Principles of Algorithms -

Note Title

The Main Goal.

Real-World Problems solving by using a computer.

Real-World Problems — Physical objects.

Computers — Mathematical objects.

$\Longleftrightarrow$

RWP $\longrightarrow$ Mathematical Problem.

Algebraic System (set of Math objects/abstract objects, set of operations)

Mathematical Problem in a Mathematical Model.

Integers — +, −, *, Mod, Div, ..

Sets — Unions, intersection

— insert, delete, search.

CS $\longrightarrow$ Abstract Data Type -

— (MM + set of operations)

What next?

Principles of Algorithms.

Principles of Algorithms.

(1) Problems — Mathematical Problems
in
Mathematical Model
(ADT)

(2) Computational Problems.

Input — set of values that the problem is required to work with.

Process — Sequence of Operations.

Output —

Specification
Solution.

Specification — Relation between input / output values.

Solution — explicit description of the process.

Algorithm. — execution on any input produces the corresponding output.

(3) Complexity — Time complexity.

— & Space complexity.

—

(4) Input size (Problems of scale)

Sorting — n — Number of items to be sorted.

Multiply two Matrices -

$A_{p \times q}$ $B_{q \times r}$.

$C = A B$.
$p \times r$

$p, q, r \longrightarrow$ input size.

$A_{n \times n}$ $B_{n \times n}$ $n \longrightarrow$ input size.

$G = (V, E)$,

$|V| = n$, $|E| = m$

$n, m \longrightarrow$ input size.

Time complexity.

Instruction Count
operation count.
Int.

Running Time
sec, min,