MACM 101-D1 (HW 2)
September 23, 2019
Date due: October 2-3, 2019 in the Tutorial.

1 Practice Problems (Not to be handed in)

1. Problems (Exercises 1.4) $2, 8, 16, 18$
2. Problems (Exercises 1.6) $2, 3, 4, 8, 10, 14, 20, 22$
3. Problems (Exercises 2.1) $4, 5, 8, 12$
4. Find the # of integral solutions to the equation $x_1+x_2+x_3+x_4+x_5+x_6 = 21$ subject to the conditions
   (a) $x_i \geq 0, i = 1, 2, 3, 4, 5, 6.$
   (b) $x_3 \geq 5, x_i \geq 1, i = 1, 2, 4, 5, 6.$
   (c) $0 \leq x_1 \leq 3, x_i \geq 1, i = 2, 3, 4, 5, 6.$

2 Homework Problems (To be handed in)

1. In how many ways can we place r red balls and w white balls in n boxes so that each box contains one ball of each color?
2. (a) How many sequences (lists) of m 0s and n 1s are there?
   (b) How many sequences are there in which each 1 is separated by at least two 0s? (Assume that for this part $m \geq 2(n-1)$.)
3. We are given a red box, a blue box and a green box. We are also given 10 red balls, 10 blue balls, and 10 green balls. Balls of the same colour are indistinguishable. Consider the following constraints:

   A: No box contains a ball that has the same colour as the box.

   B: No box is empty.

   Determine the number of ways in which we can put 30 balls into boxes so that:

   (a) No constraint has to be satisfied. Every combination is allowed.
   (b) Constraint A is satisfied.
   (c) Constraint B is satisfied.

(d) Constraints A and B are satisfied.

4. Construct a truth table for each statement.

   (a) $p \to \neg q$

   (b) $[p \wedge (p \to q)] \to q$

   (c) $[p \to (q \wedge \neg q)] \leftrightarrow \neg p$