CMSC 421.0101, Homework Assignment 2

Five problems, 10 points per problem, 50 points total.Due date: September 27.Late date (20% off): October 2.

The first four problems are the following ones from the book:

- 3.24
- 3.25
- 3.31 (but you don't need to suggest a way to calculate the heuristic)
- 4.1

Here is the fifth homework problem:

Consider a genetic programming problem in which each state is a string of 6 digits, hence a state can be any string from "000000" to "9999999". Suppose the initial population is a set of states $\{s_1, \ldots, s_k\}$, where k is a constant. Suppose reproduction is done by selecting two states s_i and s_j from the population, and creating a new state that contains the first i digits of s_i , followed by the last 6 - i digits of s_j , where i is a random number in $\{0, 1, \ldots, 6\}$. Suppose we don't allow mutation.

- (a) How many different possible states are there?
- (b) If p is an initial population, let D(p) be the set of all possible descendants of p. Over every possible p of size k, what is the maximum possible size of D(p)?
- (c) Find an initial population p such that D(p) includes every possible state. The size of p should be as small as possible.
- (d) Suppose we create p by choosing 10 states chosen randomly and independently (hence there may be duplication) from the set of all possible states. What is the probability that D(p) includes all possible states?