



Object Oriented Programming by C++

Selection & Repetition (2/2)

Conditional execution and Iteration (Loop)

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Textbook & Copyright

- Textbook: <http://python.cs.southern.edu/cppbook/progcpp.pdf>
- Sample Codes: <https://github.com/halterman/CppBook-SourceCode>

Fundamentals of C++ Programming

DRAFT

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Preface

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The source code for all labeled listings is available at

<https://github.com/halterman/CppBook-SourceCode>.

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Abnormal Loop Termination

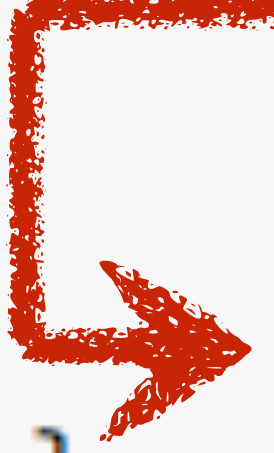
break statement

- *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

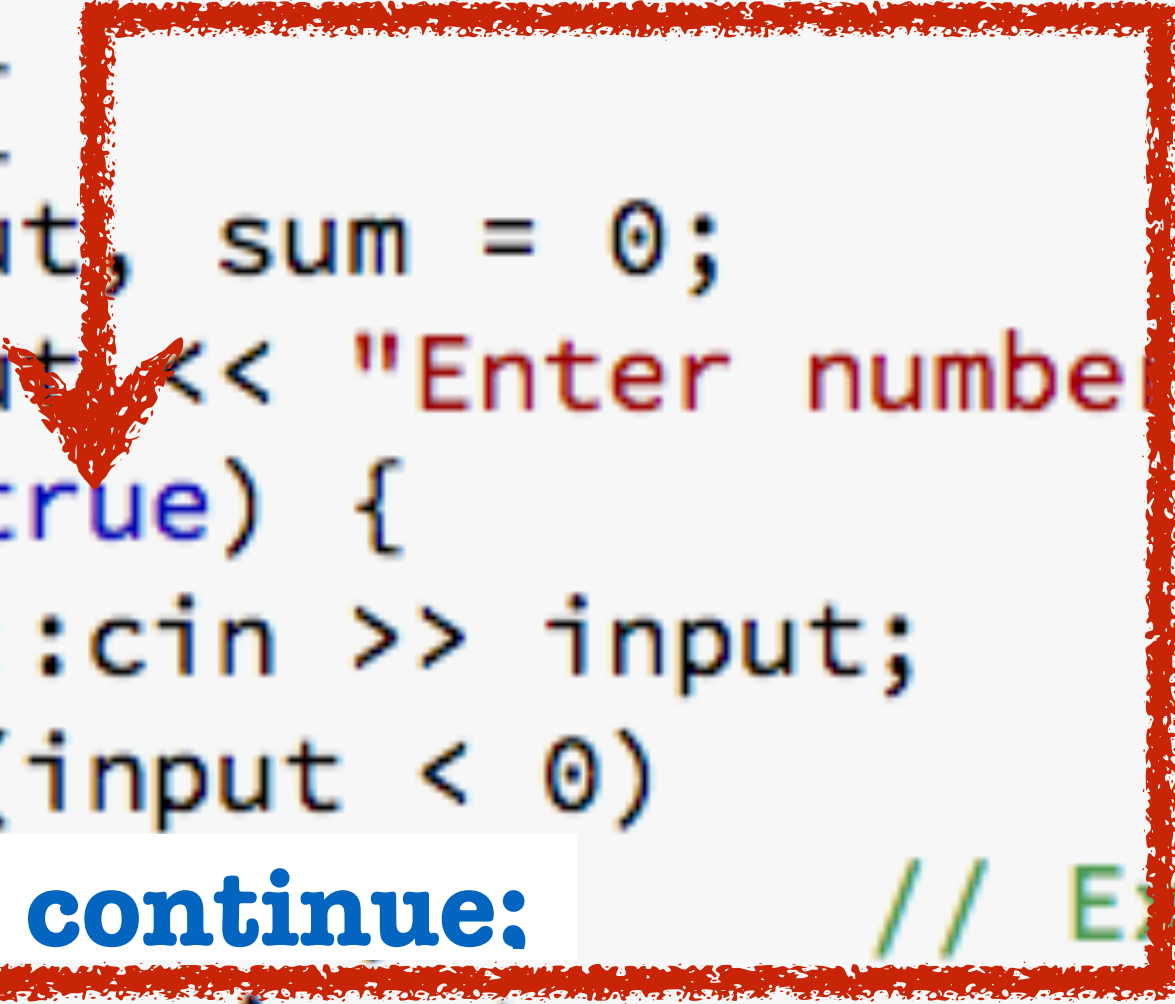
continue statement

- *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

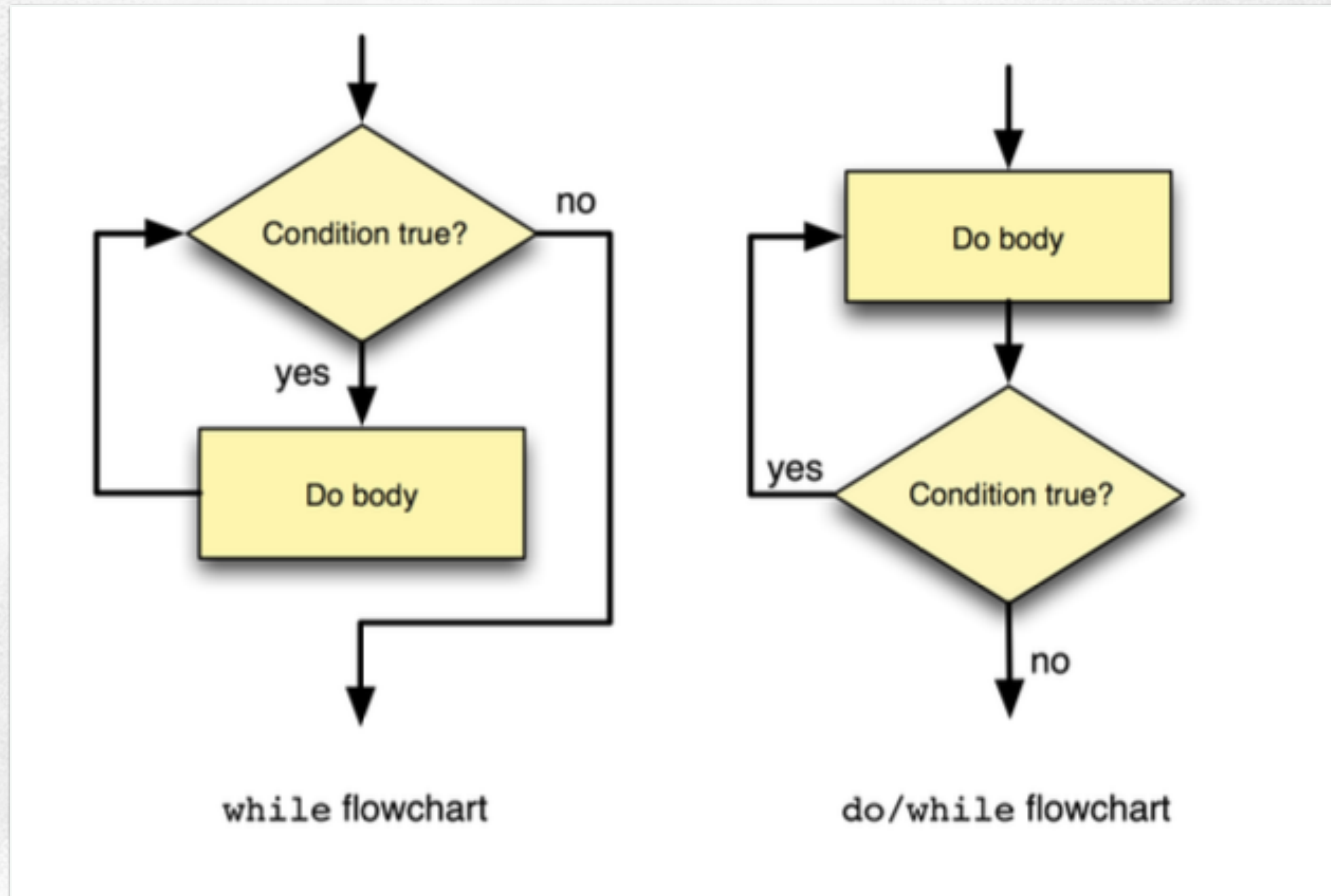
goto statement

Don't use !!

do-while Statement

while vs. do-while

“Just do it!”



do-while Statement

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';
}
```


do-while Statement

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)

do-while Statement

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

for Statement Description

initialization

while (*condition*) {

statement

modification

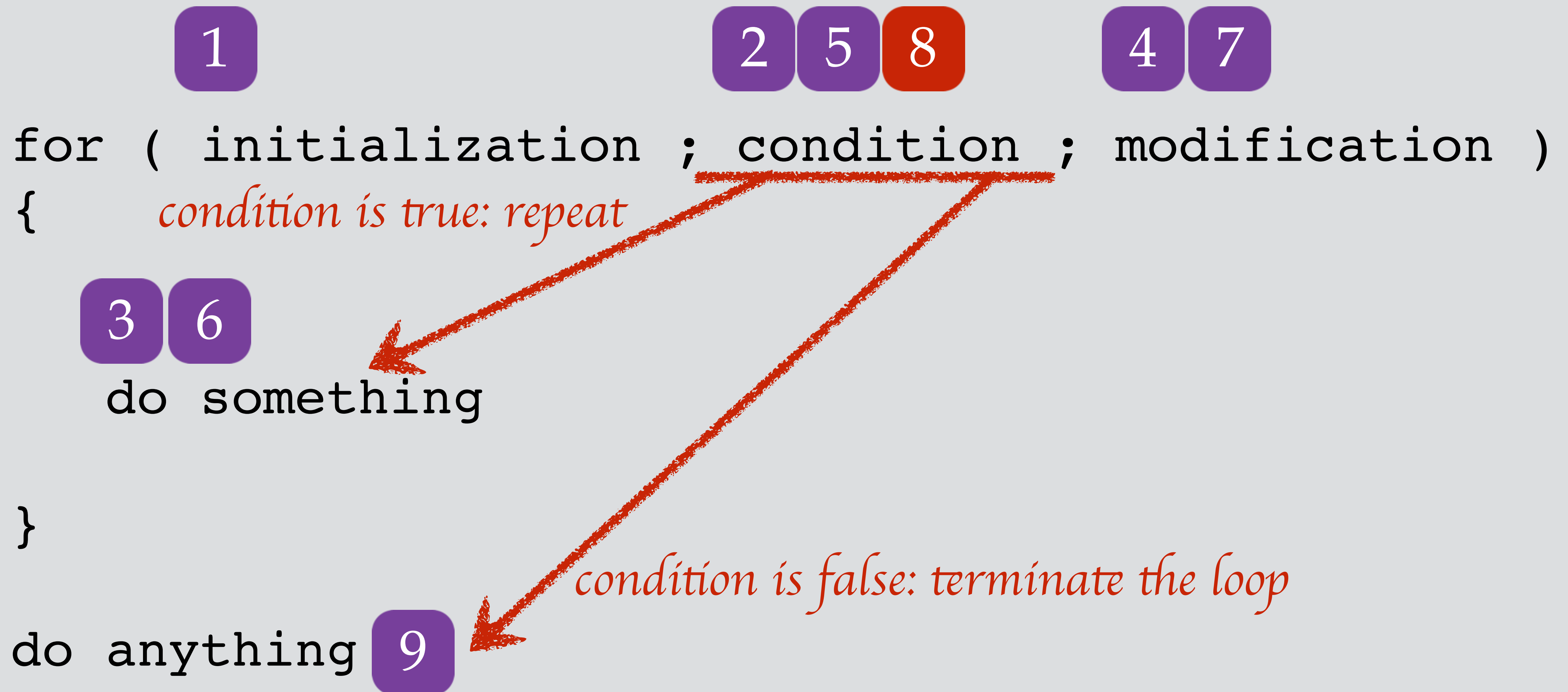
}

for (*initialization* ; *condition* ; *modification*)

statement

for Statement

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).

for 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
}
```


for Statement

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
    }
}
```


for Statement

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
    }
}
```

Please enter the table size: 3

	1	2	3
1	1	2	3
2	2	4	6
3	3	6	9

switch Statement

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*;

switch Statement

Example for *switch* Statements

Listing 7.1: switchdigittoword.cpp

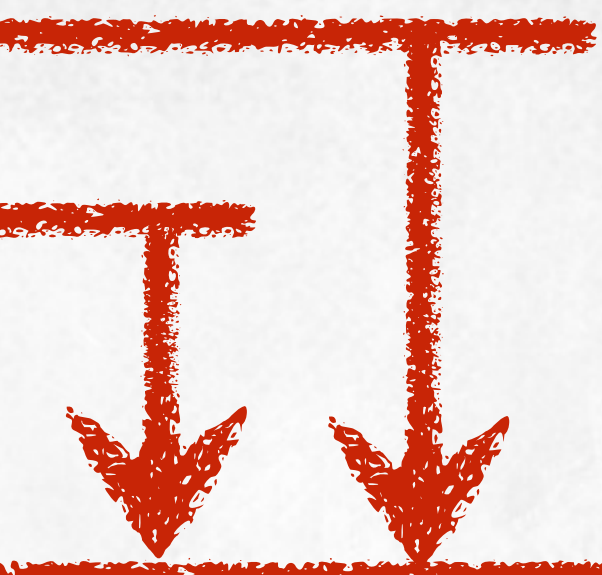
```
#include <iostream>

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';
}
```


switch Statement

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++

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