

Lesson 5

Pointer

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Concept of Memory

Every data stored in
certain **address**(位址).

Address	Data
0x000E	
0x000D	
0x000C	
0x000B	
0x000A	
0x0009	
0x0008	
0x0007	
0x0006	
0x0005	
0x0004	
0x0003	
0x0002	
0x0001	
0x0000	

Caution!

THINGS I AM GOING TO TELL MAY NOT BE
100% CORRECT. BUT CAN MAKE YOU
UNDERSTAND FASTER AND MORE CLEARLY.

Inside Memory

```
int a[3];
```

```
float b[3] = {1.1, 2.2, 3.3};
```

```
char c = 'x';
```

```
bool flag = true;
```

	Address	Data
flag c	0x08	X
	0x07	true
	0x06	'x'
b[]	0x05	3.3
	0x04	2.2
	0x03	1.1
a[]	0x02	X
	0x01	X
	0x00	X

How to get the address of variable?

Use & operator.

```
int a = 10;
```

```
cout<<&a; //you will see 0x30, not 10
```

a	Address	Data
	0x32	x
	0x31	x
	0x30	10

How to get the address of array?

First of all, array's name carries address.

```
int nums[3] = {10, 11, 12};
```

```
cout<<nums;      //address of 1st element(0x30)
```

```
cout<<nums+2;    //address of 3rd element(0x32)
```

	Address	Data
	0x32	12
	0x31	11
nums->	0x30	10

What is pointer?

Pointer will always points to an address.

How to use pointer

```
int *ptr;    //define a pointer  
  
int a, b = -1;  
  
ptr = &b;    //assign variable's address  
  
cout<<&ptr;  //pointer's address(0x30)  
  
cout<<ptr;   //data in ptr(0x32)  
  
cout<<*ptr;  //-1
```

	Address	Data
b	0x32	-1
a	0x31	x
ptr->	0x30	0x32

Knowledge

Basically, array's name is pointer.

array[i] equivalent(等於) to $*(array + i)$, that is why array[i] can get the data.

Tips

* = get data

& = at address

Exercise 1

Write a function that can print whole array out.

```
void int_array_Print(int *a, unsigned int length);
```

<Tips>

#include "array_length.h"

Use ARRAY_LENGTH() to calculate the length of array.

What is header file?

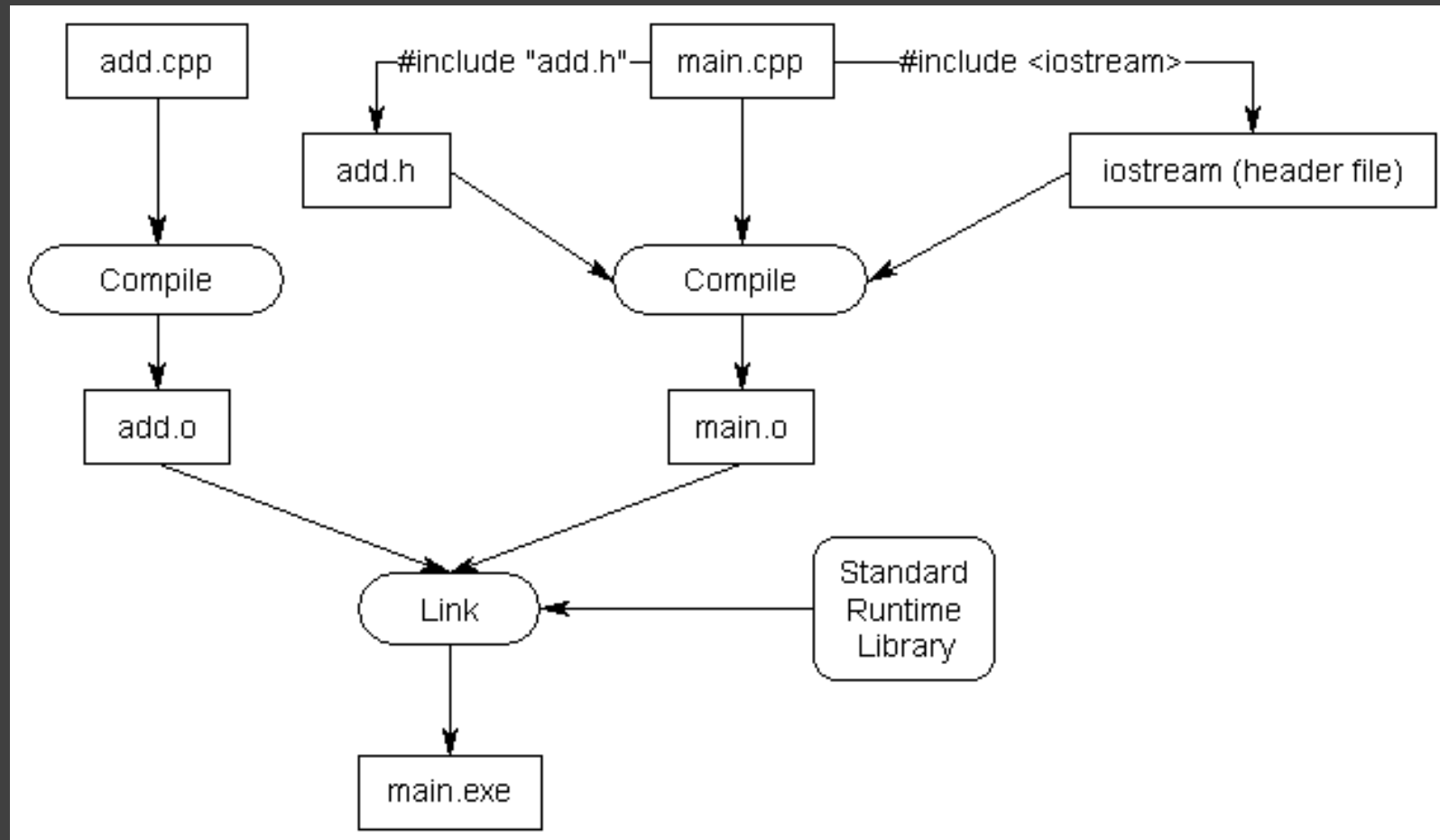
Define some macros(巨集).

Define prototype of functions.

Define data structures(結構). //we will talk in next lesson

Do a link between files.

How does header file work?



Source: LearnCpp

How to use header file?

1. Add header & source files into project.
2. Use '#include' to include header files at the beginning.
3. **Never include source file(*.c).**

Exercise 2

Use sort function that you finished last time. Do some modify. Sort several arrays and print out.