

Permutation

$${}^n P_r = \frac{n!}{(n-r)!}$$

Arrangements

4 boxes, $\{1, 2, 3\}$

$$\cancel{{}^4 P_3} \Rightarrow 24$$

b

123 -
132 -
213 -
231 -
312 -
321 -

$${}^n C_r = \frac{{}^n P_r}{r!}$$

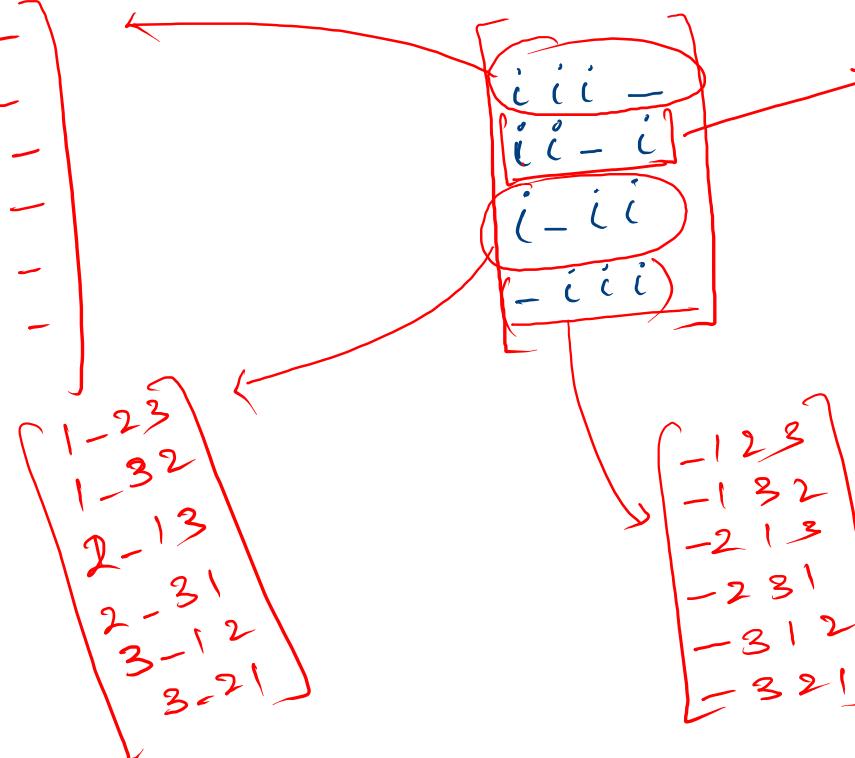
Combination

$${}^n C_r = \frac{n!}{r! (n-r)!}$$

Select

4 boxes, $\{ \overline{1}, \overline{1}, \overline{1} \}$

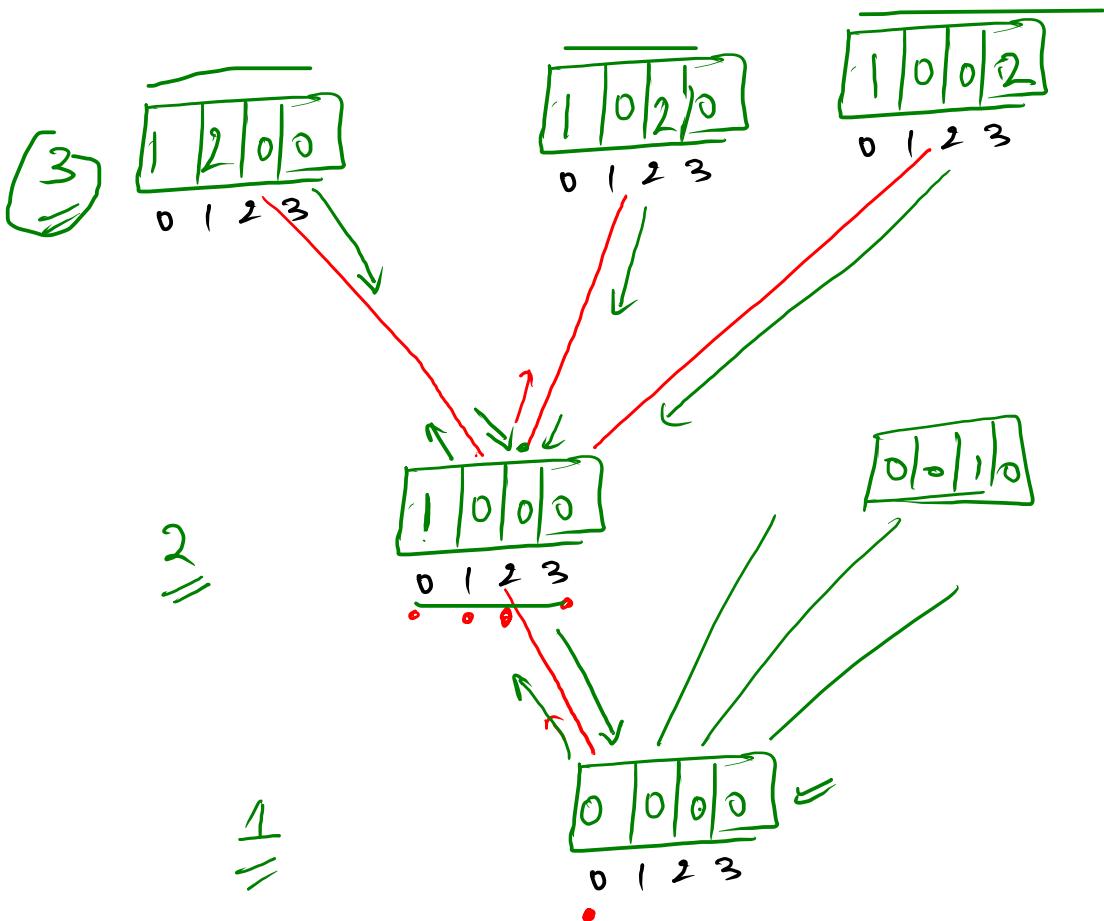
$$\boxed{{}^4 C_3 \Rightarrow 4}$$



1 2 - 3
1 3 - 2
2 1 - 3
2 3 - 1
3 1 - 2
3 2 - 1

$$\begin{cases} n = 4 \\ r = 2 \end{cases}$$

$t_{i=2}$



Permutation - 1 (object choose)

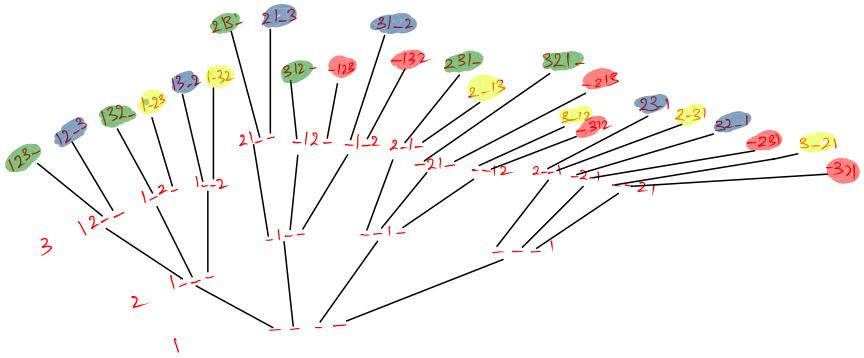
```
public static void permutations(int[] boxes, int ci, int ti){
    if(ci > ti){
        for(int vl : boxes){
            System.out.print(vl);
        }
        System.out.println();
        return;
    }
    for(int box = 0 ; box < boxes.length ; box++){
        if(boxes[box] == 0){
            boxes[box] = ci;
            permutations(boxes,ci+1,ti);
            boxes[box] = 0;
        }
    }
}
```

12

$\begin{bmatrix} 1200 \\ 1020 \\ 1002 \end{bmatrix}$

$$4P_3 \Rightarrow \frac{4!}{3!} = 4$$

$$4 \cdot 3 \cdot 2 \Rightarrow 24$$



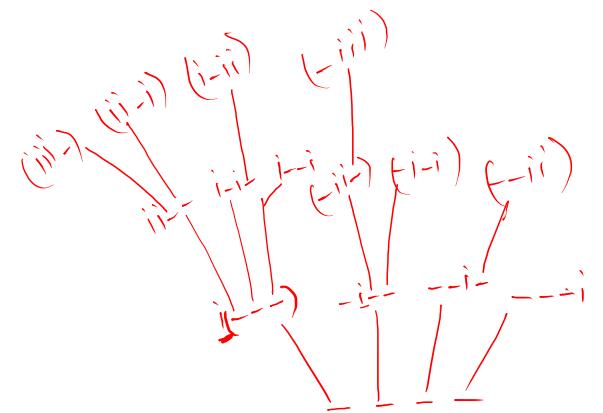
$$4P_3$$

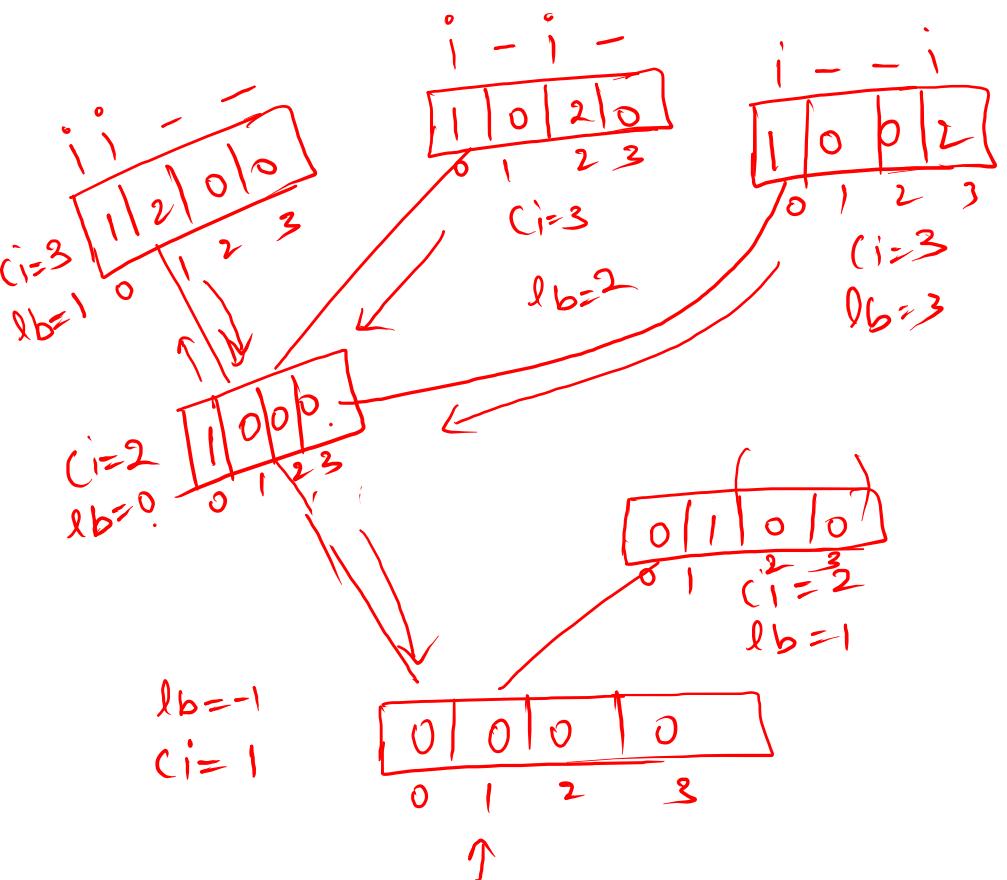
$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ -1 & -1 & -1 \\ 1 & 1 & 1 \end{pmatrix}$$

$$\begin{array}{c} \xrightarrow{\text{I}} \\ \xrightarrow{\text{II}} \end{array} \begin{array}{c} 0100 \xrightarrow{1} 2100 \\ 1000 \xrightarrow{2} 1200 \end{array}$$

$$4P_3$$

Object choosing





```

public static void combinations(int[] boxes, int ci, int ti, int lb){
    if(ci > ti){
        for(int vl : boxes){
            if(vl != 0){
                System.out.print("i");
            }else{
                System.out.print("-");
            }
        }
        System.out.println();
        return;
    }
    for(int i = lb + 1 ; i < boxes.length ; i++){
        boxes[i] = ci;
        combinations(boxes,ci+1,ti,i);
        boxes[i] = 0;
    }
}

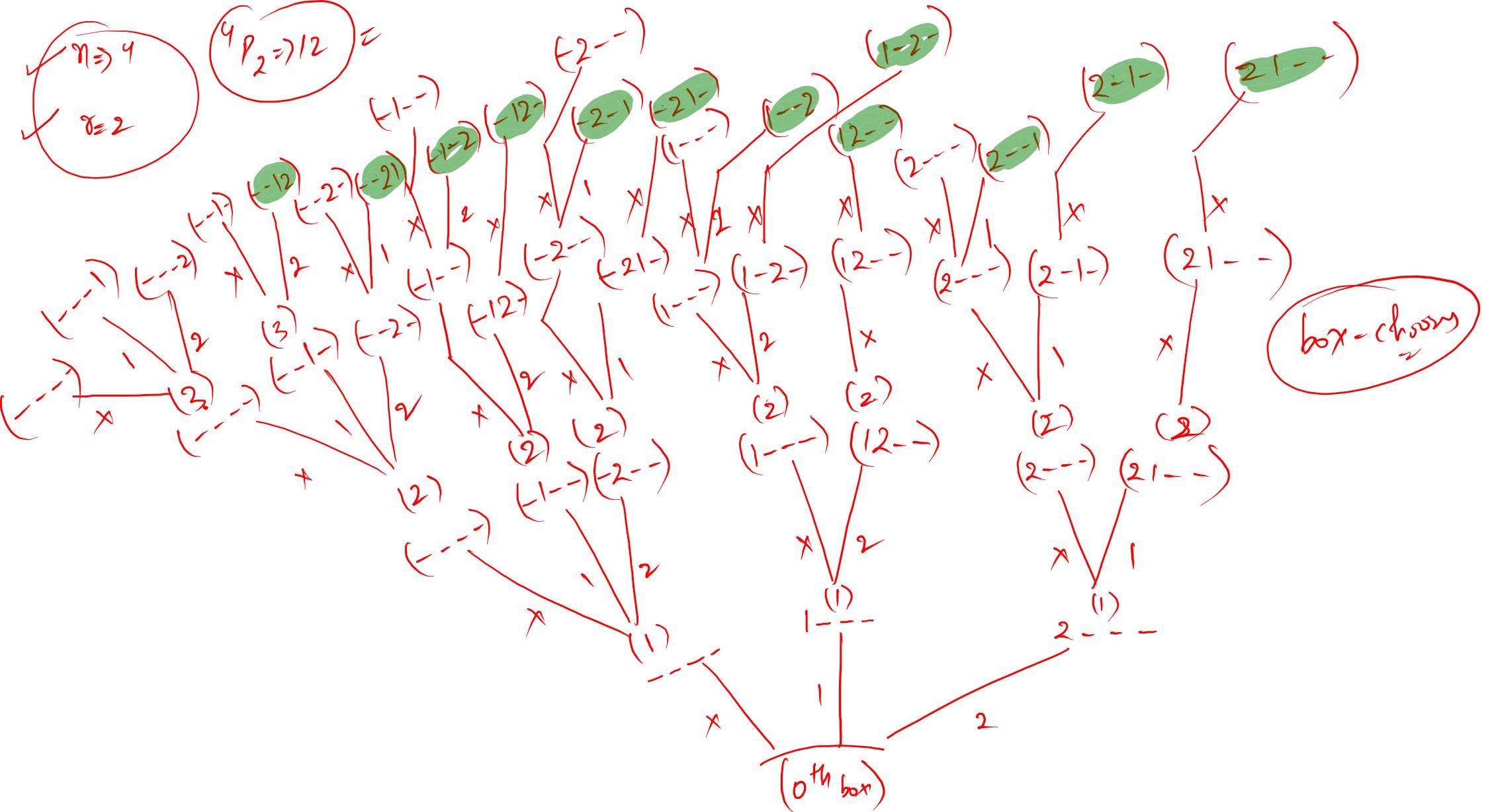
public static void main(String[] args) throws Exception {
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
    int nboxes = Integer.parseInt(br.readLine());
    int ritems = Integer.parseInt(br.readLine());
    combinations(new int[nboxes], 1, ritems, -1);
}

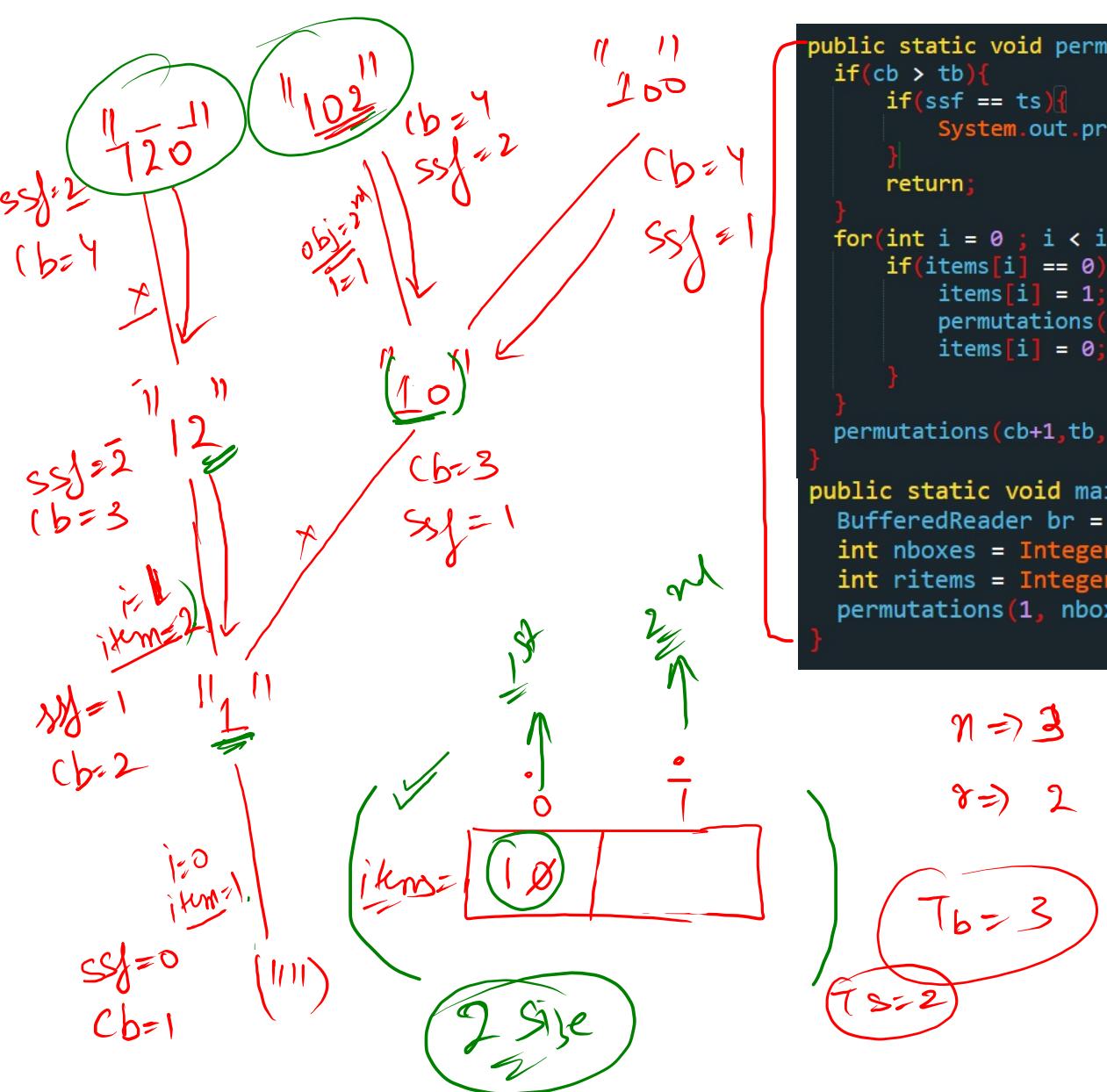
```

$$t_i \geq 2 \quad \begin{cases} n=4 \\ r=2 \end{cases}$$

$$\eta \Rightarrow q$$

$$4P_2 = 12$$





```
public static void permutations(int cb, int tb, int[] items, int ssf, int ts, String asf){  
    if(cb > tb){  
        if(ssf == ts){  
            System.out.println(asf);  
        }  
        return;  
    }  
    for(int i = 0 ; i < items.length ; i++){  
        if(items[i] == 0){  
            items[i] = 1;  
            permutations(cb+1,tb,items,ssf+1,ts,asf+(i+1));  
            items[i] = 0;  
        }  
    }  
    permutations(cb+1,tb,items,ssf,ts,asf+0);  
}  
  
public static void main(String[] args) throws Exception {  
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));  
    int nboxes = Integer.parseInt(br.readLine());  
    int ritems = Integer.parseInt(br.readLine());  
    permutations(1, nboxes, new int[ritems], 0, ritems, "");  
}
```

1 obj 2 obj
| |
0 1
[1 | 0]

$$\eta \Rightarrow 3$$

$$\gamma \Rightarrow 2$$

$$\eta p_2 \Rightarrow 3 p_2 \Rightarrow \textcircled{6}$$

$T_b = 3$

$T_{S=2}$

$$\begin{array}{r} 120 \\ - 102 \\ \hline \end{array}$$

$$\begin{pmatrix} 4 \\ C_3 \end{pmatrix}$$

$$2^n = {}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + \dots + {}^nC_n$$

$$2^4 = \begin{matrix} {}^4C_0 & + & {}^4C_1 & + & {}^4C_2 & + & {}^4C_3 & + & {}^4C_4 \end{matrix}$$

↓ ↓ ↓ ↓ ↓

1 4 6 4 1

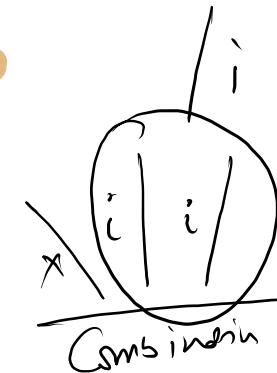
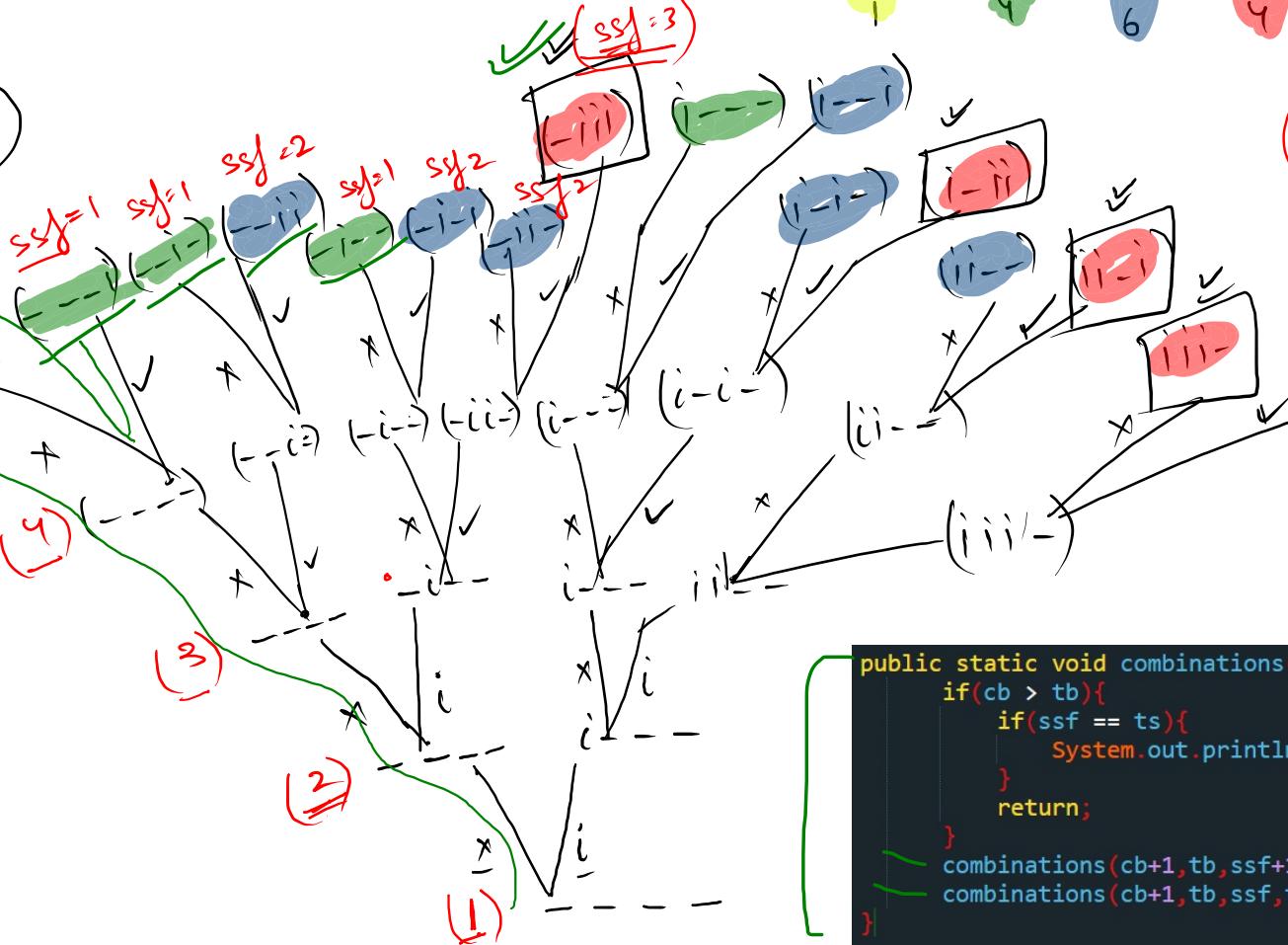
$$\begin{matrix} {}^4C_0 & = & 16 \\ 2 & 1 & 2 \end{matrix}$$

box choose

$$\begin{pmatrix} n \\ C_1 \end{pmatrix}$$

$$\begin{pmatrix} n \\ C_2 \end{pmatrix}$$

Permute



```
public static void combinations(int cb, int tb, int ssf, int ts, String asf){
    if(cb > tb){
        if(ssf == ts){
            System.out.println(asf);
        }
        return;
    }
    combinations(cb+1,tb,ssf+1,ts,asf+"i");
    combinations(cb+1,tb,ssf,ts,asf+"-");
}
```

Combination

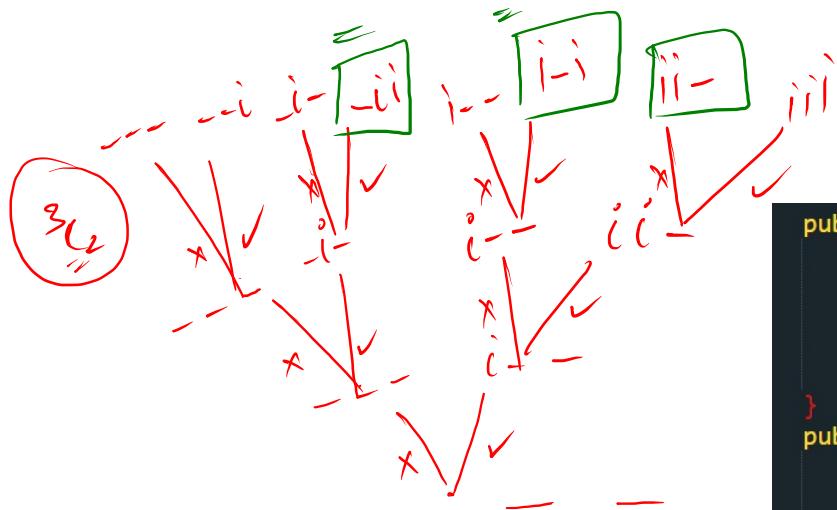
Box choose

0	1	2	3
-	-	q	Q
-	-	-	-
-	-	-	-
-	-	-	-

4 - Queens \rightarrow identical

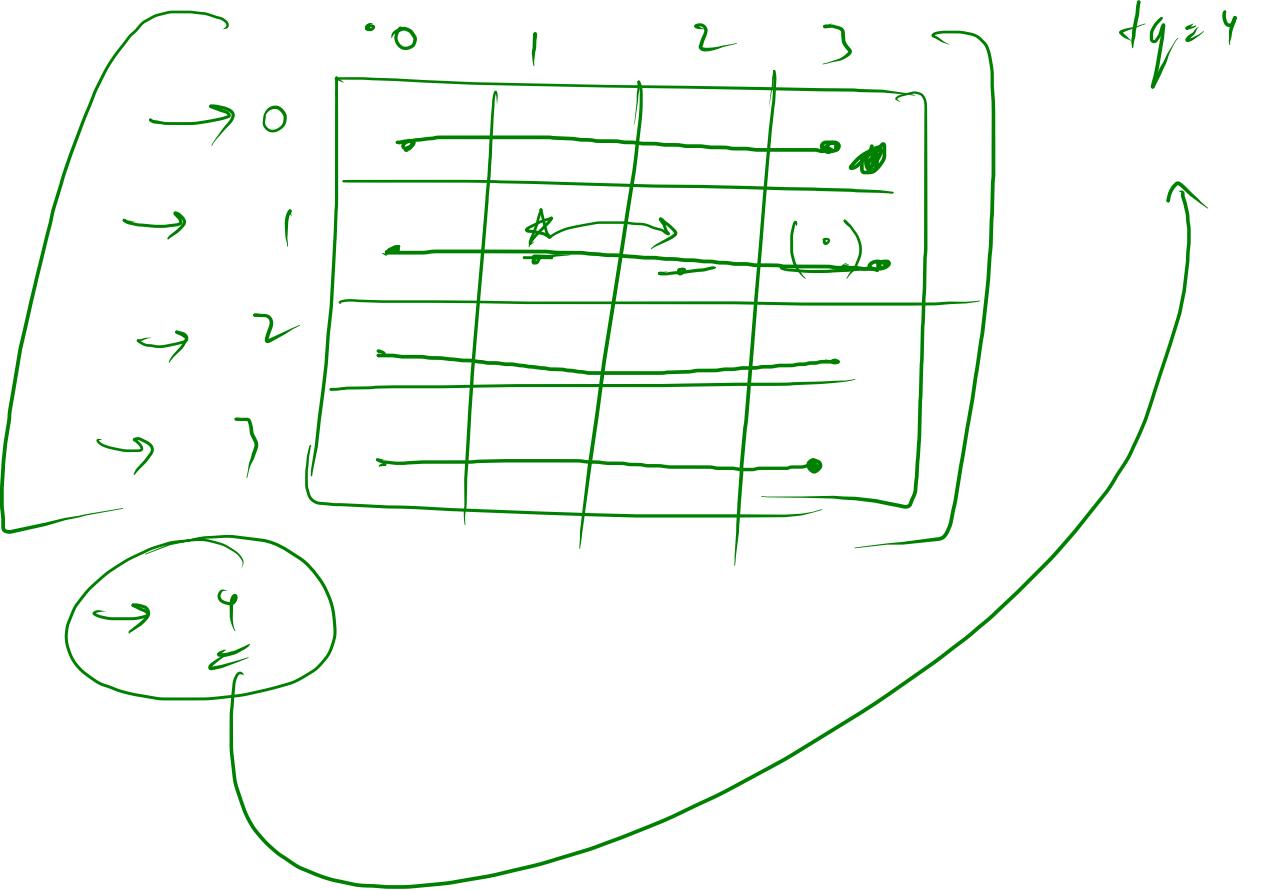
for a

(Col = $tq - 1$)

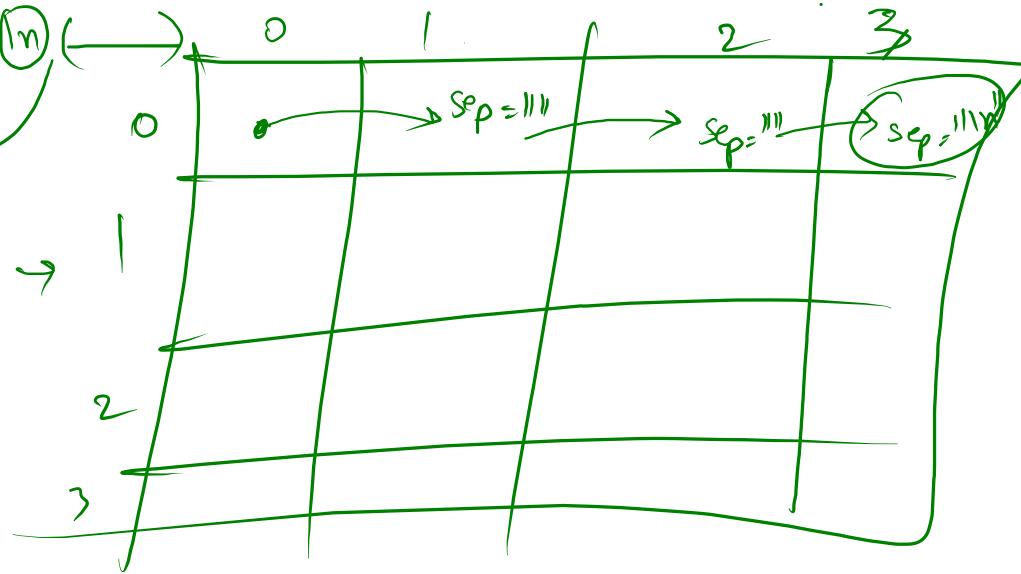


3

```
public static void queensCombinations(int qpsf, int tq, int row, int col, String asf){  
    int nr,nc;  
    |  
    queensCombinations(qpsf+1,tq,)  
}  
public static void main(String[] args) throws Exception {  
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));  
    int n = Integer.parseInt(br.readLine());  
    queensCombinations(0, n, 0, 0, "");  
}
```



```
\n\t\t\t
int nr,nc;
String sep;
if(col == tq-1){
    nr = row+1;
    nc = 0;
    sep = "\n";
} else {
    nr = row;
    nc = col+1;
    sep = "";
}
```

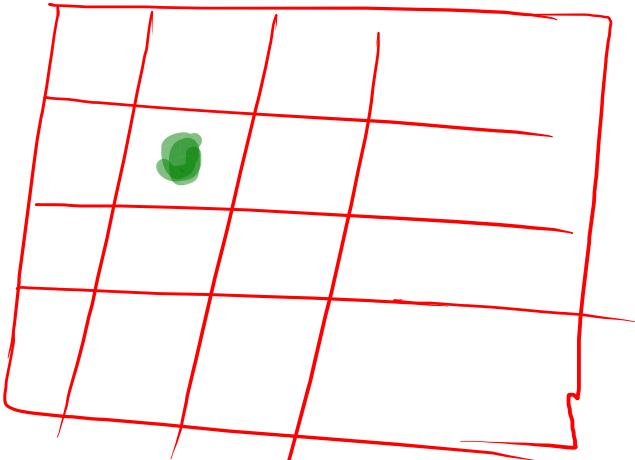
```

public static void queensCombinations(int qpsf, int tq, int row, int col, String asf){
    if(row == tq){
        if(qpsf == tq){
            System.out.println(asf);
        }
        return;
    }
    int nr,nc;
    String sep;
    if(col == tq-1){
        nr = row+1;
        nc = 0;
        sep = "\n";
    }else{
        nr = row;
        nc = col+1;
        sep = "";
    }

    queensCombinations(qpsf+1,tq,nr,nc,asf+"q"+sep);
    queensCombinations(qpsf,tq,nr,nc,asf+"-"+sep);
}

```

Permutation

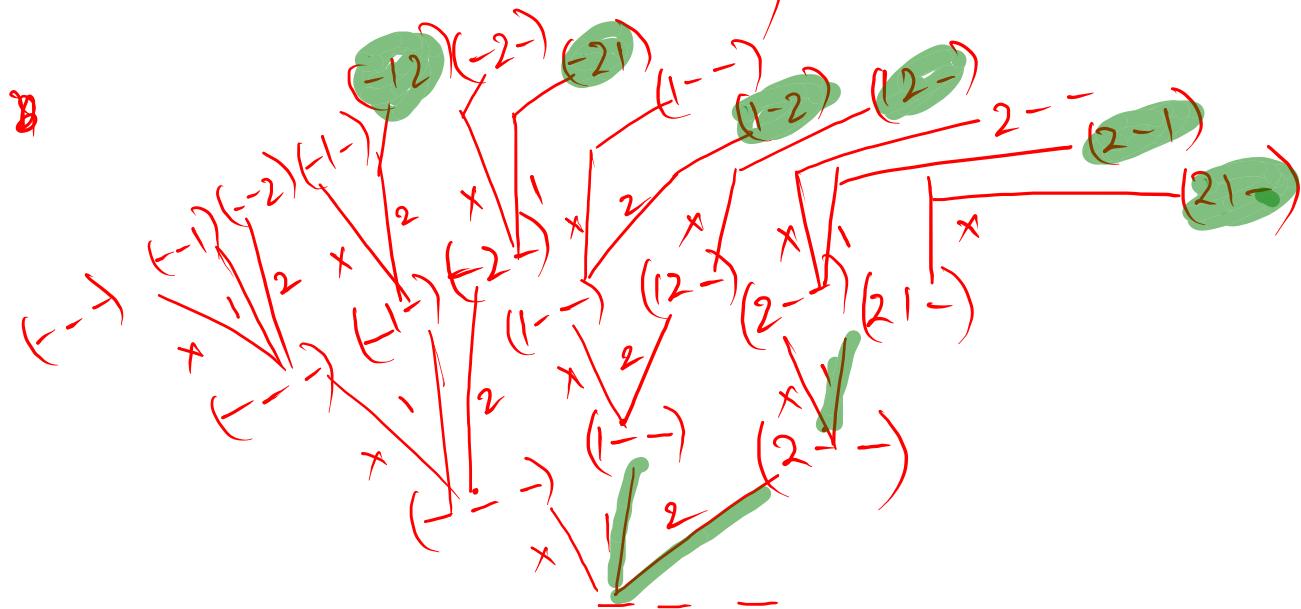


$n=4$

$q=4$

$\{1, 2, 3, 4\}$

Box chosen
→



3P_2

Permutation

q4 -

0	0	0	4
2	0	1	0
0	3	0	0
0	0	0	0

Item Chrom

Queens

H.W.

(1, 2, 3, 4)

11 15

↙ Permutation 1

revise

- </> Permutation - 1
- </> Combinations - 2
- </> Permutations - 2
- </> Combinations - 1
- </> Queens Combinations - 2d As 2d - Box Chooses
- </> Queens Permutations - 2d As 2d - Box Chooses
- </> Queens Combinations - 2d As 2d - Queen Chooses
- </> Queens Permutations - 2d As 2d - Queen Chooses

Easy	10	✓ Auth	0	✓ Public	✓ Sol	1			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	2			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	3			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	4			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	5			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	6			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	7			
Medium	10	✓ Auth	0	✓ Public	✓ Sol	8			

Hand hold -

= 10

10
→ Revise

[1] [2]

1. w try