19.e - 20.a - Hypothesis Testing

1) Turn in all p. 455 Assignments
2) Quiz 19
3) Beginning Assignment and Reading on p. 476
4) Notes 20.a : Formalizing the 4 Steps
5) Example : Does the PSA work?
6) Remainder of 20.a Assignment

Assignment (Due Friday, March 1)

1) Read Pg. 459-463
   (do this before starting problems)

2) Pg. 476, #1-6, 9, 10

3)
4-Steps to a Good Hypothesis Test

In general, these are the four things looked for in a "full-credit" response

I. state HYPOTHESIS

A) State Null Hypothesis (H₀)
   -in models with proportions, state something about "p = "
   -good idea to also put in words
   \[ H₀ : p = 0.13 \]

B) State Alternative Hypothesis (Hₐ)
   -decide and state as an inequality in context ( <, >, or ≠)
   -good idea to also put in words
   \[ Hₐ : p ≠ 0.13 \]

II. state MODEL

A) What Model are you thinking of using?
   -check conditions and assumptions
   -make very brief statements to indicate these are met

B) Clearly state the model you are using (or not using)
   "Because the conditions are satisfied, I can model the sampling distribution of the proportion with a Normal model"

C) Clearly state the test you are using
   -here, it is the one-propotion z-test
4-Steps to a Good Hypothesis Test

In general, these are the four things looked for in a "full-credit" response

III. MECHANICS
A) Computations
   - show where you got any number that is not original
   - draw a picture including the Normal curve and
     important values
   - in general for proportion tests, include
     hypothesized $p$, $\hat{p}$, SD ($\hat{p}$); z, P-value

B) Clarity!!!

IV. CONCLUSION
A) What is your conclusion? Either...
   "Reject the null hypothesis"
   or
   "Fail to reject the null hypothesis"

B) Justify your conclusion
   - refer to P-Value
Research Results

A 1996 report from the Product Safety Commission claimed that at least 90% of all American homes have at least one smoke detector. A city's fire department has been running a public safety campaign about smoke detectors consisting of posters, billboards, and ads on radio and TV and in the newspaper. The city wonders if this concerted effort has raised the local level above 90% national rate. Building inspectors visit 400 randomly selected homes and find that 376 have smoke detectors. Is this strong evidence that the local rate is higher than the national rate?

Assignment (Due Friday, February 28)

1) Read Pg. 459-463
   (do this before starting problems)

2) Pg. 476, #1-6, 9, 10
Assignment (Due Monday, March 3)

1) Read Pg. 459-463
   (do this before starting problems)

2) Pg. 476, #1-6, 9, 10

3) Pg. 476, #17, 19

4) Read Pg. 466-474

17. Law School.

   a) $H_0$: The law school acceptance rate for $LSAT_{isfaction}$ is 63% ($p = 0.63$)
      $H_A$: The law school acceptance rate for $LSAT_{isfaction}$ is greater than 63% ($p > 0.63$)

   b) Randomization condition: These 240 students may be considered representative of the
      population of law school applicants.
      10% condition: There are certainly more than 2,400 law school applicants.
      Success/Failure condition: $np = 151.2$ and $nq = 88.8$ are both greater than 10, so the sample
      is large enough.
      The conditions have been satisfied, so a Normal model can be used to model the sampling
      distribution of the proportion, with $\mu_\hat{p} = p = 0.63$ and $\sigma(\hat{p}) = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.63)(0.37)}{240}} = 0.0312$.

      We can perform a one-proportion $z$-test. The observed success rate is $\hat{p} = \frac{163}{240} = 0.6792$.

\[
\begin{align*}
  z &= \frac{\hat{p} - p_0}{\sqrt{\frac{pq}{n}}} \\
  z &= \frac{0.679 - 0.63}{\sqrt{\frac{(0.63)(0.37)}{240}}} \\
  z &= 1.58
\end{align*}
\]

   c) Since the $P$-value = 0.057 is fairly low, we reject the null hypothesis. There is weak
      evidence that the law school acceptance rate is higher for $LSAT_{isfaction}$ applicants.
      Candidates should decide whether they can afford the time and expense.
19. Pollution.

$H_0$: The percentage of cars with faulty emissions is 20%. ($p = 0.20$)

$H_A$: The percentage of cars with faulty emissions is greater than 20%. ($p > 0.20$)

Two conditions are not satisfied. 22 is greater than 10% of the population of 150 cars, and $np = (22)(0.20) = 4.4$, which is not greater than 10. It’s not advisable to proceed with a test.