

# Lesson 7

## Fundamental Data Types — Integer (Part 2)

### • Outline

- Modifiers (short, long, signed, unsigned) used for integer
- Some programming examples

### • Long and Short

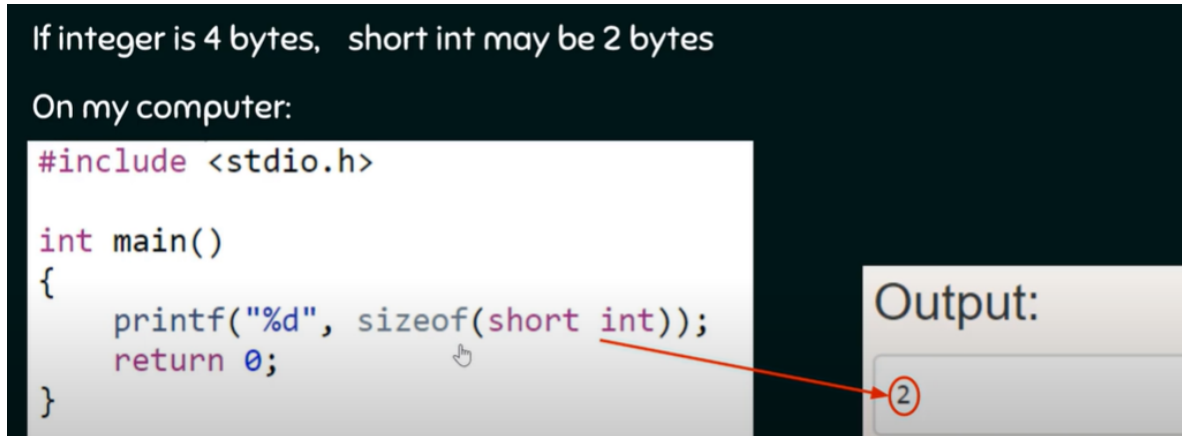
If integer is 4 bytes, short int may be 2 bytes

On my computer:

```
#include <stdio.h>

int main()
{
    printf("%d", sizeof(short int));
    return 0;
}
```

Output: 2



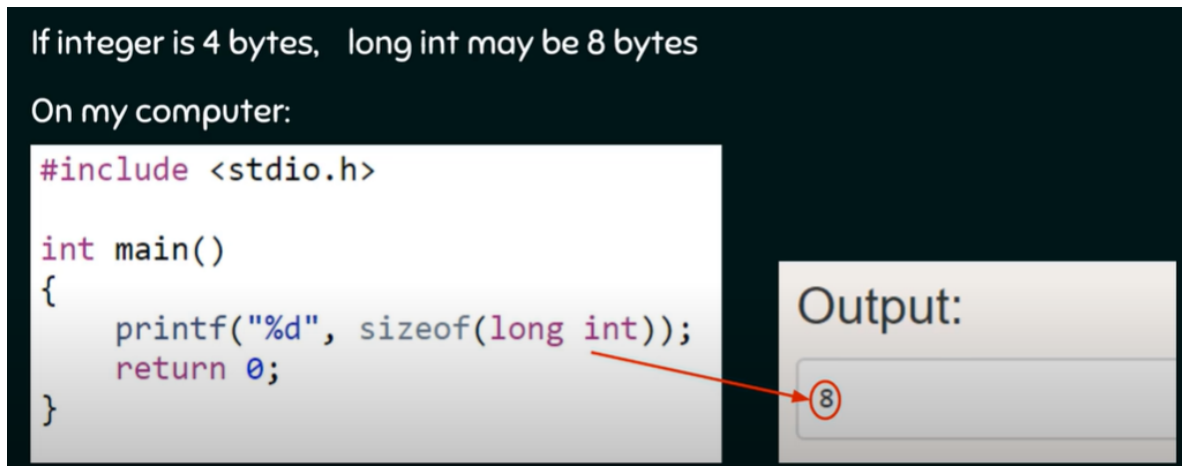
If integer is 4 bytes, long int may be 8 bytes

On my computer:

```
#include <stdio.h>

int main()
{
    printf("%d", sizeof(long int));
    return 0;
}
```

Output: 8



`sizeof(short) <= sizeof(int) <= sizeof(long)`

**Note:** by default `int some_variable_name;` is signed integer variable.  
(默认情况下变量是有符号整型变量)

`Unsigned int some_variable_name;` allows only positive values.  
(无符号整型变量仅允许正值)

### • Programming Examples

example\_1

```
#include <stdio.h>
#include <limits.h>

int main()
{
    int var1 = INT_MIN;
    int var2 = INT_MAX;

    printf("range of signed integer is from: %d to %d", var1, var2);
    return 0;
}
```

Output:

range of signed integer is from: -2147483648 to 2147483647

example\_2

```
#include <stdio.h>
#include <limits.h>

int main()
{
    unsigned int var1 = 0;
    unsigned int var2 = UINT_MAX;

    printf("range of unsigned integer is from: %u to %u", var1, var2);
    return 0;
}
```

Output:

range of unsigned integer is from: 0 to 4294967295

0表示无符号整数的最小值，UINT\_MAX表示无符号整数的最大值

example\_3

```
#include <stdio.h>
#include <limits.h>

int main()
{
    short int var1 = SHRT_MIN;
    short int var2 = SHRT_MAX;

    printf("range of short signed integer is from: %d to %d", var1, var2);
    return 0;
}
```

Output:

```
range of short signed integer is from: -32768 to 32767
```

example\_4

```
#include <stdio.h>
#include <limits.h>

int main()
{
    short unsigned int var1 = 0;
    short unsigned int var2 = USHRT_MAX;

    printf("range of short unsigned integer is from: %u to %u", var1, var2);
    return 0;
}
```

Output:

```
range of short unsigned integer is from: 0 to 65535
```

同样可以将 short 替换为 **long** 来检查长整型的范围，但是需要注意的是：在printf中需要使用 **%ld** 替换 **%d** 表示长整型，用 **%lu** 替换 **%u**

Long Long Int

if **sizeof**(long int) = 4 bytes  
then **sizeof**(long long int) = 8 bytes

else

if **sizeof**(long int) = 8 bytes  
then **sizeof**(long long int) = 8 bytes

## • Summary

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1. `sizeof (short) <= sizeof (int) <= sizeof (long)`.
2. Writing `signed int some_variable_name;` is equivalent to writing `int some_variable_name;`
3. `%d` is used to print "signed integer"
4. `%u` is used to print "unsigned integer"
5. `%ld` is used to print "long integer" equivalent to "signed long integer"
6. `%lu` is used to print "unsigned long integer"
7. `%lld` is used to print "long long integer"
8. `%llu` is used to print "unsigned long long integer"