

Conditionals

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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

```
1 if ( something ) {  
2     // do something;  
3 } else {  
4     // do otherwise;  
5 }
```

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

2. Complicated conditionals

Chain:

```
1 if ( /* some test */ ) {  
2     ...  
3 } else if ( /* other test */ ) {  
4     ...  
5 }
```

Nest:

```
1 if ( /* some test */ ) {  
2     if ( /* other test */ ) {  
3         ...  
4     } else {  
5         ...  
6     }  
7 }
```

3. Comparison and logical operators

Here are the most common logic operators and comparison operators:

Operator	meaning	example
<code>==</code>	equals	<code>x==y-1</code>
<code>!=</code>	not equals	<code>x*x!=5</code>
<code>></code>	greater	<code>y>x-1</code>
<code>>=</code>	greater or equal	<code>sqrt(y)>=7</code>
<code><, <=</code>	less, less equal	
<code>&&, </code>	and, or	<code>x<1 && x>0</code>
<code>and, or</code>	and, or	<code>x<1 and x>0</code>
<code>!</code>	not	<code>!(x>1 && x<2)</code>
<code>not</code>		<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 // basic/if.cpp
2 int i;
3 cin >> i;
4 if ( i>100 )
5   cout << "That number " << i
6       << " had more than 2 digits"
7       << '\n';
```

Output:

```
1 ... with 50 as input
    ↳....
2 ... with 150 as
    ↳input ....
3 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.cpp in the repository

Quiz 1

True or false?

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

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

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

- The test

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

prints foo if i is between zero and one.

Quiz 2

Any comments on the following?

```
1 bool x;  
2 // ... code with x ...  
3 if ( x == true )  
4   // do something
```

Exercise 2

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

```
1 if ( /* your test here */ )
2   cout << "even" << '\n';
3 else
4   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!'. 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.

Prime Project Exercise 4

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

Code:

```
1 // primes/divisiontest.cpp
2 int number, divisor;
3 bool is_a_divisor;
4 /* ... */
5 if (
6 /* ... */
7 ) {
8 cout << "Yes, " << divisor
9     << " is a divisor of "
10    << number << '\n';
11 } else {
12 cout << "No, " << divisor
13     << " is not a divisor of "
14    << number << '\n';
15 }
```

Output:

```
1 ( echo 6 ; echo 2 )
   ↗| divisiontest
2 Enter a number:
3 Enter a trial
   ↗divisor:
4 Indeed, 2 is a
   ↗divisor of 6
5
6 ( echo 9 ; echo 2 )
   ↗| divisiontest
7 Enter a number:
8 Enter a trial
   ↗divisor:
9 No, 2 is not a
   ↗divisor of 9
```

4. Switch statement example

Cases are evaluated consecutively until you ‘break’ out of the switch statement:

Code:

```
1 // basic/switch.cpp
2 switch (n) {
3     case 1 :
4     case 2 :
5         cout << "very small" << '\n';
6         break;
7     case 3 :
8         cout << "trinity" << '\n';
9         break;
10    default :
11        cout << "large" << '\n';
12 }
```

Output:

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

5. Local variables in conditionals

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

```
1 if ( something ) {  
2     int i;  
3     .... do something with i  
4 }  
5 // the variable `i' has gone away.
```

Good practice: only define variable where needed.

Braces induce a scope.