1 C Introduction

C is syntactically very similar to Java, but there are a few key differences of which to be wary:

- C is function oriented, not object oriented, so no objects for you.
- C does not automatically handle memory for you.
  - In the case of stack memory (things allocated in the “usual” way), a datum is garbage immediately after the function in which it was defined returns.
  - In the case of heap memory (things allocated with malloc and friends), data is freed only when the programmer explicitly frees it.
  - In any case, allocated memory always holds garbage until it is initialized.
- C uses pointers explicitly. \( *p \) tells us to use the value that \( p \) points to, rather than the value of \( p \), and \( &x \) gives the address of \( x \) rather than the value of \( x \).

There are other differences of which you should be aware, but this should be enough for you to get your feet wet.

2 Uncommented Code? Yuck!

The following functions work correctly (note: this does not mean intelligently), but have no comments. Document the code to prevent it from causing further confusion.

1. /*
   *
   */
   int foo(int *arr, size_t n) {
     return n ? arr[0] + foo(arr + 1, n - 1) : 0;
   }

2. /*
   *
   */
   int bar(int *arr, size_t n) {
     int sum = 0, i;

     for (i = n; i > 0; i--) {
       sum += !arr[i - 1];
     }

     return ~sum + 1;
   }

3. /*
   *
   */
   void baz(int x, int y) {
     x = x ^ y;
     y = x ^ y;
     x = x ^ y;
   }
3 Programming with Pointers

Implement the following functions so that they perform as described in the comments.

1. /* Swaps the value of two ints outside of this function. */

2. /* Increments the value of an int outside of this function by one. */

3. /* Returns the number of bytes in a string. Does not use strlen. */

4 Problem?

The following code segments may contain logic and syntax errors. Find and correct them.

1. /* Returns the sum of all the elements in SUMMANDS. */
   int sum(int* summands) {
     int sum = 0;
     for (int i = 0; i < sizeof(summands); i++)
       sum += *(summands + i);
     return sum;
   }

2. /* Increments all the letters in the string STRING, held in an array of length N. * Does not modify any other memory which has been previously allocated. */
   void increment(char* string, int n) {
     for (int i = 0; i < n; i++)
       *(string + i)++;
   }

3. /* Copies the string SRC to DST. */
   void copy(char* src, char* dst) {
     while (*dst++ = *src++);
   }