Object Oriented Programming by C++

Selection & Repetition (2/2)

Conditional execution and Iteration (Loop)

2017. 8.

Sungwon Lee / Professor

Email: drsungwon@khu.ac.kr
Web: http://mobilelab.khu.ac.kr/

Modified & taught by Jinwoo Choi
in 2023 Spring
Email: jinwoochoi@khu.ac.kr
Webpage: https://sites.google.com/site/jchoivision/

Contents

- Abnormal loop termination
- *do-while* statement
- *for* statement
- *switch-case* statement

Abnormal Loop Termination

break statement

- *break*: causes the immediate exit from the body of the loop

Listing 6.15: addmiddleexit.cpp

```
#include <iostream>

int main() {
    int input, sum = 0;
    std::cout << "Enter numbers to sum, negative number ends list:";
    while (true) {
        std::cin >> input;
        if (input < 0)
            break;          // Exit loop immediately
        sum += input;
    }
    std::cout << "Sum = " << sum << '\n';
}
```

if (input < 0) is true;

Step.1: get out of while{...} statement,

Step.2: go to next the line after while(){...} statement

Abnormal Loop Termination

continue statement

- *continue*: causes the immediate jump to the start of the loop

Listing 6.15: addmiddleexit.cpp

```
#include <iostream>

int main() {
    int input, sum = 0;
    std::cout << "Enter numbers to sum, negative number ends list:";
    while (true) {
        std::cin >> input;
        if (input < 0)
            continue;          // Exit loop immediately
        sum += input;
    }
    std::cout << "Sum = " << sum << '\n';
}
```

if (input < 0) is true;
  Step.1: get out of while{...} statement,
  Step.2: go to the *condition* of while(){...} statement

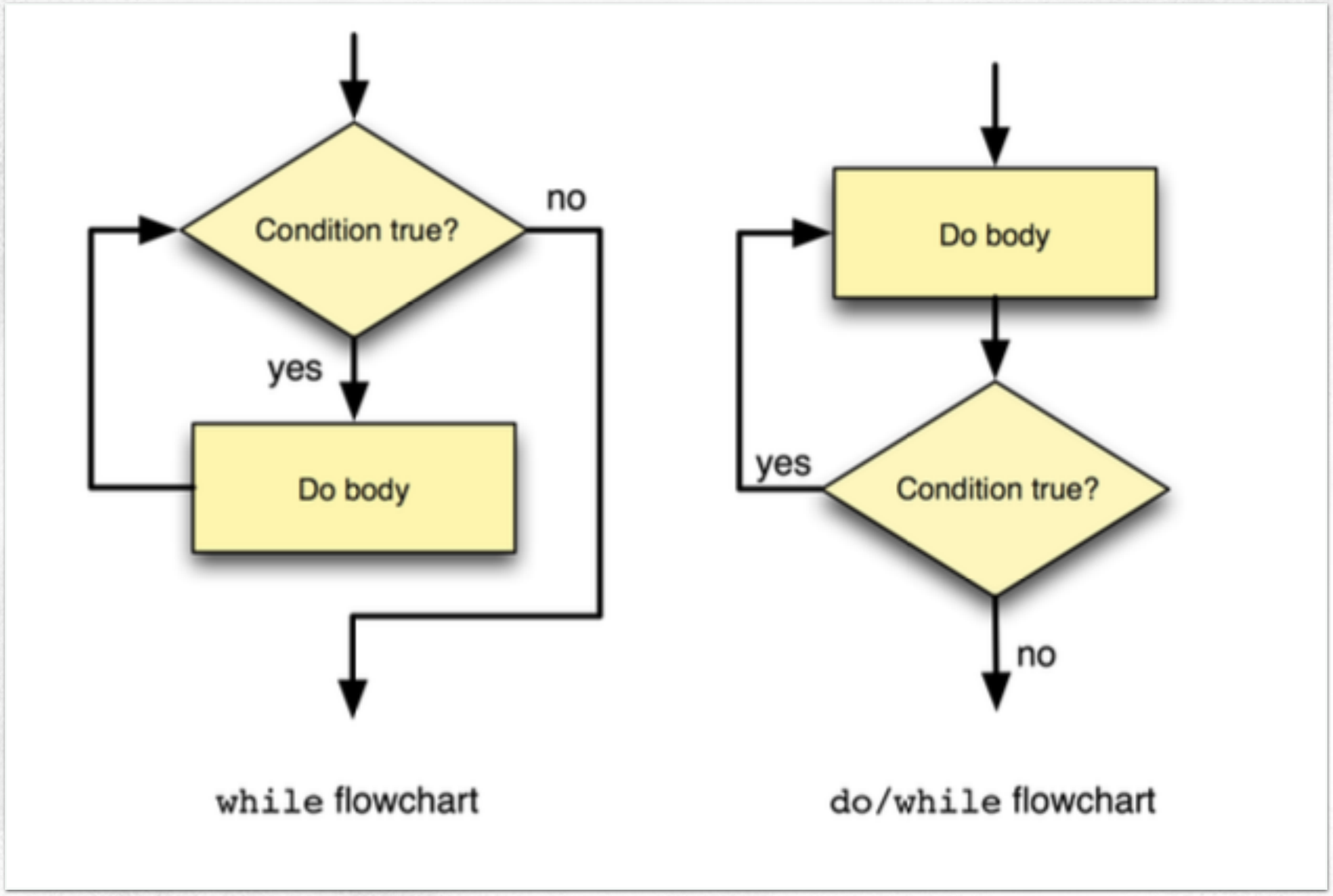
Abnormal Loop Termination

goto statement

Don't use !!

while vs. *do-while*

- *"Just do it!"*



Example using *while* Statement

Listing 7.2: goodinputonly.cpp

```
#include <iostream>

int main() {
    int in_value = -1;
    std::cout << "Please enter an integer in the range 0-10: ";
    // Insist on values in the range 0...10
    while (in_value < 0 || in_value > 10)
        std::cin >> in_value;
    // in_value at this point is guaranteed to be within range
    std::cout << "Legal value entered was " << in_value << '\n';
}
```

Example using *while* Statement

- *"Just do it!"*
- Iteration
  - Single statement Iteration
  - Multiple statement Iteration

```
do
    do something
while ( condition )
```

```
do
{
    do something #1
    ...
    do something #n
} while( condition )
```

Example using *do-while* Statement

Listing 7.3: betterinputonly.cpp

```
#include <iostream>

int main() {
    int in_value;
    std::cout << "Please enter an integer in the range 0-10: ";
    // Insist on values in the range 0...10
    do
        std::cin >> in_value;
    while (in_value < 0 || in_value > 10);
    // in_value at this point is guaranteed to be within range
    std::cout << "Legal value entered was " << in_value << '\n';
}
```

Component of Loop Statement

```
initialization
while ( condition ) {
        statement
        modification
}
```

Initialization. The *initialization* part assigns an initial value to the loop variable. The loop variable may be declared here as well; if it is declared here, then its scope is limited to the `for` statement. This means you may use that loop variable only within the loop. It also means you are free to reuse that variable's name outside the loop to declare a different variable with the same name as the loop variable.

The initialization part is performed one time.

Condition. The *condition* part is a Boolean expression, just like the condition of a `while` statement. The condition is checked each time *before* the body is executed.

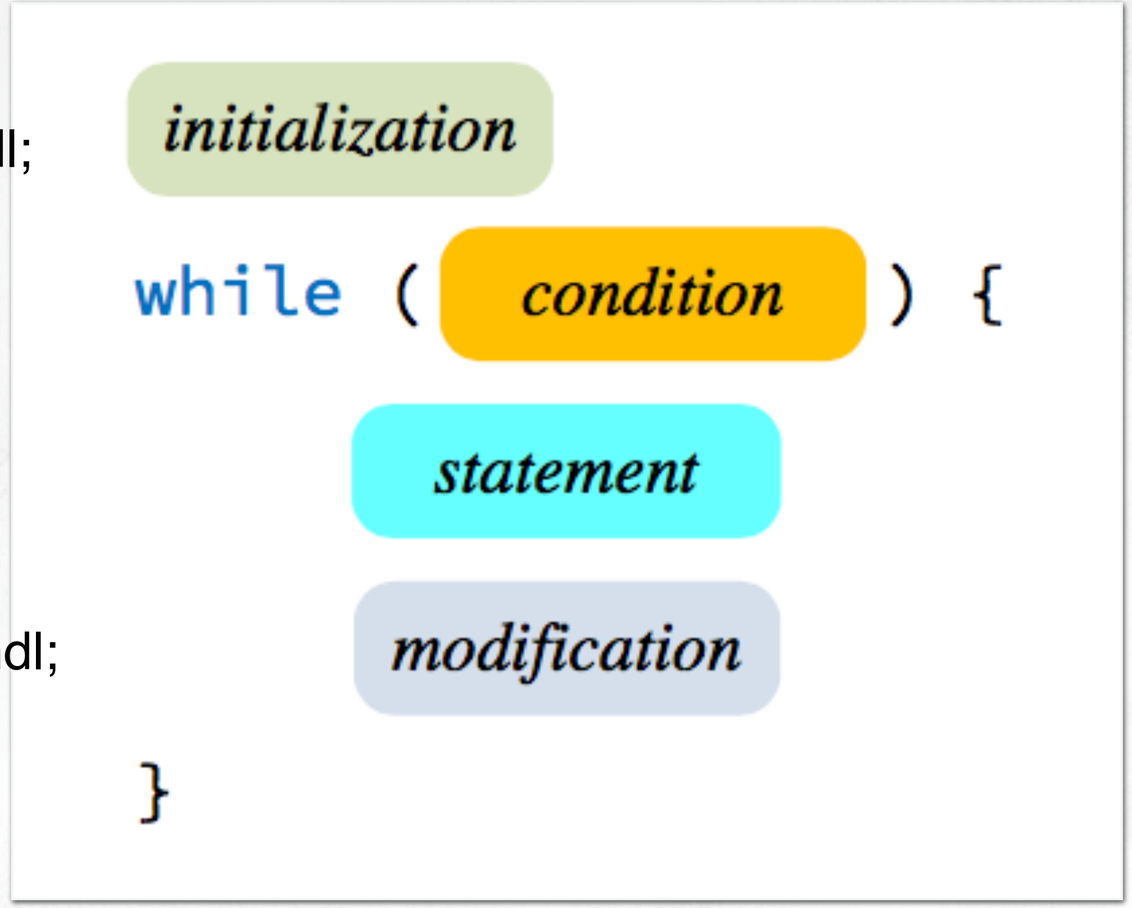
Modification. The *modification* part generally changes the loop variable. The change should be such that the condition will eventually become false so the loop will terminate. The modification is performed during each iteration *after* the body is executed.

Notice that the last part (*modification*) is not following by a semicolon; semicolons are used strictly to separate the three parts.

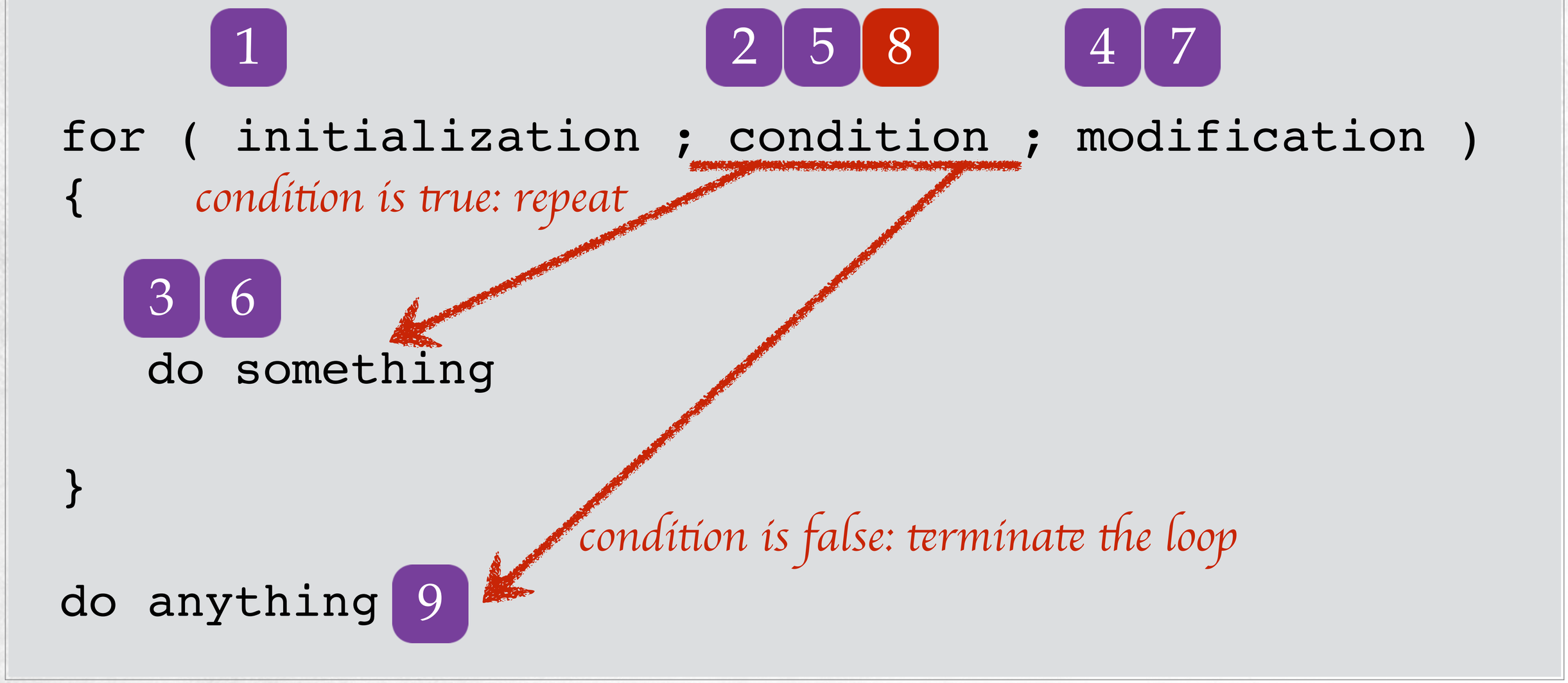
for Statement Description

```
int main(){
    int x = 0;
    while (x<10){
        cout << “x=“ << x << endl;
        x++;
    }

    cout << x;
}
```

```
 int main(){
     for (int x=0; x<10; x++){
         cout << “x=“ << x <<endl;
    }

    cout << x;
}
```



Loop Sequence in *for* Statement



For example: if (condition) is false at sequence '8' then
Terminate the *for* loop statement,
Execute the next line (of *for* loop statement).

Example using *for* Statement

Listing 7.4: forcounttofive.cpp

```
#include <iostream>

int main() {
    for (int count = 1; count <= 5; count++)
        std::cout << count << '\n';  // Display counter
}
```

Example using *nested-for* Statement

Listing 7.5: bettertimestable.cpp

```
#include <iostream>
#include <iomanip>

int main() {
    int size;  // The number of rows and columns in the table
    std::cout << "Please enter the table size: ";
    std::cin >> size;
    // Print a size x size multiplication table

    // First, print heading
    std::cout << "      ";
    for (int column = 1; column <= size; column++)
        std::cout << std::setw(4) << column; // Print heading for this column.
    std::cout << '\n';
    // Print line separator
    std::cout << "     +";
    for (int column = 1; column <= size; column++)
        std::cout << "----";          // Print separator for this column.
    std::cout << '\n';
    // Print table contents
    for (int row = 1; row <= size; row++) {
        std::cout << std::setw(4) << row << " |";  // Print row label.
        for (int column = 1; column <= size; column++)
            std::cout << std::setw(4) << row*column;   // Display product
        std::cout << '\n';                    // Move cursor to next row
    }
}
```

Example using *nested-for* Statement

Listing 7.5: bettertimestable.cpp

```
#include <iostream>
#include <iomanip>

int main() {
    int size;  // The number of rows and columns in the tab
    std::cout << "Please enter the table size: ";
    std::cin >> size;
    // Print a size x size multiplication table

    // First, print heading
    std::cout << "      ";
    for (int column = 1; column <= size; column++)
        std::cout << std::setw(4) << column; // Print heading for this column.
    std::cout << '\n';
    // Print line separator
    std::cout << "    +";
    for (int column = 1; column <= size; column++)
        std::cout << "----";          // Print separator for this column.
    std::cout << '\n';
    // Print table contents
    for (int row = 1; row <= size; row++) {
        std::cout << std::setw(4) << row << " |";  // Print row label.
        for (int column = 1; column <= size; column++)
            std::cout << std::setw(4) << row*column;   // Display product
        std::cout << '\n';                    // Move cursor to next row
    }
}
```

```
Please enter the table size: 3
          1   2   3
    +------------
  1 |   1   2   3
  2 |   2   4   6
  3 |   3   6   9
```

Solution for Nested if-else Statements

```
switch ( integral expression ) {
    case integral constant 1 :
        statement sequence 1
        break;
    case integral constant 2 :
        statement sequence 2
        break;
    case integral constant 3 :
        statement sequence 3
        break;
        ●
        ●
        ●
    case integral constant n :
        statement sequence n
        break;
    default:
        default statement sequence
}
```

if (*integral-expression* is *integral-constant-1*) then:

    execute *statement-sequence-1*;

else if (*integral-expression* is *integral-constant-2*) then:

    execute *statement-sequence-2*;

else if (*integral-expression* is *integral-constant-3*) then:

    execute *statement-sequence-3*;

… // skip statements

else if (*integral-expression* is *integral-constant-n*) then:

    execute *statement-sequence-n*;

else

    execute *default-statement-sequence*;

Example for *switch* Statements

Listing 7.1: switchdigittoword.cpp

```
#include <iostream>

int main() {
    int value;
    std::cout << "Please enter an integer in the range 0...5: ";
    std::cin >> value;
    switch (value) {
      case 0:
        std::cout << "zero";
        break;
      case 1:
        std::cout << "one";
        break;
      case 2:
        std::cout << "two";
        break;
      case 3:
        std::cout << "three";
        break;
      case 4:
        std::cout << "four";
        break;
      case 5:
        std::cout << "five";
        break;
      default:
        if (value < 0)
            std::cout << "Too small";
        else
            std::cout << "Too large";
        break;
    }
    std::cout << '\n';
}
```

Role of *break* in *switch* Statements

```
std::cin >> key;  // get key from user
switch (key) {
   case 'p':
   case 'P':
      std::cout << "You choose \"P\"\n";
      break;
   case 'q':
   case 'Q':
      done = true;
      break;
}
```

if (key is ‘p’) or (key is ‘P’) then:

Same operation; *print “You choose \”P”\n”;*

default: is not mandatory

Nested Statements Example

- Code Review: Listing 7.6 in Textbook

Read, Estimate, Execute !!

Object Oriented Programming by C++

Sungwon Lee / Professor

Email: drsungwon@khu.ac.kr

Web: http://mobilelab.khu.ac.kr/

...

- ...