

**Informatik für Mathematiker und Physiker****Serie 7****HS 10**URL: [http://www.ti.inf.ethz.ch/ew/courses/Info1\\_10/](http://www.ti.inf.ethz.ch/ew/courses/Info1_10/)**Skript-Aufgabe 77 a) (4 Punkte)**

What does the following program output, and why?

```
#include<iostream>

int main()
{
    int a[] = {5, 6, 2, 3, 1, 4, 0};
    int* p = a;
    do {
        std::cout << *p << " ";
        p = a + *p;
    } while (p != a);

    return 0;
}
```

**Skript-Aufgabe 79 (4 Punkte)**

Find and fix at least 5 problems in the following program. The fixed program should indeed correctly do what it claims to do. Is the fixed program const-correct? If not, make it const-correct! (This is a theory exercise, but you may of course use the computer to help you.)

```
#include<iostream>

int main()
{
    int a[7] = {0, 6, 5, 3, 2, 4, 1}; // static array
    int* const b = new int[7];

    // copy a into b using pointers
    for (int* p = a; p <= a+7; ++p)
        *b++ = *p;

    // cross-check with random access
    for (int i = 0; i <= 7; ++i)
        if (a[i] != b[i])
            std::cout << "Oops, copy error...\n";

    delete b;

    return 0;
}
```

**Skript-Aufgabe 80 (4 Punkte)**

Let us call a natural number *k-composite* if and only if it is divisible by exactly *k* different prime numbers. For example, prime powers are 1-composite, and  $6 = 2 \cdot 3$  as well as  $20 = 2 \cdot 2 \cdot 5$

are 2-composite. Write a program `k_composite.cpp` that reads numbers  $n \geq 0$  and  $k \geq 0$  from the input and then outputs all  $k$ -composite numbers in  $\{2, \dots, n - 1\}$ . How many 7-composite numbers are there for  $n = 1,000,000$ ?

### Skript-Aufgabe 83 (4 Punkte)

Enhance the program `read_array.cpp` from Exercise 82 so that the resulting program `sort_array.cpp` sorts the array elements into ascending order before outputting them. Your sorting algorithm does not have to be particularly efficient, the main thing here is that it works correctly. Test your program on some larger inputs (preferably read from a file, after redirecting standard input). The input is formed as follows. The first integer specifies the number of integers to be sorted. This is followed by that many integer numbers, which are separated by whitespaces. For example, on input `5 4 3 6 1 2` the program should output `1 2 3 4 6`.

#### Programm: `read_array.cpp`

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```
// Program: read_array.cpp
// read a sequence of n numbers into an array
#include <iostream>

int main()
{
    // input of n
    unsigned int n;
    std::cin >> n;

    // dynamically allocate array
    int* const a = new int[n];

    // read into the array
    for (int i=0; i<n; ++i) std::cin >> a[i];

    // output what we have
    for (int i=0; i<n; ++i) std::cout << a[i] << " ";
    std::cout << "\n";

    // delete array
    delete[] a;

    return 0;
}
```

Die **Aufgaben 74** und **88** aus den Vorlesungsunterlagen sind die **Challenge Aufgaben** und geben jeweils 8 Punkte, wenn sie vollständig gelöst werden.

**Abgabe:** Bis 16. November 2010, 15.15 Uhr.