

# Divide and Conquer

- ▶ In divide and conquer approach, the problem in hand, is divided into smaller sub-problems and then each problem is solved independently.
- ▶ When we keep on dividing the sub-problems into even smaller sub-problems, we may eventually reach at a stage where no more division is possible.
- ▶ Those "atomic" smallest possible sub-problem (fractions) are solved. The solution of all sub-problems is finally merged in order to obtain the solution of original problem.

# Divide and Conquer

Broadly, we can understand divide-and-conquer approach as three step process.

**Divide/Break** This step involves breaking the problem into smaller sub-problems. Sub-problems should represent as a part of original problem. This step generally takes recursive approach to divide the problem until no sub-problem is further dividable. At this stage, sub-problems become atomic in nature but still represents some part of actual problem.

**Conquer/Solve** This step receives lot of smaller sub-problem to be solved. Generally at this level, problems are considered 'solved' on their own.

**Merge/Combine** When the smaller sub-problems are solved, this stage recursively combines them until they formulate solution of the original problem.

This algorithmic approach works recursively and conquer and merge steps works so close that they appear as one.

Examples The following computer algorithms are based on divide-and-conquer programming approach Merge Sort Quick Sort Binary Search Strassen's Matrix Multiplication Closest pair (points) There are various ways available to solve any computer problem, but the mentioned are a good example of divide and conquer approach.