Discrete Math HW 13: Learning goals C1, C2

due anytime

C1: I can use the product, addition, and subtraction rules to count things.

Exercise 1 How many strings of eight uppercase English letters are there ...

(a) if letters can be repeated?

(b) if no letter can be repeated?

(c) that start with X, if letters can be repeated?

(d) that start with X, if no letter can be repeated?

(e) that start and end with X, if letters can be repeated?

(f) that start with the letters BO (in that order), if letters can be repeated?

(g) that start and end with the letters BO (in that order), if letters can be repeated?

(h) that start or end with the letters BO (in that order), if letters can be repeated?

Exercise 2 How many different functions are there from the set $\{A, B, C\}$ to *Bool*?

Exercise 3 How many bit strings are there of length 6 or less, not counting the empty string?

C2: I can use the division rule and binomial coefficients to count things.

Exercise 4 How many ways are there to choose three weekdays on which to exercise?

Exercise 5 How many ten-bit strings are there containing exactly three '1's?

Exercise 6 How many ten-letter strings are there containing exactly three '*A*'s?

Exercise 7 Consider the number of ways for 10 dogs and 6 cats to stand in a line so no two cats stand next to each other.

Hint: first position the dogs and then consider possible positions for the cats.

- First, how many ways are there if the dogs are all identical, and the cats are all identical?
- What about if the dogs and cats are all distinct, so it matters what order they stand in?

Exercise 8 You are a mythical creature trainer! You have seven dragons and nine unicorns, and it's time to select a team to compete in the Annual Creatures of Myth Exposition (ACME). Note that a team is defined as a *set* of creatures, that is, the order of creatures on a team does not matter.

Hint: How many possible teams are there? How many teams are there with no dragons?

(a) How many ways are there to choose a team of five creatures if at least one dragon must be on the team?

(b) How many ways are there to choose a team of five creatures if at least one dragon and at least one unicorn must be on the team?