Prep Work 1 - Functions, Strings, and Counting

CS 234

due January 27, before class

0 Introduction

This assignment has 3 parts: functions, strings, and counting.

This assignment is to be completed individually, but feel free to collaborate according to the course's external collaboration policy (which can be found in the syllabus).

The deliverables consist of one `.pdf` file. The deliverables should be submitted electronically by the deadline. Put any attribution text in the `.pdf` file.

Every file should be named like `FLast_cs234_pX.ext` where `F` is your first initial, `Last` is your last name, `X` is the assignment number, and `ext` is the appropriate file extension. For example, Lisl Gaal's `.pdf` file should be given the name `LGaal_cs234_p1.pdf`. (Lisl Gaal proved that Zermelo and Von Neumann set theories were equally consistent, among other accomplishments.)

1 Functions

Read chapter 1 in the textbook. Then complete the following tasks in your `.pdf` submission. Clearly label your responses with the task number.

1. In your own words, what is a function?
2. Give your own example of a function.
3. What is a domain?
4. What is the domain of the function from task 2?
5. What is a codomain?
6. What is the codomain of the function from task 2?
7. Explain what the function type $\mathbb{Z}^2 \to \mathbb{N} \times \mathbb{Q}$ means.

2 Strings

Read chapter 1 in the textbook. Then complete the following tasks in your `.pdf` submission. Clearly label your responses with the task number.

1. In your own words, what is a string?
2. Give your own example of a non-empty string.
3. What notation do we use for the length of a string?
4. What is the length of ϵ? (I use ϵ to represent the empty string, whereas the textbook uses λ. Either symbol is fine.)
5. In your own words, what is a substring?
6. Give an example of a substring of the string from task 2.
7. In your own words, what is a prefix?
8. Give an example of a prefix of the string from task 2.
9. In your own words, what is a suffix?
10. Give an example of a suffix of the string from task 2.
11. Is the empty string a prefix, substring, and/or suffix of the string from task 2? If so, which?
12. In your own words, what is a language?
13. Give your own example of a language containing at least 3 elements.
14. List the first 3 elements of the language from task 13 in shortlex order.

3 Counting

Read chapter A in the textbook. Then complete the following tasks in your `.pdf` submission. Clearly label your responses with the task number.

1. In your own words, what is the multiplication rule?
2. Give your own example of counting something using the multiplication rule.
3. How is the factorial function mathematically defined?
4. What does the factorial function count?
5. Give your own example of counting something using factorials.
6. In your own words, explain how the division described in chapter A.4 accounts for overcounting.
7. How are binomial coefficients mathematically defined? (A binomial coefficient is just the proper term for "n choose k", i.e., $\binom{n}{k}$.)
8. What do binomial coefficients count?
9. Give your own example of counting something using binomial coefficients.