Strings Review

- A string in C is an array of characters that is NULL terminated.

- For example:
  ```c
  char s1[] = {'s', 't', 'r', 'i', 'n', 'g'}
  // s1 is not a string
  char s2[] = {'s', 't', 'r', 'i', 'n', 'g', '\0'}
  // s2 is a valid string
  char s3[] = "string";
  // s3 is also a valid string
  ```

Useful `<string.h>` functions

```c
int strlen(char s[])
// Returns the length of the string s,
// starting from s[0] and ending at the
// first instance of '\0', not counting '\0' itself.

int strcmp(char s1[], char s2[])
// Compares s1 and s2 lexicographically.
// If both strings are identical, it returns 0.
// If str1 comes before str2, it returns an int < 0.
// If str2 comes before str1, it returns an int > 0.
```
Useful `<string.h>` functions

Never put `strlen` or other $O(n)$ functions in a loop condition!
Beginners often make this mistake, which often causes increases to runtimes.

```c
char * strcpy(char * dest, const char * src)
// Overwrites the contents of dest
// with the contents of src.

char * strcat(char * dest, const char * src)
// Copies (appends or concatenates) src
// to the end of dest.
```

Exercise: Substrings n’ Things
Implement the following function using pointer arithmetic (do not use array notation):

```c
// substr: returns a pointer to the first occurrence of
// sub inside str. if no match is found, returns NULL.
// this is suspiciously similar to "strstr".
// requires: str is a valid, non-NULL string. sub is a
// valid, non-NULL string.
char* substr(const char* str, const char* sub);
```

Exercise: Duplicate aaaaaaaaa Character
Implement the following function:

```c
// duplicate: returns a dynamically allocated,
// NULL-terminated string containing n copies of
// character c. on malloc failure, returns NULL.
// requires: n > 0.
// effects: dynamically allocates the returned string.
char* duplicate(char c, int n);
```

// Example:
```c
char* s = duplicate('n', 5);
printf("%s\n", s) ; // prints nnnnn
free(p);
```