⇒ **Dynamic Programming**

Binomial Coefficient

For calculating binomial coefficient

$$\binom{n}{k} = \begin{cases} 1 & \text{if } k=0 \text{ or } k=n \\ \binom{n-1}{k-1} + \binom{n-1}{k} & \text{if } 0<k<n \\ 0 & \text{Otherwise} \end{cases}$$

Algorithm function

```
function c(n, k)
  if (k=0 || k=n)
  {
        return 1;
  }
  else
        return c(n-1, k-1) + c(n-1, k)
```

Example

① $C\binom{4}{2}$

$= C\binom{3}{1} + C\binom{3}{2}$ $C\binom{3}{1}$

Now, for $c\binom{3}{1}$

$= c\binom{2}{0} + c\binom{2}{1}$

$= 1 + c\binom{2}{1}$

For $c\binom{2}{1}$

$= c\binom{1}{0} + c\binom{1}{1}$

$= 1 + 1$

$= 2$

$$\therefore C(3,1) = 1 + 1 + 1 = 3$$

Now for $C(3, 2)$

$$= C(2, 1) + C(2, 2)$$
$$= C(2, 1) + 1$$

For $C(2, 1)$

$$= C(1, 0) + C(1, 1)$$
$$= 1 + 1$$
$$= 2$$

$$C(3, 2) = 3$$

$$C(4, 2) = 3 + 3$$
$$= \underline{\underline{6}}$$