

CS 261 HW6

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Due April 7th

This homework covers material from Chapter 4.1 up to and including Chapter 4.4 in the textbook.

1. Exercise 4.2.4 (4 cent and 7 cent stamps)
2. Exercise 4.2.10 (breaking a chocolate bar)
3. Prove, using strong induction, that the first player has a winning strategy in the game of Chomp if the board is 2 by n (i.e. each row has 2 cookies). Hint: Use strong induction and let the first move be to chomp the bottom right cookie.
4. Recall the matchstick game we discussed in class (Example 3 in 4.2) where there were 2 piles, each with n matches, each player can take any number of matches from a pile and the player who removes the last match wins. In class we showed that the second player can always win. In this problem, you will consider the case where there are x piles, each of n matches where x is an even number. Prove that the second player can always win in this game. Hint 1: You will find it easier to prove something stronger: if the the number of matches in the k and $k + 1$ are the same for all odd k between 1 and $x - 1$, that the second player can win. Hint2: Think of a strategy that allows you to use strong induction on the number of piles.
5. Exercise 4.3.48
6. Exercise 4.3.50
7. Consider the recurrence relation for the Fibonacci numbers that we discussed in class: $f(n) = f(n - 1) + f(n - 2)$, $f(1) = f(2) = 1$. Prove using induction that for all $n \geq 2$, $f(n) \geq (3/2)^{n-2}$.

8. Give a recursive algorithm to reverse a string s . Note: The reversal of “a” is “a”. The reversal of “ab” is “ba”. The reversal of “bba” is “abb”.
9. Give a recursive algorithm for finding $2^n \bmod m$.
10. Exercise 4.4.14 (don't worry about the runtime of your algorithm)