1 Selection Sort

1.1 Pseudo-code

Algorithm 1: Selection Sort

Input: number *Array* length *l*

Output: array in ascending order

1 for $i \leftarrow 0$ **to** $l-2$ **by** 1 **do**

2 $minIndex \leftarrow i$

3   **for** $j \leftarrow i+1$ **to** $l-1$ **by** 1 **do**

4   **if** $Array[minIndex] > Array[j]$ **then**

5 $minIndex \leftarrow j$

6   **end**

7   **end**

8   **if** $minIndex \neq i$ **then**

9   Swap($Array[i]$, $Array[minIndex]$)

10   **end**

11 end

12 return *Array*

1.2 Analysis

$$
\begin{aligned}
\sum_{i=0}^{n-2} \sum_{j=i+1}^{n-1} 1 &= \sum_{i=0}^{n-2} (n-1) - (i+1) + 1 \\
&= \sum_{i=0}^{n-1} n - 1 - i \\
&= \sum_{i=0}^{n-1} i \\
&= \frac{1}{2} n(n-1) \\
&= \Theta(n^2)
\end{aligned}
$$

1.3 Mathematics

$$\sum_{i=0}^{n-1} i = 0 + 1 + 2 + \cdots + (n-1)$$

$$= \frac{1}{2}(\sum_{i=0}^{n-1} i + \sum_{i=0}^{i=n-1} n - 1 - i)$$

$$= \frac{1}{2} \sum_{i=0}^{n-1} n - 1$$

$$= \frac{1}{2} n(n-1)$$