

CSC 225 FALL 2022
ALGORITHMS AND DATA STRUCTURES I
ASSIGNMENT 1 - WRITTEN
UNIVERSITY OF VICTORIA

1. [4 marks] I have seven different programming textbooks on my bookshelf, three C++ and four Java. In how many ways can I arrange the books
 - a) if there are no restrictions?
 - b) if the languages should alternate?
 - c) if all the C++ books must be next to each other?
 - d) if all the C++ books must be next to each other and all the Java books must be next to each other?
2. [4 marks] Suppose that you draw five cards from a standard deck of 52.
 - a) How many ways can you draw exactly 3 spades?
 - b) How many ways can you draw at most 3 spades?
 - c) How many ways can you draw 2 spades and 3 hearts?
 - d) How many ways can you draw exactly 1 spade, 2 diamonds and 2 kings, where there may be overlap (that is, 1 king may be a spade, and/or 1 king may be a diamond, etc.)?
3. [4 marks] Show that if n is a positive integer and $n > 2$, then

$$\binom{n}{2} + \binom{n-1}{2}$$

is a perfect square (i.e. its square root is an integer.)

4. [4 marks] Determine the number of integer solutions of $x_1 + x_2 + x_3 + x_4 = 20$, where
 - a) $x_i \geq 0, 1 \leq i \leq 4$
 - b) $x_1, x_2 \geq 2, x_3, x_4 \geq 1$
 - c) $x_i \geq -1, 1 \leq i \leq 4$
 - d) $x_i \geq 0, 1 \leq i \leq 3$, and $2 \leq x_4 \leq 7$
5. [4 marks] During the first six weeks after you graduate you send out at least one resumé a day but no more than 60 resumé in total. Show that there must be a period of consecutive days during which you send out exactly 23 resumé.