COSC 072 Homework 3

1. From the book: R-3.13, C-4.20 (but write C++ code).
2. Analyze the following algorithms. Derive $t(n)$, c, n_0, and $O(g(n))$.

   (a) **Algorithm** `a1`(n)

   input: The integer n.
   output: An integer indicating the number of times the for loop executes.

   1. Let a be an integer
   2. $a \leftarrow 0$
   3. **for** $i \leftarrow 1, \ldots, n$ **do**
   4. $\quad a \leftarrow a + 1$
   5. **return** a

   (b) **Algorithm** `a2`(n)

   input: The integer n.
   output: An integer indicating the number of times the for loop executes.

   1. Let a be an integer
   2. $a \leftarrow 0$
   3. **for** $i \leftarrow 0, \ldots, n$ **do**
   4. $\quad a \leftarrow a + 1$
   5. **return** a

   (c) **Algorithm** `a3`(n)

   input: The integer n.
   output: An integer indicating the number of times the for loop executes.

   1. Let a be an integer
   2. $a \leftarrow 0$
   3. **for** $i \leftarrow 1, \ldots, n - 1$ **do**
   4. $\quad a \leftarrow a + 1$
   5. **return** a

   (d) **Algorithm** `a4`(n)

   input: The integer n.
   output: An integer indicating the number of times the for loop executes.

   1. Let a be an integer
   2. $a \leftarrow 0$
   3. **for** $i \leftarrow 0, \ldots, n - 1$ **do**
   4. $\quad a \leftarrow a + 1$
   5. **return** a

   (e) **Algorithm** `a5`(n)

   input: The integer n.
   output: An integer indicating the number of times the for loop executes.

   1. Let a be an integer
   2. $a \leftarrow 0$
   3. **for** $i \leftarrow 0, \ldots, n + 1$ **do**
   4. $\quad a \leftarrow a + 1$
   5. **return** a

3. For algorithm `a1`, write a C++ program that analyzes the for-loop. The program should print `n`, the number of iterations, the number of tests, and the number of increments.