Lecture #02
Flow Control – conditional statement, loop statement

SE271 Object-Oriented Programming (2020)

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Original slides from Prof. Shin at DGIST

Short Notice

- Welcome again!

- New TA
  - 정수지 (sujijung@dgist.ac.kr)
  - Will announce her office hour later in LMS

- Use this IDE:
  - **Microsoft Visual Studio Community Edition**

Today's Topic

- Operator Precedence *(cont.)*
- Conditional statement
  - if – else if – else
    - Conditional operator => A ? B : C
  - switch - case
- Loop statement
  - for statement
  - while
  - do while
- goto statement

Operator Precedence and Associativity

- **Operator precedence**
  - **ex) 1 + 2 * 3 ➔ (1 + (2 * 3))**

- **Operator associativity**
  - **ex) 1 + 2 + 3 ➔ ((1 + 2) + 3)**

Operator Precedence

- (L->R) Type parentheses, post-increment/decrement, Type cast
- (R->L) sign, c-style cast, pre-increment/decrement
- (L->R) *, /, %
- (L->R) +, -
- (L->R) <<, >>
- (L->R) <, <=, >, >=
- (L->R) ==, !=
- (L->R) bit operators(&)
- ...
- (L->R) logical operators(&&)
- (R->L) assignment

Use ( ) if necessary!

```
int x = 1, y = 2;
cout << (++x > 2 && ++y > 2);
cout << "x=" << x << ", y=" << y << endl;
cout << (++x > 2 || ++y > 2);
cout << "x=" << x << ", y=" << y << endl;
```

https://www.learncpp.com/cpp-tutorial/operator-precedence-and-associativity/

Today's Topic

- ~~Operator Precedence *(cont.)*~~
- Conditional statement
  - if – else if – else
    - Conditional operator: ?
  - switch - case
- Loop statement
  - for statement
  - while
  - do while
- goto statement

Conditional Statement – IF

- **Syntax**

```
if (condition) statement;
```

Q1. More than 1 statement?

```
if (condition)
    statement;
else if (condition)        // Optional
    statement;
else if (condition)        // Optional
    statement;
else                       // Optional
    statement;
```

Example: Multiple branches

```cpp
int iScore{ 0 };
cout << "Enter your score : " << endl;
cin >> iScore;
if (iScore >= 85)
{
    cout << iScore;
    cout << "Points:";
    cout << "\t";
    cout << "Grade A";
    cout << endl;
}
else if (iScore >= 70) cout << iScore << "Points:\tGrade B\n";
else if (iScore >= 50) cout << iScore << "Points:\tGrade C\n";
else cout << iScore << "Points:\tGrade F\n";
```

```
Enter your Score : 90
90Points :     Grade
A
90Points :     Grade
B
90Points :     Grade
C
```

Conditional Statement – ternary operator

- **Syntax (① ? ② : ③)**

(condition) **?** Statement (if true) **:** Statement (if false)

```
int max{ 0 };
int x{ 10 }, y{ 20 };

if (x>y)
{
    max = x;
}
else
{
    max = y;
}
cout << max;
```

```
int max{ 0 };
int x{ 10 }, y{ 20 };

max = (x > y) ? x : y;
cout << max;
```

Conditional Statement – Switch

▪ Syntax

```
switch (variable or expression)
{
    case constant1 :          // Optional
        statements;
        break;
    case constant2 :
        statements;           // Optional
            ⋮


    default :                 // Optional
        statements;
}
```

Example: Switch

```cpp
char grade{ 'F' };
cin >> grade;
switch (grade) {
    case 'A':
    case 'a':
        cout << "85~100" << endl;
        break;
    case 'B':
    case 'b':
        cout << "70~84" << endl;
        break;
    case 'C':
    case 'c':
        cout << "50~69" << endl;
        break;
    default:
        cout << "less than 50" << endl;
}
```

```cpp
char grade{ 'F' };
cin >> grade;
if (grade == 'A' || grade == 'a')
    cout << "85~100" << endl;
else if (grade == 'B' || grade == 'b')
    cout << "70~84" << endl;
else if (grade ==  'C' || grade == 'c')
    cout << "50~69" << endl;
else
    cout << "less than 50" << endl;
```

Loop Statement – For loop

- **Syntax**

```
for ( ① ; ② ; ③ ) statement;
```

① : initial statement – can be omitted

② : termination condition – can be omitted

③ : statement after each iteration – can be omitted

Example: For loop

```cpp
#include <iostream>
using namespace std;
int main()
{

    int sum{ 0 };
    for (int i=0; i < 4; i++)
        sum += i;
    cout << sum << endl;
    return 0;

}
```

```cpp
// initialization
int i=0;
// check condition before loop
if (i < 4) {
    sum += i;  // i = 0, sum = 0
    i++;  // end loop - i = 1
}
if (i < 4) {
    sum += i;  // i = 1, sum = 1
    i++;  // end loop - i = 2
}
if (i < 4) {
    sum += i;  // i = 2, sum = 3
    i++;  // end loop - i = 3
}
if (i < 4) {
    sum += i;  // i = 3, sum = 6
    i++;  // end loop - i = 4
}
if (i < 4) {
}
```

Loop Statement – Break, Continue

- **Syntax**

```
break;              // escaping from the closest loop block
continue;           // ignoring the rest of loop block
```

Example: break; continue;

```
// break;
for (int i = 1; i < 11; i++) {
    if (i == 4) break;
    std::cout << i << "\t";
}
```

```
// continue;
for (int i = 1; i < 11; i++) {
    if (i % 2 == 0) continue;
    std::cout << i << "\t";
}
```

```
1    2    3
```

```
1    3    5    7    9
```

예제: Circumference Calculator

```cpp
#include <iostream>
#define PI 3.14
using namespace std;
int main()
{
    int iValue(2);
    double circum{0};
    for (;;) {
        cout << "Enter the radius? ";
        cin >> iValue;
        if (iValue == 0)
            break;
        circum = iValue * 2 * PI;
        cout << "circumference with a radius of " << iValue << " : ";
        cout << circum << "(" << typeid(circum).name() << ")" << endl;
    }
    return 0;
}
```

Enter the radius? 3

circumference with a radius of 3 : 18.84(double)

Enter the radius?

Loop Statement – Range-based For loop

- **Syntax (c++11)**

```
for ( ① : ② ) statement;
```

① individual element of ②

② **array** or container (will learn later)

```python
arr = [1,3,5,7,9]                                Python


for element in arr:
    print(element)
––––––––––––––––––––––––––––––––––––––––––––––––––
for (int i=0; i<sizeof(arr)/sizeof(int);i++){

    int element = arr[i];
    cout << element << " ";
}
```

```cpp
int arr[5] = { 1,3,5,7,9 };


for (int element : arr)
{

    cout << element << " ";
}
```

CPP

Loop Statement – While loop

- **Syntax**

```
while (condition) Statements
```

```
int iMenu{ 1 };
cout << "1. Coffee\n2. Juice\n3. Quit\n";
cout << "Select Menu? ";
cin >> iMenu;
cout << "Your choice is " << iMenu << endl;
while (iMenu != 3)
{
    cout << "Select Menu? ";
    cin >> iMenu;
    cout << "Your choice is " << iMenu << endl;
}
```

Loop Statement – Do ~ While loop

■ **Syntax**

```
do Statements while (condition);
```

```cpp
int iMenu{ 1 };
cout << "1. Coffee\n2. Juice\n3. Quit\n";
cout << "Select Menu? ";
cin >> iMenu;
cout << "Your choice is " << iMenu << endl;
while (iMenu != 3)
{
    cout << "Select Menu? ";
    cin >> iMenu;
    cout << "Your choice is " << iMenu
<< endl;
}
```

```cpp
int iMenu{ 1 };
cout << "1. Coffee\n2. Juice\n3. Quit\n";
do
{
    cout << "Select Menu? ";
    cin >> iMenu;
    cout << "Your choice is " << iMenu << endl;
} while (iMenu != 3);
```

Goto Statement

- **Syntax**

```
goto LABEL;


LABEL:
```

```
int i{0}, sum{ 0 };
Sum:
sum += i;
i++;

if (i < 11)
    goto Sum;
else
    cout << sum << endl;
```

```
int sum{ 0 };

for (int i=0; i < 11; i++)
    sum += i;

cout << sum << endl;
```

References

- Learn c++
  - https://www.learncpp.com/
  - Chapter c5.1~c5.8

ANY QUESTIONS?