

Introduction

CS236 - Discrete Structures

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SPRING 2020 SECTION 1

Definitions and Notation

This course is a Discrete Mathematics course. You will be introduction to many foundational Computer Science theory topics. There are a lot of terms, definitions, and notation that will probably be unfamiliar to you. This can be very confusing and discouraging. Be patient with yourself and understand that this material requires multiple exposures and practice to fully grasp. This document contains some definitions and notations that are used early in the course, but explained in detail later.

Set

A set is a collection of elements. A key property of a set is that it does not contain duplicates. We denote a set with braces $\{\dots\}$. Inside the braces we list all the unique elements separated by commas. The elements of a set can also be sets. We can use labels with sets. This is the notation to say there is a set named 'B' with elements 'b', 'r', 'e', 't': $B = \{b, r, e, t\}$ (no duplicate 't').

Set Operations

This symbol, \cup , is the set union symbol. Let A, B , and C be sets. For $C = A \cup B$ we add all the elements from A into C , and then add all the elements from B into C (but doing duplicate any elements). This symbol, $-$, is set difference. Let A, B , and C be sets. For $C = A - B$ we add all the elements from A into C , then remove all elements from C that are in B . The more precise way to think of it is only add elements from A into C if each element is not also in B .

Tuple

A tuple is an ordered collection of elements. Tuples are denoted with parenthesis (\dots) . Tuples may have duplicate elements. Here is a 3-tuple: (b, b, b) . Sets may contain tuples as elements, such as: $A = \{(a, 1), (b, 2), (c, 3)\}$. Tuples do not contain sets as elements.

Machines

We will discuss theoretical computation state machines, called simply machines. We will only learn about finite-state machines, machines that have a finite number of states. Machines read input one character at a time and perform a transition (move from one state to another state, which can be the same state). During a transition some machines will output a character. We will discuss a special kind of finite-state machine call an automaton (said “o-tom-a-ton” or “aw-tom-a-ton”).

Conclusion

When learning new theory, the key thing is to keep studying, keep discussing, and keep practicing. With time and effort the notation will stop looking like gibberish and instead convey precise meaning.