C Coursework 1

David Chisnall

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This coursework will involve writing a simple set of wrappers around C strings. This should be submitted as four files:

- `string.c` shall contain the implementation of your string functions.
- `string.h` shall contain the interface to these functions.
- `test.c` shall contain your `main()` function and any supporting functions.
- `Makefile` shall create an executable called `StringTest` from your sources.

1. Define a structure storing a C string and a length. [3 marks]
2. Use `typedef` to define a `String` type which is a pointer to this structure. [2 marks]
3. Create a pair of functions for allocating and freeing these structures. [10 marks]
4. Add a function for turning a C string into a `String`. [5 marks]
5. Write a function for copying an existing `String`. [5 marks]
6. Write functions for concatenating two `String`s and returning a new string, and for appending a `String` to another. [10 marks]
7. Write a function for accessing characters in a `String` by their index. Return `NULL` if the index is out of the range of the string. [5 marks]
8. Create a header file for the interfaces to your `String` type, exposing it as an opaque type and including all of the function prototypes. [5 marks]
9. Create a `main()` function which reads user input until a blank line is entered. These should be stored in an array of `String`s, sorted, and then printed out in alphabetical order. A good implementation of this will be split across more than one function. [15 marks]
10. Create a `Makefile` for the project. [10 marks]

An additional 10 marks will be awarded for code readability (indenting, commenting, etc).