1. The Role of the Algorithms in Computer

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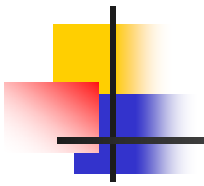
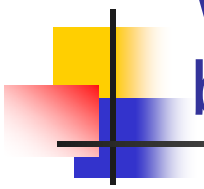
1.1 Algorithms

- **Algorithm:** Any well-defined computation procedure that takes some value, or set of values, as input and produces some value, or set of values, as output.
- *Or:* tool for solving well specific computational problem.
- **Example:** Sorting problem
- Input: A sequence of n numbers $< a_1, a_2, \ldots, a_n >$
- Output: A permutation $< a_1', a_2', \ldots, a_n' >$

of the input sequence such that $a_1' \le a_2' \le \ldots \le a_n'$.



- An ***instance of a problem*** consists of all inputs needed to compute a solution to the problem.
- An algorithm is said to be ***correct*** if for every input instance, it halts with the correct output.
- A correct algorithm ***solves*** the given computational problem. An incorrect algorithm might not halt at all on some input instance, or it might halt with other than the desired answer.



What kind of problem can be solved by algorithm?

- The Human Genome Project
- The Internet Applications
- Electronic Commerce with Public-key cryptography and digital signatures
- Manufacturing and other commercial settings