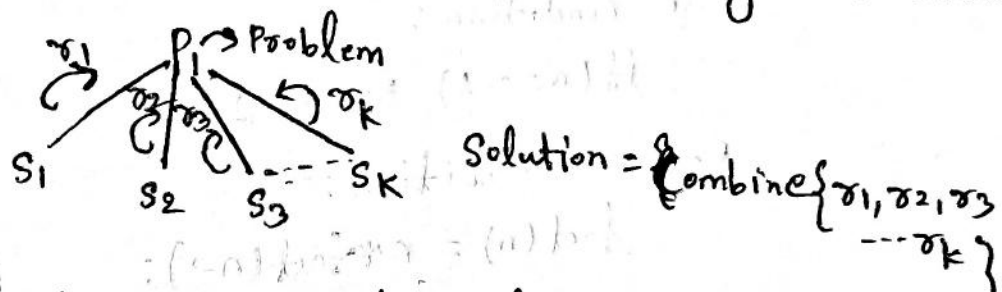


# Divide - and - conquer approach

→ In divide-and-conquer approach, break the problem into several subproblems that are similar to the original problem but smaller in size, solve the subproblem recursively, and then combine these solutions to create a solution to the original problem.



The divide-and-conquer approach involves three steps.

↳ Divide: Divide the problems into a number of subproblems.

↳ Conquer: Conquer the subproblems ~~into~~ by solving them recursively. If the subproblems sizes are small enough, however, just solve the subproblems in a straightforward manner.

↳ Combine: Combine the solutions to the subproblems into the solution for the original problem.

Note → All sorting and searching algorithm which are based on divide-and-conquer approach must take  $\log_2 n$  no. of passes to solve the given problem.

## Decomposition and Recursive solution.

(2)

Problem 1: factorial.

$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

$4! = 4 \times 3 \times 2 \times 1 = 24$

$3! = 3 \times 2 \times 1 = 6$

$2! = 2 \times 1 = 2$

$n! = n \times (n-1)!$

$fact(n) = n * fact(n-1);$

Base condition:

if  $(n == 1)$  Return 1.

Recursive condition:

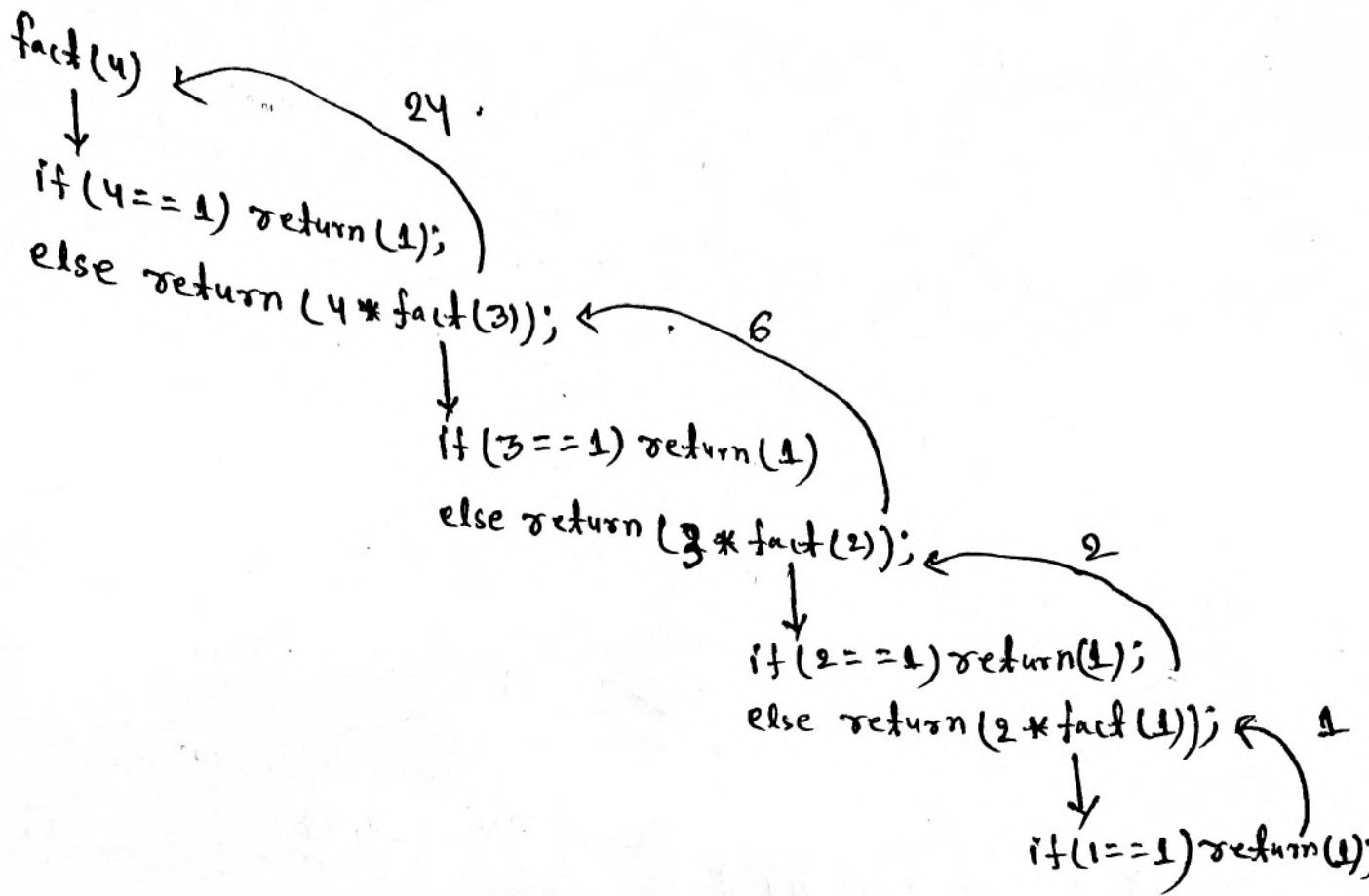
$fact(n) = n * fact(n-1);$

→ `fact(int n)`

```
{
  if (n == 1)
    return (1);
  else
    return (n * fact(n-1));
}
```

`fact (int n)`

```
{
  if (n == 1) | Base condition |
    Return (1);
  else /* (n > 1) */
  {
    x = fact (n-1); | Decompose
    val = n * x; | Recompose
  }
  return (val);
}
```



Problem 2: Tower of hanoi Problem: Move all the disks over to tower 3 from Tower 1 But you cannot place a larger disk onto a smaller disk.