University of Colorado
Department of Mathematics

2020/21 Semester 2   Math 2001-003 Intro to Discrete Math   Assignment 1

Due Friday Jan. 22, 2021

1. Recall the game we played in class Friday, Jan. 15., Player 1 vs. Player 2. There is a pile of 10 "pennies" or "protons" on a table. Player 1 can remove one or two pennies from the pile. These removed pennies are then out of play. From the remaining pile, Player 2 can remove one or two pennies from the pile, and the removed pennies are out of play. Player 1 goes back to the remaining pile, and removes one or two pennies from the pile, etc. and this process is repeated by taking turns, with only a choice of one or two pennies to remove. The player who wins is the player who takes the last one or two pennies, leaving the opposing player with no pennies in the pile. Describe in straightforward language an optimal strategy to win this game. If we change the game and have three players, each removing one or two pennies, how does the strategy for the game change?

2. If we assume that:
   "There is always rain or snow or sleet when the wind is from the Northeast"

   which of the following statments is always true?

   (a) "If it is raining or snowing or sleeting, the wind is from the Northeast."
   (b) "If the wind is not from the Northeast, then it must be sunny."
   (c) "If is sunny, then the wind must not be from the Northeast."

   Explain your answers.

3. Do Exercise 1.1 on p. 2 of the text.

4. Consider the two statements below:

   (a) "For each X there exists Y."
   (b) "For all X there exists Y."

   Either explain why these two statements are the same, or give examples of $X's$ and $Y's$ to show how these two statements are different.

5. Do Exercises 3.1, 3.3 and 3.5 on p. 6 of the text.

6. There is a party with 8 guests. All guests have two hands. If each guest shakes one of every other guest's hand exactly once during the party, how many total handshakes take place at the party? If each guest shakes each of every other guest's hand exactly once, how many total handshakes take place at the party?