SOC 4930/5050: Lab-05 - The Distribution of Random Variables

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Directions

Please complete all steps below. The final parts of this lab use the `auto17` data from the `testDriveR` package. Your your work "by hand" as well as your well-formatted R Notebook source (the `.Rmd` file) and `html` output should be uploaded to your GitHub assignment repository by 4:15pm on Monday, October 2nd, 2017.

Part 1: Binomial Distribution

1. What is the probability of more than 24 successes occurring in a sequence of 250 independent trials with a binary outcome where the probability of success is .4 for each trial?
2. What is the probability of 25 or fewer successes occurring in a sequence of 250 independent trials with a binary outcome where the probability of success is .4 for each trial?
3. What is the probability of exactly 25 successes occurring in a sequence of 250 independent trials with a binary outcome where the the probability of success is .4 for each trial?

Part 2: Poisson Distribution

4. The probability of a catastrophic failure of a rocket carrying satellites into space is .025. Over 1,000 launches, what is the probability of observing more than 4 failures?
5. What is the probability of observing exactly 18 failures?
6. What is the probability of observing 15 for fewer failures?

Part 3: Normal Distribution

7. A literature review shows the distribution of literacy test scores on a given instrument to be normally distributed. The population average test score is 21 with a standard deviation of 3. What is the probability of drawing a individual whose score is a 25?

Part 4: Skew and Kurtosis by Hand

8. The following are a distribution of scores on a simple functional capacity task for individuals recovering from a stroke: 1, 4, 3, 2, 4, 2, 1, 4, 3, 3. What is the skewness and kurtosis of this distribution of scores?

Part 5: Normality Testing in Stata

9. Use the variable `fuelCost` from the `auto17` data set in the `testDriveR` package to conduct a full set of normality tests:
   (a) What is the variable's skew?
   (b) What is the variable's kurtosis?
   (c) Create and interpret a q-q plot.
   (d) What are the results of a Shapiro-Francia test?