Please include supporting Stata Log and/or Do-files in an appendix.

1. Show that the following equivalence holds:
2. Suppose are i.i.d normally distributed random variables with . Show, using the properties discussed in class, that .
3. Let X denote the 9-month salary of assistant professors of entrepreneurship in the U.S., measured in thousands of USD. Suppose the average salary is $115, with a standard deviation of $30. Find the mean, standard deviation, and variance when salary is measured in dollars.
4. Suppose is a continuous RV. Use Stata to compute the following:
   1. .
5. Recall the airline flight reservation example that we discussed in class. A given flight has a seat capacity of 150 seats and the airline knows that the probability that a passenger shows up for the flight is, on average, 0.91. If the management team is willing to accept an oversold flight 5 percent of the time, how many reservations should it accept if it prefers to fly a full flight? Use Stata to find the answer and include a log of your work.
6. Three out of four venture capital-backed businesses fail, according to data from the National Venture Capital Association. Assume then, that the success of a VC-backed startup (i.e., experience an IPO or acquisition) is completely random and the outcomes of startups are independent of one another. If a VC firm invests in 10 startups, compute (using Stata) the following (hint: . help binomial):
   1. Probability that none of its startups succeed
   2. Probability that only one of its startups succeed
   3. Probability that 2 or more of its startups succeed
7. For this question, you need to download and work with a dataset from IPUMs. Instructions for downloading the data is provided below.
   1. Examine the summary statistics for the education (detailed/EDUCD), sex, and and income variables. Create a table showing the following: minimum, maximum, mean, standard deviation, variance, median and number of observations for each. Repeat this exercise using the person weights provided in the data file and comment on how the summary statistics differ between the unweighted and weighted samples (Hint: .help summarize).
   2. Create a histogram showing the distribution of self-employment income. Now generate a new variable using the inverse hyperbolic sine (IHS) transformation of income. Create a histogram to show the distribution of the IHS-transformed self-employment income. For both figures, include a figure title, label the axes, add a normal density plot, and include a note indicating the source of the data. Briefly comment on the two figures and discuss why the natural log transformation may not be an appropriate choice for your sample.
   3. Create a bar graph showing the average income of self-employed persons by sex. Use the person weights in your results. Include a figure title, label the axes, and add a table note describing the source of your data.
   4. The educational attainment variable takes a large number of discrete values. Create a new education variable that takes on a smaller number of discrete values to categorize the self-employed by educational attainment. Summarize your categorization method in a table.
   5. Create a figure that shows the mean self-employment by educational attainment and sex. Include a figure title, label the axes, and add a table note describing the source of your data.

* Select the following harmonized person variables:
  + Education 🡪 Educational Attainment (EDUC)
  + Work 🡪 Class of Worker (CLASSWKR)
  + Income 🡪 Total Personal Income (INCTOT)
  + Demographics 🡪 Sex (SEX)
* Click on “view cart” and select “Add More Samples”
* Select only the 2018 ACS 5yr sample and click “Create Data Extract”
* Click on the “Select Cases” button and select the CLASSWKR variable on the next screen
* Select the Self-Employed case to limit the data to only those individuals who are self-employed in your dataset
* After submitting your dataset for extraction, you will receive an email when it is ready to be downloaded. You will need WinZip (or a similar file decompression app) to unzip the DAT file. You should also access the Stata command file, as this will provide general code importing your data to Stata. You can copy the text from the command file into a Stata do file. You will need to do some minor coding to change the file path directory of the folder where you save the DAT file. See our example from class. Additionally, you may want to access the codebook and copy the text into another file for reference.
* Once you have download the data and opened it in Stata, you are ready to begin the assignment.