In Class Exercise #8: Counting

1. **Password**

   At one time, Facebook had a master password that could unlock any user's account. The password spelled "Chuck Norris" more or less but with upper and lower case letters, symbols, and numbers. According to insiders, the Chuck Norris reference was a nod to the American actor and cultural icon who was known to be tough, determined, and could do anything.

   (a) Facebook requires users to create a password that is a minimum of eight characters in length. If only numbers and lower case letters are used with repetition allowed, how many eight character passwords are there?

   (b) If all letters (upper and lower case included) and all numbers are used with repetition allowed, how many eight character passwords are there?

   (c) If only upper case letters are used, and no repetition is allowed, how many eight character passwords are there?

2. **Make America Grammatically Great Again**

   Early into his presidency, Donald Trump described himself as being highly educated and using only "the best words". Too bad he can't spell them right. Recently, Trump Tweeted how two years of his term were "stollen" from him. Opponents were quick to skewer him alive for the typo, pointing out that "stolen" is the past participle for "steal" and that "stollen" was a German fruit-cake eaten around Christmas time. Someone then asked if "stollen" would go well with a cup of "covfefe".

   (a) In how many different ways can the word "stolen" be arranged if all the letters are to be used?

   (b) In how many different ways can the word "stollen" be arranged if all the letters are to be used?

   (c) In how many different ways can the word "covfefe" be arranged is all the letters are to be used?

3. **Alpine Race**

   Alpine ski races often award animals to winners: a goat, a hawk, a reindeer, etc. But the prize is mostly symbolic. When Lindsey Vonn won a calf at Val d'Isŕe, France, in 2005, she was offered $5,000 as an alternative. Much to the organizers' surprise, she took the calf instead of the cash. When asked to "give it back and take the cheque"; Vonn stood her ground. Eventually, organizers relented, and Vonn was able to keep the calf who she named "Olympe". Olympe now lives in a barn just outside of Austria, and has given birth to two calves since. At the Val d'Isŕe alpin race, there are a total of 20 skiers.

   (a) Organizers of the race, have decided to split the 20 skiers into several heats (subgroups) to avoid over-crowding at the start line. In the first heat, five skiers need to be selected from the 20. In how many ways can five different skiers be selected from the 20?

   (b) After the first heat had been given a 10 minute head start, organizers will select another five skiers to run in the second heat. In how many different ways can five skiers be selected to race in the second heat?

   (c) In how many different ways can the 20 participants achieve first place, second place, and third on the podium?