

Les 1 huiswerk

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1 Opgave 1

- $\log_2(N) + 0.01N$
- $2\log_2(N)$
- $0.5N \log_2(0.5N)$
- $3N^2 + 4N$
- $N^3 + 801N$

2 Opgave 2

A. $O(N)$:

$$\frac{500}{100} = 5$$
$$0.4 \cdot 5 = 2\text{ms}$$

B. $O(N^2)$:

$$100 \cdot 100 \text{ operations}$$
$$500 \cdot 500 = 250\,000 \text{ operations}$$
$$\frac{250\,000}{10\,000} = 25$$
$$25 \cdot 0.4 = 10\text{ms}$$

C. $O(N^3)$:

$$100^3 = 1\,000\,000$$
$$500^3 = 125\,000\,000$$
$$\frac{125\,000\,000}{1\,000\,000} = 125$$
$$125 \cdot 0.4 = 50\text{ms}$$

3 Opgave 3

With $60\,000\text{ms} = 60\text{s}$

A. $O(N)$:

$$t(N) = k \cdot N$$

$$t(100) = 0.5\text{ms}$$

$$0.5 = k \cdot 100$$

$$k = \frac{0.5}{100} = 0.005$$

$$60\,000 = 0.005 \cdot N$$

$$N = \frac{60\,000}{0.005} = 12\,000\,000 \text{ operations}$$

B. $O(N^2)$:

$$t(N) = k \cdot N^2$$

$$t(100) = 0.5\text{ms}$$

$$0.5 = k \cdot 100^2$$

$$k = \frac{0.5}{10\,000} = 5 \times 10^{-5}$$

$$60\,000 = 5 \times 10^{-5} \cdot N^2$$

$$N^2 = \frac{60\,000}{5 \times 10^{-5}} = 1\,200\,000\,000$$

$$N = \sqrt{1\,200\,000\,000} = 34\,641 \text{ operations}$$

C. $O(N^3)$:

$$t(N) = k \cdot N^3$$

$$t(100) = 0.5\text{ms}$$

$$0.5 = k \cdot 100^3$$

$$k = \frac{0.5}{100^3} = 5 \times 10^{-7}$$

$$60\,000 = 5 \times 10^{-7} \cdot N^3$$

$$N^3 = \frac{60\,000}{5 \times 10^{-7}} = 120\,000\,000\,000$$

$$N = \sqrt[3]{120\,000\,000\,000} = 4932 \text{ operations}$$

4 Opgave 4

$O(N)$

5 Opgave 5

- A. $O(N)$
- B. $O(\frac{N}{2}) = O(N)$
- C. $O(N^2)$
- D. $O(N) + O(N) = O(N)$
- E. $O(N^3)$
- F. $O(N^2)$
- G. $O(N^5)$
- H. $O(\log_2 N)$

6 Opgave 6

Main function: $O(N^3)$ Functie: $O(y)$ Functie2: $O(3 \log_2 x)$
 $y := N^2 - i$ and $x := N$
gives $O(N^3 \log_2 N)$

7 Opgave 7

- A. $O(N)$ groeit minder snel dan $O(N^2)$
- B. $O(\log_2 N)$ plateaut
- C. $\log_2 N$ plateaut, N gaat recht, $N \log_2 N$ gaat hoger dan N

8 Opgave 8

- B. $\log_2 1024 = 10, \log_2 2048 = 11$
- C. $x = 2^4 = 16$
- D. $x = 2^{10} = 1024$

9 Opgave 9

- A. $x^2 = 10x$ doorkruist op $x = 10$. $x^2 = 1\,000x$ doorkruist op $x = 1\,000$.
 α moet minimaal x zijn en wordt dan versimpelt naar $x^2 + \alpha$.
- B. $x = e^{-W_{-1} - \log 2/100} \approx 996$
- C. $x = e^{-W_{-1} - \log 2/100} \approx 996$