
- *There is no pairing.*
- Sample sizes may not be equal.
- The goal of inference to compare the responses to treatments or to compare the characteristics from two populations.
- This is not matched-pairs!
Side-by-side Comparison:

- Matched-pairs
- One subject-two scores
- \( \mu_d = 0 \)
- Equal number sets (always)

2-Sample
- Two groups – two means
- \( \mu_1 = \mu_2 \)
- Mostly unequal sets
Assumptions for Inference

- Need two SRS’s.
- Samples are independent – no shared subjects.
- The same variable is measured for both samples (don’t have to list this one).
- Both populations are normally distributed.
Hypotheses

- $H_0: \mu_1 = \mu_2$
- or $H_0: \mu_1 - \mu_2 = 0$
Test Statistic

\[ t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_1^2/n_1 + s_2^2/n_2}} \]

- \( df = \) smaller of \( n_1 - 1 \) or \( n_2 - 1 \) (just let the calculator figure it out for you).
Confidence Intervals

\[(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{s^2_1/n_1 + s^2_2/n_2}\]

\text{df} = \text{smaller of } n_1 - 1 \text{ or } n_2 - 1

*Look for zero (no difference) in the interval.
Homework

- 11.37, 11.40, 11.42, 11.53