7. $\mu = 19$ in

$n = 73$

$\bar{x} = 18.7$ in

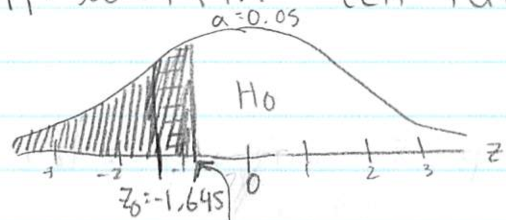
$s = 3.2$ in

$\alpha = 0.05$

$H_0: \mu = 19$ in there is no difference in the mean length of cutthroat fish.

$H_1: \mu < 19$ in left-tailed test

b)



a) $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

$= \dfrac{18.7 - 19}{3.2 / \sqrt{73}}$

$= \boxed{-0.8010}$

we reject H_1 and fail to reject H_0 when $\alpha = 0.05$.
∃X insufficient statistical evidence to suggest that the lengths of cutthroat fish in Pyramid Lake is less than 19 in.

c) P value $= P(z < -0.8010)$
$= 0.2119$

d) Data isn't significant because $\underset{\text{p value}}{0.2119} > \underset{\alpha}{0.05}$

8. $\mu = \$61,400$

$n = 34$

$\bar{x} = \$55,200$

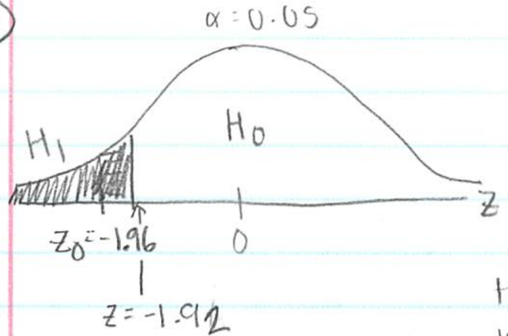
$s = \$18,800$

$\alpha = 0.05$

$H_0: \mu = \$61,400$ there is no difference in the avg start-up cost in the San Antonio region.

$H_1: \mu < \$61,400$ left-tailed test

b)



a) $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \dfrac{55,200 - 61,400}{18,800 / \sqrt{34}}$

$= -1.92$

we reject H_1 and fail to reject H_0, $\alpha = 0.05$
∃X insufficient statistical evidence to suggest that the start-up costs in San Antonio are lower than the national average.

c) P value $= P(z < -1.92)$
$= 0.0274$

d) Data is statistically significant because $\underset{\text{p-value}}{0.0274} < \underset{\alpha}{0.05}$

CATHY SUN

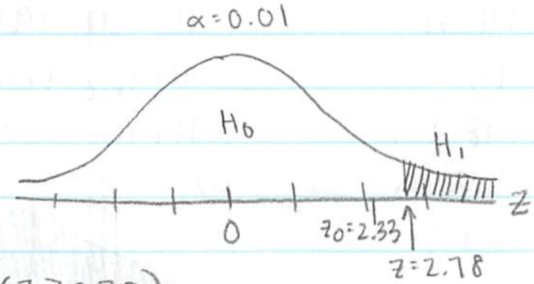
10.3: # 1-4, 7-10

1. a) $Z = \frac{\bar{X} - \mu}{s/\sqrt{n}}$

$Z = \frac{6.1 - 5}{2.5/\sqrt{140}}$

$Z = 2.78$

b)



c) P value $= p(\bar{X} > 6.1) = p(Z > 2.78)$
$= 1 - 0.9973$
$= 0.0027$

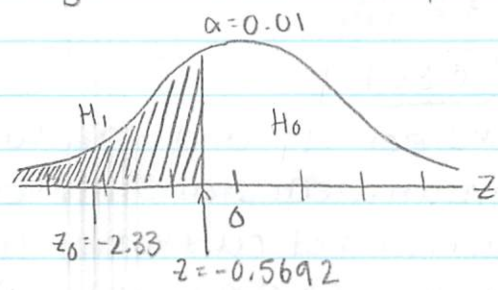
$0.0027 < 0.01$
d) Data are statistically significant b/c p value $< \alpha$

2. a) $Z = \frac{\bar{X} - \mu}{s/\sqrt{n}}$

$Z = \frac{52.7 - 53.1}{4.5/\sqrt{41}}$

$Z = -0.5692$

b)



c) P value $= p(Z < -0.57)$
$= 0.2843$

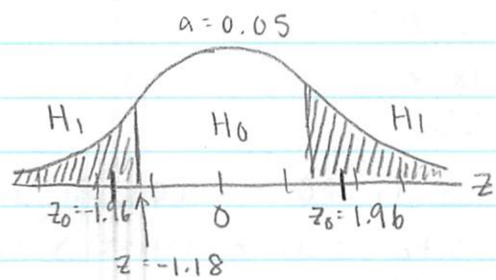
d) Data are not statistically significant because
p value α
$0.2843 > 0.01$

3. a) $Z = \frac{\bar{X} - \mu}{s/\sqrt{n}}$

$Z = \frac{20.5 - 21.7}{6.8/\sqrt{45}}$

$Z = -1.18$

b)



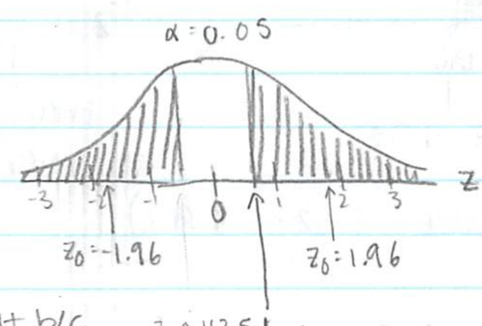
c) p value $= 2[P(Z < -1.18)]$
$= 2(0.1190)$
$= 0.238$

d) Data are not statistically significant because
$0.283 > 0.05$.

4. a) $Z = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{19.1 - 18.7}{5.2/\sqrt{32}}$

$= 0.4351$

b)



c) P value $= 2[P(Z < -0.43)]$
$= 2 \times 0.3336$
$= 0.6672$

d) Not statistically significant b/c
$0.6672 > 0.05$

c) The p value of the one-tail test is half the p-value of a two-tailed test because the p-value in the 2-tailed test is double the area since there are 2 shaded regions of equal size.

9. $\mu = \$15.35$

$n = 34$

$\bar{x} = 11.85$

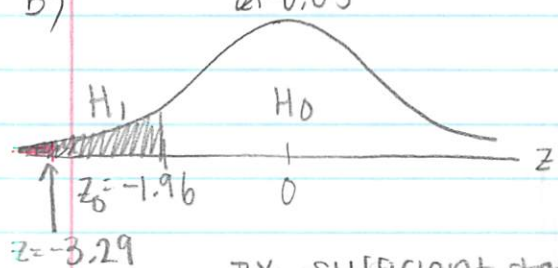
$s = 6.21$

$\alpha = 0.05$

$H_0: \mu = \$15.35$ There is no difference in the avg daily ownership expenses of college students.

$H_1: \mu < \$15.35$ left-tailed test

b) $\alpha = 0.05$



a) $z = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{11.85 - 15.35}{6.21/\sqrt{34}}$

$= -3.29$

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

∃X. sufficient statistical evidence to suggest that the college student's avg daily ownership expenses are less than the national average.

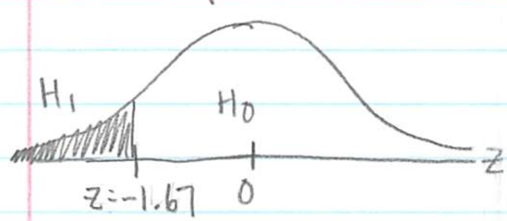
c) P value $= p(z < -3.29)$
$= 0.0005$

d) Data is statistically significant because $\underset{\text{p value}}{0.0005} < \underset{\alpha}{0.05}$

10a) $H_0: \mu = 19.5$ mpg There is no difference in avg mileage of new cars and old cars.

$H_0: \mu < 19.5$ mpg Left-tailed test

$\bar{x}$ (sample mean) $= 18.75$ mpg



P value $= 0.047$

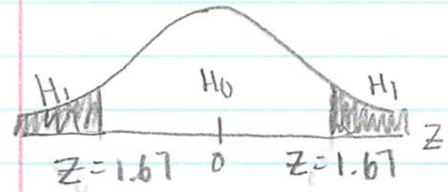
we will reject the null when $\alpha \geq 0.047$, and data will be statistically significant to conclude that avg mileage is less than 19.5 mpg.

b) $H_0: \mu = 19.5$ mpg there is no difference in avg mileage for these cars.

$H_1: \mu \neq 19.5$ two-tailed test

$\bar{x} = 18.75$

P value $= 0.094$



we reject the null hypothesis when $\alpha \geq 0.094$, and the data are statistically significant to conclude that the avg mileage is different from 19.5 mpg.

7. $\mu = 10.2$ s

$n = 41$

$\bar{x} = 9.7$ s

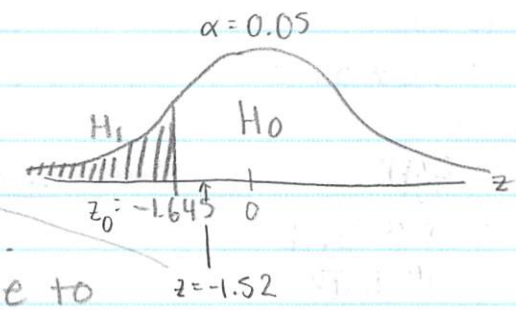
$s = 2.1$ s

$\alpha = 0.05$

$H_0: \mu = 10.2$ s. There is no difference in the avg acceleration time when premium unleaded gas is used, μ doesn't change, remains 10.2 s.

$H_1: \mu < 10.2$ s left-tailed test "reduce"

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{9.7 - 10.2}{2.1/\sqrt{41}} = \boxed{-1.52}$$



we fail to reject H_0 and reject H_1.
$\exists x$ insufficient statistical evidence to suggest that the avg acceleration time decreased when premium gasoline is used in Dodge Intrepids.

8. $\mu = 159$ ft

$n = 45$

$\bar{x} = 148$ ft

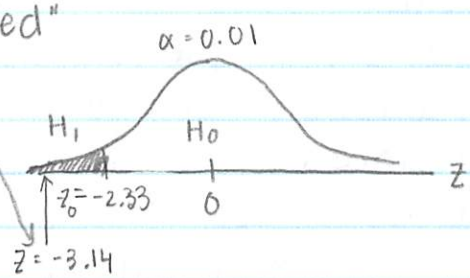
$s = 23.5$ ft

$\alpha = 0.01$

$H_0: \mu = 159$ ft There is no difference in the mean braking distance for Mercury stables on wet pavement with new tire thread.

$H_1: \mu < 159$ ft left-tailed test "reduced"

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{148 - 159}{23.5/\sqrt{45}} = \boxed{-3.14}$$



we fail to reject H_1 and reject H_0.
$\exists x$ sufficient statistical evidence to suggest that the mean braking distance for Mercury stables on wet pavement has indeed decreased with use of new tire thread.

cathy sun

10

10.2 #3,4,7,8,10 or 11,12

3. $\mu = 31.8$ calls

$n = 63$

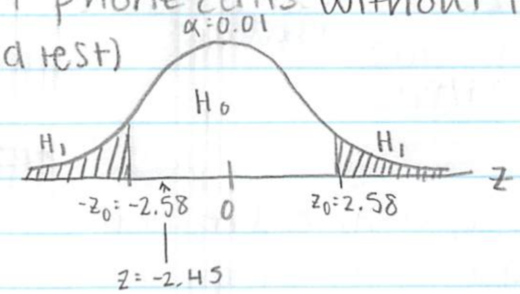
$\bar{x} = 28.5$ calls

$s = 10.7$ calls

$\alpha = 0.01$

$H_0: \mu = 31.8$ calls/day there is no difference between the avg number of phone calls per day with the new priorities list and the old avg number of phone calls without the priorities list

$H_1: \mu \neq 31.8$ (two-tailed test)



$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

$$= \frac{28.5 - 31.8}{10.7/\sqrt{63}}$$

$$= \boxed{-2.45}$$

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

∃x insufficient statistical evidence to suggest that there has been a change in the avg number of phone calls per day with a "priority list."

4. $\mu = 3218$ people

$n = 42$

$\bar{x} = 3392$ people

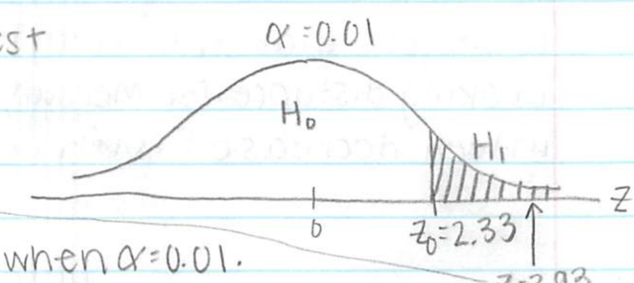
$s = 287$

$\alpha = 0.01$

$H_0: \mu = 3218$ people entering the store each day.

There is no difference in the mean number of people entering the store before and after Judy started working, μ doesn't change and remains 3218.

$H_1: \mu > 3218$ right-tailed test



$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{3392 - 3218}{287/\sqrt{42}}$$

$$= \boxed{3.93}$$

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

∃x sufficient statistical evidence to suggest that the number of people entering the store has indeed increased.

11. $\mu = 7.4$ pH

$n = 33$

$\bar{x} = 8.1$ pH

$s = 1.9$ pH

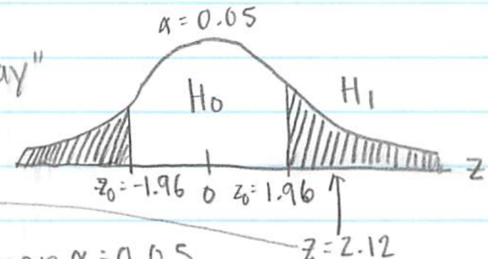
$\alpha = 0.05$

$H_0 : \mu = 7.4$ pH there is no difference in the mean pH of the blood with the new drug is used.

$H_1 : \mu \neq 7.4$ two-tail test "change either way"

$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{8.1 - 7.4}{1.9 / \sqrt{33}}$

$= \boxed{2.12}$



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

∃X sufficient statistical evidence to suggest that the blood pH has indeed changed with use of new drug for arthritis.

12. $\mu = 0.25$ gallon/can

$n = 100$ cans

$\bar{x} = 0.28$ gallon/can

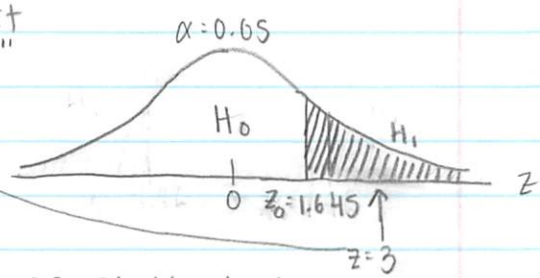
$s = 0.10$

$\alpha = 0.05$

$H_0 : \mu = 0.25$ gallon/can There is no difference in the avg liquid content between the supplier's claim and the random sample.

$H_1 : \mu > 0.25$ gallon/can right-tail test "too low"

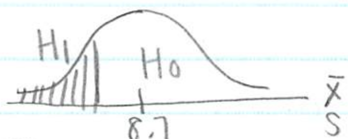
$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{0.28 - 0.25}{0.10 / \sqrt{100}} = \boxed{3}$



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

∃X sufficient statistical evidence to suggest that the supplier's claim is indeed too low.

c) $H_1: \mu < 8.7s$



d) (b): critical region would be on right because we are testing if μ is greater than 8.7s, and we shade the area to the right of 8.7s.

(c): critical region on the left because we are testing if μ is less than 8.7s, so we shade in the area if its to the left of 8.7s.

cathy sun
3/5/14

10.1 # 2-5, 8

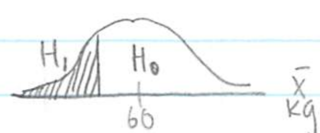
2. The alternate hypothesis. Because when $H_1: \mu < K$, then it is a left-tailed test. when $H_1: \mu > K$, then it is a right-tailed critical region. when $H_1: \mu \neq K$, then it is a two-tailed critical region. The null hypothesis would be $H_0: \mu = K$. the alternate hypothesis is based if μ isn't K, which determines the critical region.

3. No, since the data is from a sample, there is variation and we prove nothing. the data suggests that we have only failed to find sufficient statistical evidence to reject it.

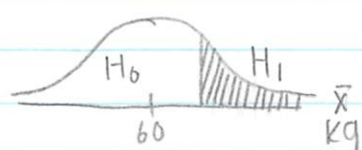
4. No, again since it is sample data, we have not proven it to be false beyond all doubt. the data only suggests that there is enough statistical evidence to justify failing to reject H_0 and choosing to fail to reject the alternate hypothesis. It is always on average, never beyond doubt.

5. a) $H_0: \mu = 60$ kg

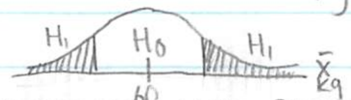
b) $H_1: \mu < 60$ kg



c) $H_1: \mu > 60$ kg



d) $H_1: \mu \neq 60$ kg



e) (b): on the left because we are testing if the avg weight (μ) is less than 60

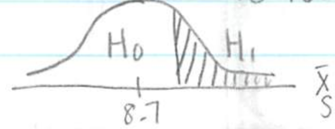
(c): on the right because we are testing whether the avg weight (μ) is greater than 60

(d): on both sides because we are testing if the avg weight was different from 60 kg, which fall on both sides of the curve.

8. a) $H_0: \mu = 8.7$ sec

we believe that on average, $\mu = 8.7$ s and there is no difference in mean time for chrysler concorde to go from 0-60 mph.

b) $H_1: \mu > 8.7$ s



SUN

ch 9 Review #7, 8, 11

7. $\hat{p} = \frac{1538}{2958} = 0.5199$

$n = 2958$

$n\hat{p} > 10$, $(2958)(0.5199) = 1537.86 > 10$ ✓

$n\hat{q} > 10$, $(2958)(0.4801) = 1420.14 > 10$ ✓

A normal approximation is certainly justified.

$E \approx z_c \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$\approx 1.645 \sqrt{\frac{0.5199 \times 0.4801}{2958}} = 0.01$

≈ 0.0151

$0.5048 < p < 0.535$

If we took a thousand samples of the same sample size of 2958, we expect to capture the pop probability p of wage and salaried workers responding the same way (personal satisfaction) to the stated question 900 times. For this particular sample, we got an interval of $0.5048 < p < 0.535$.

8. $\hat{p} = 0.52$

$\hat{q} = 0.48$

$E = 0.01$

95% C

$n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2$

$= (0.52)(0.48)\left(\frac{1.96}{0.01}\right)^2$

$= 9588.63 \rightarrow 9589$ wage & salaried workers

11. a) $\bar{x} = 9.55$ min

$s = 2.7237$ min

b) $E = t_c \frac{s}{\sqrt{n}}$

$= 2.093 \left(\frac{2.72}{\sqrt{20}}\right)$

$= 1.27$

$8.28 < \mu < 10.82$

If we took a 1000 samples of the same sample size of 20, we expect to capture the pop mean μ of times between commercial breaks on miniseries 950 times. For this particular sample, we got an interval of $8.28 < \mu < 10.82$ mins.

14. $E = 0.03$ $n = \frac{1}{4}\left(\frac{z_c}{E}\right)^2$

95% C $= \frac{1}{4}\left(\frac{1.96}{0.03}\right)^2$

$= 1067.11 \rightarrow 1068$ respondents of registered voters

SUN

9.4 # 3, 4, 7, 8, 11, 14

3. $S = 26.58$ lbs $\quad n = \left(\frac{z_c \sigma}{E}\right)^2$

$\bar{x} =$

$E = 4$ lbs $\quad = \left(\frac{1.645 \times 26.58}{4}\right)^2$

90% C

$= 119.49 \rightarrow 120$

120 - 56 = 64 more basketball players

4. $S = 3.32$ in $\quad n = \left(\frac{z_c \sigma}{E}\right)^2$

$\bar{x} =$

$E = 0.75$ in $\quad = \left(\frac{1.96 \times 3.32}{0.75}\right)^2$

95% C

$= 75.28 \rightarrow 76$

76 - 41 = 35 more basketball players

7. $S = 3.8$ min $\quad n = \left(\frac{z_c \sigma}{E}\right)^2$

$\bar{x} =$

$E = 30$ s (1/2 min) $\quad = \left(\frac{2.58 \times 3.8}{0.5}\right)^2$

99% C

$= 384.47 \rightarrow 385$

385 - 167 = 218 more phone customers

8 a) 90% C $\quad n = \frac{1}{4}\left(\frac{z_c}{E}\right)^2$

$E = 0.05$ $\quad = \frac{1}{4}\left(\frac{1.645}{0.05}\right)^2$

$= 270.60 \rightarrow 271$ drivers

b) $\hat{p} = 0.52$ $\quad n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2$

$\hat{q} = 0.48$

90% C $\quad = 0.52 \times 0.48 \left(\frac{1.645}{0.05}\right)^2$

$E = 0.05$

$= 270.17 \rightarrow 271$ drivers

11 a) 99% C $\quad n = \frac{1}{4}\left(\frac{z_c}{E}\right)^2$

$E = 0.05$ $\quad = \frac{1}{4}\left(\frac{2.58}{0.05}\right)^2$

$= 665.64 \rightarrow 666$ college students

b) $\hat{p} = 0.54$ $\quad n = \hat{p}\hat{q}\left(\frac{z_c}{E}\right)^2$

$\hat{q} = 0.46$ $\quad = 0.54 \times 0.46 \times \left(\frac{2.58}{0.05}\right)^2$

99% C

$E = 0.05$ $\quad = 661.38 \rightarrow 662$ college students

cathy sun

The People's Choice?

Source: Editorial cartoon by Robert Englehart (engletoon@sbcglobal.net), *Hartford Courant*, December 4, 2007

Connecticut Senator Christopher Dodd, shown seated in the cartoon, was a 2008 Democratic presidential candidate. The cartoon depicts the results of a poll taken before the Iowa caucuses, meetings held in preparation for the Democratic National Convention.

Consider the level of support Dodd received from the sample of Iowans polled and the inference being made about his actual level of support among "the people" of Iowa.

1. What percent of the sample indicated support for Dodd?

2. In projecting Dodd's percentage of support from the sample to "the people," the poll claimed what margin of error?

3. In projecting Dodd's percentage of support from the sample to "the people," the poll claimed what interval estimate?

4. Why do you think some media might report the margin of error as 4.4 "percentage points" instead of as 4.4 "percent"?

   Suppose that the poll had been administered to a simple random sample of 1000 people and that the pollster wanted to project Dodd's support among "the people" at a 95 percent confidence level.

5. Determine an interval estimate of Dodd's percentage of support among "the people" that is based on his 1 percent of support in the sample.

6. Would the margin of error have been as high as 4.4 percentage points, as stated in the cartoon?

   Given the conditions necessary for inference, consider whether the margin of error could have been as high as 4.4 percentage points if the changes indicated in questions 7–9 were made to each of the following assumptions: assumed confidence level of 95 percent; assumed sample size of 1000; and stated candidate support of 1 percent of the sample.

7. Increasing the confidence level increases the margin of error in projecting a population proportion from a sample proportion. Could the margin of error have reached 4.4 percentage points if the only difference had been an increase in the confidence level from 95 percent to 99 percent?

8. Decreasing the sample size increases the margin of error in projecting a population proportion from a sample proportion. Could the margin of error have reached 4.4 percentage points if the only difference had been a decrease in the sample size from 1000 people to 500 people?

9. The largest margin of error occurs for a sample proportion of 50 percent when projecting a population proportion from a sample proportion. Could the margin of error have reached 4.4 percentage points if the only difference had been that Dodd had received support from 50 percent of the sample instead of 1 percent?

Catny Sun

People's choice

1. 1%
2. 4.4%
3. $-3.4 < p < 5.4\%$
4. Percentage points sounds more educated. It may also help illuminate the fact that the margin of error is a ± value. It may be clearer with percentage points.
5. $E = z_c\sqrt{\frac{\hat{p}\hat{q}}{1000}}$

   $= 1.96\sqrt{\frac{0.01 \times 0.99}{1000}}$

   $= 0.0062$

   $0.0038 < p < 0.0162$

   If we took a 1000 samples of the same size of 1000 people, we expect to capture the pop percentage p of Dodd's support 950 times. For this particular sample, we got an interval of $0.38 < p < 1.62\%$.
6. No, it is only 0.62 percentage points. Since we are dividing $\sqrt{\frac{\hat{p}\hat{q}}{n}}$, having $n = 1000$ greatly decreases the margin of error.
7. No, having the z_c change from 1.96 to 2.58 is not enough to increase the margin of error to 4.4 % points.

   $E = 2.58\sqrt{\frac{0.01 \times 0.99}{1000}}$

   $= 0.0081$
8. No, halving the sample size from 1000 to 500 cannot boost the margin of error to reach 4.4 percentage points.

   $E = 1.96\sqrt{\frac{0.01 \times 0.99}{500}}$

   $= 0.0088$
9. No, it will increase the margin of error to around 3% points but it does not reach 4.4 percentage points.

   $E = z_c\sqrt{\frac{\hat{p}\hat{q}}{1000}}$

   $= 1.96\sqrt{\frac{0.5 \times 0.5}{1000}}$

   $= 0.031$

"The People's Choice?" answers

1. One percent of the sample indicated support for Dodd.

2. In projecting Dodd's level of support from the sample to "the people," the poll claimed a margin of error of "plus or minus 4.4%."

3. In projecting Dodd's level of support from the sample to "the people," the poll claimed an interval estimate of −3.4 percent to +5.4 percent of "the people."
   Compute:
   $$1\% - 4.4\% = -3.4\%$$
   $$1\% + 4.4\% = +5.4\%$$
   Note that percentages may be added or subtracted when they refer to the same base—in this case, "the people."

4. Some media might report the margin of error as 4.4 *percentage points* instead of as 4.4 *percent*, because 4.4 *percent* could be misinterpreted to mean 4.4 percent of 1 percent instead of 4.4 percent of "the people." The term *percentage points* makes it clear that the figures refer to the same base and can, therefore, be added.

5. On the basis of Dodd's 1 percent support in the sample, his support among "the people" would have been estimated to be between 0.4 percent and 1.6 percent.

   The formula for a confidence interval estimate of a population proportion is given by
   $$\hat{p} \pm z_C \sqrt{\frac{\hat{p}\left(1-\hat{p}\right)}{n}},$$
   where $\hat{p}$ represents the sample proportion, z_C represents the z-score associated with confidence level C, and n represents the sample size.

   Compute:
   $$0.01 \pm 1.96\sqrt{\frac{(0.01)(1-0.01)}{1000}} \approx 0.01 \pm 0.006 = (0.004,\ 0.016)$$

6. No, the margin of error would have been approximately 0.6 of a percentage point, well short of 4.4 percentage points. Refer to the calculation in answer 5.

7. If the only difference had been an increase in the confidence level from 95 percent to 99 percent, the margin of error would have been approximately 0.8 of a percentage point and would not have reached 4.4 percentage points.
   Compute:
   $$2.576\sqrt{\frac{(0.01)(1-0.01)}{1000}} \approx 0.008$$

8. If the only difference had been a decrease in the sample size from 1000 people to 500 people, the margin of error would have been approximately 0.9 of a percentage point and would not have reached 4.4 percentage points.
   Compute:
   $$1.96\sqrt{\frac{(0.01)(1-0.01)}{500}} \approx 0.009$$
   Note: There are a number of rules for choosing a sample that is sufficiently large for inference from a sample proportion. One rule of thumb is that a sample is sufficiently large if it could reasonably be expected to contain at least 5 supporters and 5 nonsupporters. In the case of a 1 percent sample proportion, a sample size smaller than 500 would not be expected to contain enough supporters.

9. If the only difference had been that Dodd had received support from 50 percent of the sample instead of 1 percent, the margin of error would have been approximately 3.1 percentage points and would not have reached 4.4 percentage points.
   Compute:
   $$1.96\sqrt{\frac{(0.50)(1-0.50)}{1000}} \approx 0.031$$ ∞

6c) $n\hat{p} > 10$, $(10351)(0.76) = 7866.76 > 10$ ✓
$n\hat{q} > 10$, $(10351)(0.24) = 2484.24 > 10$ ✓
A normal approximation is certainly justified because the sample is large enough for normal approximation.

8a) $\hat{p} = \frac{r}{n} = 0.85$
$\hat{q} = 0.15$
$n\hat{p} > 10$, $n\hat{q} > 10$
$(100)(0.85) = 85 > 10$ $(100)(0.15) = 15 > 10$
A normal approximation is certainly justified
$E \approx z_c \sqrt{\frac{pq}{n}}$
$\approx 1.96 \sqrt{\frac{0.85 \times 0.15}{100}}$
≈ 0.07
$0.78 < p < 0.92$
If we took a thousand samples of the same sample size of 100, we expect to capture the pop percentage p of illegible handwriting errors 950 times. For this particular sample, we got an interval of $0.78 < p < 0.92$

b) $\hat{p} = \frac{850}{1000} = 0.85$
$\hat{q} = 0.15$
$n\hat{p} > 10$, $(1000)(0.85) = 850 > 10$ ✓
$n\hat{q} > 10$, $(1000)(0.15) = 150 > 10$ ✓
A normal approximation is certainly justified.
$E \approx z_c \sqrt{\frac{pq}{n}}$
$\approx 1.96 \sqrt{\frac{0.85 \times 0.15}{1000}}$
≈ 0.0221
$0.8279 < p < 0.8721$ If we took 1000 samples of the same sample size of 1000, we expect to capture the pop percentage p of illegible handwriting errors 950 times. For this particular sample, we got an interval of $0.8279 < p < 0.8721$.

c) the confidence interval in (a) is greater than that of (b) because the margin of error (and thus length of confidence interval) decreases as sample size increases.

10. The margin of error is 7%. The percentage that a doctor's illegible handwriting causes error or safety problems is 0.85 ± 0.07. A survey of 100 pharmacists has shown that 85% of doctor's illegible handwriting causes problems.

SUN

10
Good

9.3 #1, 3, 4, 6, 8, 10, 13

1a) $\hat{p} = \frac{r}{n} = \frac{39}{62} = 0.6290$

b) $E \approx z_c \sqrt{\frac{pq}{n}}$

$\approx 1.96 \sqrt{\frac{(0.63)(0.37)}{62}}$

≈ 0.1202

$0.51 < p < 0.75$

If we took a thousand samples of the same size ($n=62$), we expect to capture the pop probability p of extroverts among actors 950 times. For this particular sample, we got an interval of $0.51 < p < 0.75$

c) $n\hat{p} > 10$, $n\hat{q} > 10$

$(62)(0.6290) = 40 > 10$ ✓, $(62)(0.371) = 23 > 10$ ✓

A normal approximation is certainly justified because the sample is large enough.

3a) $\hat{p} = \frac{r}{n} = \frac{1619}{5222} = 0.31$

b) $E \approx z_c \sqrt{\frac{pq}{n}}$

$\approx 2.58 \sqrt{\frac{(0.31)(0.69)}{5222}}$

$= 0.0165$

$0.2935 < p < 0.3265$ If we took a thousand samples of the same sample size ($n=5222$), we expect to capture the pop percentage p of traditional Navajo Hogans 990 times. For this particular sample, we got an interval of $0.2935 < p < 0.3265$

c) $n\hat{p} > 10$, $n\hat{q} > 10$

$(5222)(0.31) = 1618.82 > 10$ ✓, $(5222)(0.69) = 3603 > 10$ ✓. A normal approximation is indeed justified because the sample is large enough.

4a) $\hat{p} = \frac{360}{592} = 0.6081$

b) $E \approx 1.96 \sqrt{\frac{(0.6081)(0.3919)}{592}}$

≈ 0.0393

$0.5688 < p < 0.6474$ If we took 1000 samples of the same sample size ($n=592$), we expect to capture the pop percentage p of Santa Fe black on white potsheds 950 times. For this particular sample, we got an interval of $0.5688 < p < 0.6474$.

c) $n\hat{p} > 10$, $(592)(0.6081) = 360 > 10$ ✓

$n\hat{q} > 10$, $(592)(0.3919) = 232 > 10$ ✓

A normal approximation is certainly justified because the sample is large enough

6a) $\hat{p} = \frac{7867}{10351} = 0.76$

b) $E \approx 2.58 \sqrt{\frac{(0.76)(0.24)}{10351}}$

≈ 0.0108

$0.7492 < p < 0.7708$

If we took 1000 samples of the same sample size ($n=10351$), we expect to capture the pop percentage p of recaptured prisoners 990 times. For this particular sample, we got an interval of $0.7492 < p < 0.7708$.

13a) $\hat{p} = \frac{250}{1000} = 0.25$

b) $n\hat{p} > 10$, $(1000)(0.25) = 250 > 10$ ✓

$n\hat{q} > 10$, $(1000)(0.75) = 750 > 10$ ✓

A normal approximation is certainly justified.

$E \approx 1.96\sqrt{\frac{(0.25)(0.75)}{1000}}$

≈ 0.0268

$0.2232 < p < 0.2768$

If we took a 1000 samples of the same sample size ($n=1000$), we expect to capture the pop probability p of a large corporation choosing the nonsmoker over the smoker 950 times. For this particular sample, we got an interval of $0.2232 < p < 0.2768$.

c) In a survey of 1000 large corporations, 25% will choose to employ a nonsmoker over a smoker. The margin of error was 2.7%.

10a) $\bar{x} = 4.70\%$

$s = 1.97806\%$

$E = t_{0.90}\frac{s}{\sqrt{n}}$

$= 1.796\left(\frac{1.98}{\sqrt{12}}\right)$

$= 1.03$

$3.67\% < \mu < 5.73\%$

If we took a thousand samples of the same sample size ($n = 12$), we expect to capture the pop mean μ of percentage tuition increase in East coast colleges 900 times. For this particular sample, we got an interval of $3.67\% < \mu < 5.73\%$

b) $\bar{x} = 3.17857$

$s = 1.34289$

$E = t_{0.90}\frac{s}{\sqrt{n}}$

$= 1.771\left(\frac{1.34}{\sqrt{14}}\right)$

$= 0.6342$

$2.55 < \mu < 3.81$

~~If we took a~~ thousand samples of the same sample size ($n=14$), we expect to capture the pop mean μ of percent increase in East coast college professors' salaries 900 times. For this particular sample, we got an interval of $2.55 < \mu < 3.81\%$.

13 a) The boxplots have different IQR, medians, and whisker length, which is expected since all the samples were different.

b) Yes, the intervals differ in length. Yes, the intervals all contain the expected pop mean μ of 68 inches. If we draw more samples, we expect only 95% of intervals to contain pop mean μ. because the confidence interval is 95%. If we took 1000 samples of the same size ($n=20$), we expect to capture the pop mean μ of heights of 18 year old men 950 times.

SUN

10

9.2 # 1, 3, 6-8, 10, 13

1. $t_{0.95} = 2.110$

3. $t_{0.90} = 1.721$

6. a) $\bar{x} = 91$

$S = 30.71807$

b) $E = t_{0.75} \frac{s}{\sqrt{n}}$

$= 1.301 \left(\frac{30.7}{\sqrt{6}}\right)$

$= 16.31$

$74.69 < \mu < 107.31$

If we took a thousand samples of the same sample size (6), we expect to capture the pop mean μ of weights of wild mountain lions in the San Andreas Mts 750 times. For this particular sample, we got an interval of $74.69 < \mu < 107.31$ /65

7a) $\bar{x} = 12.3475$

$s = 2.24869$

b) $E = t_c \frac{s}{\sqrt{n}}$

$= 1.895 \left(\frac{2.25}{\sqrt{8}}\right)$

$= 1.51$

$10.84 < \mu < 13.86$

If we took a thousand samples of the same sample size (n=8), we expect to capture the pop mean μ of tips received by André 900 times. For this particular sample, we got an interval of $10.84 < \mu < 13.86$.

8. $\bar{x} = 106.89$

$S = 29.44251$

$E = t_c \frac{s}{\sqrt{n}}$

$= 1.860 \left(\frac{29.4}{\sqrt{9}}\right)$

$= 18.23$

$88.67 < \mu < 125.13$

If we took a thousand samples of the same sample size (n=9), we expect to capture the pop mean μ of start-up costs for candy stores 900 times. For this particular sample, we got an interval of $88.67 < \mu < 125.13$

b) $E = 1.28\left(\frac{3.8}{\sqrt{35}}\right)$
$= 0.8222$
$4.2778 < \mu < 5.9222$
If we took a thousand samples of the same size, we expect to capture the pop mean μ of annual profits per employees 800 times. In this particular sample, we got an interval of $4.2778 < \mu < 5.9222$. \$ thous,
c) Yes, because 80% of annual profits for employees is between \$4,278 and \$5,922. so \$3,000 profits are lower than 80% of other retail companies.
how?
d) Yes, because 80% of profits are between \$4,278 and \$5,922. Thus, \$6,500 profits is higher than 80% of other retail sale companies.
e) b. $E = 1.96\left(\frac{3.8}{\sqrt{35}}\right)$
$= 1.26$
$3.84 < \mu < 6.36$
If we took a thousand samples of the same sample size, we expect to capture the pop mean μ of annual profits per employee 950 times. In this particular sample, we got an interval of $3.84 < \mu < 6.36$.
c. It is a little low b/c 95% of annual profits per employee is between \$3,840 and \$6,360.
d. You would feel a little better b/c 6,500 is higher than the confidence interval from \$3,840 to \$6,360. 95% of retail companies have annual profits in this range.
9a) $\bar{x} = 146.51429$, $s = 12.71260$
b) $E = 1.28\left(\frac{12.7}{\sqrt{35}}\right)$
$= 2.75$
$143.75 < \mu < 149.25$
If we took a thousand samples of the same size, we expect to capture the pop mean μ of cookie calories 800 times. For this particular sample, we got an interval of 143.75 to 149.25.

SUN

10

9.1 # 1, 5, 8-12

1. $\bar{x} = 11.9$

$s = 4.3$

$E = z_c \frac{s}{\sqrt{n}}$

$= 1.96\left(\frac{4.3}{\sqrt{196}}\right)$

$= 0.602$

$11.298 < \mu < 12.502$

If we took a thousand samples of the same size (196 patients), we expect to capture the population mean μ of the serum levels of vitamin E 950 times. For this particular sample, we got an interval of $11.298 < \mu < 12.502$

5 a) $\bar{x} = 1.2$ $s = 0.4$

$E = 2.58\left(\frac{0.4}{\sqrt{102}}\right)$

$= 0.1022$

$1.10 < \mu < 1.30$

If we took a thousand samples of the same size (102 coyotes), we expect to capture the population mean μ of howl times 990 times. For this particular sample, we got an interval of $1.10 < \mu < 1.30$.

b) $\bar{x} = 609$ $s = 248$

$E = 1.96\left(\frac{248}{\sqrt{102}}\right)$

$= 48.13$

$560.87 < \mu < 657.13$

If we took a thousand samples of the same size (102 coyotes), we expect to capture the population mean μ of howl frequency 950 times. For this particular sample, we got an interval of $560.87 < \mu < 657.13$

8(a) $\bar{x} = 5.10286$

$s = 3.76981$