

CA3000 Lab Exam 2

Note 1: upload both code and output

Note 2: you need to upload a .docx document with evidence (e.g. screenshot or copy and paste of your R shell). Optional you could upload an R script with your answers and save them.

Note 3: In R, a vector is the same thing as an array

Q1 (20 ptos) Binomial probability: let's assume a probability of a student lending a book from a library is 0.7. There are 3 students in the library.

- What is the probability of (0,1,2,3) of them lending a book? **(10 ptos)**.
- Plot the results using a *barplot* **(10 ptos)**.

Q2 (10 ptos) Binomial probability: Suppose Tyler scores a strike on 30% of his attempts when he bowls. If he bowls 10 times, what is the probability that he scores 4 or more strikes?

Q3 (10 ptos) Conditional Probability: suppose that exam scores were distributed normally. Let the mean be 80 and standard deviation be 8. If it is known that a student's score is greater than 75, what is the probability that his score is greater than 90?

$$P(B|A) = P(A \cap B) / P(A)$$

Q4 (20 ptos) Normal distribution: from previous records it is known that examination results are normally distributed with mean $\mu = 45$ and the variance = 16.

- What percentage of students obtain a mark larger than 45? **(5 ptos)**.
- What percentage of students obtain a mark larger than 50? **(5 ptos)**.
- What percentage of students obtain a mark between 40 and 50? **(5 ptos)**.
- What percentage of students obtain a mark greater than 37? **(5 ptos)**.

Q5 (20 ptos): A department store chain has 10,000 credit card holders, who are billed monthly for purchases. The company want to take a sample of these credit card customers to determine average amount spent each month by all those holding credit cards. A random sample of 25 credit card holders was selected and the sample average was €75, with a sample variance of €400.

$$CI = \bar{x} \pm Z \frac{S}{\sqrt{n}}$$

p = significance level for 95% = 0.975

p = significance level for 99% = 0.995

- Find a 95% confidence interval, round the lower and upper intervals to 2 decimal places **(10 ptos)**.
- Find a 99% confidence interval, round the lower and upper intervals to 2 decimal places **(10 ptos)**.

Q6 (20 ptos): imagine we wish to estimate the percentage of citizens in a county who support a particular bill. We pick 500 residents at random and ask them about their opinions on the policy, 310 residents support of bill.

$$CI = p \pm Z \sqrt{\frac{p(1-p)}{n}}$$

p = significance level for 95% = 0.975

$p = \text{significance level for } 99\% = 0.995$

- a) Find a 95% confidence interval for the true proportion of the county residents who support this bill. Round the lower and upper intervals to 2 decimal places **(10 ptos)**.
- b) Find a 99% confidence interval for the true proportion of the county residents who support this bill. Round the lower and upper intervals to 2 decimal places **(10 ptos)**.