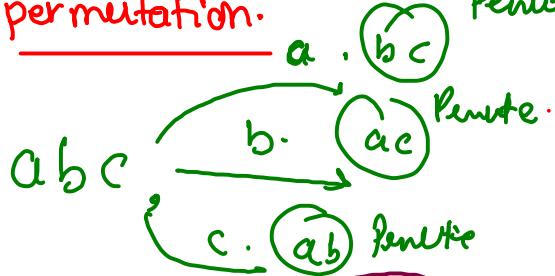


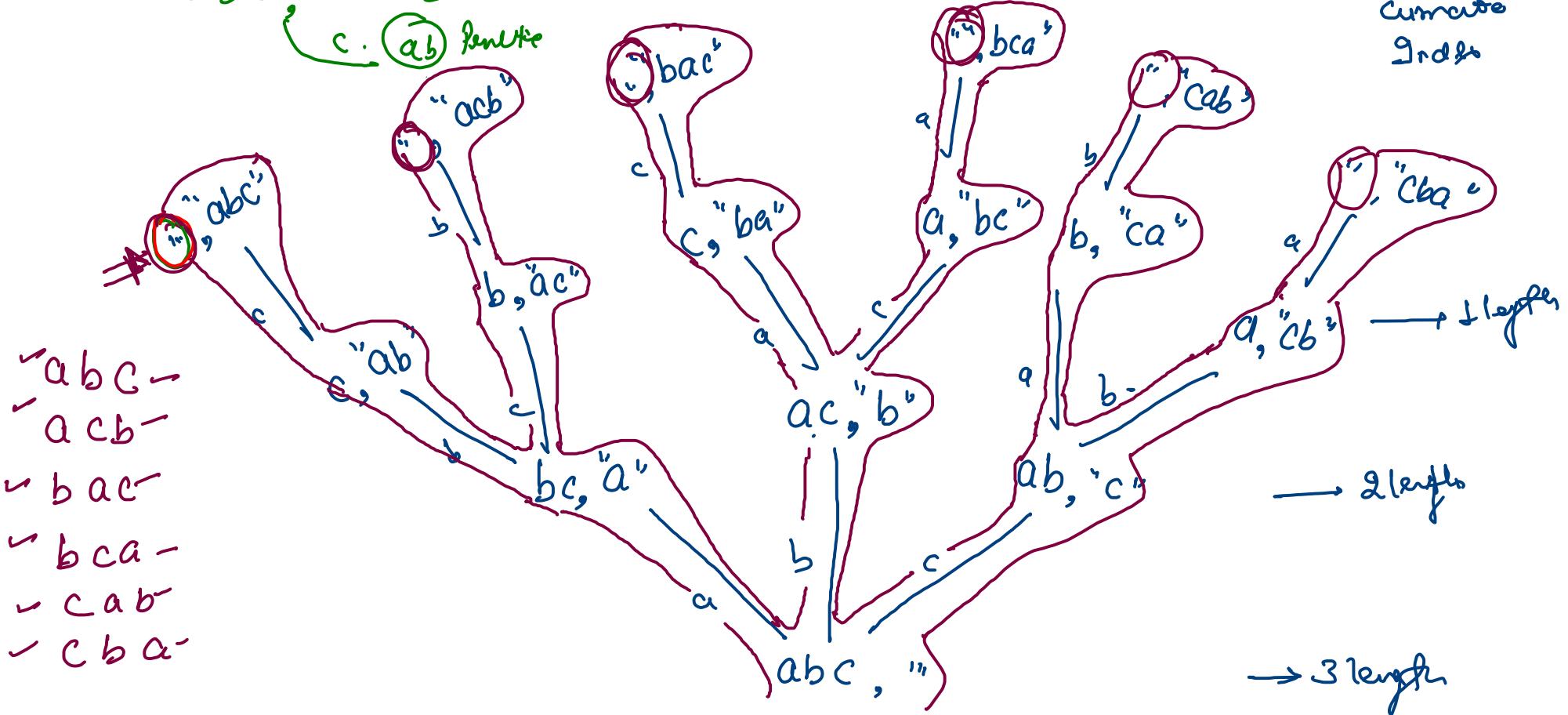
Point permutation.

Permute



level - String -

option - character  
add on  
current  
grades



## Get Permutation.

a b c

faith

3 length.

Expectation,  $\rightarrow$  permutation  $\overbrace{(abc)}^{\text{3 length.}} = \text{all permutation of } abc \text{ in array list}$

permutation(b c)

permutation(a c)

permutation(a b)

Merging of  
faith and  
Expectation,

permutation(abc) =

3 length

"a" + permutation(bc)

"b" + permutation(ac)

"c" + permutation(ab)

2 length.

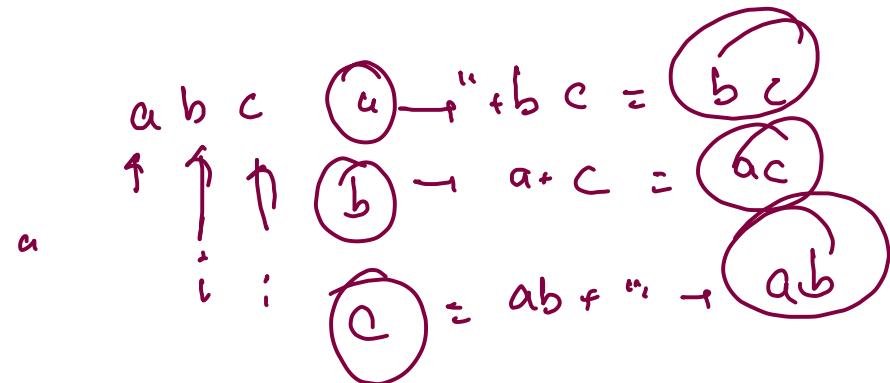
Recurssn

abc  
acb  
bac  
bca  
cab  
cba

abc  
acb

bac  
bca

cab  
cba



$\text{Hab c d}$   
 $i=0 \rightarrow a \text{ str.substring}(0, i) + \text{str.substring}(i+1)$   
 $- + bcd = bcd$   
 $i=1 \rightarrow \cancel{b} \text{ str.substring}(0, i) + \text{str.substring}(i+1)$   
 $\cancel{a} + cd = acd$   
 $i=2, \cancel{c} \rightarrow ab + d = abd$

$b c d e$   
 $\uparrow \uparrow \uparrow \uparrow \uparrow$   
 $a b c d e$   
 $\uparrow \uparrow \uparrow \uparrow \uparrow$   
 $\text{str.substring}(0, i) + \text{str.substring}(i+1);$   
 $ab + de = \textcircled{abc}c$

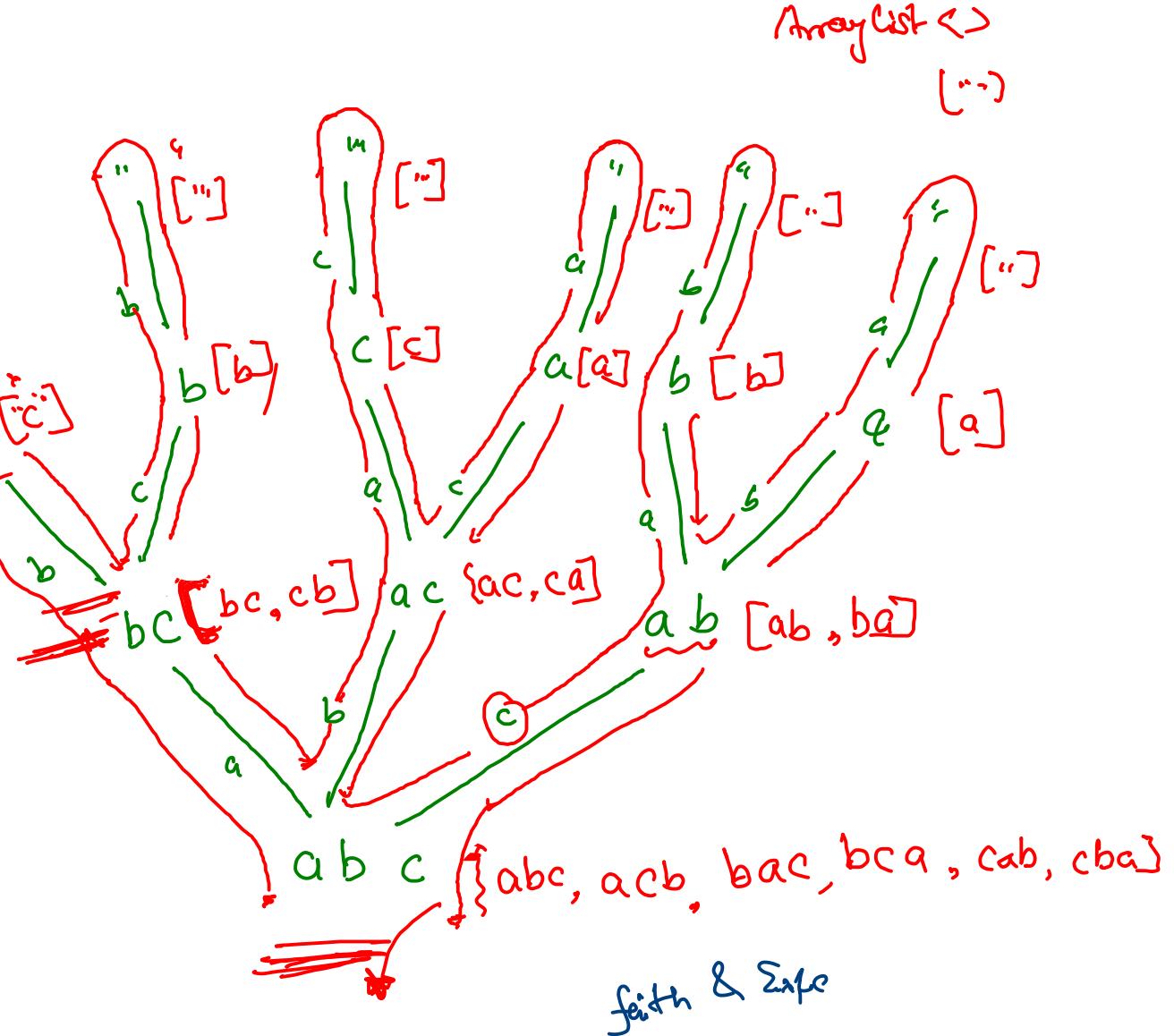
$a_1, a_2, a_3 \Rightarrow$  
  
 $a_1, a_2, a_3$   
 $a_1, a_3, a_2$   
 $a_2, a_1, a_3$   
 $a_2, a_3, a_1$   
 $a_3, a_1, a_2$   
 $a_3, a_2, a_1$

```

public static ArrayList<String> getPermutation(String str) {
    if(str.length() == 0) {
        ArrayList<String> bres = new ArrayList<>();
        bres.add("");
        return bres;
    }

    ArrayList<String> mres = new ArrayList<>();
    for(int i = 0; i < str.length(); i++) {
        char ch = str.charAt(i);
        String roq = str.substring(0, i) + str.substring(i + 1);
        ArrayList<String> rres = getPermutation(roq);
        for(String s : rres) {
            mres.add(ch + s);
        }
    }
    return mres;
}

```

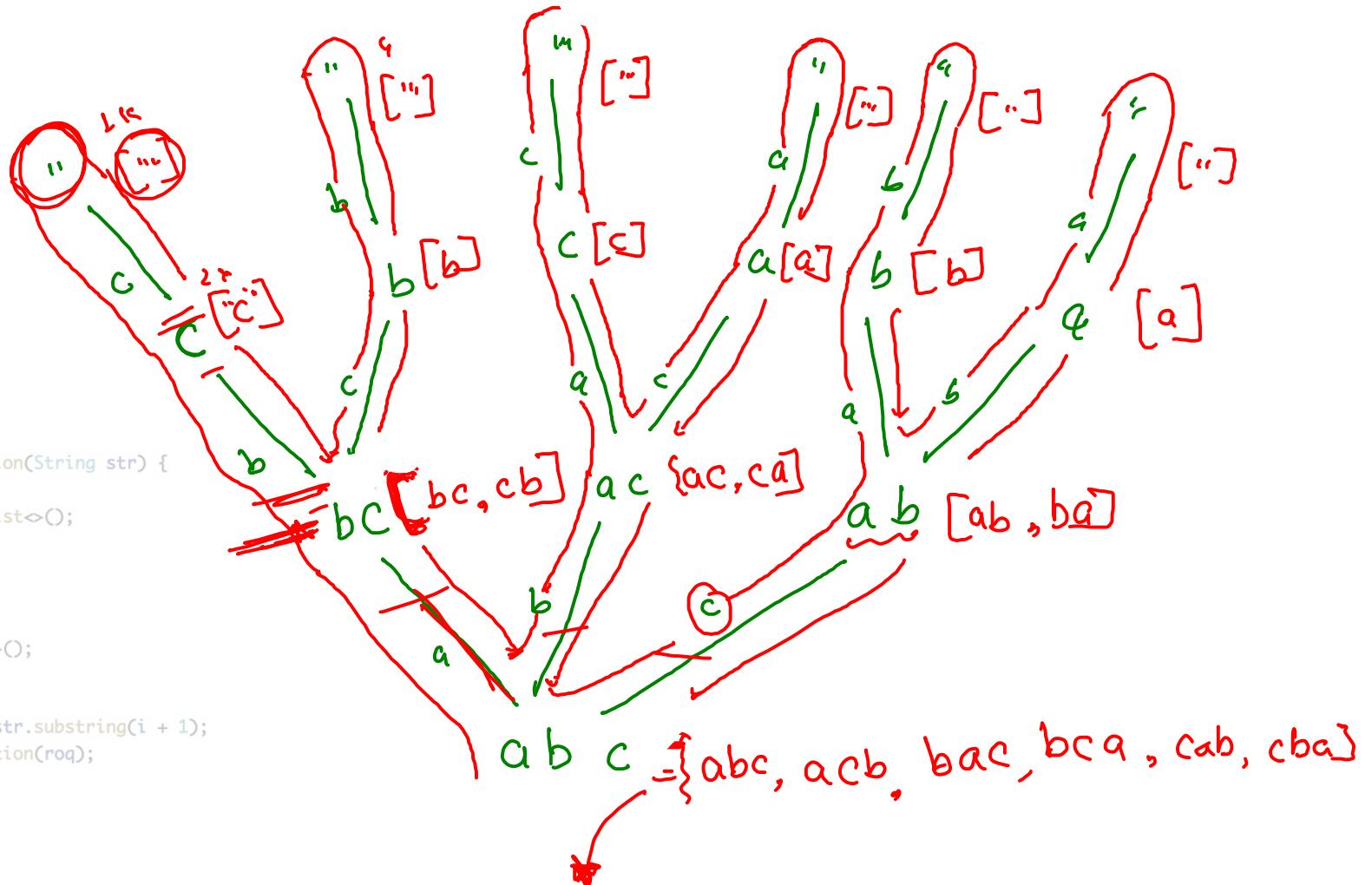


```

public static ArrayList<String> getPermutation(String str) {
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        char ch = str.charAt(i);
        String roq = str.substring(0, i) + str.substring(i + 1);
        ArrayList<String> rres = getPermutation(roq);
        for(String s : rres) {
            mres.add(ch + s);
        }
    }
    return mres;
}

```



## Point Encoding.

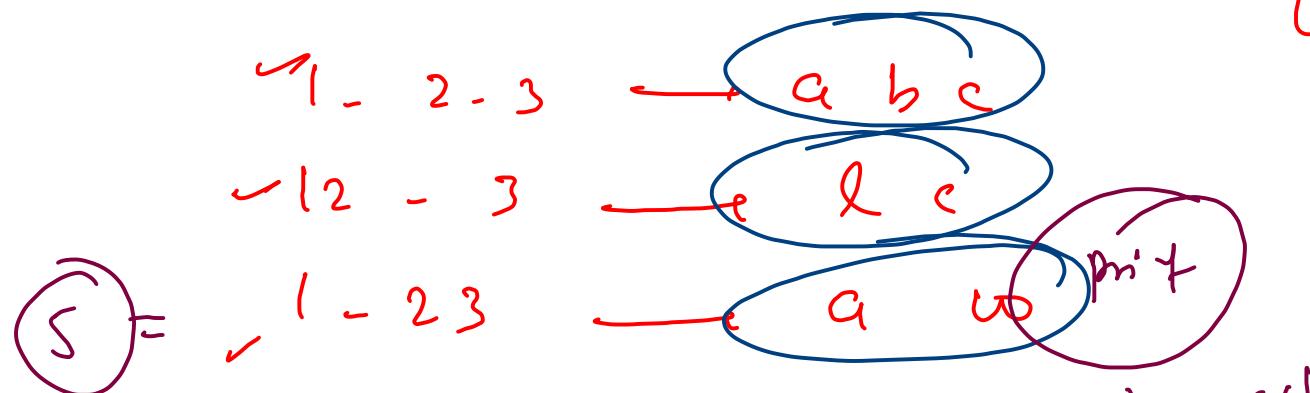
lo → j

String.  $\overline{\begin{matrix} 1 & 2 & 3 \\ - & - & - \\ \vdots & & \end{matrix}}$  → abc  
lc

5 1 27 512c

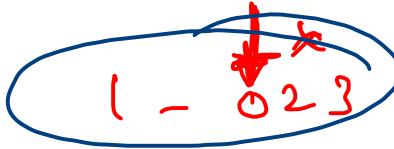
[8 - 12 - 7] 5-12c

1-a  
2-b  
3-c  
⋮  
16-1k



5-127  
[5 - 1 - 2 - 7] 5-1-2-7  
5-1-4

5127  
5-1-2-7

 x  $(5-12-7)$

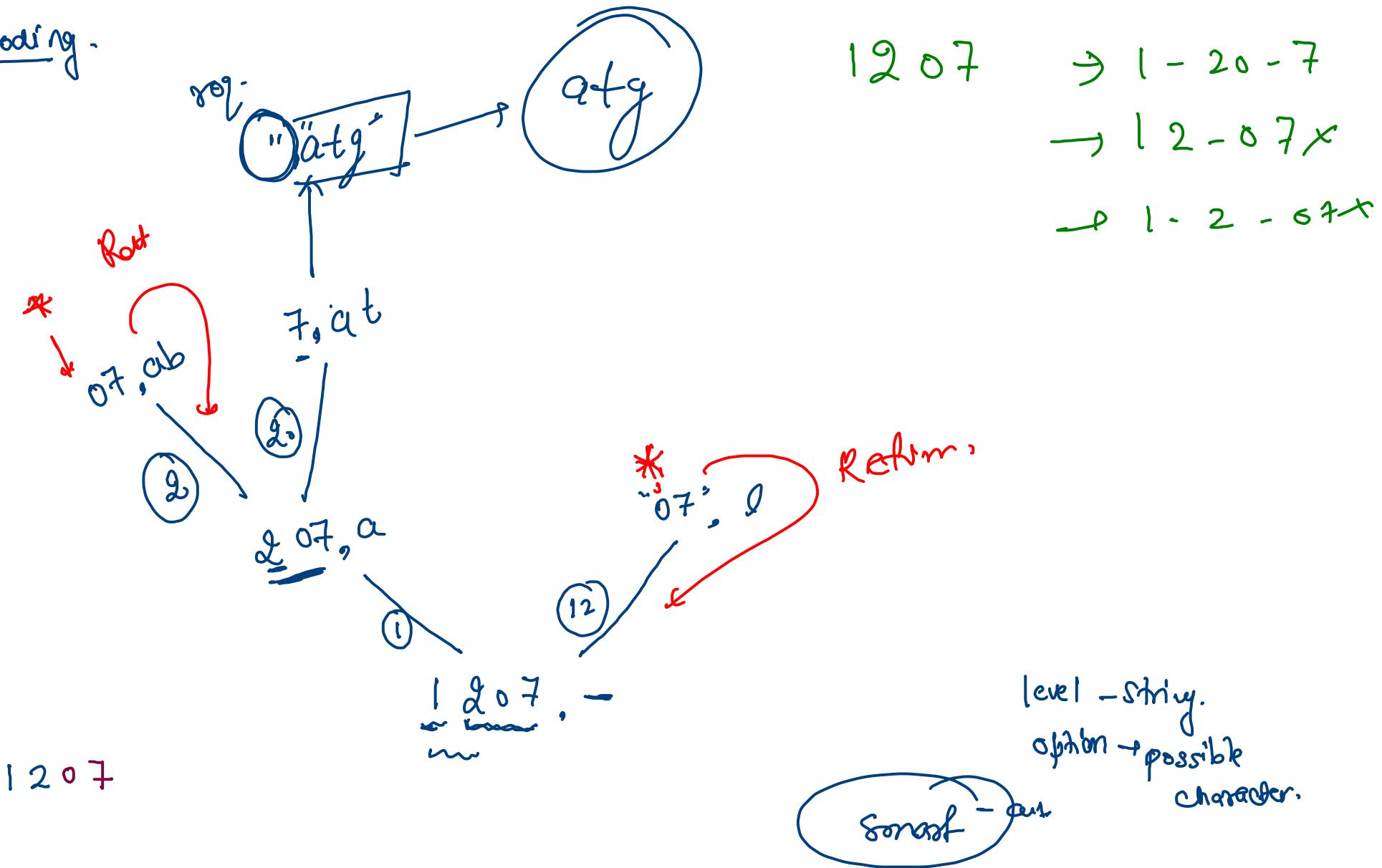
$\overline{\begin{matrix} 1 & 0 & 2 & 3 \\ - & - & - & - \\ \vdots & & & \end{matrix}}$

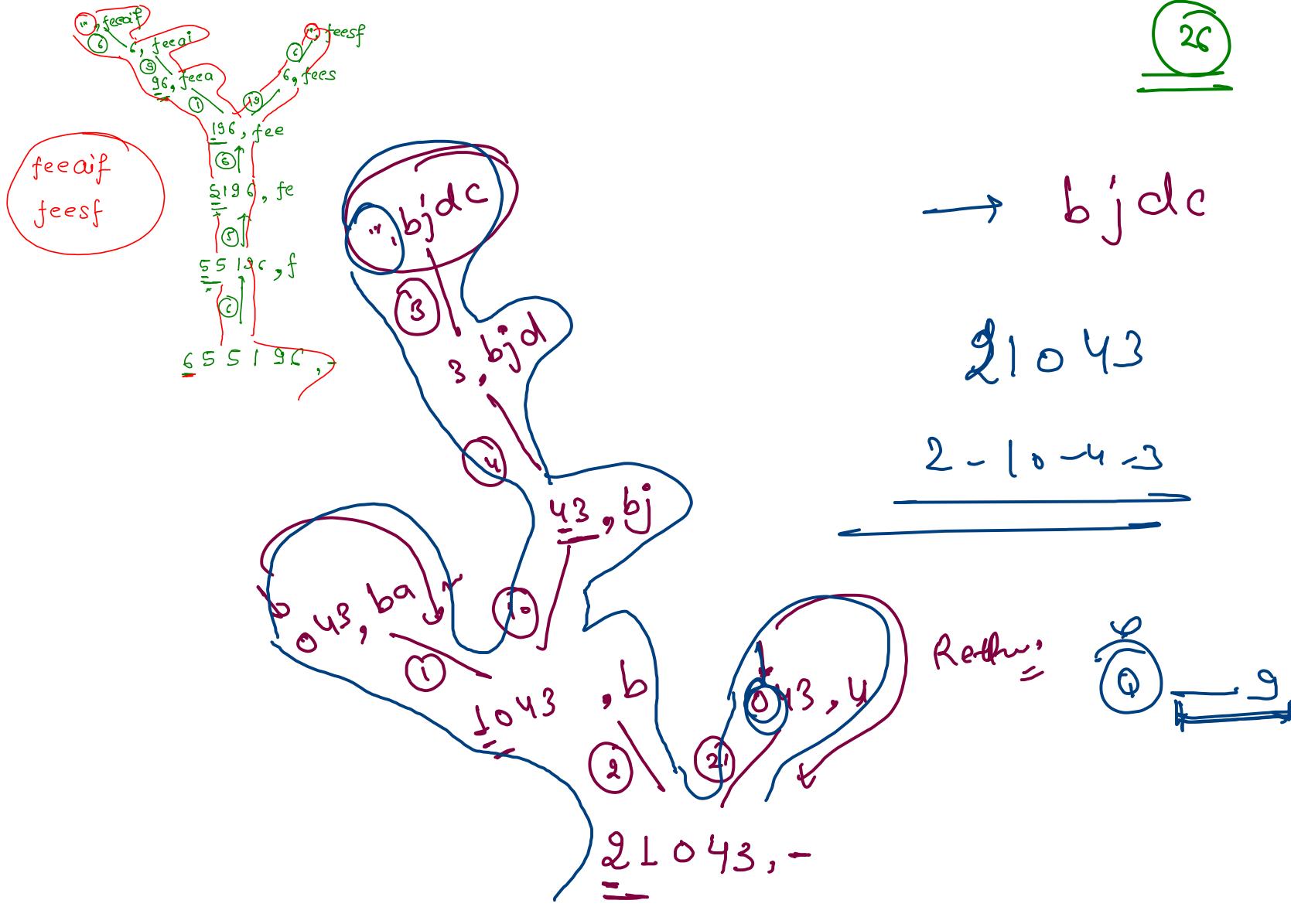
10 - 2 - 3

$10 - 2 - 3 \rightarrow j b c$   
 $5-12-7 = 102-1 = (10) \rightarrow ASCII$

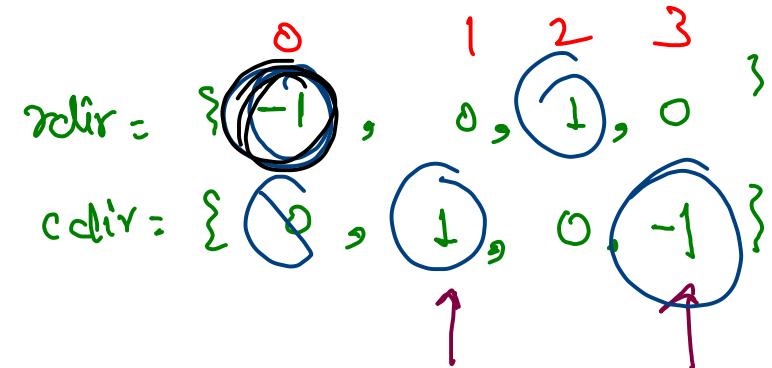
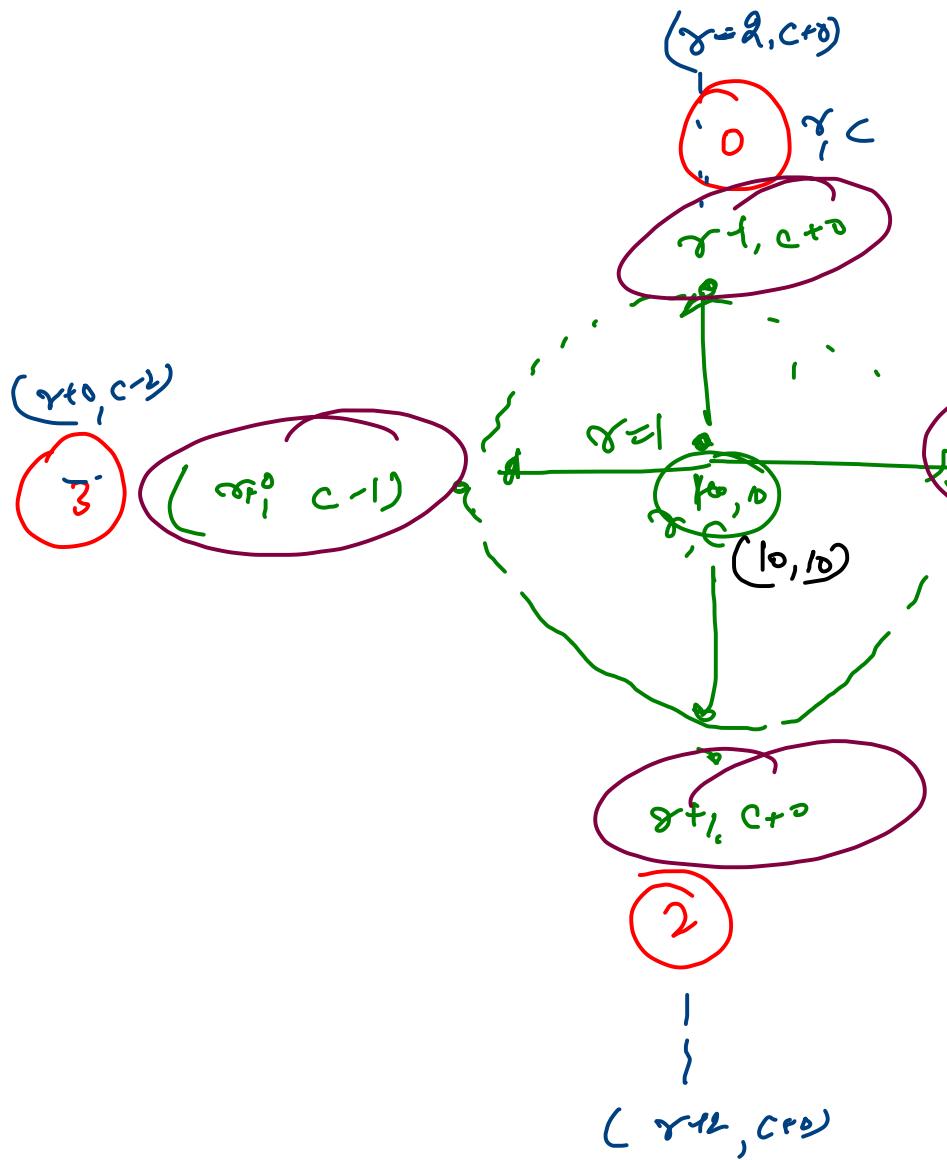
  
d 1 n o

## point Encoding -





a → 1	s - 19
b - 2	t - 20
c - 3	v - 21
d - 4	n - 22
e - 5	w - 23
f - 6	x - 24
g - 7	y - 25
h - 8	g - 26
i - 9	z - 26
j - 10	
k - 11	
l - 12	
m - 13	
ŋ - 14	
o - 15	
p - 16	
ɛ - 17	
r - 18	



$\gamma = (r, c)$        $rdir$        $cdir$   
 $0 \rightarrow (\gamma+1, c+0)$   
 $1 \rightarrow (\gamma+0, c+1)$   
 $2 \rightarrow (\gamma+1, c+0)$   
 $3 \rightarrow (\gamma+0, c+1)$

```

int radius = 1;
// for radius 1
for(int rad = 1; rad <= radius; rad++) {
    for(int dir = 0; dir < rdir.length; dir++) {
        int rr = r + rad * rdir[dir];
        int cc = c + (rad * cdir[dir]);
        System.out.println("Radius : " + rad + " -> row : " + rr + ", col :" + cc)
    }
}

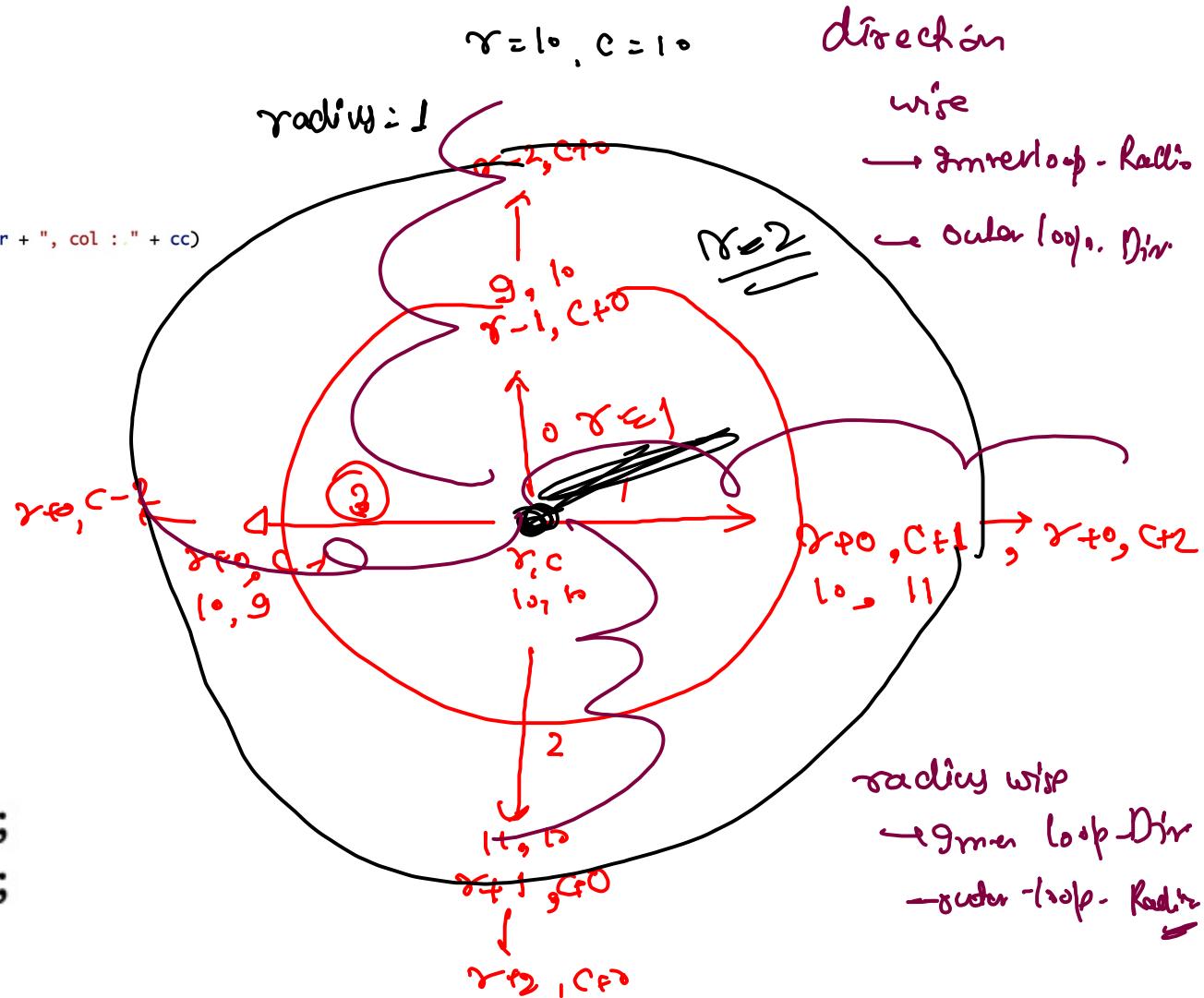
```

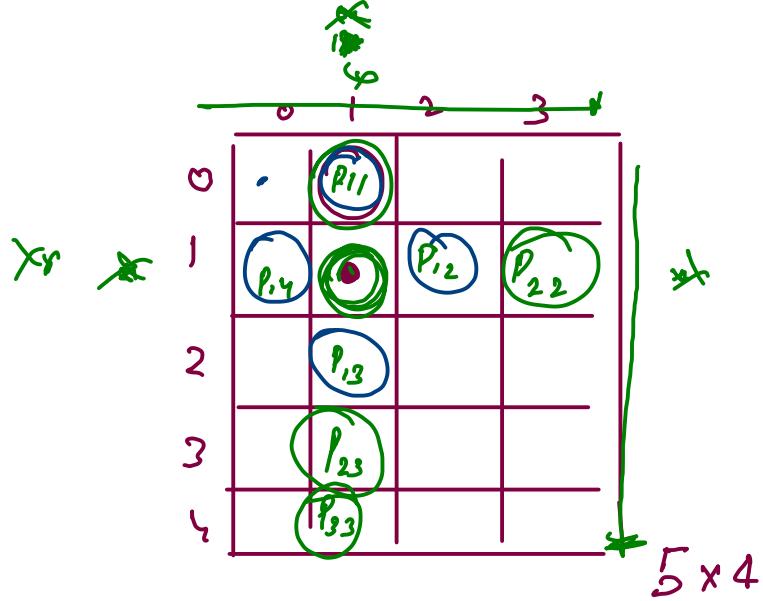
Radius : 1 -> row : 9, col : 10  
 Radius : 1 -> row : 10, col : 11  
 Radius : 1 -> row : 11, col : 10  
 Radius : 1 -> row : 10, col : 9  
 Radius : 2 -> row : 8, col : 10  
 Radius : 2 -> row : 10, col : 12  
 Radius : 2 -> row : 12, col : 10  
 Radius : 2 -> row : 10, col : 8

```

int[] rdir = {-1, 0, 1, 0};
int[] cdir = {0, 1, 0, -1};

```





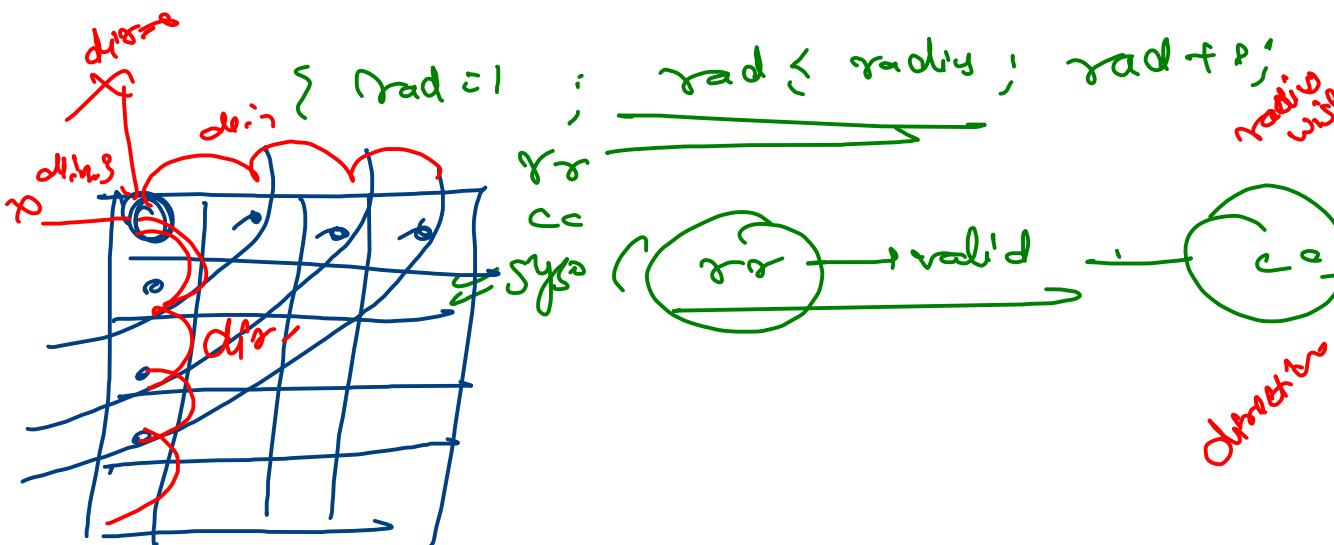
Radius wise

$(0,1), (1,2), (2,1), (1,0)$ ,  $(1,5), (3,1)$ ,  $(4,1)$   
 $\text{rad} = 1$        $\text{rad} = 2$        $\text{rad} = 3$

direction wise

$(0,1) - (1,2), (1,3)$ ,  $(2,1), (3,1), (4,1)$ ,  $(1,2)$   
 $\text{dir} = 1$        $\text{dir} = 2$        $\text{dir} = 3$

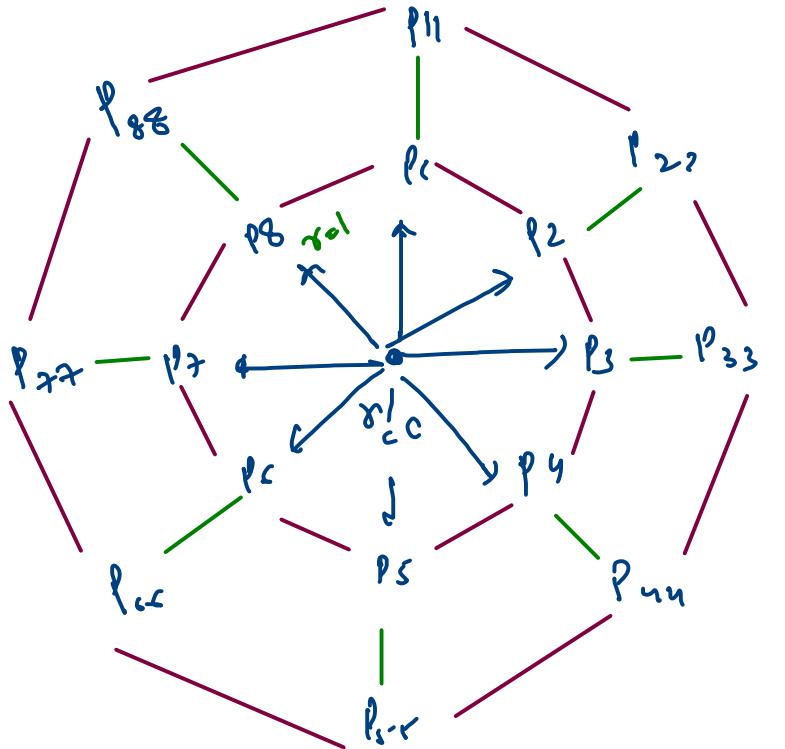
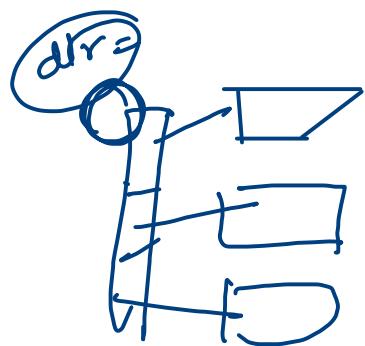
radius = max (arr\_left, arr\_right)



```

Radius : 1, dir : 0 :-> row : 0, col : 1
Radius : 1, dir : 1 :-> row : 1, col : 2
Radius : 1, dir : 2 :-> row : 2, col : 1
Radius : 1, dir : 3 :-> row : 4, col : 0
Radius : 2, dir : 1 :-> row : 1, col : 3
Radius : 2, dir : 2 :-> row : 3, col : 1
Radius : 3, dir : 2 :-> row : 4, col : 1
~~~~~
Radius : 1, dir : 0 :-> row : 0, col : 1
Radius : 1, dir : 1 :-> row : 1, col : 2
Radius : 2, dir : 1 :-> row : 1, col : 3
Radius : 1, dir : 2 :-> row : 2, col : 1
Radius : 2, dir : 2 :-> row : 3, col : 1
Radius : 3, dir : 2 :-> row : 4, col : 1
Radius : 1, dir : 3 :-> row : 1, col : 0

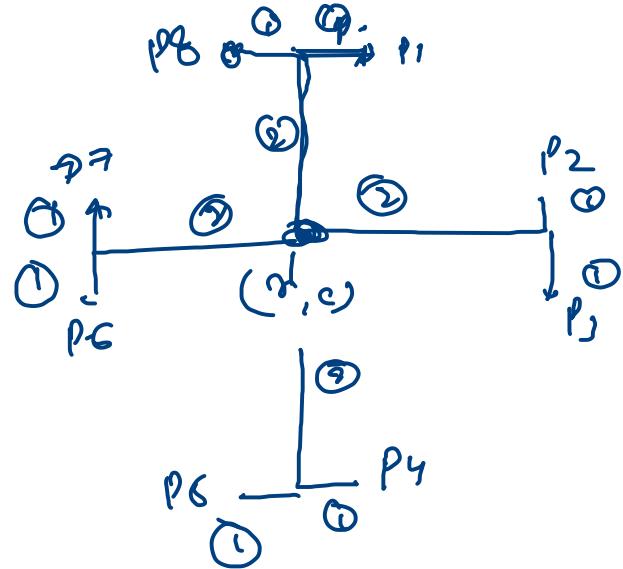
```



`int [ ] [ ] dir = { { -1, 0 }, { -1, 1 }, { 0, 1 }, { 1, 1 }, { 1, 0 }, { 1, -1 }, { 0, -1 }, { -1, -1 } }`

- | <u>for row 1</u>                             | <u>for row 2</u> |
|--|------------------|
| • $p_1 \rightarrow (r+1, c+0)$               | $(r-2, c+0)$     |
| • $p_2 \rightarrow (r+1, c+1)$               | $(r-2, c+1)$     |
| • $p_3 \rightarrow (r+0, c+1)$               | $(r+0, c+2)$     |
| • $p_4 \rightarrow (r+1, c+1)$               | $(r+2, c+2)$     |
| • $\textcircled{p}_5 \rightarrow (r+1, c+0)$ | $(r+2, c+0)$     |
| • $\textcircled{p}_6 \rightarrow (r+1, c-1)$ | $(r+2, c-2)$     |
| • $p_7 \rightarrow (r+0, c-1)$               | $(r+0, c-2)$     |
| • $p_8 \rightarrow (r+1, c-1)$               | $(r-2, c-2)$     |

$\gamma_{dir} =$   
 $c_{dir} =$



$dir = \{ \{ -2, 1 \}, \{ 1, 2 \}, \{ 1, 2 \}, \{ 2, 1 \}, \{ 2, -1 \}, \{ 1, -2 \}, \{ -1, -2 \}, \{ -2, -1 \} \}$

$P_1 \rightarrow (\gamma - 2, c + 1)$   
 $P_2 \rightarrow (\gamma + 1, c + 2)$   
 $P_3 \rightarrow (\gamma + 1, c + 2)$   
 $P_4 \rightarrow (\gamma + 2, c + 1)$   
 $P_5 \rightarrow (\gamma + 2, c + 1)$   
 $P_6 \rightarrow (\gamma + 1, c - 2)$   
 $P_7 \rightarrow (\gamma - 1, c - 2)$   
 $P_8 \rightarrow (\gamma - 2, c - 1)$