

Intro to Programming

C/C++

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Learning Goals

- Comfort with
 - Basics of C/C++
 - Basics of Computer Science
- Familiarity with IDE
 - Visual Studio Community Edition
- Thinking logically
 - i.e. One step at a time
 - And Visualizing how computer works
- Independence of technology

Why C/C++

- Foundational understanding
 - Understand Computer Science
- Speed and control
 - Fastest programming language
- Really small programming language
 - C has 32 keywords
 - C++ has 92 keywords as of 2023
- Makes you digital native

When NOT C/C++?

- Slower manual speed of writing code
- Don't care about speed
- Don't care about deep Computer Science
 - Although this may not be achievable

Bit : Smallest unit of memory

- Bits are used for representing everything
- Have 2 states : 0 and 1 , like a bulb
 - On : 1
 - Off : 0
- Nibble : 4 bits
- Byte : 8 bits
- int (integer) 4 bytes
- char (character) 1 byte

Hertz : Unit of time and speed in Computers

- 1 Hertz : once per second
 - 1 unit of work per clock instruction
- Modern processors
 - Measured in Giga hertz
 - High Core Counts
 - More instructions

Hello World

- Let's go ,
- Program to print “Hello World”

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    cout << “Hello World”;
```

```
    return 0;
```

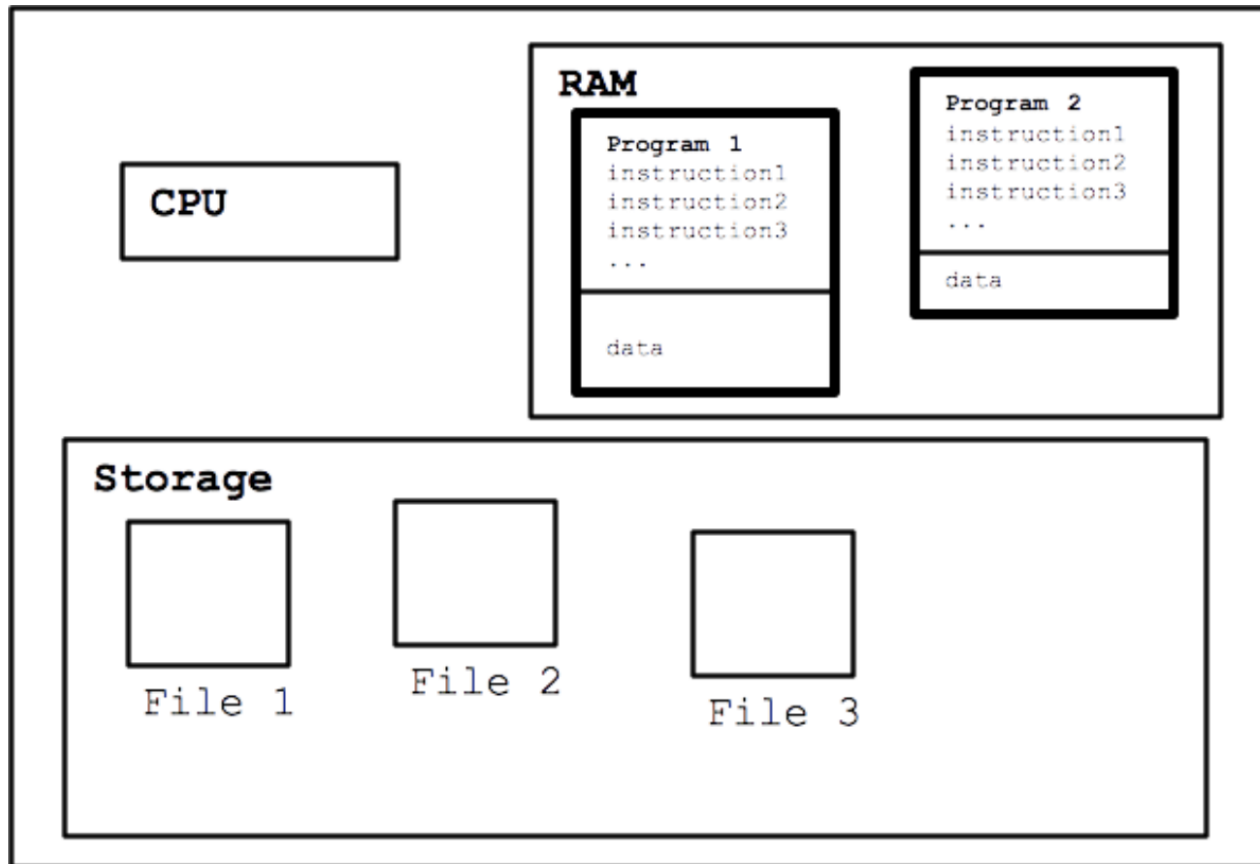
```
}
```

Print a diamond pattern

*

*

Running the program : model



Data Types_(Primitive/built in)

- bool
- int
 - short(2), long(4)
 - signed,unsigned
- float
 - float(4), double(8) , long double(8,10,16)
- char(1)
 - signed,unsigned
 - wchar_t(2)
- void

Variables

- Containers for storing data
- Value can change during execution (unless you don't want it to)
- Declaration
 - `int birthyear;`
 - `float weight;`
 - `char courseGrade;`

Data Types (Derived)

- Arrays
 - `char name[100];`
 - Size 100
 - Index : 0 - 99
 - `int age[10];`
 - Size 10
 - Index : 0 - 9
 - `float power[20]`
 - Size 20
 - Index : 0 - 19

Integer vs floating math

- Division
 - Float :continuous, contains decimal point
 - Int : discrete , truncates everything after decimal ,
- `float f = 10;`
 - `cout << f/3;`
 - 3.33
- `int i = 10;`
 - `cout << i/3;`
 - 3

Type Name	Bytes	Other Names	Range of Values
int	4	signed	-2,147,483,648 to 2,147,483,647
unsigned int	4	unsigned	0 to 4,294,967,295
bool	1	none	false or true
char	1	none	-128 to 127 by default
signed char	1	none	-128 to 127
unsigned char	1	none	0 to 255
short	2	short int, signed short int	-32,768 to 32,767
unsigned short	2	unsigned short int	0 to 65,535
long	4	long int, signed long int	-2,147,483,648 to 2,147,483,647
unsigned long	4	unsigned long int	0 to 4,294,967,295
long long	8	None	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
unsigned long long	8	none	0 to 18,446,744,073,709,551,615
enum	varies	None	
float	4	None	3.4E +/- 38 (seven digits)
double	8	None	1.7E +/- 308 (fifteen digits)
long double	8	None	Same as double
wchar_t	2		0 to 65,535

User Defined Data Type

- Enum
 - Short for enumeration
 - Define a set of named, integer constants

```
enum ESPEED
{
    low,
    medium,
    high
};
```

```
ESPEED fanSpeed;
fanSpeed = low;
```

Code : Greeting with name/age

- Given user
 - Store name in char array (`char name[100]`)
 - Store year of birth in int(`int birthyear`)
- Calculate age
 - `age = currentYear – birthyear;`
- Print Name, age.
 - `cout << "Hello "`
 `<< name`
 `<< " I know your age is :"`
 `<< age;`

Code : Count digits in a number

- Define a number
- Return the number of digits, (assume positive)
 - 129 \rightarrow 3
 - 34 \rightarrow 2
 - 0 \rightarrow 1
- Hints
 - You need to know loops
 - while
 - You need to know integer maths
 - division