C/C++ Exercise Set 1

1. (a) What is the difference between `'a'` and `"a"`?
   (b) What is the difference between a local and global variable in C? (Consider variable scope, storage and initialisation.)
2. (a) Define a macro `SWAP(t,x,y)` that exchanges two arguments of type `t`
   (b) Does your macro work as expected for `SWAP(int, v[i++], w[f(x)])`?
3. Write an implementation of bubble sort for a fixed array of integers. (An array of integers can be defined as `int i[] = {1,2,3,4};` the 2nd integer in an array can be printed using `printf("%d\n",i[1]);`.)
4. (a) Write a macro `CONCAT` that takes two string literals as arguments and results in them being concatenated into a single string after the preprocessor has run.
   (b) Why is the following code wrong?

```
#define b "UoCCL"
char a[] = "UoCCL";
char i[] = CONCAT(b,a);
```

5. A C programmer makes use of the `goto` construct as follows:

```
int test() {
    int x=0,y=0,i,j;
    int err=0;
    if ((y=init())==-1)
        goto error;
    for (i=1;i<10;i++) {
        for (j=1;j<10;j++) {
            if ((x=process(i,j))==-1) {
                err = 10*i+j;
                goto error;
            }
            y += x;
        }
    }
    return y;
  error:
    printf("Something went wrong: %d %d\n",err/10,err%10);
    exit(1);
}
```

   Rewrite this code maintaining the same functionality but avoiding the use of `goto`.

6. Submit your solution for the lab2 work to reverse substrings.

   (see `https://www.cl.cam.ac.uk/teaching/2021/ProgC/djg-primary-materials/c-labs-djg-oct2020.pdf`)

7. *(extra)* Use function recursion to write an implementation of merge sort for a fixed array of integers; how much memory does your program use for a list of length n?