

Informatik für Mathematiker und Physiker**Serie 5****HS 09**URL: http://www.ti.inf.ethz.ch/ew/courses/Info1_09/**Skript-Aufgabe 41 (4 Punkte)**

Find at least four problems in the code given below.

```
1  #include <iostream>
2  int main()
3  {
4      { unsigned int x; }
5      std::cin << x;
6      unsigned int y = x;
7      for (unsigned int s = 0; y >= 0; --y)
8          s += y;
9      std::cout << "s=" << s << "\n";
10     return 0;
11 }
```

Skript-Aufgabe 45 (4 Punkte)

What is the behavior of `prime.cpp` if the user inputs 0 or 1? Rewrite the program (if this is necessary at all) so that it correctly handles all possible inputs (we adopt the convention that 0 and 1 are not prime numbers).

Skript-Aufgabe 49 (4 Punkte)

Write a program `perfect.cpp` to test whether a given natural number n is perfect. A number $n \in \mathbb{N}$ is called *perfect* if and only if it is equal to the sum of its proper divisors, that is, $n = \sum_{k \in \mathbb{N}, s.t. k < n \wedge k | n} k$. For example, $28 = 1 + 2 + 4 + 7 + 14$ is perfect, while $12 < 1 + 2 + 3 + 4 + 6$ is not.

Extend the program to find all perfect numbers between 1 and n . How many perfect numbers exist in the range $[1, 50000]$?

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).

Programm: prime.cpp

```
// Program: prime.cpp
// Test if a given natural number is prime.

#include <iostream>

int main ()
{
    // Input
    unsigned int n;
    std::cout << "Test if n>1 is prime for n =? ";
    std::cin >> n;

    // Computation: test possible divisors d
    unsigned int d;
    for (d = 2; n % d != 0; ++d);

    // Output
    if (d < n)
        // d is a divisor of n in {2,...,n-1}
        std::cout << n << " = " << d << " * " << n / d << ".\n";
    else
        // no proper divisor found
        std::cout << n << " is prime.\n";

    return 0;
}
```

Die **Aufgaben 53, 54** und **55** aus den Vorlesungsunterlagen sind die **Challenge Aufgaben** und geben jeweils 8 Punkte, wenn sie vollständig gelöst werden.

Abgabe: Bis 27. Oktober 2009, 15.15 Uhr.