

Aufgabe 1

Note Title

5/11/2016

$$a, n=1 \Rightarrow T(n) = 1 \quad (\text{oder } T(n) = 2)$$

$$n=2 \Rightarrow T(n) = 1 \quad (\text{--- } n \text{ ---})$$

$$n \geq 3 \Rightarrow T(n) = 1 + T(n-1) + T(n-2)$$

$$\begin{aligned} n=3 \Rightarrow T(3) &= 1 + T(2) + T(1) = \\ &= 1 + 1 + 1 = 3 \end{aligned}$$

$$\begin{aligned} n \geq 4 \Rightarrow T(n) &= 1 + T(n-1) + T(n-2) \\ &\leq 2 \cdot T(n-1) \end{aligned}$$

$$\Rightarrow T(n) \leq 2 \cdot T(n-1) \leq 2 \cdot 2 \cdot T(n-1-1)$$

$$\leq \dots \leq 2^{n-3} \cdot T(3)$$

$$\underline{2^{n-3} \cdot 3}$$

$$T(n) = O(2^n)$$

$$b) T(n) = 1 + 1 + 1 + 1 + (n-3+1+1) + (n-3+1) + (n-3+1) - 1$$

$$T(n) = O(n)$$

c) Rekursive Berechnung

$$2^{n/2} \leq T(n) \leq 2^{n-3} \cdot 3$$

$$\Rightarrow 0.4 \text{ ns} \cdot 2^{n/2} \leq T(n) \leq 0.4 \text{ ns} \cdot 2^{n-3} \cdot 3$$

$$\stackrel{n=100}{\Rightarrow} 0.4 \cdot 2^{100/2} \text{ ns} \leq T(n) \leq 0.4 \cdot 3 \cdot 2^{100-3} \text{ ns}$$

$$\stackrel{\approx}{\Rightarrow} 4.5036 \cdot 10^{14} \text{ ns} \leq T(n) \leq 1.9015 \cdot 10^{29} \text{ ns}$$

$$\stackrel{\approx}{\Rightarrow} 5 \text{ d} \leq T(n) \leq 6 \cdot 10^{12} \text{ a}$$

Aufgabe 2

Note Title

5/11/2016

a)

Zeile	Häufigkeit
4	i (Multiplikation)
5	i (— — —)
6	1 (Multipl.)
7	1 (Addition)

$n+1$ - Additionen

Multiplikation: $\left(\sum_{i=1}^n i \right) + (n+1) =$
 $= \left(\frac{n(n+1)}{2} \right) + (n+1) = \frac{1}{2}n^2 + \frac{3}{2}n + 1$

Additionen: $n+1$

$$T(n) \geq (n+1) + \left(\frac{1}{2}n^2 + \frac{3}{2}n + 1 \right)$$

$$\Rightarrow T(n) = O(n^2)$$

Zeile	Häufigkeit
4	<u>1</u> (\sqrt{n})
5	<u>1</u> (\sqrt{n})
6	<u>1</u> (A)

$(n+1)$ -Iterationen

Multiplikationen: $2 \cdot (n+1) = 2n + 2$

Additionen: $n+1$

$$T(n) \gg (2n+2) + (n+1) = \underline{\underline{3n+3}}$$

$$\Rightarrow T(n) = O(n)$$

c)

Zeile	Häufigkeit
3	<u>n</u> (A)
4	<u>n</u> (A)

n - Iterationen

$$T(n) \geq n + n = \underline{2n}$$

$$\Rightarrow T(n) \neq O(n)$$

Aufgabe 5

Note Title

5/11/2016

a, 9, 8, 7, 6, 5, 4, 3, 2, 1

Pivot

9, 8, 7, 6, 5, 4, 3, 2, 1

1, 8, 7, 6, 5, 4, 3, 2, 9

Partitionierung

1, 8, 7, 6, 5, 4, 3, 2

9

Pivot

1, 8, 7, 6, 5, 4, 3, 2

9

2, 8, 7, 6, 5, 4, 3, 1

9

Partitionierung

2, 8, 7, 6, 5, 4, 3, 1

9

1 8, 7, 6, 5, 4, 3, 2

9

Pivot

1 8, 7, 6, 5, 4, 3, 2

9

1 2, 7, 6, 5, 4, 3, 8 9

Partitionierung

1 2, 7, 6, 5, 4, 3 8 9

Pivot

1 2, 7, 6, 5, 4, 3 8 9

1 3, 7, 6, 5, 4, 2 8 9

Partitionierung

1 3, 7, 6, 5, 4, 2 8 9

1 2 7, 6, 5, 4, 3 8 9

Pivot

1 2 7, 6, 5, 4, 3 8 9

1 2 3, 6, 5, 4, 7 8 9

Partitionierung

1 2 3, 6, 5, 4 7 8 9

Pivot

1 2

3, 6, 5, 4

7

8

9

1 2

4, 6, 5, 3

7

8

9

Partitionierung

1 2

4, 6, 5, 3

7

8

9

1 2 3

6, 5, 4

7

8

9

Pivot

1 2 3

6, 5, 4

7

8

9

1 2 3

4, 5, 6

7

8

9

Partitionierung

1 2 3

4, 5

6

7

8

9

Pivot

1 2 3

4, 5

6

7

8

9

1 2 3

5, 4

6

7

8

9

Partitionierung

1 2 3 5,4 6 7 8 9

1 2 3 4 5 6 7 8 9

Trivial

1, 2, 3, 4, 5, 6, 7, 8, 9

b, 9, 8, 7, 6, 5, 4, 3, 2, 1

Pivot

9, 8, 7, 6, 5, 4, 3, 2, 1

9, 8, 7, 6, 1, 4, 3, 2, 5

Partitionierung

9, 8, 7, 6, 1, 4, 3, 2, 5

1, 4, 3, 2, 9, 8, 7, 6, 5

1, 4, 3, 2 5 8, 7, 6, 9

Pivot

1, 4, 3, 2 5 8, 7, 6, 9

1, 4, 2, 3 5 8, 7, 9, 6


Partitionierung

1, 4, 2, 3 5 8, 7, 9, 6

1, 2, 4, 3 5 8, 7, 9, 6

1, 2, 3 4 5 6 7, 9, 8

Pivot

1, 2 3 4 5 6 7, 9, 8 

1, 2 3 4 5 6 7, 8, 9

Partitionierung

1 2 3 4 5 6 7, 8 9

Pivot

1 2 3 4 5 6 7, 8 9

Partitionierung

1 2 3 4 5 6 7 8 9

Trivial

1, 2, 3, 4, 5, 6, 7, 8, 9