

Conditionals

Victor Eijkhout, Susan Lindsey

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Reference material

The following slides are a high-level introduction;
for details see: chapter Textbook, section 5 upto section Textbook,
section 5.5

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. 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:

```
1 int i;
2 cin >> i;
3 if ( i>100 )
4     cout << "That number " << i
5         << " had more than 2 digits"
6         << '\n';
```

Output:

```
... 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" << '\n';  
else  
    cout << "odd" << '\n';
```

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!'. 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.

Prime Project Exercise 4

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

Code:

```
1  int number,divisor;
2  bool is_a_divisor;
3  /* ... */
4  if (
5      /* ... */
6      ) {
7      cout << "Indeed, " << divisor
8          << " is a divisor of "
9          << number << '\n';
10 } else {
11     cout << "No, " << divisor
12         << " is not a divisor of "
13         << number << '\n';
14 }
```

Output:

```
( 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
```

4. Switch statement example

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

Code:

```
1 switch (n) {  
2 case 1 :  
3 case 2 :  
4     cout << "very small" << '\n';  
5     break;  
6 case 3 :  
7     cout << "trinity" << '\n';  
8     break;  
9 default :  
10    cout << "large" << '\n';  
11 }
```

Output:

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

5. 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.