

CS138 Section Week 1

April 1, 2016

Contact Info

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Office hours Tuesday & Thursday 9-10am, GSL (trailer 698, across from HFH).

Practice Problems

1. Let $\Sigma = \{a, b, c\}$. List all elements of $\Sigma^{\leq 3}$.

2. A US phone number is of the form “XXX-XXX-XXXX”, where “X” denotes a digit. Let $\Sigma = \{0, 1, \dots, 9, -\}$, $D = \{0, 1, \dots, 9\}$, and $S = \{-\}$. Write down an expression for the set of US phone numbers using D, S , language operations $\bullet, \cap, \cup, *$, and parentheses.

3. Let $\Sigma = \{0, 1\}$. Using $\{0\}, \{1\}$, language operations $\bullet, \cap, \cup, *$, and parentheses, write down an expression for the language

$$L = \{w \mid w \text{ contains even number of 0's and odd number of 1's}\}.$$

4. Consider the language $L = \{(n, t) \in \mathbb{N}^2 \mid n \text{ has a prime factor } \leq t\}$. Suppose that you are given an algorithm, D_L , that decides membership of L . In particular, on input (n, t) , D_L outputs 1 if $(n, t) \in L$, and 0 if $(n, t) \notin L$. Write an algorithm that, on input n , decides the primality of n , and returns a prime factor of n if n is not prime. Your algorithm should call D_L $O(\log(n))$ times.