

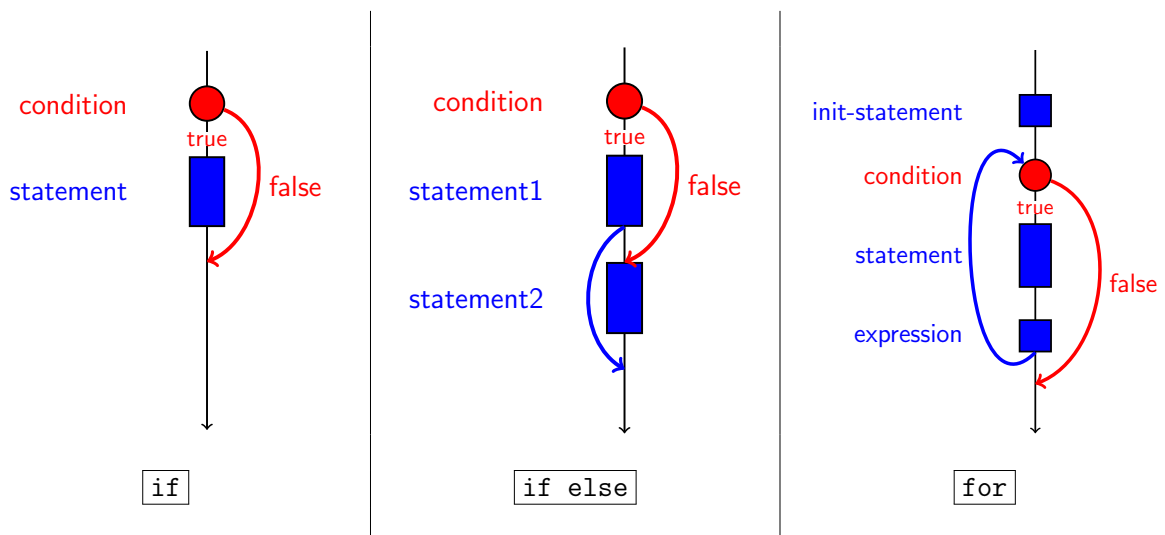
## Informatik für Mathematiker und Physiker HS14

## Exercise Sheet 5

Submission deadline: 15:15 - Tuesday 21th October, 2014

Course URL: <http://lec.inf.ethz.ch/ifmp/2014/>**Assignment 1 (4 points)**

In the lecture on the 7th of October you saw flow charts which describe the control flow of `if`, `if-else` and `for`:



In this exercise we will derive flow charts for other statements which modify the control flow of C++ programs. Draw flow charts for `while`, `do`, `break` and `continue`. For `break` and `continue` you can draw flow charts where `break` and `continue` appear in the body of a `for`-loop.

**Assignment 2 (4 points)**

For this (theory) exercise we assume IEEE standard 754.

a) What is the value of `a`, and why?

```
float x = 1.9f;
unsigned int a = x;
```

b) What is the value of b, and why?

```
float y = 0.2f;
bool b = 5 * y == 1.0f;
```

c) What is the problem with the following loop?

```
for (float i = 0.0f; i < 100000000.0f; ++i)
    std::cout << i << "\n";
```

d) **Challenge:** What is the value of d, and why?

```
int d = 0;
for (float z = 1.0f; z > 0; z /= 2) ++d;
```

**Note:** To answer this question you have to read up on the “special numbers” defined in the IEEE 754 standard. (This topic has not been covered in the lecture and is not relevant for the exam.)

## Assignment 3 – Skript-Aufgabe 63 (4 points)

How many floating point numbers do the systems  $\mathcal{F}^*(\beta, p, e_{\min}, e_{\max})$  and  $\mathcal{F}(\beta, p, e_{\min}, e_{\max})$  contain?

## Assignment 4 – Skript-Aufgabe 67 (4 points)

Write a program `dec2float.cpp` that outputs for a given decimal input number  $x$ ,  $0 < x < 2$ , its normalized float value on your platform. The output should contain the (binary) digits of the significand, starting with 1, and the (decimal) exponent. You may assume that the floating point number system underlying the type `float` has base  $\beta = 2$ .

## Challenge - Skript-Aufgabe 77

This exercise asks you to draw an approximation to the famous *Mandelbrot set*. You can use the `libwindow` library to produce the drawing. This library is already installed on your system if you set it up according to the documentation from the webpage (or if you use `VirtualBox`).

Example code that shows how to draw points (and more complicated objects), can be found in the folder `progs/libraries/demo`. A small documentation can be found in the folder `progs/libraries/doc_html` (open the file `contents.html`).