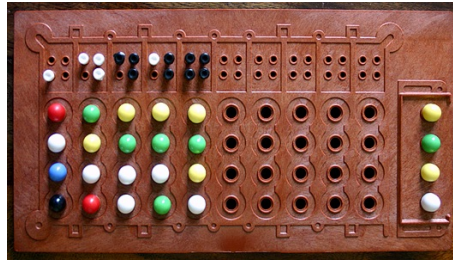


APPM 3570: Homework Set 1

Due Wed. Jan. 24, 2018

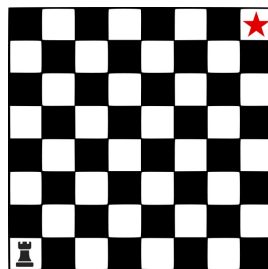
1. Chapter 1 in Ross: Problems 1, 8, 11, 16, 20, 23; Theoretical Exercise 5



2. Consider the game *Mastermind* (pictured above). In each row, there are four holes, which can be filled with colored pegs. The pegs come in six different colors. The *codemaker* builds a hidden four-valued code (on the right) that the *codebreaker* tries to guess.
- (a) If all four holes must be filled with different colors, how many different possible codes are there?
 - (b) If we allow a *gap*, so that one hole may remain unfilled, how many different codes are there?
 - (c) If we allow gaps and the same color to be used more than once, how many possibilities are there?



3. Suppose we have a six-sided die and a coin, and we perform a mixture of coin-flipping and die-rolling to accumulate five events. For example, *T3H26* means we flipped the coin first yielding tails, then we rolled the die yielding three, then heads was flipped, then two was rolled, then six was rolled. It may be helpful for you to practice the following with your own die and coin.
- (a) Assume we can choose either flip the coin or roll the die on each of our five events. What choice of object (die or coin) on each event will maximize the number of possible event sequences? What choice of object (die or coin) on each event will minimize the number of possible event sequences?
 - (b) If the first three events must be coin flips, and the last two must be die rolls, how many possible event sequences are there?
 - (c) Consider a game where we start by rolling the die, but switch to flipping the coin only if we roll a six. How many possible event sequences are there for which we roll the die for all five events? How many possible event sequences are there for which we end up flipping the coin four times.



4. Consider a rook chess piece that is only allowed to move up by one square or to the right by one square. If we start it at the bottom left square of an 8 by 8 chessboard, how many different paths are there that the rook can take from the bottom left to the top right square?