\# 8
3 things

SECTION 10.4
MEAN (SMALL SAMPLE)

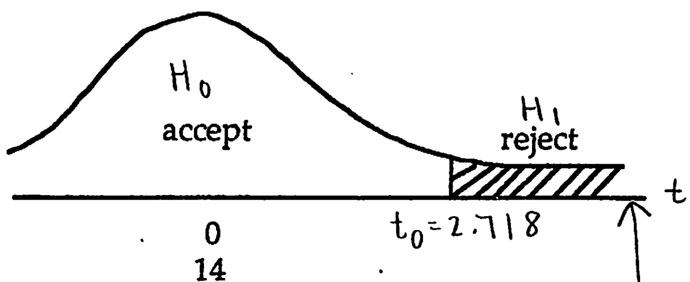
1. $n = 12$ $\bar{x} = 18.33$ $s = 2.71$

2. $H_0 =$ There is no difference between the population average HC for this patient and 14 (the average for a healthy adult woman). $\mu = 14$

   $H_1 =$ This patient's average HC is greater than 14. $\mu > 14$

3. $\alpha' = .01$ is given. Note minor change in notation.

4. Right-tail since "greater" occurs in H_1 d.f.= n - 1 = 12 - 1 = 11



The critical value is $t = 2.718$ in the t-table; put it on the picture.

5. The test statistic is $\bar{x} = 18.33$. Using the formula from the book,

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{18.33 - 14}{2.71/\sqrt{12}} = \frac{4.33}{.78} = \boxed{5.535}$$

6. Since $5.535 > 2.718$, we reject H_0 and accept H_1. The evidence suggests this patient's HC is higher than that of a healthy adult woman.

   To find the P-value for this problem, we look in the t-table in the d. f. = 11 row. Since 5.535 > 3.106 (the largest value in the row), we conclude P-value < .005 (note the change in the inequality sign).

13. a) $\bar{x} = 74.45$ yrs

$s = 18.0918$ yrs

b) $\mu = 77$ yrs

$\bar{x} = 74.45$ yrs

$s = 18.0918$ yrs

$n = 20$

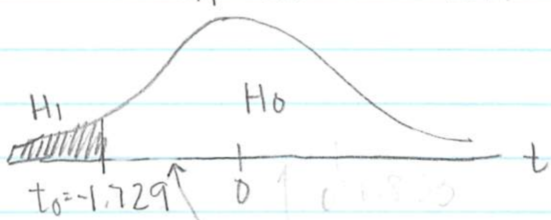
$df = 19$

$\alpha = 0.05$

"less than"

$H_0: \mu = 77$ yrs There is no difference in the pop mean life span for Honolulu residents.

$H_1: \mu < 77$ left-tailed test



$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$= \frac{74.45 - 77}{18.0918/\sqrt{20}}$$

$$= \boxed{-0.6303}$$

we reject the H_1 and fail to reject H_0, $\alpha = 0.05$

$\exists$x insufficient statistical evidence to suggest that the pop mean life span of Honolulu residents is less than 77 yrs.

The p value is greater than 0.25. thus, we do not reject H_0.

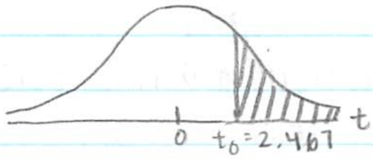
Cathy Sun
3/17/14

10
Good

10.4 #6-9, 11-13

6. $n = 29$, d.f. = 28, right-tail test, $\alpha = 0.01$

$t_0 = 2.467$



7. a) $\bar{x} = 4.0667$, $s = 0.4412$

b) $\mu = 4.8$ millions/mm^3

$\bar{x} = 4.0667$

$s = 0.4412$

$n = 6$

d.f. = 5

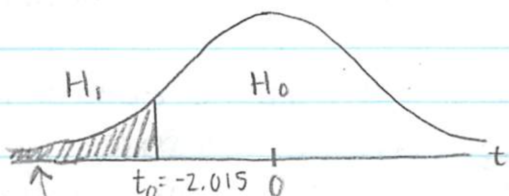
$\alpha = 0.05$

"lower"

$H_0: \mu = 4.8$ millions/mm^3

There is no difference for this female and other healthy women.

$H_1: \mu < 4.8$ left-tailed test



$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{4.0667 - 4.8}{0.4412/\sqrt{6}}$

$= \boxed{-4.07}$

we reject the H_0 and fail to reject H_1 when $\alpha = 0.05$.
∃x sufficient statistical evidence to suggest that this woman's RBC is less than 4.8 millions/mm^3.
P value is smaller than 0.005, so we reject the null hypothesis.

8. see attached

9. a) $\bar{x} = 17.8333$, $s = 2.2029$

b) $\mu = 16.5$ days

$\bar{x} = 17.8333$

$s = 2.2029$

$n = 18$

d.f. = 17

$\alpha = 0.05$

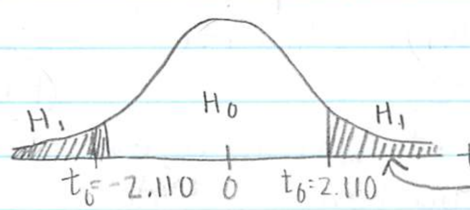
"different"

$H_0: \mu = 16.5$ days

There is no difference in the avg incubation time at higher elevations.

$H_1: \mu \neq 16.5$ days two-tailed test

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{17.8333 - 16.5}{2.2029/\sqrt{18}}$



$= \boxed{2.57}$

we reject the H_0 and fail to reject H_1 $\alpha = 0.05$.
∃x sufficient statistical evidence to suggest that the avg incubation time above 8000 ft elevation is different.
P value is between 0.01 and 0.02, so we reject the null hypothesis.

11. a) $\bar{x} = 1268$

$S = 37.2887$

b) $\mu = 1300$ A.D.

$\bar{x} = 1268$ A.D.

$S = 37.2887$

$n = 10$

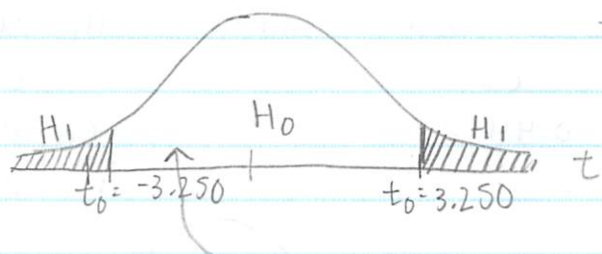
d.f. $= 9$

$\alpha = 0.01$

"different"

$H_0: \mu = 1300$ A.D. There is no difference in the population mean of tree ring dates.

$H_1: \mu \neq 1300$ A.D. Two-tailed test



$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{1268 - 1300}{37.2887/\sqrt{10}} = \boxed{-2.71}$$

We reject the H_1 and fail to reject H_0, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that the population mean of tree-ring dates of Burnt Mesa Pueblo are different than those of prehistoric Indian ruins in southwest U.S.

The p value is between 0.02 and 0.04. Thus, we do not reject H_0.

12. a) $\bar{x} = 61.8125$

$S = 10.6347$

b) $\mu = 67$ cm

$\bar{x} = 61.8125$ cm

$S = 10.6347$ cm

$n = 16$

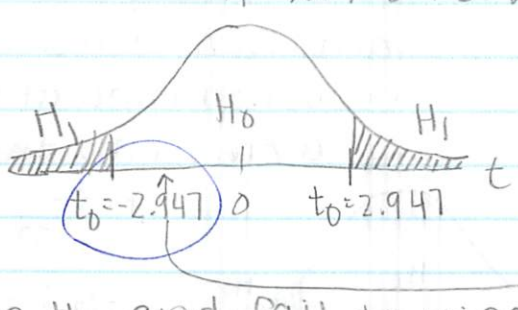
d.f. $= 15$

$\alpha = 0.01$

"different"

$H_0: \mu = 67$ cm There is no difference in the mean slab thickness in the Vail Region and Canada.

$H_1: \mu \neq 67$ cm Two-tailed test



$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{61.8125 - 67}{10.6347/\sqrt{16}} = \boxed{-1.9489}$$

We reject the H_1 and fail to reject the H_0, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that the mean slab thicknesses of avalanches in the spring are different in Vail and Canada

The p value is between 0.05 and 0.1. Thus, we do not reject H_0.

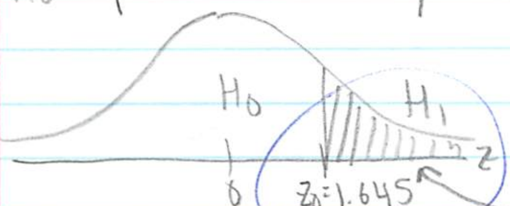
11. $\hat{p} = \frac{k}{n} = \frac{29}{196} = 0.148$

$n\hat{p} = (196)(0.148) = 29 > 10$ ✓ A normal approximation is

$n\hat{q} = (196)(0.852) = 167 > 10$ ✓ certainly justified.

$H_0: p = 9.2\%$ there is no difference in pop proportion of blood pressure hypertension of students during finals exam week.

$H_0: p > 9.2\%$ Right-tailed test



$$z = \frac{\hat{p}-p}{\sqrt{pq/n}} = \frac{0.148-0.092}{\sqrt{\frac{0.092\times 0.908}{196}}} = \boxed{2.71}$$

We reject the Ho and fail to reject Ho, $\alpha = 0.05$

∃x sufficient statistical evidence to suggest that the pop proportion of students w/ hypertension is higher than 9.2% during finals exam week at this particular college.

P value $= p(Z > 2.71)$

$= 0.0034$

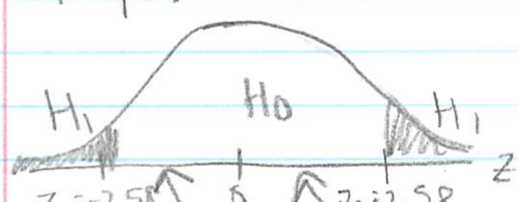
13. $\hat{p} = \frac{k}{n} = \frac{56}{73} = 0.7671$

$n\hat{p} = 73\times 0.7671 = 56 > 10$ ✓ A normal approximation is

$n\hat{q} = 73\times 0.2329 = 17 > 10$ ✓ certainly justified.

$H_0: p = 0.82$ there is no difference in pop proportion of extroverts among college student gov leaders at the national leadership conference.

$H_1: p \neq 0.82$ two-tailed test



$$z = \frac{\hat{p}-p}{\sqrt{pq/n}} = \frac{0.7671-0.82}{\sqrt{\frac{0.82\times 0.18}{73}}} = \boxed{-1.18}$$

We reject H_1 and fail to reject Ho, $\alpha = 0.01$.

∃x insufficient statistical evidence to suggest that the pop proportion of extroverts among college student gov leaders is different from 0.82 at the national leadership conference.

P value $= 2\,p(Z < -1.18)$

$= 2(.1190)$

$= 0.238$

Cathy Sun

10

Good

10.5 #2-4, 8, 11, 13

2. $\hat{p} = \frac{21}{38} = 0.5526$

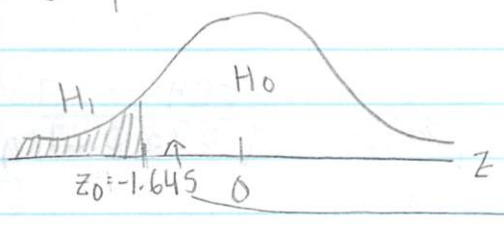
$n\hat{p} = 38 \times 0.5526 = 21 > 10$ ✓

$n\hat{q} = 38 \times 0.4474 = 17 > 10$ ✓

A normal approximation is certainly justified.

$H_0: p = 0.67$ There is no difference in graduation rates from Uni of Colorado, Boulder for women athletes.

$H_0: p < 0.67$ left-tailed



$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.5526 - 0.67}{\sqrt{\frac{0.67 \times 0.33}{38}}}$

$= \boxed{-1.54}$

we fail to reject H_0 and reject H_1, $\alpha = 0.05$

∃ X insufficient statistical evidence to suggest that the graduation rate for women athletes at the University of Colorado, Boulder is less than 67%.

P value = $p(z < -1.54)$

$= 0.0618$

3. $\hat{p} = \frac{r}{n} = \frac{15}{27} = 0.5556$

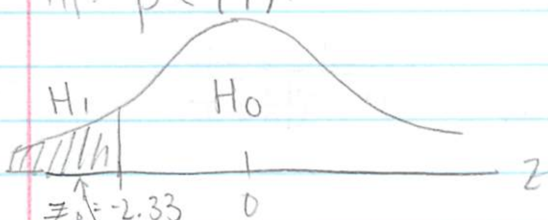
$n\hat{p} = 27 \times 0.5556 = 15 > 10$ ✓

$n\hat{q} = 27 \times 0.4444 = 12 > 10$ ✓

A normal approximation is certainly justified.

$H_0: p = 77\%$ There is no different in pop proportion of driver fatalities related to alcohol in Kit Carson County, Colorado.

$H_1: p < 77\%$



$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.5556 - 0.77}{\sqrt{\frac{0.77 \times 0.23}{27}}}$

$= \boxed{-2.65}$

we reject H_0 and fail to reject H_1, $\alpha = 0.01$

∃ X sufficient statistical evidence to suggest that the pop proportion of driver fatalities related to alcohol is less than 77% in Kit Carson County.

P value = $p(z < -2.65)$

$= 0.004$

(5 for book)

4. $\hat{p} = \frac{33}{41} = 0.8049$

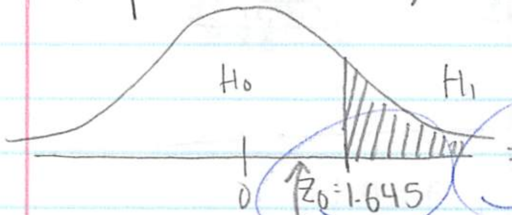
$n\hat{p} = (41)(0.8049) = 33.710$ ✓ Doesn't reach prerequisites for

$n\hat{q} = (41)(.1951) = 8 < 10$ X normal but we will continue

problem by assuming it can be a normal approximation.

$H_0: p = 73\%$ There is no difference in pop proportion of accidents in which the driver of an airbag vehicle was at fault in Fargo, ND versus America.

$H_1: p > 73\%$ right-tailed test



$z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.8049 - 0.73}{\sqrt{0.73 \times 0.27/41}}$

$= \boxed{1.08}$

We fail to reject H_0 and reject H_1, $\alpha = 0.05$.

∃x insufficient statistical evidence to suggest that the pop proportion of accidents in which driver of an airbag vehicle was at fault in Fargo, ND was greater than 73%.

P value $= P(z > 1.08)$

$= 0.1401$

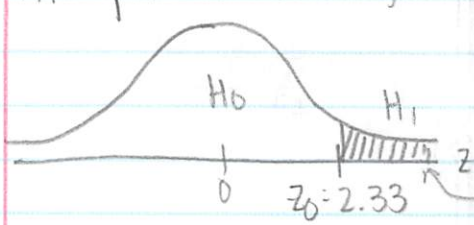
8. $\hat{p} = \frac{r}{n} = \frac{136}{493} = 0.2759$

$n\hat{p} = (493)(0.2759) = 136.01$ ✓ A normal approximation is

$n\hat{q} = (493)(0.7241) = 357$ ✓ certainly justified.

$H_0: p = 21.4\%$ There is no difference in pop proportion of five syllable sequence.

$H_1: p > 21.4\%$ Right tailed test



$z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.2759 - 0.214}{\sqrt{\frac{0.214 \times 0.786}{493}}}$

$= \boxed{3.35}$

We reject Ho and fail to reject H_1, $\alpha = 0.01$

∃x sufficient statistical evidence to suggest that the pop proportion of the new five-syllable sequence is higher than that found in Plato's symposium.

P value $= P(z > 3.35)$

$= 0.0004$

Catny Sun

10 RVW #1, 4, 7, 11

1. a) single mean

b) large sample

c) $\mu = 11{,}300$ miles

$n = 36$ vehicles

$\bar{x} = 11{,}000$ miles

$\sigma = 600$ miles

$\alpha = 0.05$

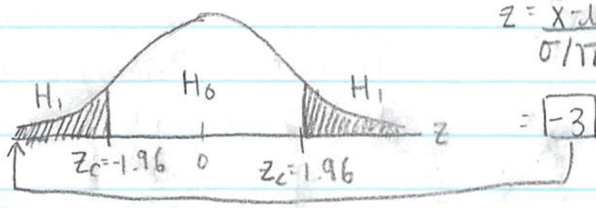
"different than"

$H_0: \mu = 11{,}300$ miles There is no difference is the avg miles driven per vehicle in Chicago versus the nation last year.

$H_1: \mu \neq 11.3$ thousand miles two-tailed test

$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{11{,}000 - 11{,}300}{600 / \sqrt{36}}$

$= \boxed{-3}$



we reject H_0 and fail to reject H_1, $\alpha = 0.05$.

$\exists$x significant statistical evidence to suggest that the average mileage per year in Chicago last year was different than the national average.

P value $= 2P(z < -3)$

$= 2 \times 0.0013 = \overset{\text{P value}}{0.0026} < \alpha (0.05)$, so we reject H_0

4. a) proportion

b) large sample

c) $p = 0.35$

$\hat{p} = \frac{39}{81} = 0.4815$

$n = 81$

$\alpha = 0.05$

"more than"

$n\hat{p} = 81 \cdot \frac{39}{81} = 39 > 10$ ✓ A normal approximation

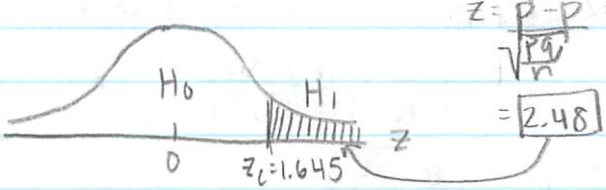
$n\hat{q} = 81 \cdot \frac{42}{81} = 42 > 10$ ✓ is certainly justified.

$H_0: p = 0.35$ There is no difference in the population proportion of students @ Flora College who have jobs of the sample vs Professor Jenning's claim.

$H_1: p > 0.35$ right-tailed test

$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.4815 - 0.35}{\sqrt{\frac{0.35 \cdot 0.65}{81}}}$

$= \boxed{2.48}$



We reject H_0 and fail to reject H_1, $\alpha = 0.05$.

$\exists$x sufficient statistical evidence to suggest that the population proportion of students who have jobs at Flora College is more than 35%.

P value $= P(z > 2.48)$

$= 1 - 0.9934$

$= 0.0066 > 0.05 (\alpha)$, so we reject H_0

7. a) proportion

b) large sample

c) $p = 0.846$ $\quad$ $n\hat{p} = 50 \cdot 0.72 = 36 \geq 10$ ✓ A normal approximation is

$\hat{p} = \frac{36}{50} = 0.72$ $\quad$ $n\hat{q} = 50 \cdot 0.28 = 14 \geq 10$ ✓ certainly justified.

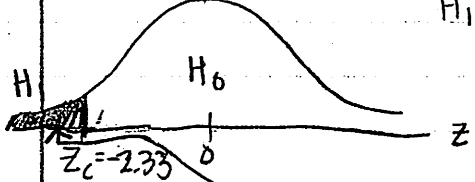
$n = 50$ $\quad$ $H_0: p = 0.846$ There is no difference in the

$\alpha = 0.01$ $\quad$ population proportion of CJ research people in the 25-34 age

"less than" $\quad$ group who believe everyone has a perfect match

than those in the 18-24 age group.

$H_1: p < 0.846$ left-tailed test



$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.72 - 0.846}{\sqrt{\frac{0.846 \times .154}{50}}}$

$= \boxed{-2.47}$

we fail to reject H_1 and reject H_0, $\alpha = 0.01$

∃x sufficient statistical evidence to suggest that the population proportion of CJ research people in the 25-34 age group who believe everyone has a perfect match is less than those in the 18-24 year old age group.

P value $= p(z < -2.33)$

$= 0.0068 < \overset{\alpha}{0.01}$, so we reject H_0

11. a) $\bar{x} = 46.2$ months, $s = 10.8505$ moths

b) simple mean, small sample

$\mu = 48$ months $\quad$ $H_0: \mu = 48$ months there is no difference on avg in how long

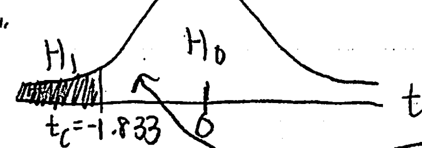
$\bar{x} = 46.2$ mnths $\quad$ the fuel injection lasts before needing replacement

$n = 10$, $df = 9$ $\quad$ between sample and manufacturer

$s = 10.8505$ months $\quad$ $H_1: \mu < 48$ months left-tailed test

$\alpha = 0.05$

"less than"



$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{46.2 - 48}{10.8505/\sqrt{10}}$

$= \boxed{-0.5246}$

we reject H_1 and fail to reject H_0, $\alpha = 0.05$

∃x insufficient statistical evidence to suggest that the average length of time (in months) before fuel injection needs replacement of sample is less than manufacturers claim of 48 months.

P value $= p(t < -0.5246)$

P value is greater than 0.125, so we fail to reject H_0.

SUN

+3ec

supreme court

1. $p = 0.10$, $r = 5$, $n = 6$

$P(r=5) = \text{binompdf}(6, 0.10, 5)$

$= 5.4 \times 10^{-5} \approx 0$

∃x essentially a 0% chance that five of the last six presidents elected would be left-handed.

2. It is biased because the last six presidents is not a random and representative sample. The statistic is relevant because it shows that Alito's sample of the last six (not five or seven) was picked specifically to demonstrate a high probability of left-handers.

3. out of the last six presidents, technically only 2 can be considered truly left-handed.

$P(r=2) = \text{binompdf}(6, 0.10, 2)$

$= 0.0984$

∃x a 9.84% chance that 2 of the last 6 presidents were left-handed.

Although the chance is low, having 2 left-handed presidents is much more realistic than having 5. This information affects Alito's argument because he claimed that 5 left-handed presidents occurred despite the probability being 0. In actuality, 2 left-handed presidents (out of 6) existed and there was actually a 10% chance of what happened

$P(r=4) = \text{binompdf}(43, 0.10, 4)$

$= 0.2027$

∃x a 20.67% chance that of the last 43 presidents, four were left handed.

4. $p = 5/48$, $r = 0$, $n = 48$

$P(r=0) = \text{binompdf}(48, 5/48, 0)$

$= 0.0051$

∃x a 0.51% chance that no juror amongst the 48 selected would have been African American.

This is significantly less than actual stats of left-handed presidents.

the same objection might apply because in Riley's case, there were first 3 African-Americans but they were eliminated.

$P(r=3) = \text{binompdf}(48, 5/48, 3)$

$= 0.1385$

∃x a 13.85% chance that 3 African-Americans were selected.

However, they were all eliminated.

5. There seems to be clear statistical evidence of racial bias to me because the African-Americans were all released. It seems unlikely that they all would've been unfit for jury. There are many factors that we don't know since this is one sample. Also, there are numerous reasons for being released or maybe the African-Americans simply did not want to participate in the trial.

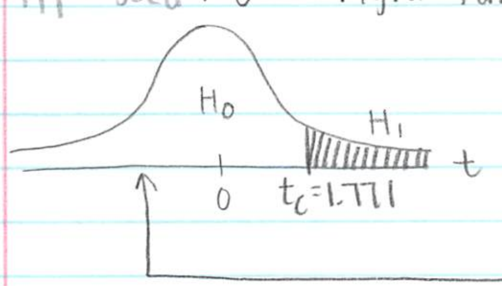
6. It shows that nobody really bothers to question or check facts, especially when they stem from an authoritative figure. People just blindly accepted his statistics without further research or investigation. It makes it seem like numerous wrong statistics have been used in the past as well.

Cathy Sun
4/1/14
P4 - Stats

Bigfoot

Left	Right	Diff
10 in	11 in	-1
10.5	10.5	0
10	10	0
10.5	10.5	0
10.5	10.5	0
9.75	9.75	0
10	10	0
9.5	9.75	-0.25
9.25	9.251	-0.001
10	10.1	-0.1
9.75	10	-0.25
10.5	11	-0.5
9.5	9.25	0.25
10.5	10.5	0

$\bar{d} = -0.1322$ in $n = 14$
$S_d = 0.3042$ in $df = 13$
$\alpha = 0.05$
$H_0: \mu_d = 0$ There is no difference in the size between the left and right feet of males in Micek's P4 stats class.
$H_1: \mu_d > 0$ right-tailed test



$d \to t = \dfrac{\bar{d} - \mu_d}{S_d/\sqrt{n}}$

$= \dfrac{-0.1322 - 0}{0.3042/\sqrt{14}}$

$= \boxed{-1.63}$

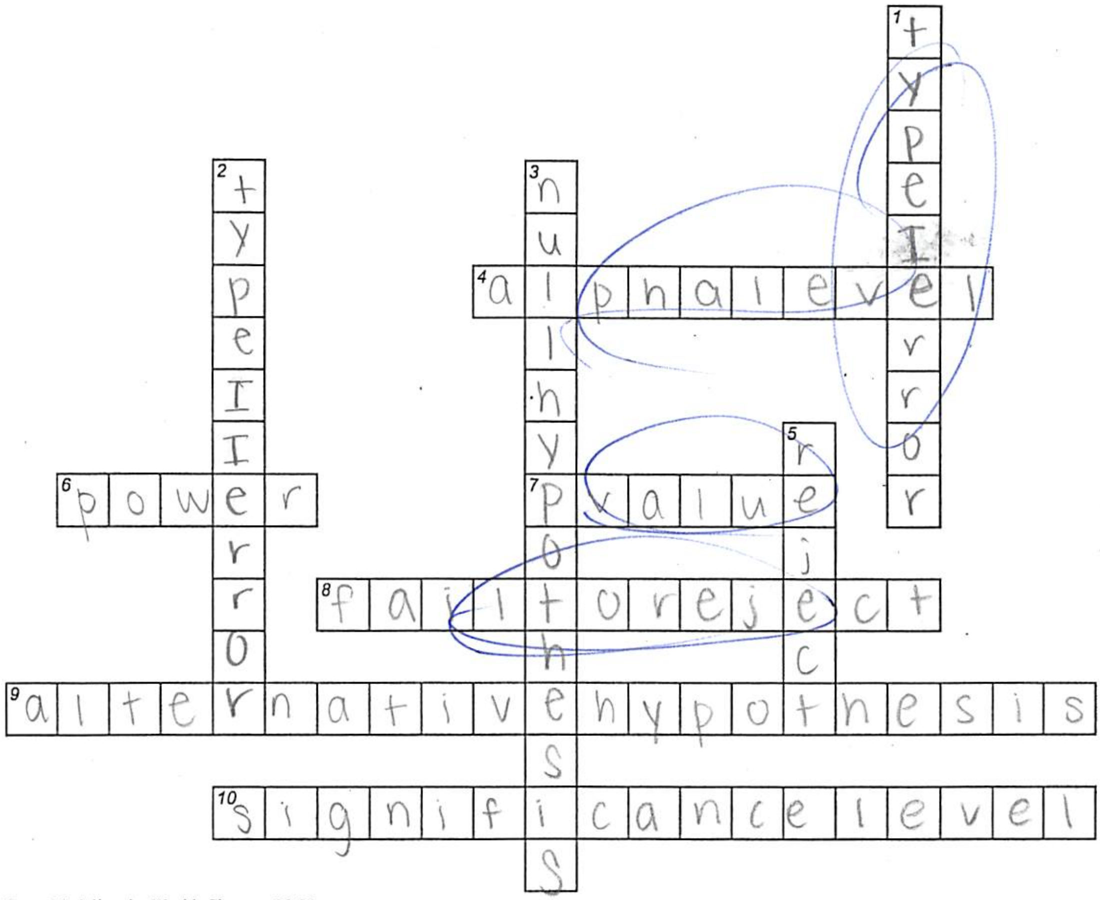
we fail to reject H_0 and reject H_1, $\alpha = 0.05$
$\exists$x insufficient statistical evidence to suggest that the left foot is bigger than the right foot in males of Micek's P4 stats class
P value = 0.9361 > 0.05 (α) weak evidence against the null

Cathy Sun

10

Testing Hypotheses about Proportions

Advanced Placement Statistics



Stats: Modeling the World, Chapters 20-21

ACROSS

4 threshold P-value that determines when we reject a null hypothesis

6 probability that a hypothesis test will correctly reject a false null hypothesis

7 the probability of observing a value for a test statistic at least as far from the hypothesized value as the statistic actually observed if the null hypothesis is true

8 decision made when the p-value is large enough to believe that the statistic could have occurred due to chance variation

9 proposes what we should conclude if we find the null hypothesis to be unlikely

10 alpha level

DOWN

1 error of rejecting a null hypothesis when in fact it is true (also called a "false positive")

2 error of failing to reject a null hypothesis when in fact it is false (also called a "false positive")

3 claim that specifies a value for some population parameter that can form the basis for assuming a sampling distribution for a test statistic

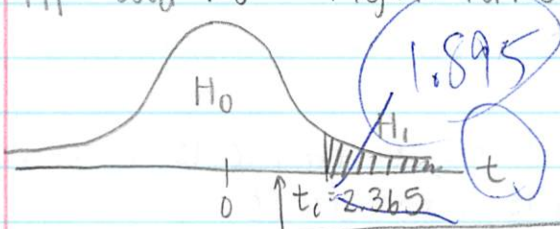
5 decision made when the p-value is too small to believe that the statistic could have occurred due to chance variation

10. $\bar{d} = 1.25$ $\alpha = 0.05$

$S_d = 1.91$

$H_0: \mu_d = 0$ There is no difference in the number of times a mother correctly identifies her baby through a hunger cry versus a pain cry.

$H_1: \mu_d > 0$ right-tailed test



$t = \frac{\bar{d} - \mu_d}{S_d/\sqrt{n}} = \frac{1.25 - 0}{1.91/\sqrt{8}}$

$= \boxed{1.85}$

we fail to reject H_0 and reject H_1, $\alpha = 0.05$.

∃x insufficient statistical evidence to suggest that the number of times of picking out their own babies with hunger cries is greater than that of pain cries.

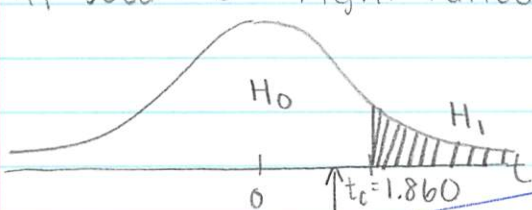
P value = 0.0532 > 0.05 (α) weak evidence against null

13. $\bar{d} = 2$ $\alpha = 0.05$

$S_d = 4.5$

$H_0: \mu_d = 0$ There is no difference in the pop mean score of the first and last round of a professional golf tournament

$H_1: \mu_d > 0$ right-tailed test



$t = \frac{\bar{d} - \mu_d}{S_d/\sqrt{n}} = \frac{2 - 0}{4.5/\sqrt{9}}$

$= \boxed{1.33}$

we fail to reject H_0 and reject H_1, $\alpha = 0.05$

∃x insufficient statistical evidence to suggest that the pop mean score on the last round of a professional golf tournament is higher than that of the first.

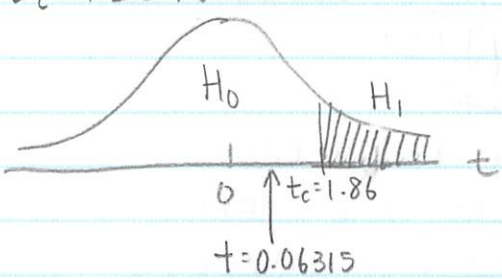
P value = 0.1096 > α (0.05) weak evidence against the null

14. a) $H_0: \mu_d = 0$ there is no difference in the avg number of female and male assistant professors in small/medium sized colleges in western U.S.

b) $\bar{d}$ must be positive b/c S_d and $\sqrt{n}$ are positive too

c) P value = 0.4756 > α (0.05). weak evidence against null so we fail to reject H_0.

d) The t stat is 0.063150898, which is smaller than $t_c = 1.85954832$.



Fail to reject H_0, consistent with results from part (c)

e) ∃X insufficient statistical evidence to suggest that in small and medium-sized colleges in the western U.S., the pop mean # of male assistant professors is greater than that of female assistant professors.

Cathy sun

9

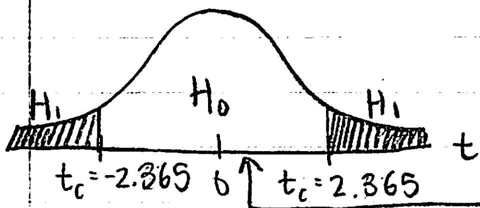
11.1 (1,2,4,6,10,13,14)

1. $\bar{d} = 2.25$ $\alpha = 0.05$

$s_d = 7.78$

$H_0: \mu_d = 0$ The population mean percentage increase in corporate revenue and CEO salary is the same.

$H_1: \mu_d \neq 0$ Two-tailed test



$t = \dfrac{\bar{d} - \mu_d}{s_d/\sqrt{n}} = \dfrac{2.25 - 0}{7.78/\sqrt{8}}$

$= \boxed{0.8180}$

We fail to reject H_0 and reject H_1, $\alpha = 0.05$

∃x insufficient statistical evidence to suggest that the population mean percentage increase in corporate revenue is different from that of a CEO's salary.

P value = 0.4402 > α (0.05) weak evidence against null

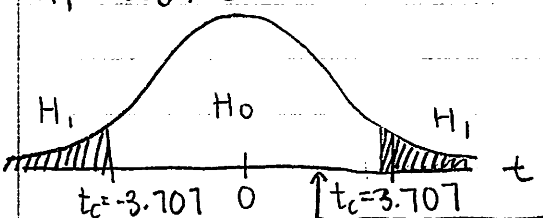
2. $\bar{d} = 0.3714$

$s_d = 0.4716$

$\alpha = 0.01$

$H_0: \mu_d = 0$ The population mean hours per fish using a boat compared with fishing from the shore is the same in Pyramid Lake, Nevada (Paiute Reservation)

$H_1: \mu_d \neq 0$



$t = \dfrac{\bar{d} - \mu_d}{s_d/\sqrt{n}} = \dfrac{0.3714 - 0}{0.4716/\sqrt{7}}$

$= \boxed{2.08}$

We fail to reject H_0 and reject H_1, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that the pop mean hours per fish using a boat compared with fishing from the shore in Pyramid Lake on Paiute Reservation in Nevada is different.

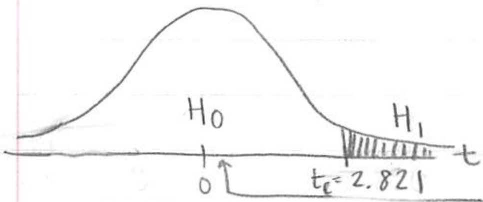
P value = 0.08229 > 0.01 (α) weak evidence against the null

4. $\bar{d} = 0.08$ $\alpha = 0.01$

$S_d = 1.70$

$H_0 : \mu_d = 0$ Avg population of deer in Jan in this particular region of Colorado is the same before and after the highway

$H_1 : \mu_d > 0$ Right-tailed test



$t = \dfrac{\bar{d} - \mu_d}{S_d/\sqrt{n}} = \dfrac{0.08 - 0}{1.70/\sqrt{10}}$

$= \boxed{0.1488}$

we fail to reject Ho and reject H_1, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that the avg deer population in this region of Colorado in Jan has dropped.

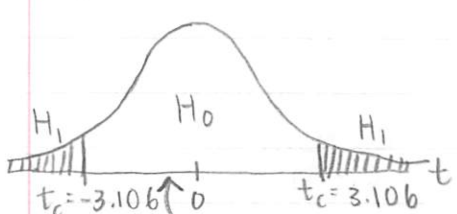
P value = 0.8850 > 0.01 (α) weak evidence against null

6. $\bar{d} = -0.8417$

$S_d = 3.57$

$H_0 : \mu_d = 0$ The avgerage temperatures throughout the year in Miami and Honolulu is the same.

$H_1 : \mu_d \neq 0$



$t = \dfrac{\bar{d} - \mu_d}{S_d/\sqrt{n}} = \dfrac{-0.8417 - 0}{3.57/\sqrt{12}}$

$= \boxed{-0.8167}$

we fail to reject Ho and reject H_1, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that the average temperature throughout the year in Miami and Honolulu is different.

P value = 0.4315 > α (0.01), thus, it is weak evidence against the null

We fail to reject H_0 and reject H_1, $\alpha = 0.01$
$\exists$X insufficient statistical evidence to suggest that the performance of the experimental group on the vocab portion of the test is better than that of the control group.
P value = 0.063 > 0.01(α) weak evidence against the null

7. a) $z = -3.718026896$
b) $H_1: \mu_1 \neq \mu_2$ (football μ_1, basketball μ_2)
P value = 0.0002
Conclusion: since P value < α (0.05), we reject the null. $\exists$X sufficient statistical evidence to suggest that the avg football player height is different from the avg bball player height.

9. a) $E \approx z_c \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

$= 2.58 \sqrt{\frac{11.69^2}{32} + \frac{11.60^2}{32}}$

$= 7.51$

$(\bar{x}_1 - \bar{x}_2) - E < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + E$

$10.44 - 7.51 < \mu_1 - \mu_2 < 10.44 + 7.51$

$2.93 < \mu_1 - \mu_2 < 17.95$

b) If we took a thousand samples of reports w/ n = 32, we expect to capture $\mu_1 - \mu_2$ 990 times. For this particular sample, we got an interval of 2.93 → 17.95
All positive numbers, μ_1 (for mothers) is higher than μ_2 (fathers) @ 99% confidence

12 a) $E \approx z_c \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

$= 1.645 \sqrt{\frac{126.62^2}{47} + \frac{105.99^2}{51}}$

$= 38.98$

$(\bar{x}_1 - \bar{x}_2) - E < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + E$

$69 - 38.98 < \mu_1 - \mu_2 < 69 + 38.98$

$30.2 < \mu_1 - \mu_2 < 107.98$

b) If we took a thousand samples of the same size ($n_1 = 47$ males and $n_2 = 51$ females), we expect to capture $\mu_1 - \mu_2$ 900 times. For this particular sample, we got an interval of \$30.2 to \$107.98. The numbers are all positive, which means μ_1 (pop mean premium for males) is greater than μ_2 (pop mean premium for females)

cathy sun
P4-AP Stats
4/13/14

11-2 (2, 4-7, 9, 12)

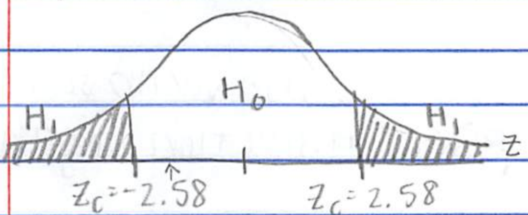
2. $n_1 = 62$ $\quad n_2 = 51$ $\quad$ "difference"

$\bar{X}_1 = \$83{,}000$ $\quad \bar{X}_2 = \$91{,}000$ $\quad \alpha = 0.01$

$S_1 = \$17{,}000$ $\quad S_2 = \$22{,}000$

$H_0: \underset{\text{clothes}}{\mu_1} = \underset{\text{bakery}}{\mu_2}$ There is no difference in the mean startup costs of small clothing stores compared with small bakeries

$H_1: \mu_1 \neq \mu_2$



$$z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$= \frac{(83{,}000 - 91{,}000) - 0}{\sqrt{\frac{17{,}000}{62} + \frac{22{,}000}{51}}}$$

$$= \boxed{-2.13}$$

H_0, ~~H_1~~, $\alpha = 0.01$

∃x insufficient statistical evidence to suggest that start-up costs for small bakeries and clothing stores are different. Thus, they are the same.

P value = 2(0.166) = 0.0332 > 0.01 (α) Thus, it is weak evidence against the null

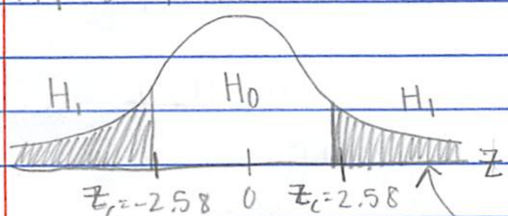
4. $n_1 = 201$ $\quad n_2 = 135$ $\quad$ "difference"

$\bar{X}_1 = 4.7$ $\quad \bar{X}_2 = 4.2$ $\quad \alpha = 0.01$

$S_1 = 1.1$ $\quad S_2 = 1.4$

$H_0: \underset{\text{fishing}}{\mu_1} = \underset{\text{camping}}{\mu_2}$ there is no difference regarding preference for camping or fishing as an outdoor activity.

$H_1: \mu_1 \neq \mu_2$



$$z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$= \frac{(4.7 - 4.2) - 0}{\sqrt{\frac{1.1^2}{201} + \frac{1.4^2}{135}}}$$

$$= \boxed{3.49}$$

we fail to reject H_1 and reject H_0, $\alpha = 0.01$

$\exists x$ sufficient statistical evidence to suggest that there is a difference regarding a preference for camping or fishing as an outdoor activity.

P value $\approx 0 < 0.01$, strong evidence against Null

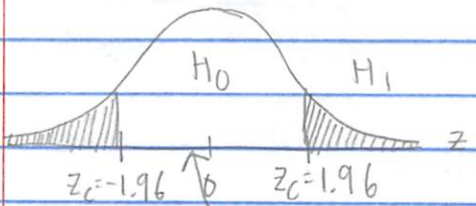
5. $n_1 = 30$ $\quad n_2 = 30$ $\quad$ "difference"

$\bar{x}_1 = 344.5$ $\quad \bar{x}_2 = 345.9$ $\quad \alpha = 0.05$

$s_1 = 49.1$ $\quad s_2 = 50.9$

$H_0: \overset{\text{expt}}{\mu_1} = \overset{\text{control}}{\mu_2}$ There is no difference in the vocab scores on the Gates-MacGintie Test before instruction began.

$H_1: \mu_1 \neq \mu_2$



$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$= \frac{(344.5 - 345.9) - 0}{\sqrt{\frac{49.1^2}{30} + \frac{50.9^2}{30}}}$$

$$= \boxed{-0.1084}$$

H_0, ~~H_1~~, $\alpha = 0.05$

$\exists x$ insufficient statistical evidence to suggest that the vocab scores on the Gates-MacGintie test were different before instruction began.

P value $= 2(0.4562) = 0.9124 > 0.05(\alpha)$, weak evidence against null

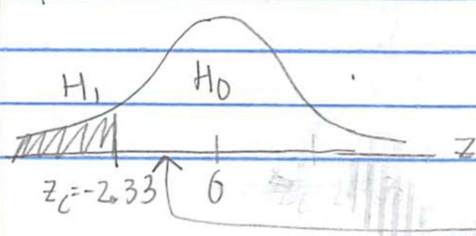
6. $n_1 = 30$ $\quad n_2 = 30$ $\quad$ "better than"

$\bar{x}_1 = 349.2$ $\quad \bar{x}_2 = 368.4$ $\quad \alpha = 0.01$

$s_1 = 56.6$ $\quad s_2 = 39.5$

$H_0: \overset{\text{control}}{\mu_1} = \overset{\text{expt.}}{\mu_2}$ There is no difference in performance on the vocab portion of the test between the experimental and control group.

$H_1: \mu_1 < \mu_2$



$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$= \frac{(349.2 - 368.4) - 0}{\sqrt{\frac{56.6^2}{30} + \frac{39.5^2}{30}}} = \boxed{-1.52}$$

SUN

5a) independent

normal z distribution

H_0: $\overset{\text{face to face}}{p_1} = \overset{\text{telephone}}{p_2}$ there is no difference in the proportion who answer correctly during face-to-face interviews and telephone interviews.

$H_1: p_1 \neq p_2$

conditions

· independent

· simple random sample

· $n < 1/10\ N$

$n_1\hat{p}_1 = (93)(\frac{79}{93}) = 79 > 10$ ✓

$n_1\hat{q}_1 = (93)(\frac{14}{93}) = 14 > 10$ ✓

$n_2\hat{p}_2 = (83)(\frac{74}{83}) = 74 > 10$ ✓

$n_2\hat{q}_2 = (83)(\frac{9}{83}) = 9 > 10$ X

A normal approximation is certainly justified $9 > 5$ ✓

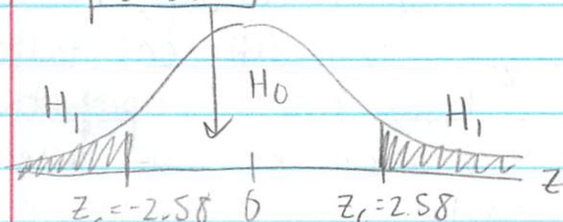
$\hat{p} = \frac{r_1 + r_2}{n_1 + n_2} = \frac{79+74}{93+83} = 0.8693$ $\quad \hat{q} = 1 - 0.8693 = 0.1307$

$\hat{p}_1 = \frac{79}{93} = 0.8495$ $\quad \hat{q}_1 = 0.1505$

$\hat{p}_2 = \frac{74}{83} = 0.8916$ $\quad \hat{q}_2 = 0.1084$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}} = \frac{0.8495 - 0.8916}{\sqrt{\frac{0.8495 \cdot .1505}{93} + \frac{0.8916 \cdot 0.1084}{83}}}$$

$$= \boxed{-0.8355}$$



We fail to reject H_0 and reject H_1, $\alpha = 0.01$

∃X insufficient statistical evidence to suggest that there is a diff in proportion who answer correctly during face to face and telephone interviews.

P value = $0.4081 > a\,(0.01)$ weak evidence against null

b) $E = z_c \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$

$= 2.58 \sqrt{\frac{0.8495 \cdot .1505}{93} + \frac{0.8916 \cdot 0.1084}{83}}$

$= 0.1301$

$p_1 \approx p_2$

At the 99% confidence level, we cannot conclude whether p_1 or p_2 is larger. b/c it has + and negative values.

$(0.8495 - 0.8916) - 0.1301 < p_1 - p_2 < (0.8495 - 0.8916) + 0.1301$

$-0.1721 < p_1 - p_2 < 0.088$

If we repeat 1000 times, we expect to capture proportion diff 990 times. We got interval of $-0.172 < p_1 - p_2 < 0.088$

6 independent

normal z distribution

$H_0: p_1 = p_2$ (face-to-face, telephone) There is no difference in the proportion of respondents who respond accurately about drunk driving during face-to-face and telephone interviews.

$H_1: p_1 \neq p_2$

<u>conditions</u>

- independent
- simple random sample
- $n < \frac{1}{10} N$, we assume more than 760 people earned DUI

$n_1 \hat{p}_1 = 30\left(\frac{16}{30}\right) = 16 > 10$ ✓

$n_1 \hat{q}_1 = 30\left(\frac{14}{30}\right) = 14 > 10$ ✓

$n_2 \hat{p}_2 = (46)\left(\frac{25}{46}\right) = 25 > 10$ ✓

$n_2 \hat{q}_2 = (46)\left(\frac{21}{46}\right) = 21 > 10$ ✓

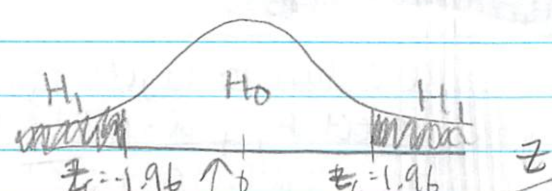
A normal approximation is certainly justified

$\hat{p} = 0.5395$ $\quad \hat{q} = 1 - 0.5395 = 0.4605$

$\hat{p}_1 = 0.5333$ $\quad \hat{q}_1 = 1 - 0.5333 = 0.4667$

$\hat{p}_2 = 0.5435$ $\quad \hat{q}_2 = 1 - 0.5435 = 0.4565$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}} = \frac{0.5333 - 0.5435}{\sqrt{\frac{0.5333 \times 0.4667}{30} + \frac{0.5435 \times 0.4565}{46}}} = \boxed{z = -0.08673}$$



We fail to reject Ho and reject H_1, $\alpha = 0.05$. ∃ insufficient statistical evidence to suggest that the proportion of respondents who respond accurately about drunk driving incidents is different when conducting face to face and telephone interviews; proportions are the same. P value = 0.9309, weak evidence against null

$$E = z_c \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$$

$$= 1.96\sqrt{\frac{0.5333 \cdot 0.4667}{30} + \frac{0.5435 \cdot 0.4565}{46}}$$

$$= 0.2293$$

We cannot conclude at the 95% confidence level that either p_1 or p_2 is larger b/c it is positive and negative. $p_1 \approx p_2$

$$(0.5333 - 0.5435) - 0.2293 < p_1 - p_2 < (0.5333 - 0.5435) + 0.2293$$

$$-0.2395 < p_1 - p_2 < 0.2191$$

If we repeated this a 1000 times, we expect to capture the proportion diff $p_1 - p_2$ 950 times. For this particular sample, we got an interval of -0.2395 to 0.2191