Homework 2

Due date: Wednesday February 13 2019, 11:59pm

Use the notebook interface and send me the notebook via canvas

1. Write a function *middlesquare(seed)* that codes a random number generator that was first proposed by John von Neumann in the late forties. The pseudocode algorithm is like this:

   (a) write down a 6-digit number n (the seed) [use numbers that do not contain zeroes]

   (b) square this number n^2

   (c) take out the middle 6 digits (this is the first random number)

   (d) this random number becomes now the new seed and we start over at 1 again

   (for further information on this random number generator see this https://en.wikipedia.org/wiki/Middle-square_method) Print a list of 20 random numbers using this random number generator. Start with 123456 as a seed. [Hint: use the fact that you can easily convert between numbers and strings and lists, e.g. `str(number)` to generate a string from a number, `list(string)` to break a string into characters, to join lists of characters or strings use this
   `mynewstring = "".join(mylist_of_strings)`

2. Plot a histogram of 10,000 of these random numbers, make sure to label the axes, also use the option to make this a probability distribution (aka the histogram integrates to 1.0).

3. Plot 1000 pairs of these random numbers in a X/Y plot. Make sure the axes are labeled.

If this is too easy for you then look up how to test random numbers and show me that this is not a good random number generator.