

Introduction to Computer Science E14 – Discussion Sections – Week 41

1. Page 247: Problem 23.
2. Page 249: Problem 40.
3. Page 250: Problems 46, 48, 49, 55. For problem 55, discuss preconditions, postconditions, loop invariants and possible improvements.
4. Suppose you are given a list, P , of the first n primes, where n might be large. Design two algorithms that, when given an input, s , finds the smallest index, i , in the list $1 \leq i \leq n$, such that multiplying the i th and $i + 1$ st primes together gives a result at least as large as s . (Find i such that $P[i] * P[i + 1] \geq s$.) The first algorithm should be based on sequential search and the second on binary search.
 - (a) Write your algorithms in pseudocode. Explain why they work.
 - (b) Analyze the running time of your algorithms (using Θ notation). You may assume that multiplying and comparing numbers takes 1 unit of time. (Think about why this assumption might not be reasonable.) Also, explain how your answer would change if you could assume that $s \leq n$.
5. Use pseudocode to write a recursive algorithm to compute the length of a list. Assume that you have a built-in function to get the next entry in a list and another function to check if there are more items still left in the list. Analyze the running time of your algorithm (using Θ notation).