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sorting problem

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Let \leq be a *total ordering* on the set S . Given a sequence of n elements, $x_1, x_2, \dots, x_n \in S$, find a sequence of distinct indices $1 \leq i_1, i_2, \dots, i_n \leq n$ such that $x_{i_1} \leq x_{i_2} \leq \dots \leq x_{i_n}$.

The sorting problem is a heavily studied area of computer science, and many *sorting algorithms* exist to solve it. The most general algorithms depend only upon the relation \leq , and are called *comparison-based sorts*. It can be proved that the lower bound for sorting by any comparison-based sorting algorithm is $\Omega(n \log n)$.

A few other specialized sort algorithms rely on particular properties of the values of elements in S (such as their structure) in order to achieve lower time complexity for sorting certain sets of elements. Examples of such a sorting algorithm are the *bucket sort* and the *radix sort*.