Exercises from Lectures 1

Discreteness

1. Order the following jobs from least to most discrete: Stockboy, waiter, accountant, poet, lawyer, surgeon.

   Justify your choice.

2. Order the following games from least to most discrete: Tic-Tac-Toe, Chess, volleyball, jumprope, monopoly.

   Justify your choice.

3. Which inputs to your cellphone are continuous? Which are discrete?

Multiplicative Principle

1. A character in the game of Bamboozle can have one of three weapons, one of six cars, and and one of eight skill-levels.

   What is the maximum number of characters there can be?

   How might the maximum fail to be achieved.

2. A password for the website `www.nosecurityatall.com` has 10 characters drawn from digits and upper case letters. Also, to be a legal password, no character or digit can occur twice in a row. So BEABEAR121 and 1234512345 are ok, but 6SLEEPYZZZ and LETMEIN are rejected.

   Use the multiplicative principle to determine how many legal passwords there are.

3. Use the multiplicative principle to determine how many 10 digit numbers there are.

4. Use the multiplicative principle to determine how many 10 digit numbers there are in base 8.

5. In a Roman discrete mathematics class in the year CCXXII the students were asked to compute how many 6 digit numbers there were.

   The Romans had 7 digits, M, D, C, L, X, V and I. Should the teacher mark the answer 7^6 as correct or incorrect, and why.