Problem Set 1

22.211 Fall 2023

Due Date 2/13/2023

Question 1: Run the jupyter notebook that installs and runs OpenMC on google colab.

a) What value did you get for the block with "`fission.q_value`"? and what are the units?

Question 2: You are given 100$ and offered the possibility place 1$ wagers on a betting game with fair odds (50/50 chance of winning or losing). Before deciding to gamble, you decide to model the process and gain an understanding of your potential outcomes.

Write a computer code that simulates the following gambling process:

- Bettor starts with 100$
- Bets 1$ at each turn
- Game is fair 50/50 chance of winning or losing
- House pays 1$ if they win, and you lose your 1$ bet if you lose
- Game ends when you have no money left

Repeat the process 10 times using a different random number seed.

a) Plot the total amount of money the bettor has as a function of the number of bets placed. (all 10 simulations on the same plot)

Create a table that shows

b) The maximum amount of money you could have made if you decided to walk away at the right time.
c) The number of bets that you placed before losing all of your money.

d) Inferring from your results, what is the probability that you will lose all of your money? Explain why?

Question 3:

a) Find the number of resonances in U238 in the resolved resonance range (RRR) of ENDF/B-VIII and explain your approach/references.
b) If we were to extend the RRR of U-238 to also cover the unresolved resonance range (URR), estimate how many resonances U238 would have and explain your approach.