

# C Programming Language

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# Introduction

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- C

- ▶ is a general-purpose programming language. But C is a relatively “low level” language.
- ▶ provides a variety of data types.
- ▶ Provides the fundamental control-flow constructions required for well-structured programs: statement grouping, decision making, selecting one of a set of possible cases, looping with the termination test at the top or at the bottom, and early loop exit.

- C Program

- ▶ Whatever its size, consists of functions and variables.
- ▶ A function contains statements that specify the computing operations to be done, and variables store values used during the computation.
- ▶ main will usually call other function to help perform its job, some that you wrote, and others from libraries that are provided for you.

# *C Language - I*

- Comment – explains briefly what the program does.
  - ▶ `/* and */`
  - ▶ `//`
- Declaration – announces the properties of variables.
  - ▶ `int fahr, celsius;`
  - ▶ `int lower, upper, step;`
    - ▶ `int` integers
    - ▶ `float` floating point
    - ▶ `char` character – a single byte
    - ▶ `short` short integer
    - ▶ `long` long integer
    - ▶ `double` double-precision floating point
- Assignment statements
  - ▶ `lower = 0;`
  - ▶ `upper = 300;`

# C Language - II

- printf

- ▶ %d : print as decimal integer
- ▶ %6d
- ▶ %f : print as floating point
- ▶ %6f
- ▶ %6.2f

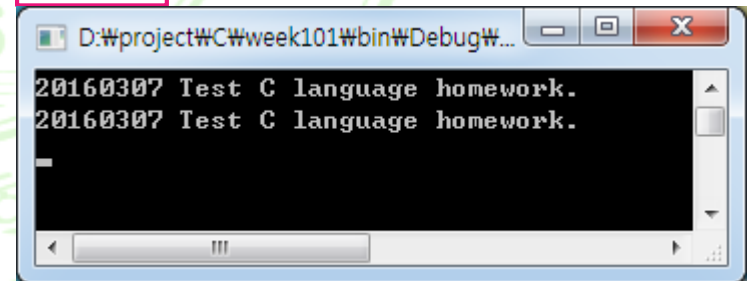
- Character Input and output

- ▶ C = getchar();
- ▶ putchar(c);
- ▶ Copy
- ▶ printf(" ",...);
- ▶ scanf("%d",&a);

## Source

```
1 #include <stdio.h>
2 #include <stdlib.h>
3
4 int main()
5 {
6     int c;
7     c = getchar();
8     while(c != EOF)
9     {
10         putchar(c);
11         c = getchar();
12     }
13     return 0;
14 }
15
```

## Result



# Examples – 온도변환 프로그램

✓ File name : ex\_01.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3
4  int main()
5  {
6      float fahr=0, celsius;
7      int lower, upper, step;
8
9      lower = 0;
10     upper = 300;
11     step = 20;
12     while(fahr <= upper)
13     {
14         celsius = (5.0/9.0) * (fahr - 32.0);
15         printf("fahr = %3.0f  celsius = %6.1f\n", fahr, celsius);
16         fahr = fahr + step;
17     }
18     return 0;
19 }
20
```

## Result

```
fhar = 0 celsius = -17.8
fhar = 20 celsius = -6.7
fhar = 40 celsius = 4.4
fhar = 60 celsius = 15.6
fhar = 80 celsius = 26.7
fhar = 100 celsius = 37.8
fhar = 120 celsius = 48.9
fhar = 140 celsius = 60.0
fhar = 160 celsius = 71.1
fhar = 180 celsius = 82.2
fhar = 200 celsius = 93.3
fhar = 220 celsius = 104.4
fhar = 240 celsius = 115.6
fhar = 260 celsius = 126.7
fhar = 280 celsius = 137.8
fhar = 300 celsius = 148.9

Process returned 0 (0x0) exec
Press any key to continue.
```

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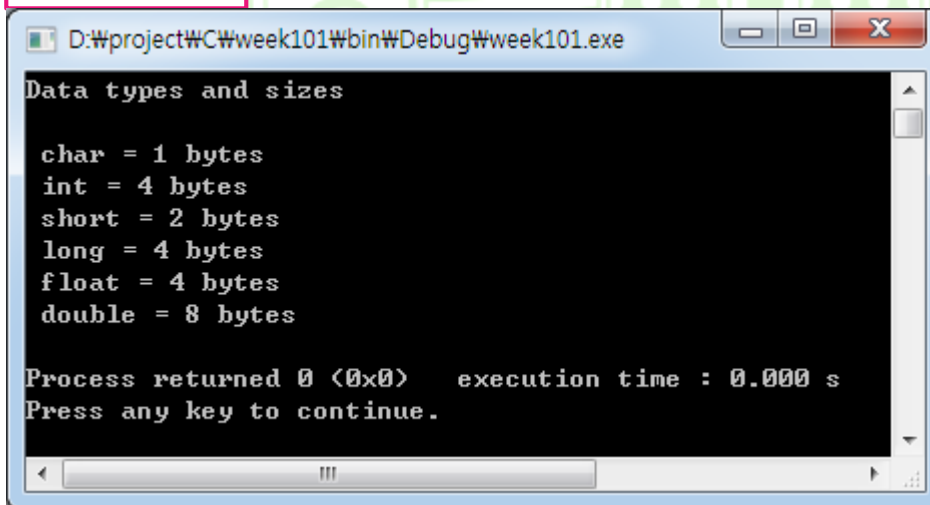
# Examples – Data types and sizes

✓ File name : ex\_02.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  /* Data types and sizes */
4  int main()
5  {
6      printf("Data types and sizes \n\n");
7      printf(" char = %d bytes \n int = %d bytes\n",sizeof(char), sizeof(int));
8      printf(" short = %d bytes \n long = %d bytes\n",sizeof(short), sizeof(long));
9      printf(" float = %d bytes \n double = %d bytes\n",sizeof(float), sizeof(double));
10     return 0;
11 }
12
```

## Result



The screenshot shows a Windows command prompt window titled "D:\project\WC\week101\bin\Debug\week101.exe". The output of the program is displayed as follows:

```
Data types and sizes

char = 1 bytes
int = 4 bytes
short = 2 bytes
long = 4 bytes
float = 4 bytes
double = 8 bytes

Process returned 0 (0x0)   execution time : 0.000 s
Press any key to continue.
```

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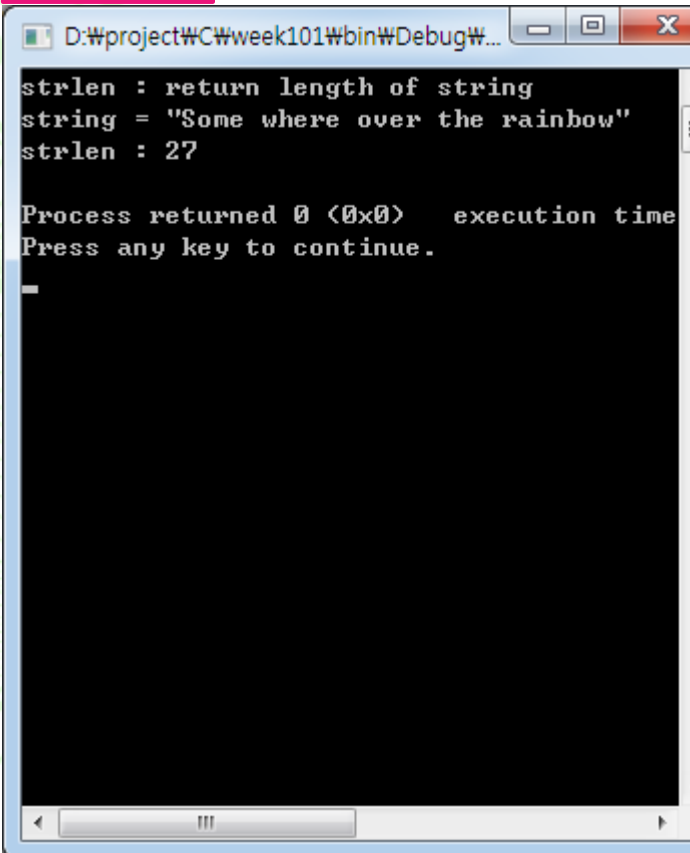
# Examples – return length of string

✓ File name : ex\_03.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  /* strlen : return length of s */
4  int strlen(unsigned char str[]);
5  int main()
6  {
7      int len;
8      unsigned char *str = "Some where over the rainbow";
9
10     printf("strlen : return length of string\n");
11     printf("string = \"%s\"\n", str);
12     len = strlen(str);
13     printf("strlen : %d\n", len);
14     return 0;
15 }
16 int strlen(unsigned char str[])
17 {
18     int i=0;
19     while(str[i] != '\0')
20     {
21         ++i;
22     }
23     return i;
24 }
25
```

## Result



```
strlen : return length of string
string = "Some where over the rainbow"
strlen : 27

Process returned 0 (0x0)   execution time
Press any key to continue.
```

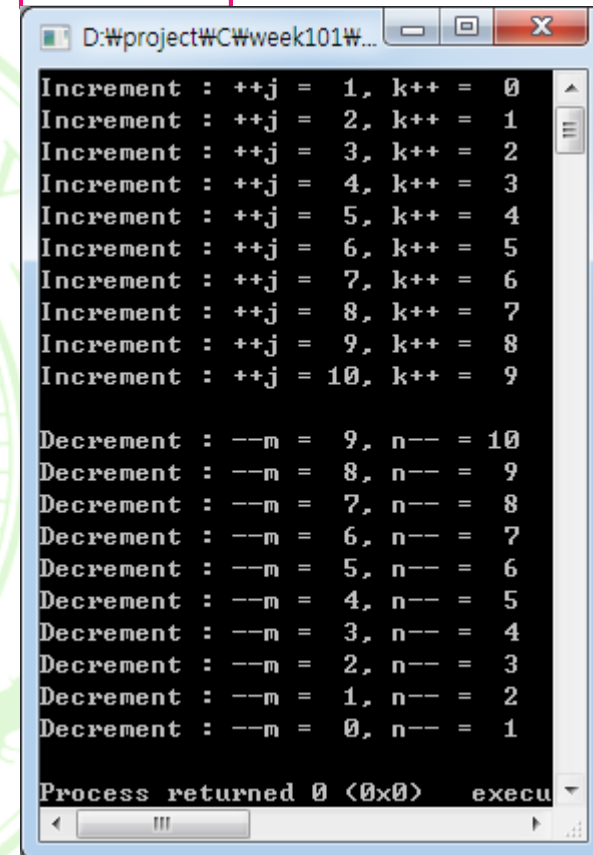
# Examples – 증가/감소 연산자

✓ File name : ex\_04.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3
4  int main()
5  {
6      int i;
7      int j=0, k=0;
8      int m=10, n=10;
9
10     for(i=0; i<10; i++)
11     {
12         printf("Increment : ++j = %2d, k++ = %2d \n", ++j, k++);
13     }
14
15     printf("\n");
16
17     for(i=0; i<10; i++)
18     {
19         printf("Decrement : --m = %2d, n-- = %2d \n", --m, n--);
20     }
21     return 0;
22 }
23
```

## Resource



```
Increment : ++j = 1, k++ = 0
Increment : ++j = 2, k++ = 1
Increment : ++j = 3, k++ = 2
Increment : ++j = 4, k++ = 3
Increment : ++j = 5, k++ = 4
Increment : ++j = 6, k++ = 5
Increment : ++j = 7, k++ = 6
Increment : ++j = 8, k++ = 7
Increment : ++j = 9, k++ = 8
Increment : ++j = 10, k++ = 9

Decrement : --m = 9, n-- = 10
Decrement : --m = 8, n-- = 9
Decrement : --m = 7, n-- = 8
Decrement : --m = 6, n-- = 7
Decrement : --m = 5, n-- = 6
Decrement : --m = 4, n-- = 5
Decrement : --m = 3, n-- = 4
Decrement : --m = 2, n-- = 3
Decrement : --m = 1, n-- = 2
Decrement : --m = 0, n-- = 1

Process returned 0 (0x0)   execu
```



# Control Flow

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# Control Flow - I

## ● Statements and Blocks

### ▶ Statement

```
1 x=0;  
2 i++;  
3 printf<...>;
```

### ▶ Block

```
{ }
```

## ● If-Else

If (expression)

Statement1

else

Statement2

## ● Else-if

if (expression)

Statement1

else if (expression)

Statement2

else if (expression)

Statement3

else if (expression)

Statement4

else

Statement5

# Examples – (else-if)

✓ File name : ex\_06.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  #include <time.h>
4
5  int main()
6  {
7      int a, b;
8      srand((unsigned)time(NULL));
9      a = rand()%100 + 1;
10     while(1)
11     {
12         printf("user>> ");
13         scanf("%d",&b);
14         if(a == b)
15         {
16             printf("\t a(%d) = %d \n", a, b);
17             break;
18         } else if (a > b) {
19             printf("\t a > %d \n",b);
20         } else if (a < b) {
21             printf("\t a < %d \n",b);
22         }
23     }
24     return 0;
25 }
26
```

## Result

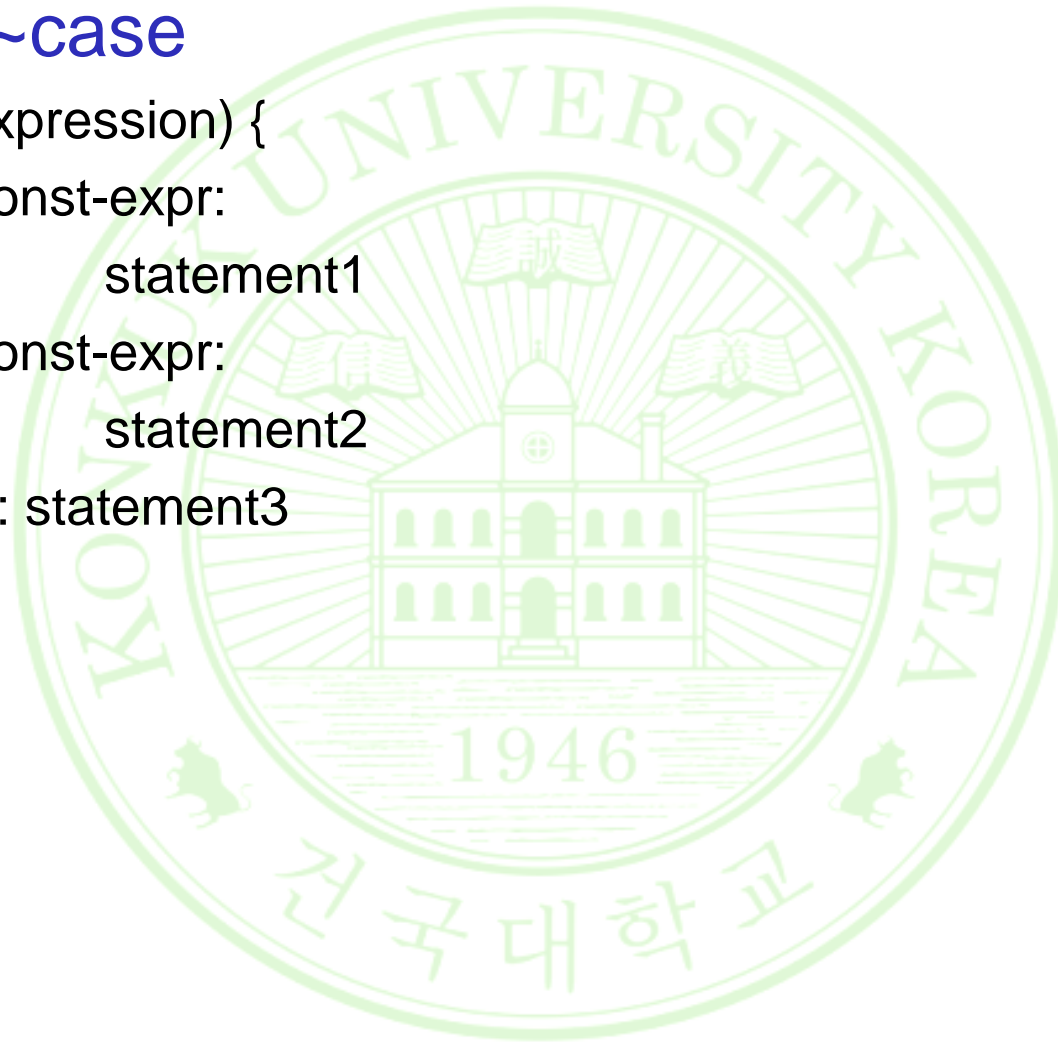
```
D:\project\CW\week101\bin\Debug\week101.exe
user>> 90
        a < 90
user>> 34
        a > 34
user>> 56
        a > 56
user>> 86
        a < 86
user>> 74
        a < 74
user>> 65
        a > 65
user>> 69
        a < 69
user>> 67
        a < 67
        a(67) = 67

Process returned 0 (0x0)   execution time : 21.720 s
Press any key to continue.
```

# *Control Flow - II*

- **switch~case**

```
switch (expression) {  
    case const-expr:  
        statement1  
    case const-expr:  
        statement2  
    default: statement3  
}
```



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# Examples – (switch~case)

✓ File name : ex\_07.c

## Source

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  int sumAB(int a, int b);
4  int mulAB(int a, int b);
5  int main()
6  {
7      int a, b, n, result;
8      while(1)
9      {
10         printf("1:ADD, 2:MUL, 3: quit\n");
11         scanf("%d", &n);
12         if(n==3)
13             break;
14         printf("a : ");
15         scanf("%d", &a);
16         printf("b : ");
17         scanf("%d", &b);
18         switch(n) {
19             case 1 : result = sumAB(a,b);
20                 printf("%d + %d = %d\n\n",a,b,result);
21                 break;
22             case 2 : result = mulAB(a,b);
23                 printf("%d * %d = %d\n\n",a,b,result);
24                 break;
25             default: break;
26         }
27     }
28     return 0;
29 }
30 int sumAB(int a, int b)
31 {
32     return a+b;
33 }
34 int mulAB(int a, int b)
35 {
36     return a*b;
37 }
```

## Result

```
D:\project\WC\week101\bin\Debug\week101.exe
1:ADD, 2:MUL, 3: quit
1
a : 47
b : 38
47 + 38 = 85

1:ADD, 2:MUL, 3: quit
2
a : 57
b : 32
57 * 32 = 1824

1:ADD, 2:MUL, 3: quit
3

Process returned 0 (0x0) execution time : 10.993 s
Press any key to continue.
```