Stat 1040 Recitation 10 Solutions

1. A child has 6 packets of candy remaining from Halloween:

   - 3 Snickers
   - 2 M&Ms
   - 1 Skittles

   The child decides to choose packets at random to eat each day. (Note: obviously, the child is choosing without replacement!)

   (a) (2 points) What is the chance the first choice will be M&Ms?

   $\frac{2}{6} = \frac{1}{3}$

   (b) (2 points) What is the chance the first choice will be M&Ms and the second choice will also be M&Ms?

   $\frac{2}{6} \times \frac{1}{5} = \frac{2}{30} = \frac{1}{15}$

   (c) (2 points) What is the chance that neither of the first two choices will be Snickers?

   $\frac{3}{6} \times \frac{2}{5} = \frac{6}{30} = \frac{1}{5}$

   (d) (2 points) What is the chance that at least one of the first 2 choices will be Snickers?

   1 - chance that neither is $= 1 - \frac{1}{5} = \frac{4}{5}$

   (e) (2 points) What is the chance that the last remaining packet of candy (on day 6) will be a packet of skittles?

   $\frac{1}{6}$ same as any other day

2. A fast food chain has a game in which each large burger wins a prize with probability $\frac{1}{4}$ and the chances are independent.

   (a) (2 points) If I buy 4 burgers, what is the chance I get no prizes?

   $\left(\frac{3}{4}\right)^4 = .316$

   (b) (2 points) If I buy 4 burgers, what is the chance I get 4 prizes?

   $\left(\frac{1}{4}\right)^4 = .0039$

   (c) (2 points) If I buy 4 burgers, what is the chance that I get at least one prize?

   1 - chance of no prizes $= 1 - \left(\frac{3}{4}\right)^4 = .684$

3. In each of the following cases, circle the correct answer. 16 2/3

(a) (2 points) A die will be rolled some number of times and you win \$1 if it shows "6" more than 20% of the time. Which is better for you: 60 rolls or 600 rolls?

(b) (2 points) A die will be rolled some number of times and you win \$1 if it shows "6" more than 15% of the time. Which is better for you: 60 rolls or 600 rolls?

(c) (2 points) A die will be rolled some number of times and you win \$1 if it shows "6" between 15% and 20% of the time. Which is better for you: 60 rolls or 600 rolls?

(d) (2 points) A die will be rolled some number of times and you win \$1 if it shows "6" exactly $\frac{1}{6}$ of the time. Which is better for you: 60 rolls or 600 rolls?

(e) (2 points) A die has been rolled 10 times and the last 3 rolls have all been "6"s. The chance the next roll will be a "6" is (underline the correct answer):

i. less than $\frac{1}{6}$.

ii. exactly $\frac{1}{6}$

iii. more than $\frac{1}{6}$.

4. (15 points) In the 2008 election, 63% of Utah voters voted for McCain. If we take a simple random sample of 300 these Utah voters, what is the chance that fewer than 50% of our sample voted for McCain?

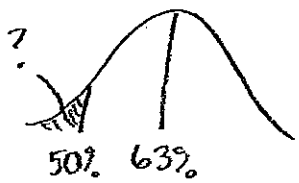
37 [0] 63 [1] $ave_{box} = .63$, $SD_{box} = .48$

$EV_{sum} = 300(.63) = 189$

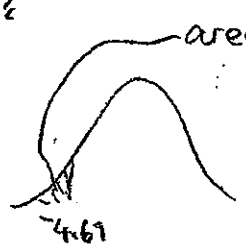
$SE_{sum} = \sqrt{300}(.48) = 8.31$

$EV_{\%} = \frac{189}{300} \times 100\% = 63\%$

$SE_{\%} = \frac{8.31}{300} \times 100\% = 2.77\%$



$z = \frac{50 - 63}{2.77} = -4.69$



5. For each of the following answer True or False. (2 points each)

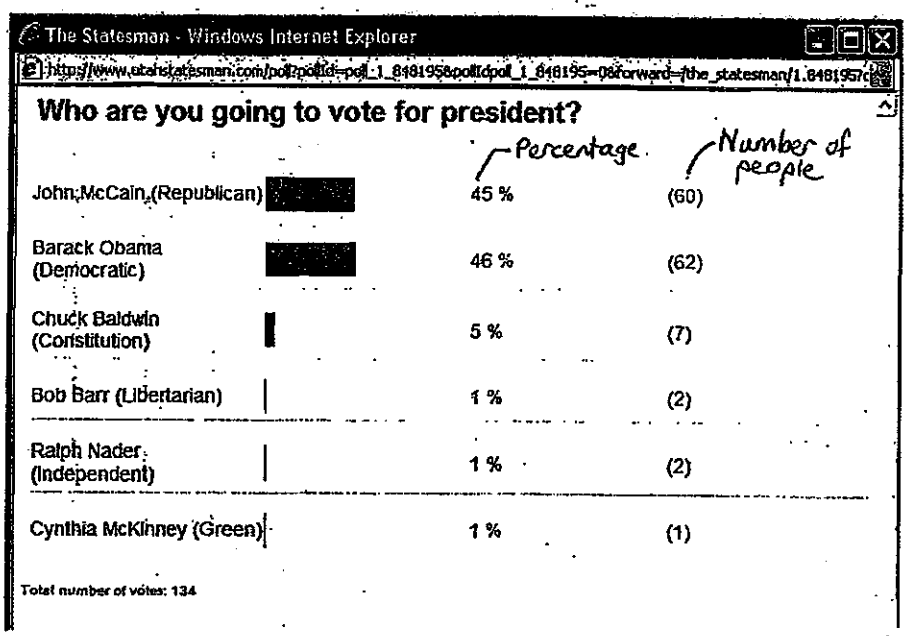
(a) For confidence intervals, we do not need the tickets in the box to follow the normal curve provided we have a large enough simple random sample. T

(b) The law of averages says that if we toss a coin more and more times, the percentage of heads will tend to get closer and closer to 50%. T

(c) For a large sample, the sample itself will follow the normal curve even if the tickets in the box do not. F

(d) For a large sample, the average of the sample will follow the normal curve even if the tickets in the box do not. T

6. The following chart comes from the Utah Statesman 10/31/08.



(a) (12 points) Assuming these 134 people are a simple random sample of all USU students, find a 90% confidence interval for the percentage of USU students who were planning to vote for Obama at the time of the survey.

bootstrap: box is approx: 54 [0] 46 [1] $ave_{box} = .46$ $SD_{box} = .498$

$SE_{sum} = \sqrt{134}(.498) = 5.77$

$SE_{\%} = \frac{5.77}{134} \times 100\% = 4.3\%$

90% between -1.65 and 1.65

CI is $46\% \pm 1.65(4.3\%)$

$46\% \pm 7\%$

(b) (9 points) Now suppose you find out that these results came from the Statesman's online poll. Give 3 *different* reasons why your confidence interval in (a) is unreliable. Note: points will be deducted if your reasons are too vague or if they overlap too much.

- not all students visit the Statesman online, and the ones that do might have different political views from the ones that don't.
- even if students visit the site, ones who feel strongly may be more likely to take the poll
- people can vote more than once
- non-students may vote
- talk is cheap

7. The average GPA for graduating seniors in a large university is 3.13 with an SD of 0.7.

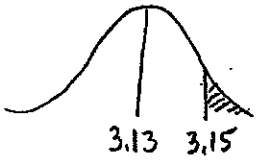
(a) (15 points) If I take a simple random sample of 100 graduating seniors from this university, what is the chance that the average GPA of those in my sample will be more than 3.15?

[GPAs] $ave_{box} = 3.13$, $SD_{box} = .7$

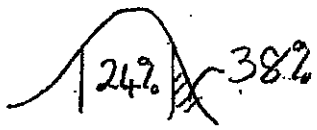
$EV_{ave} = 3.13$

$SE_{sum} = \sqrt{100}(.7) = 7$

$SE_{ave} = \frac{7}{100} = .07$



$z = \frac{3.15 - 3.13}{.07} = .29$



(b) (3 points) If you find out that the histogram for the GPAs does not follow the normal curve, is your answer to part (a) still valid? Why/why not?

Yes, because the sample is quite large and the GPAs are probably not extremely non-normal (how low can a GPA go?)

8. (12 points) For a simple random sample of 400 Cache Valley 6-year-olds, the average height is 117.25 cm with an SD of 4.2 cm. Find a 95% confidence interval for the average height of all Cache Valley 6-year-olds.

bootstrap: [ ] $ave_{box} = ?$, $SD_{box} = ? \approx 4.2$

$SE_{sum} = \sqrt{400}(4.2) = 84$

$SE_{ave} = \frac{84}{400} = .21$

CI: $117.25 \pm 2(.21)$

$117.25 \pm .42$