

Conditionals

Victor Eijkhout, Susan Lindsey

Fall 2022

last formatted: August 28, 2022

1: Conditionals

1. If-then-else

A conditional is a test: 'if something is true, then do this, otherwise maybe do something else'. The C++ syntax is

```
if ( something ) {  
    // do something;  
} else {  
    // do otherwise;  
}
```

- The 'else' part is optional
- You can leave out braces in case of single statement.

2. Complicated conditionals

Chain:

```
if ( /* some test */ ) {  
    ...  
} else if ( /* other test */ ) {  
    ...  
}
```

Nest:

```
if ( /* some test */ ) {  
    if ( /* other test */ ) {  
        ...  
    } else {  
        ...  
    }  
}
```

3. What are logical expressions?

```
logical_expression ::  
    comparison_expression  
    | NOT comparison_expression  
    | logical_expression CONJUNCTION comparison_expression  
comparison_expression ::  
    numerical_expression COMPARE numerical_expression  
numerical_expression ::  
    quantity  
    | numerical_expression OPERATOR quantity  
quantity :: number | variable
```

4. Comparison and logical operators

Here are the most common logic operators and comparison operators:

Operator	meaning	example
==	equals	<code>x==y-1</code>
!=	not equals	<code>x*x!=5</code>
>	greater	<code>y>x-1</code>
>=	greater or equal	<code>sqrt(y)>=7</code>
<,<=	less, less equal	
&&,	and, or	<code>x<1 && x>0</code>
and,or	and, or	<code>x<1 and x>0</code>
!	not	<code>!(x>1 && x<2)</code>
not		<code>not (x>1 and x<2)</code>

Precedence rules of operators are common sense. When in doubt, use parentheses.

Exercise 1

The following code claims to detect if an integer has more than 2 digits.

Code:

```
int i;
cin >> i;
if ( i>100 )
    cout << "That number " << i
        << " had more than 2 digits"
        << "\n";
```

Output

[basic] if:

```
... with 50 as input
....
... with 150 as
    input ....
That number 150 had
more than 2
digits
```

Fix the small error in this code. Also add an 'else' part that prints if a number is negative.

You can base this off the file `if.cxx` in the repository

Review quiz 1

True or false?

- The tests `if (i>0)` and `if (0<i)` are equivalent.

`/poll "Same tests: 'i>0' and '0<i' ?" "T" "F"`

- The test

```
if (i<0 && i>1)
    cout << "foo"
```

prints foo if $i < 0$ and also if $i > 1$.

`/poll "'if (i<0 && i>1)' is true if i negative and if i greater than one" "T" "F"`

- The test

```
if (0<i<1)
    cout << "foo"
```

prints foo if i is between zero and one.

`/poll "'if (0<i<1)' true if i between 0 and 1" "T" "F"`

Review quiz 2

Any comments on the following?

```
bool x;  
// ... code with x ...  
if ( x == true )  
    // do something
```

Exercise 2

Read in an integer. If it is even, print 'even', otherwise print 'odd':

```
if ( /* your test here */ )  
    cout << "even" << endl;  
else  
    cout << "odd" << endl;
```

Then, rewrite your test so that the true branch corresponds to the odd case.

Exercise 3

Read in a positive integer. If it's a multiple of three print 'Fizz!'; if it's a multiple of five print 'Buzz!'. If it is a multiple of both three and five print 'Fizzbuzz!'. Otherwise print nothing.

Note:

- Capitalization.
- Exclamation mark.
- Your program should display at most one line of output.

Turn it in!

- If you have compiled your program, do:

```
coe_fizzbuzz yourprogram.cc
```

where 'yourprogram.cc' stands for the name of your source file.

- Is it reporting that your program is correct? If so, do:

```
coe_fizzbuzz -s yourprogram.cc
```

where the -s flag stands for 'submit'.

Note: this will send your file to the instructors with a **time stamp**. If you submit again after the deadline, you will be recorded as a late submission.

Project Exercise 4

Read two numbers and print a message stating whether the second is as divisor of the first:

Code:

```
int number,divisor;
bool is_a_divisor;
/* ... */
if (
/* ... */
) {
    cout << "Indeed, " << divisor
        << " is a divisor of "
        << number << "\n";
} else {
    cout << "No, " << divisor
        << " is not a divisor of "
        << number << "\n";
}
```

Output

[primes] division:

```
( echo 6 ; echo 2 )
    | divisiontest
```

Enter a number:

Enter a trial

divisor:

Indeed, 2 is a
divisor of 6

```
( echo 9 ; echo 2 )
    | divisiontest
```

Enter a number:

Enter a trial

divisor:

No, 2 is not a
divisor of 9

5. Switch statement example

Cases are executed consecutively until you 'break' out of the switch statement:

Code:

```
switch (n) {  
  case 1 :  
  case 2 :  
    cout << "very small" << "\n";  
    break;  
  case 3 :  
    cout << "trinity" << "\n";  
    break;  
  default :  
    cout << "large" << "\n";  
}
```

Output

```
[basic] switch:  
  
for v in 1 2 3 4 5 ;  
do \  
    echo $v |  
    ./switch ; \  
done  
  
very small  
very small  
trinity  
large  
large
```

6. Local variables in conditionals

The curly brackets in a conditional allow you to define local variables:

```
if ( something ) {  
    int i;  
    .... do something with i  
}  
// the variable 'i' has gone away.
```

Good practice: only define variable where needed.

Braces induce a scope.