

COMP1511
Static arrays
Week 3 Lecture 2

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functions/procedures
recap

- Reusable blocks of code
- Callable multiple times
- variables within a function are scoped to that function

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PI function

Would be annoying to write this every time we need to calculate!

```
double pi() {  
    double sum = 0.0;  
    for (int i = 0; i < 1000;  
i++) {  
        sum += (-1.0) * pow(1.0 /  
2.0, i) / (i + 1);  
    }  
    return 4.0 * sum;  
}
```

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Arrays

**So far, we can store a
single item in each
variable**

**What if you wanted to
store many values?**

Number of ice creams eaten

```
int day_1 = 2;
int day_2 = 3;
int day_3 = 3;
int day_4 = 5;
int day_5 = 7;
int day_6 = 1;
int day_7 = 3;
// Any day with 3 or more scoops is
too much!
if (day_1 >= 3){
    printf("Too much ice cream\n");
}
if (day_2 >= 3) {...
```

Seem repetitive?

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- Many variables would clutter the program
- Many variables would not always be efficient

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Data structures

- Are common structures (not structs) used to store multiples of data
 - Usually (especially in COMP1511) of the same data type
- Can scale, easily storing a handful, up to thousands, or more elements of data!

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Data structures in COMP1511

We will look primarily at two data structures:

- arrays (today)
- linked lists (future)

These are very, very powerful data structures you will use forever

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Arrays

- 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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Arrays

- We can read or modify individual elements
- It is a **contiguous** data structure

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contigu-what?
Let's visualise arrays

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Static arrays have a set size

(which you specify)

index:	0	1	2	3	4
values:					

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int array

index:	0	1	2	3	4
values:					

- This int array will store 5 integers
- $32\text{bit} * 5 \text{ elements} = 160 \text{ bits}$ of memory used

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

Creates:

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

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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	5

Writing elements

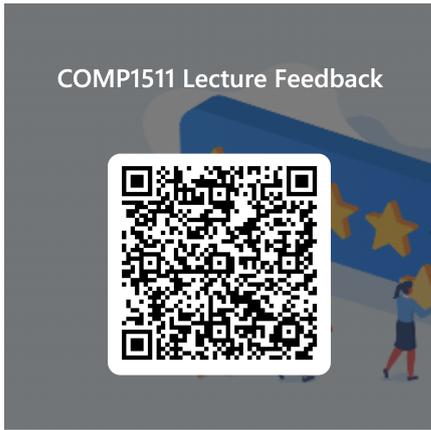
```
ice_cream_per_day[0] =  
5;
```

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

arrays 🤝 loops
The power of arrays

Feedback

<https://forms.office.com/r/K3PjvWebtD>



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