

Exercise for Analysis of Algorithms

Exercise 10

Solve the following recurrence: Let $a_0 = 1$, $a_1 = 1$, $a_2 = 4$ and

$$a_n = 2a_{n-1} - a_{n-2} + 2a_{n-3}, \text{ for } n \geq 3.$$

Exercise 11

Solve the following recurrence: Let $a_0 = 0$, $a_1 = 3$ and

$$a_n = 4a_{n-1} - 4a_{n-2} \text{ for } n > 1.$$

Exercise 12

Consider the following program: The input to this program is an array $a[0, \dots, n-1]$

```
int sel_sort ( int a[], int n ) {  
    for ( int i = 0; i < n; ++i ) {  
        int min = i;  
        for ( int j = i; j < n; ++j ) {  
            if ( a[j] < a[min] ) {  
                min = j;  
            }  
        }  
        int temp = a[i];  
        a[i] = a[min];  
        a[min] = temp;  
    }  
}
```

that contains n pairwise distinct integer keys in random order.

- Explain how this program sorts the given array.
- Analyse how often each instruction of the program is executed on average depending on n .
- There is only one instruction whose analysis is not trivial. Which one is it?

Make a table for small values of n by hand that lists the results for this instruction. Compare the table entries with the results from your closed formula that you obtained in b).

Exercise 13

Solve the following recurrence and find a nice representation of the solution (in a mathematical sense).

$$\begin{aligned}c_0 &= 2 \\c_1 &= 4 \\c_n &= c_{n-2}^{\log c_{n-1}}\end{aligned}$$

Hint: Let F_n be the n th Fibonacci number. Write c_n as some function of F_n .