Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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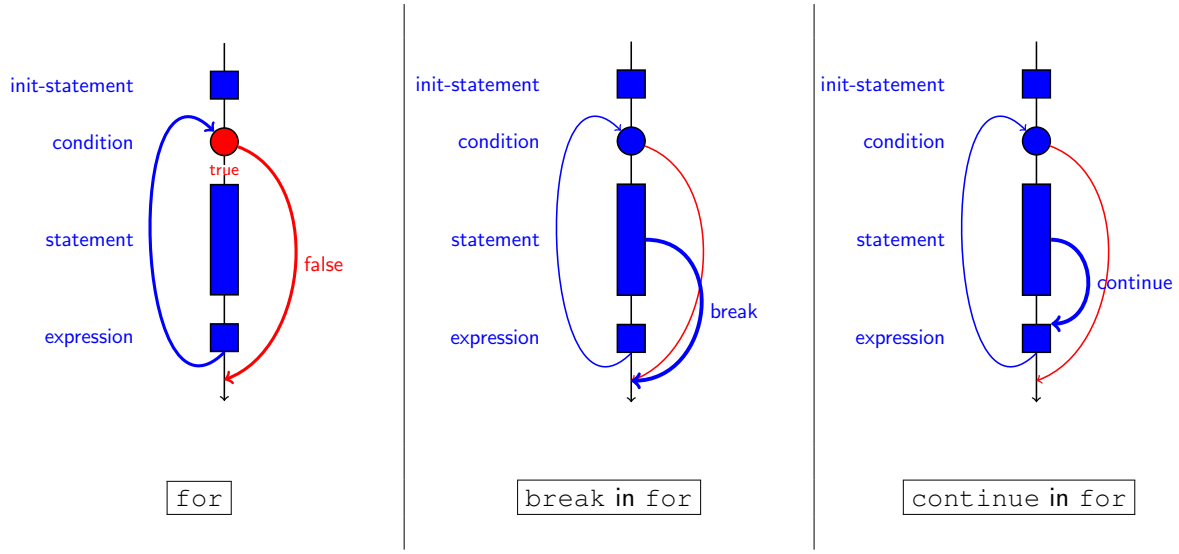
Informatik für Mathematiker und Physiker HS15

Exercise Sheet 4

Submission deadline: 15:15 - Tuesday 13th October, 2015
`Course URL`: http://lec.inf.ethz.ch/ifmp/2015/

Assignment 1 (4 points)

In the lecture you saw flow charts describing for example the control flow of `for` with and without `break` or `continue` in the body:



Your task is to draw the corresponding flow charts for the `while` as well as the `do` loops. This means that you draw the following 6 flow charts: (i) `while`, (ii) `break` in `while`, (iii) `continue` in `while`, (iv) `do`, (v) `break` in `do`, (vi) `continue` in `do`

Assignment 2 (4 points)

Write a program `kdivisors.cpp` that inputs a natural number `k` (including `0`) and outputs a list of all numbers `n` between 1 and 1000 with exactly `k` divisors (including `1` and `n`).

Judge Examples (Explanation: http://lec.inf.ethz.ch/ifmp/2015/judge_boxes.html)

```
Number k =? 5
16 81 625
```

```
Number k =? 20
240 336 432 528 560 624 648 810 816 880 912
```

```
Number k =? 0
```

Submission: https://challenge.inf.ethz.ch/team/websubmit.php?cid=5&problem=MP15042

Assignment 3 – Skript-Aufgabe 50 (4 points)

Write a program `dec2bin2.cpp` that inputs a natural number `n` and outputs the binary digits of `n` in the *correct* order.

Hint: Find a way to "invert" the output of `dec2bin.cpp`.

Judge Examples (Explanation: http://lec.inf.ethz.ch/ifmp/2015/judge_boxes.html)

```
Number n =? 2
Binary representation is: 10
```

```
Number n =? 11
Binary representation is: 1011
```

```
Number n =? 0
Binary representation is: 0
```

Submission: https://challenge.inf.ethz.ch/team/websubmit.php?cid=5&problem=MP15043

Assignment 4 – Skript-Aufgabe 69 (4 points)

The number π can be defined through various infinite sums. Here are two of them.

$$\begin{aligned} \frac{\pi}{4} &= 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots \\ \frac{\pi}{2} &= 1 + \frac{1}{3} + \frac{1 \cdot 2}{3 \cdot 5} + \frac{1 \cdot 2 \cdot 3}{3 \cdot 5 \cdot 7} + \cdots \end{aligned}$$

Write a program for computing an approximation of π, based on these formulas. Which formula is better for that purpose?

Note: Your program must have the prefix `---` on each output line which does not contain the ***result***. Furthermore, the ***result*** must be printed on a separate line. This makes sure that the Judge can correctly judge floating point numbers[1].

Judge Examples (Explanation: http://lec.inf.ethz.ch/ifmp/2015/judge_boxes.html)

```
--- Number of iterations =? 2
--- Pi is approximately
2.66667
```

```
--- Number of iterations =? 20
--- Pi is approximately
3.14159
```

Submission: https://challenge.inf.ethz.ch/team/websubmit.php?cid=5&problem=MP15044

Challenge - Skript-Aufgabe 56 (8 points)

(Submission by email.)

[1] Explanation: Since this exercise involves floating point numbers we need to use a special code validator of the judge. This validator expects all lines where the ***result*** is not contained to start with `---` as prefix; the validator ignores these lines. Thus the only line which shall not be ignored is the one with the ***result***. And this remaining line is then compared with the reference solution up to a certain precision.