

Informatik für Mathematiker und Physiker**Serie 8****HS 07**URL: http://www.ti.inf.ethz.ch/ew/courses/Info1_07/**Aufgabe 1 (4 Punkte)**

Find and fix at least 4 problems in the following program. The fixed program should indeed correctly do what it claims to do (this is a theory exercise).

```
#include<iostream>

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

    // 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 62 (4 Punkte)

Consider the string matching algorithm of `string_matching.C` (Program 15 of the lecture notes). Prove that for all $m > 1, n \geq m$, there exists a search string s of length m and a text t of length n on which the algorithm in `string_matching.C` performs $m(n - m + 1)$ comparisons between single characters.

Skript-Aufgabe 63 (4 Punkte)

Consider the program `threedim_array_init.C` from the course homepage, that defines and initializes a three-dimensional array.

Modify the program (and save as `threedim_array.C`) by enhancing it by a (nested) loop that iterates over the array `a` and its subarrays to output all the 24 int values that are stored in `a` and its subarrays. Do not use random access to do this but pointer arithmetic.

Skript-Aufgabe 64 (4 Punkte)

Write a program `frequencies.C` that reads a text from standard input (like in `string_matching.C`) and outputs the frequencies of the letters in the text, where we do not distinguish between lower and upper case letters. For this exercise, you may assume that the type `char` implements ASCII encoding. This means that all characters have integer values in $\{0, 1, \dots, 127\}$. Moreover, in ASCII, the values of the 26 upper case literals 'A' up to 'Z' are consecutive numbers in $\{65, \dots, 90\}$; for the lower case literals 'a' up to 'z', the value range is $\{97, \dots, 122\}$.

Running this on the lyrics of *Yesterday* (The Beatles) for example should yield the following output.

Frequencies:	i:	27 of 520	r:	19 of 520	
a:	45 of 520	j:	0 of 520	s:	36 of 520
b:	5 of 520	k:	3 of 520	t:	31 of 520
c:	5 of 520	l:	20 of 520	u:	9 of 520
d:	28 of 520	m:	10 of 520	v:	6 of 520
e:	65 of 520	n:	30 of 520	w:	19 of 520
f:	4 of 520	o:	43 of 520	x:	0 of 520
g:	13 of 520	p:	4 of 520	y:	34 of 520
h:	27 of 520	q:	0 of 520	z:	0 of 520
			Other:	37 of 520	

Challenge

This week's opportunities for a challenge are exercises 66 and 67 from the lecture notes. You can replace two of the normal exercises by one challenge exercise, which will be awarded a maximum of 8 points.

Abgabe: Bis 20. November 2007, 15.15 Uhr.