

Informatik für Mathematiker und Physiker**Serie 6****HS 07**URL: <http://www.ti.inf.ethz.ch/ew/courses/Info1.07/>**Skript-Aufgabe 55 (4 Punkte)**

- a) 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;
}
```

- b) More generally, suppose that in the previous program,
- a
- is initialized with some sequence of
- n
- different*
- numbers in
- $\{0, \dots, n-1\}$
- (we see this for
- $n = 7$
- in the previous program). Prove that the program terminates in this case.

Skript-Aufgabe 56 (4 Punkte)Assume that in some program, a is an array of underlying type `int` and length n .

- a) Given a variable i of type `int` with value $0 \leq i \leq n$, how can you obtain a pointer p to the element of index i in a ? (Note: if $i = n$, this is asking for a past-the-end pointer.)
- b) Given a pointer p to some element in a , how can you obtain the index i of this element? (Note: if p is a past-the-end pointer, the index is defined as n .)

Write code fragments that compute p from i in a) and i from p in b).**Skript-Aufgabe 57 (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.C` 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 60 (4 Punkte)

Enhance the program `read_array.C` from the course homepage so that the resulting program `sort_array.C` 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). For example, on input `5 4 3 6 1 2` the program should output `1 2 3 4 6`.

Challenge

This week's opportunity for a challenge is exercise 65 from the lecture notes. You can replace two of the normal exercises by the challenge, which will be awarded a maximum of 8 points.

Abgabe: Bis 6. November 2007, 15.15 Uhr.