ME 466 Introduction to AI
Fall 2021
Programming Assignment 1
Due: 24 October 2021 @23:59 by e-mail

The solutions of this assignment should be prepared according to the guidelines in the course syllabus. Please read the syllabus first. Submit all evidence of your work; i.e., code, algorithms, flowcharts, MATLAB Command Window/command prompts, inputs, outputs, plots, results, error messages, etc. as an appendix or in the main body of your submission, with proper explanations. Also submit your code and a text file with instructions to run it. **Please fill in the page at the end of this assignment, sign it, and use it as the cover page of your assignment report.**

This assignment is intended for you to refresh your knowledge and get you reacquainted with algorithms, data structures, code, and concepts related to programming. You are free to use any programming language you want, such as Python, MATLAB, C++, Java, etc.

In this assignment, you are going to write a program that solves a modified version of the Mastermind game, called the Bulls and Cows game. While the original Mastermind game is played with colored pegs, Bulls and Cows is played with digits and repeated digits are not allowed. In our version of the game, Player A picks a secret four-digit number (leading zero is not allowed) and Player B tries to guess the number. After each guess, Player A tells Player B how many digits of the guess match the secret number; how many digits are in place (bulls) and how many digits are out of place (cows). By making repeated guesses, Player B eventually determines the secret number.

Here is a sample run of the game. Suppose Player A's secret number is 4186.
B. My guess is 3914.
A. 0 digits in place, 2 digits out of place.
B. My guess is 2480.
A. 1 digit in place, 1 digit out of place.
B. My guess is 8173.
A. 1 digit in place, 1 digit out of place.
B. My guess is 1623.
A. 0 digits in place, 2 digits out of place.
B. My guess is 4186.
A. 4 digits in place, 0 digits out of place.

In this assignment, you will write a program so that the computer plays the role of Player B. You will play the role of Player A. In other words, the computer will try to guess the number you pick. You have to come up with an algorithm that makes the computer solve the problem. Of course, sequentially trying all numbers between 1023 and 9876 (excluding numbers with repeated digits), without regard to A's answer is a valid algorithm and the computer will eventually determine the secret number. But the purpose here is to find a better algorithm. It is a proven fact that the answer can be found in at most seven guesses. However, you are not expected to find "the optimal" algorithm in this assignment; some sort of logical reasoning is enough.

Hints:

- Write a function that inputs a four-digit number and returns True if there are any repeated digits in it.

- Write a function that inputs two four-digit numbers and returns how many digits match in place and how many match out of place.

ME 466 Introduction to AI
Fall 2021
Programming Assignment 1
Submitted on: 24 October 2021

Name:

Student ID:

Grade:

I hereby declare that the paper I am submitting under this cover is product of my own efforts only. Even if I worked on some of the problems together with my classmates, I prepared this paper on my own, without looking at any other classmate's paper. I am knowledgeable about everything that is written under this cover, and I am prepared to explain any scientific/technical content written here if a short oral examination about this paper is conducted by the instructor. I am aware of the serious consequences of cheating.

Signature: _____