

## Strings Or, arrays Pt 2

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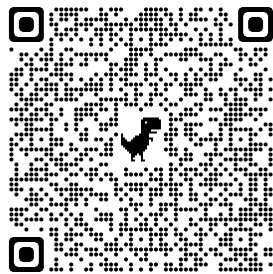
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## Call for research participants

- We are evaluating some new AI-powered tools
- We need your help!



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## Assignment 1

- Released Tuesday
- Watch the Assignment Walkthrough live stream
- Watch the Catchup-up video
- Submission in Week 7
- Worth 20%

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## Arrays recap

- A collection of data, all of the same type. (homogenous)
- We have a single identifier for the entire array
- It is a random access data structure, meaning we can access any element in the array at any time

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## The array declaration syntax

```
int  
ice_cream_per_day[7];
```

index:	0	1	2	3	4	5	6
values:							

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## Declare + initialise

```
int ice_cream_per_day[7]  
= {3, 2, 1, 2, 1, 3, 5};
```

^ Note you can only do this when you declare, not later!

```
int ice_cream_per_day[7]  
= {};
```

^ Will initialise all elements to 0

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## Some corrections

```
int my_data[] = {3, 2, 1,  
2, 1, 3, 5};
```

^ Will create a 7-element array

```
int my_data[14] = {3, 2, 1,  
2, 1, 3, 5};
```

^ Will create a 14-element array, with the first 7 elements then 7 0'd out

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## Accessing elements

```
int first_day_ice_creams  
= ice_cream_per_day[0];
```

index:	0	1	2	3	4	5	6
values:	3	2	1	2	1	3	4

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## Writing elements

```
ice_cream_per_day[0] =  
5;
```

index:	0	1	2	3	4	5	6
values:	5	2	1	2	1	3	4

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# Strings

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## Strings!

- Strings are multi-character words
- `"Jake Renzella"` -> is a string with 13 characters!
- Strings are great! They are everywhere!

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### Bad news

C doesn't have a string data type :(

### Good news

C has arrays! :)

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## An int array

```
int numbers[7] = {3, 2,  
1, 2, 1, 3, 4}
```

index:

values:

0	1	2	3	4	5	6
3	2	1	2	1	3	4

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## A char array

index:

values:

0	1	2	3	4	5	6	7	8	9	10	11	12	13
J	A	K	E		R	E	N	Z	E	L	L	A	\0

We can build our own  
string type by using an  
array of chars!

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## Strings in C are char arrays

- A collection of characters
- C does know how to  
work with `char[]`s

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```
#include <stdio.h>

int main(void) {
    char name[3] = {'G',
    'a', 'b'};
    // change name to
    Jake
    // :( can't, won't
    fit

    return 0;
}
```

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```
#include <stdio.h>
#define MAX_STR 50

int main(void) {
    char name[MAX_STR] =
    {'J', 'a', 'k', 'e'};

    return 0;
}
```

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## New problem

**How does C know where  
the string ends?**

```
char name[MAX_STR] =
{'J', 'a', 'k',
'e'};
```

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## The null terminator

- Remember in C, we don't know when arrays end
- We have to keep track of the length ourselves
- We can't always do this with `char[]` ...
- Instead, we place a special character called the null terminator at the end of our character arrays `\0`

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`char[]`

Index:	0	1	2	3	4	5	6	7	8	9	10	11	12	13
values:	J	A	K	E		R	E	N	Z	E	L	L	A	\0

Notice the `\0` at the end!  
This means that C will know when it reaches the end of the array

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## How to use strings in C

- Because strings are character arrays, the type is `char[]`
- There are two ways to declare a string, here's one:

```
char word[] = {'h', 'e',  
               'l', 'l', 'o', '\0'};
```

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**Anyone think that's annoying?**

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## Strings are very common

So there are easier ways to use them:

```
char word[] = "hello";
```

- This is exactly the same as the previous example
- It includes the null terminator!

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## String literals

```
"Jake! "
```

- uses double quotes " to wrap the string literal
- single quote for characters!
- Used to assign strings to

```
char[] easily:
```

```
char name[] = "Jake  
Renzella";
```

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## Using strings

- printing: `printf` or `fputs`
- scanning: `fgets`
- Both included in `<stdio.h>`

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### `fgets`

- Reads a string from the terminal
- `fgets(array[], length, stream)`
  - **array[]** -> The array that the string will be stored
  - **length** -> The number of characters that can be read in
  - **stream** -> The origin of the string (we always use `stdin`)

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### `fgets` usage

```
// Declare the array which
will contain the string.
Note, we don't know how big
the string will be, so
let's come up with a
maximum.
char my_string[MAX_LENGTH]

// read the string in
fgets(my_string,
MAX_LENGTH, stdin);
```

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## Reading strings in a loop

- We can read until `CTRL+D` is entered in the terminal by calling `fgets` in a loop
- `fgets()` stops reading when either length-1 characters are read, newline character is read or an end of file is reached, whichever comes first

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## Reading strings in a loop

```
#include <stdio.h>

// I know my string will never need to
// be more than 15 chars
#define MAX_LENGTH 15

int main(void) {
    char name[MAX_LENGTH];
    printf("Enter your name: ");

    // fgets reads the entire string,
    // including the newline character
    while (fgets(name, MAX_LENGTH,
        stdin) != NULL) {
        // every time this runs, we
        // update `name`!
    }
}
```

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## Printing strings

`fputs(array[],  
stream)`

- **array[]** -> the character array to be printed
- **stream** -> the location to print, always use `stdout` in COMP1511

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## Printing strings

```
char name[] = "Jake"
fputs(name, stdout)
```

^ Why doesn't fputs need the LENGTH, like fgets?

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## Other useful string functions

- strlen() -> gives us the length of the string (excluding the \0).
- strcpy() -> copy the contents of one string to another
- strcat() -> join one string to the end of another (concatenate)
- strcmp() -> compare two strings
- strchr() -> find the first occurrence of a character

note: some of these may require

```
#include <string.h>
```

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## Demo

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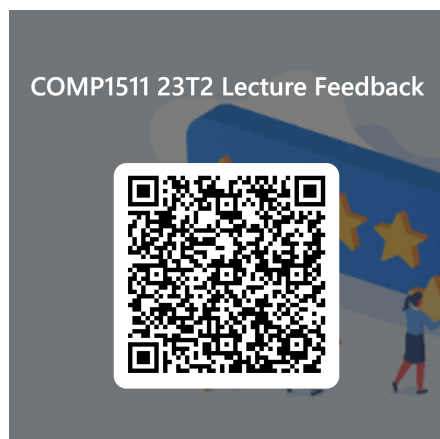
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## Feedback

<https://forms.office.com/r/Ze4admEWnR>



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