

Problem solving techniques

(i) Problem solving by Analogy

Analogies involve reasoning about relations, in particular about relational similarity, which helps in problem solving.

Eg. pattern drawing, pascal's triangle, etc

<https://www.youtube.com/watch?v=MMNcCJf9jog>

<https://www.youtube.com/watch?v=dGLAJBA61hU>

(ii) Recursion

Recursion in computer science is a method of solving a problem where the solution depends on solutions to smaller instances of the same problem (as opposed to iteration). The approach can be applied to many types of problems, and recursion is one of the central ideas of computer science.

Recursion - a function to call itself from within its own code. The basis of **recursion** is function arguments that make the task so simple that the function does not make further calls.

Eg. Fibonacci series, GCD of two numbers, factorial of a number, binary search, etc

Eg. Nth number in Fibonacci sequence using recursion technique

<https://www.youtube.com/watch?v=jXAlk1DLfc0>

(iii) Divide and Conquer Approach

In computer science, **divide and conquer** is an algorithm design paradigm based on multi-branched recursion. A divide-and-conquer algorithm works by recursively breaking down a problem into two or more sub-problems of the same or related type, until these become simple enough to be solved directly. The solutions to the sub-problems are then combined to give a solution to the original problem.

This divide-and-conquer technique is the basis of efficient algorithms for all kinds of problems, such as sorting (quicksort, merge sort), binary search, computing discrete fourier transform, etc

Binary Search - https://www.youtube.com/watch?v=4Q9P6fxd_4A

Binary Search - <https://www.youtube.com/watch?v=l5DF0EfgLEU>

Merge Sort - https://en.wikipedia.org/wiki/Merge_sort (animation in the right side explains a lot)

(iv) Means End Analysis

Means-ends analysis (MEA) is a problem solving technique used commonly in artificial intelligence (AI) for limiting search in AI programs. Application of systems thinking to planning whereby the overall goal is broken down into objectives which in turn are broken down into individual steps or actions.

<https://www.youtube.com/watch?v=K9ISPA1QsnA>

Means End Analysis (MEA) is a problem-solving technique that has been used since the fifties of the last century to stimulate creativity. Means End Analysis is also a way of looking at the organizational planning, and helps in achieving the end-goals. With MEA, it is possible to control the entire process of problem solving. It starts from a predetermined goal, in which actions are chosen that lead to that goal. Each action that is executed leads to the next action; everything is connected together in order to reach the end-goal. In the meantime however, problems may arise. It is often hard to determine where exactly the crux is. With the help of Means End Analysis, both forward and backward research can be done to determine where the stagnation is occurring. This enables the larger parts of a problem to be solved first, to subsequently return to the smaller problems afterwards.

<https://www.toolshero.com/problem-solving/means-end-analysis-mea/>