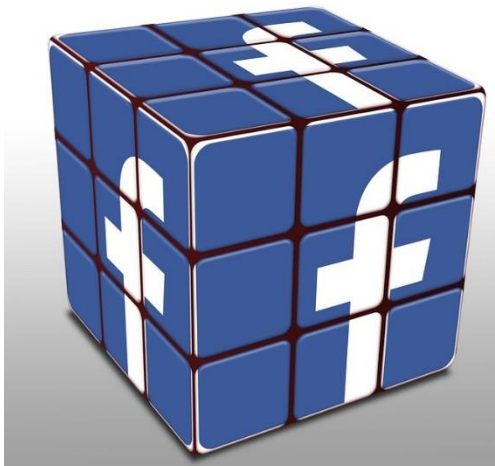
Overview – what are inference procedures?

- One sample z-interval
- One sample t-interval
- Two sample z-interval for p_1-p_2
- Two sample t-interval for μ_1-μ_2
- Paired t-interval for $\mu_{1\text{-}2}$
- t-interval for least squares regression line

- One sample z-test for p
- One sample t-test for means
- Two sample z-test for p_1-p_2
- Two sample t-test for μ_1-μ_2
- Paired t-test for $\mu_{1\text{-}2}$
- t-test for least squared regression line
- X^2 goodness-of-fit test
- X^2 test for homogeneity
- X^2 test for association/independence

One sample z-interval

- When?
  - Proportions (or a known standard deviation)
  - Looking for a proportion of ONE variable within a group
- Conditions?
  - Random (or representative) sample
  - Less than 10% of the overall population
  - At least 10 expected successes and failures
- Example
  - What percent of students at your school have a Facebook account?



One sample z-test

- When?
  - Proportions (or a known standard deviation)
  - Comparing a proportion of ONE variable within ONE group
- Conditions?
  - Random (or representative) sample
  - Less than 10% of the overall population
  - At least 10 expected successes and failures
- Example
  - A recent study said that 70% of high school students bring a lunch to school. Is that true for students at your school?

One sample t-interval

- When?
  - Quantitative Data (units)
  - Looking for an estimate for one group
- Conditions?
  - Random (or representative) sample
  - Less than 10% of population
  - At least 30 in the sample
  - Nearly normal distribution
- Example
  - How long do teens typically spend brushing their teeth?

One sample t-test

- When?
  - Quantitative Data (units)
  - Comparing to an estimate for one group
- Conditions?
  - Random (or representative) sample
  - Less than 10% of population
  - At least 30 in the sample
  - Nearly normal distribution
- Example
  - According to a recent survey, a typical teenager has 38 contacts stored in his/her phone. Is this true at your school?

Two sample z-interval for p_1-p_2

- When?
  - Proportions (or known standard deviation)
  - Looking for an estimate of difference in percent between two groups
- Conditions?
  - EACH group random or representative
  - EACH group no more than 10% of entire population
  - EACH group expected at least 10 successes and 10 failures
  - Groups independent of each other
- Example
  - What is the approximate difference in graduation rate between students of color and white students?

Two sample z-test for p_1-p_2

- When?
  - Proportions (or known standard deviation)
  - Determining if there is a difference (or what kind of difference) between two groups
- Conditions?
  - EACH group random or representative
  - EACH group no more than 10% of entire population
  - EACH group expected at least 10 successes and 10 failures
  - Groups independent of each other
- Example
  - Who is more likely to own an iPhone, middle school girls or middle school boys?

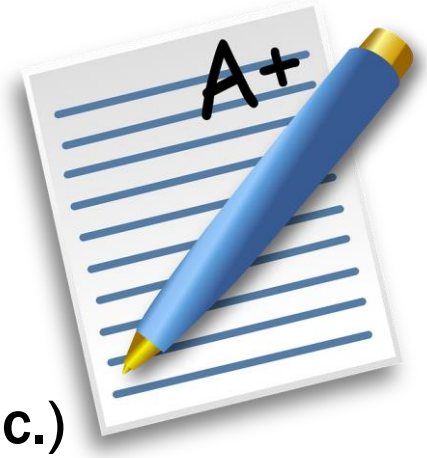
Two sample t-interval for μ_1-μ_2

- When?
  - Quantitative Data – units
  - Comparing the difference between two independent groups (may or may not have different quantities)
- Conditions?
  - BOTH groups Random (or representative) of population
  - BOTH groups less than 10% of population(s)
  - At least 30 in sample (each)
  - BOTH groups – nearly normal distribution
  - Independent Groups
- Example
  - What is the approximate grade difference between AP Stats students in the 2017-18 school year with this school year?

Two sample t-test for μ_1-μ_2

- When?
  - Quantitative Data – units
  - Testing the difference between two independent groups (may or may not have different quantities)
- Conditions?
  - BOTH groups Random (or representative) of population
  - BOTH groups less than 10% of population(s)
  - At least 30 in sample
  - BOTH groups – nearly normal distribution
  - Independent groups
- Example
  - Do Duracell batteries last longer than Eveready?

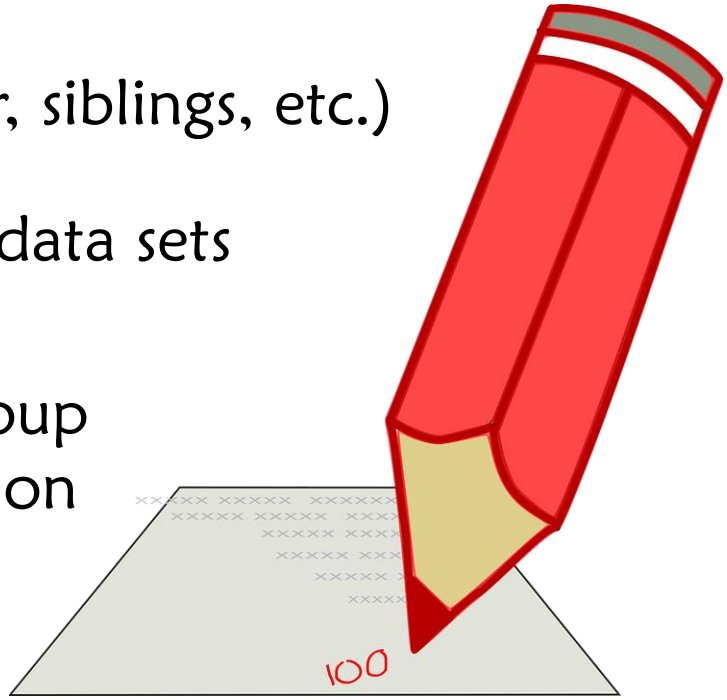
Paired t-interval for μ_{1-2}



- When?
  - Quantitative Data – units
  - Connected groups (before/after, siblings, etc.) making really one group
  - Determining the difference between data sets
- Conditions?
  - Random (or representative) group
  - Less than 10% of total population
  - At least 30 in group
  - Nearly normal distribution
- Example
  - How do GPA's change between junior year and senior year? 50 students were chosen and their 11^{th} grade and 12^{th} grade GPA's were compared.

Paired t-test for μ_{1-2}

- When?
  - Quantitative Data – units
  - Connected groups (before/after, siblings, etc.) making really one group
  - Testing the difference between data sets
- Conditions?
  - Random (or representative) group
  - Less than 10% of total population
  - At least 30 in group
  - Nearly normal distribution



- Example
  - Does participation in a tutoring program make a difference. Students' success rate was compared before and after participation in a tutoring program.

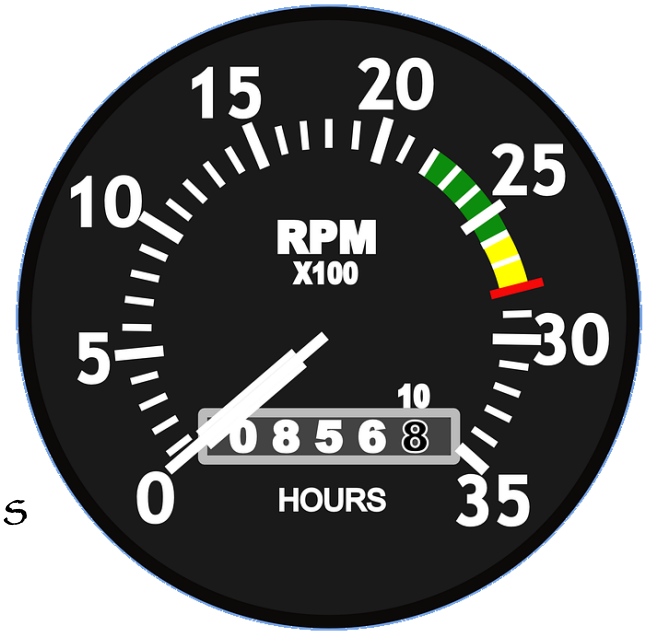
t-interval for least squares regression line

- When?
  - A set of two different quantitative values for each subject
  - Determining what the relationship is between those variables
- Conditions?
  - Quantitative Data
  - Scatterplot is straight enough
  - No pattern in the residuals
  - No strong outliers
  - Nearly normal distribution of residuals

- Example
  - Approximately what slope describes the relationship between hours of sleep and salary for adults in their 20's?

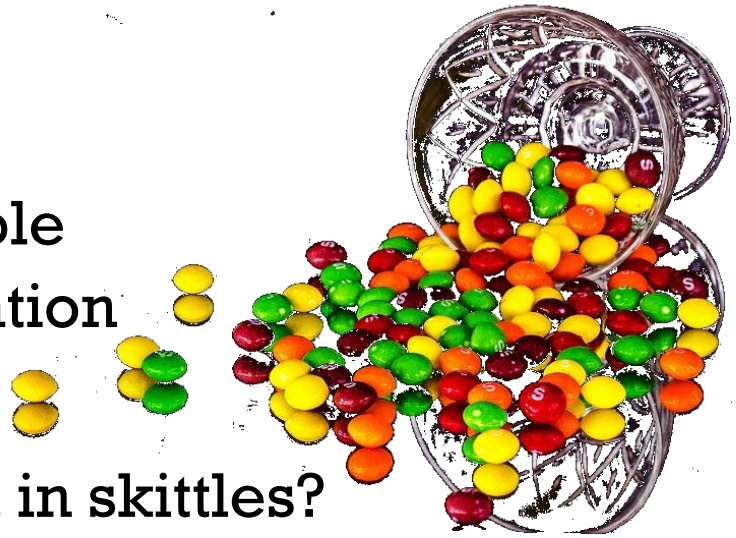
t-test for least squared regression line

- When?
  - A set of two different quantitative values for each subject
  - Testing if there is a relationship is between those variables
- Conditions?
  - Quantitative Data
  - Scatterplot is straight enough
  - No pattern in the residuals
  - No strong outliers
  - Nearly normal distribution of residuals
- Example
  - Is there a relationship between the age of a students' car and the mileage reading on the odometer?



X^2 goodness-of-fit test

- When?
  - Categorical Data (counts in each category)
  - One set of categories (color, race, flavor, etc)
- Conditions?
  - Counted Data
  - Expected 5 in each category
  - Random (representative) sample
  - Less than 10% of entire population
- Example
  - Are flavors equally distributed in skittles?



X^2 test for homogeneity

- When?
  - Categorical Data (counts in each category)
  - Two sets of categories (color, race, flavor, etc)
  - Asking about "proportional" or "distribution"
- Conditions?
  - Counted Data
  - Expected 5 in each category
  - Random (representative) sample
  - Less than 10% of entire population
- Example
  - Is involvement in various sports (basketball, baseball, wrestling, etc.) proportional to ethnicity in area high schools??

$$\frac{(\text{row total})(\text{col total})}{\text{grand total}}$$

X^2 test for association/independence

- When?
  - Categorical Data (counts in each category)
  - Two sets of categories (color, race, flavor, etc)
  - Asking about "relationship", "association", or "independent"
- Conditions?
  - Counted Data
  - Expected 5 in each category
  - Random (representative) sample
  - Less than 10% of entire population

- Example
  - Is there a relationship between students' favorite academic subject and preferred music type?

http://bit.ly/InfProc