Conditionals

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Reference material

The following slides are a high-level introduction;
for details see: chapter Textbook, section 5 upto sectionTextbook, 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
==	equals	`x==y-1`
!=	not equals	`x*x!=5`
>	greater	`y>x-1`
>=	greater or equal	`sqrt(y)>=7`
<,<=	less, less equal	
&&,||	and, or	`x<1 && x>0`
and,or	and, or	`x<1 and x>0`
!	not	`!( x>1 && x<2 )`
not		`not ( x>1 and x<2 )`

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!'. 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 as 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 |
      ↪./switch ; \
3         done
4 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.