Exam IV

1. (25 points) A survey is conducted of 100 freshmen at public universities. Among the surveyed students, 20% (or 1/5) work at least 15 hours per week for pay.

a) Find a 95% confidence interval on the percent of freshmen at public universities who work at least 15 hours per week for pay.

b) True or false and explain: There is a 95% chance that the percent among *all* freshmen at public universities is in the range you found in a).

c) True or false and explain: There is a 95% chance that if a second sample of 100 freshmen were taken, the sample percent would be in the range you found in a).

d) True or false and explain: There is a 95% chance that the average hours a week worked for pay among all 18–20 year olds is in the range you found in a).

2. (10 points) Would taking the average of 100 measurements divide the likely size of the chance error by a factor of 5, 10 or 25? Justify your answer.

3. (10 points)

a) Other things being equal, which of the following P-values is best for the null hypothesis? Explain.

0.1% 3% 17% 32%

b) Repeat b) for the alternative hypothesis.

4. (15 points) The Zorro News Organization reports that 50% of freshmen at public universities work 15 hours a week for pay. If that is report is accurate, approximately what is the chance of getting a sample percent as low as 20% (as we did in #1) or lower? Hint: Use a z-test.

5. (15 points) Five hundred draws are made at random from the box

$$\boxed{60{,}000\ \boxed{0}\text{s} \quad 20{,}000\ \boxed{1}\text{s}}$$

Note that $\sqrt{0.25 \times 0.75}\,/\sqrt{500} \approx 0.02$. True or false? Explain your conclusions.

i. The expected value for the percentage of 1s among the draws is exactly 25%.

ii. The expected value for the percentage of 1s among the draws is around 25%, give or take 2% or so.

iii. The percentage of 1s among the draws will be around 25%, give or take 2% or so.

iv. The percentage of 1s among the draws will be exactly 25%.

v. The percentage of 1s in the box is exactly 25%.

vi. The percentage of 1s in the box is around 25%, give or take 2% or so.

6. (10 points) Find the specified area under the normal curve. Write down the `R` command that you use.

a) $z < -0.35$

b) $z > -1.35$

c) $-1.5 < z < 0.8$

7. (15 points) Laser altimeters can measure elevation to within a few inches, witut bias, and with no trend or pattern to the measurements. As part of an experiment, 25 readings were made on the elevation of a mountain peak. These averaged out to 81,411 inches, and their SD was 30 inches.

a) The elevation of the mountain peak is estimated as _____; this estimate is likely to be off by _____ or so.

b) (T/F) 81,411± 12 inches is a 95%-confidence interval for the elevation of the mountain peak.

c) (T/F) 81,411± 12 inches is a 95%-confidence interval for average of the 25 readings.

d) (T/F) There is about a 95% chance that the next reading will be in the range 81,411 ± 12 inches.

e) (T/F) About 95% of the readings were in the range 81,411 ± 12 inches.

f) If another 25 readings are made, there is about a 95% chance that their average will be in the range 81,411 ± 12 inches.