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Informatik für Mathematiker und Physiker Serie 6 HS 10

URL: http://www.ti.inf.ethz.ch/ew/courses/Info1_10/

Skript-Aufgabe 50 (4 Punkte)

Write a program `dec2bin2.cpp` that inputs a natural number `n` and outputs the binary digits of `n` in the correct order. For example, for `n==2` the output is `10` and for `n==11` the output is `1011` (see also Exercise 47, `dec2bin.cpp`).

Skript-Aufgabe 58 (4 Punkte)

Evaluate the following expressions step-by-step, according to the conversion rules of mixed expressions. We assume a floating point representation according to IEEE 754, that is, `float` corresponds to $F^*(2, 24, -126, 127)$ and `double` corresponds to $F^*(2, 53, -1022, 1023)$. We also assume that 32 bits are used to represent `int` values.

a) `6 / 4 * 2.0f - 3`

b) `2 + 15.0e7f - 3 / 2.0 * 1.0e8`

c) `392593 * 2735.0f - 8192 * 131072 + 1.0`

d) `16 * (0.2f + 262144 - 262144.0)`

Skript-Aufgabe 63 (4 Punkte)

Compute the value of the variable `d` after the declaration statement

```
float d = 0.1;
```

Assume the IEEE standard 754.

Skript-Aufgabe 73 (4 Punkte)

We have seen that there are decimal numbers without a finite binary representation (such as 1.1 and 0.1). Conversely, every (fractional) binary number *does* have a finite decimal representation, a fact that may be somewhat surprising at first sight. Prove this fact!

More formally, given a number b of the form

$$b = \sum_{i=1}^{k} b_i 2^{-i}, \quad b_1, b_2, \ldots, b_k \in \{0, 1\},$$

prove that there is a natural number ℓ such that b can be written as an ℓ-digit decimal number

$$b = \sum_{i=1}^{\ell} d_i 10^{-i}, \quad d_1, d_2, \ldots, d_\ell \in \{0, 1, \ldots, 9\}.$$

Die **Aufgaben 53** und **75** sind die **Challenge Aufgaben** und geben jeweils 8 Punkte.

Abgabe: Bis 9. November 2010, 15.15 Uhr.