EDIT DISTANCE

Convert A to B.

Operations Permitted:
1) Insert
2) Delete
3) Replace

A = "abad" B = "abac"

↓ Replace

"abac"

⇒ O/P = 1

A = "Anshuman"
B = "Antihuman"

Replace 's' with 't'

"Anthuman"

↓ Insert 'i'

"Antihuman"

⇒ O/P = 2

A = "Anshuman" (i; 0 1 2 3 4 5 6 7)
B = "Antihuman" (j; 0 1 2 3 4 5 6 7 8)

A = "abcd"
B = "abd"

CASE-I: Insertion: 1 + get_min_steps ("shuman", "ihuman")
= 1 + get_min_steps (A[2…7], B[3…7])
A[i…], B[j+1…]

CASE-II: Deletion: 1 + get_min_steps ("human", "tihuman")
= 1 + get_min_steps (A[3…7], B[2…8])
A[i+1…], B[j…]

CASE-III: Replace: 1 + get_min_steps ("human", "ihuman")
= 1 + get_min_steps (A[3…7], B[3…8])
A[i+1…], B[j+1…]

"abc"
"abd"

if (i == A.length()) ⇒

A = "" B = "abc"

A = "abc"
B = "abcde"

i = 3
j = 3

5 − j = 5 − 3 = 2

A = "abc"
B = "abc"

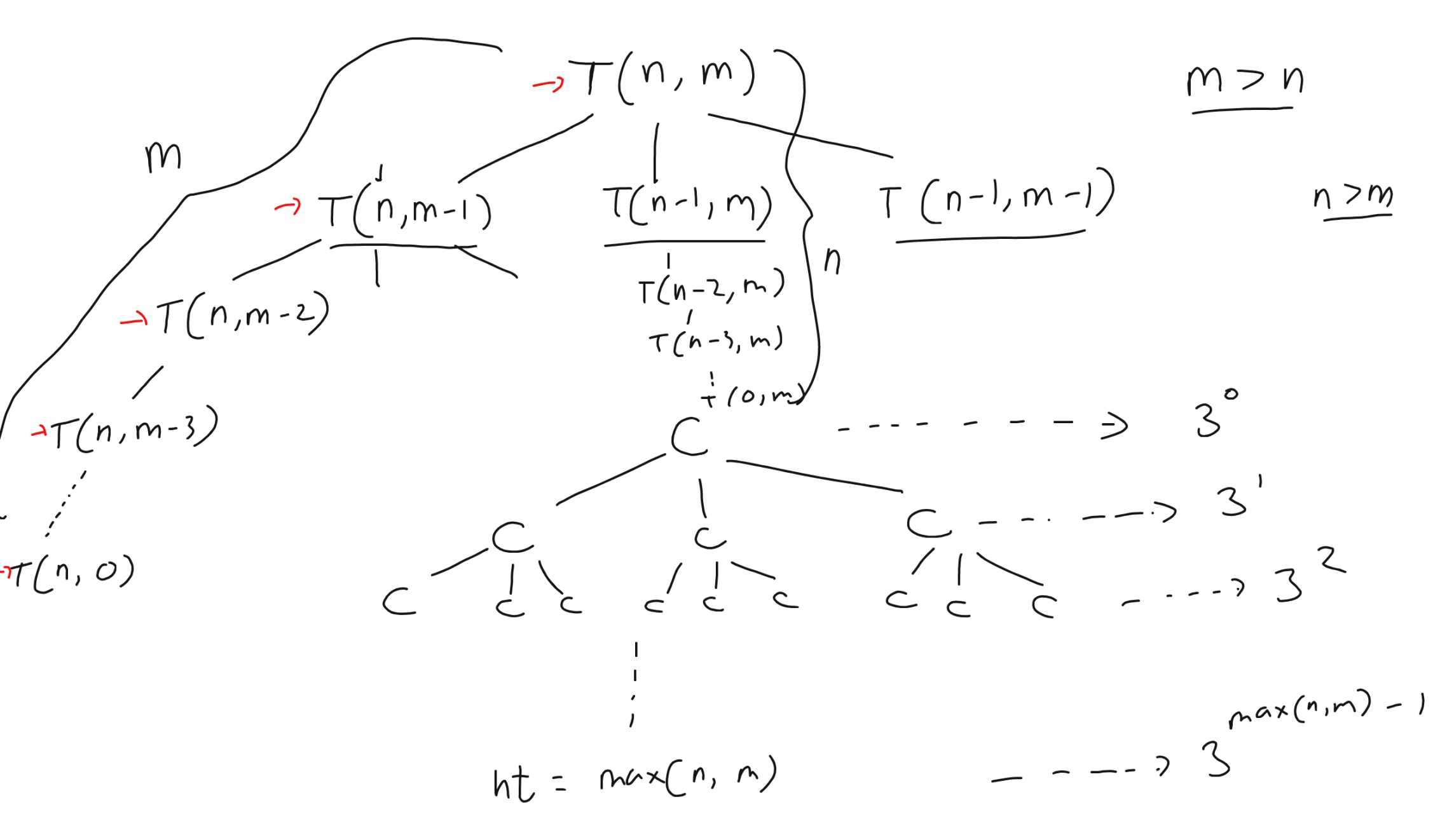
i = 3
j = 3

3 − j = 3 − 3 = 0

A = "abcde"
B = "abc"

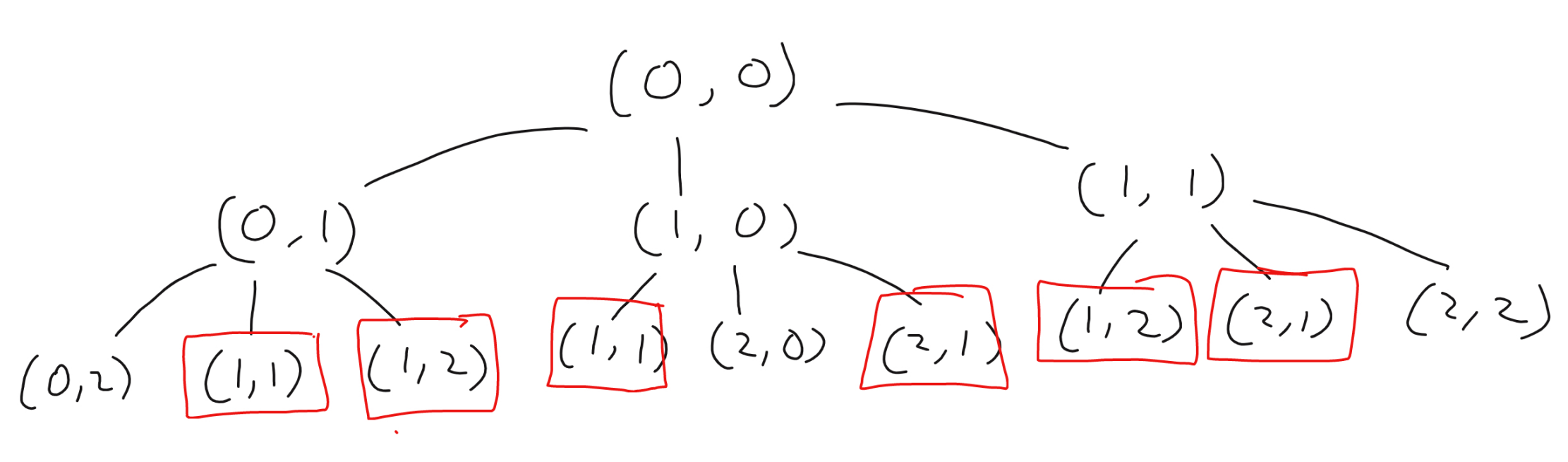
i = 3
j = 3

= A.length() − i
= 5 − 3 = 2

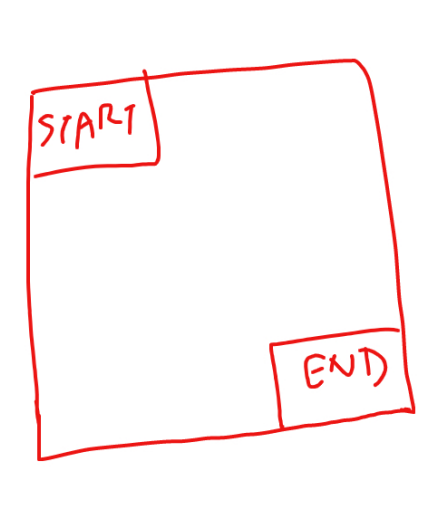


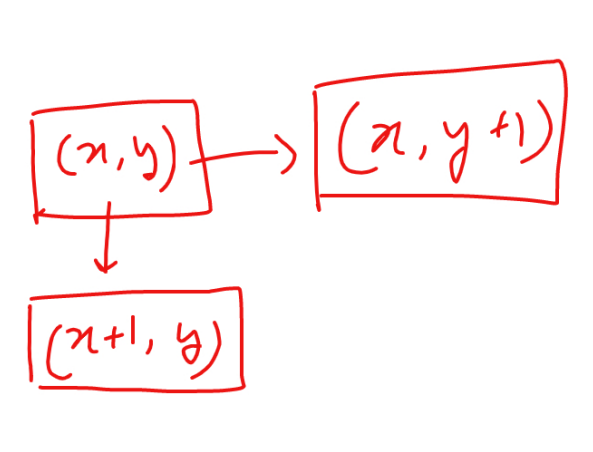
T(n, m)
m
T(n, m-1)
T(n-1, m)
T(n-1, m-1)
m > n
n > m
T(n, m-2)
T(n, m-3)
T(n, 0)
T(n-2, m)
T(n-3, m)
T(0, m)
n
C
3⁰
3¹
3²
ht = max(n, m)
3^max(n,m) − 1

$$\Rightarrow O\left(3^{\max(n,m)}\right)$$

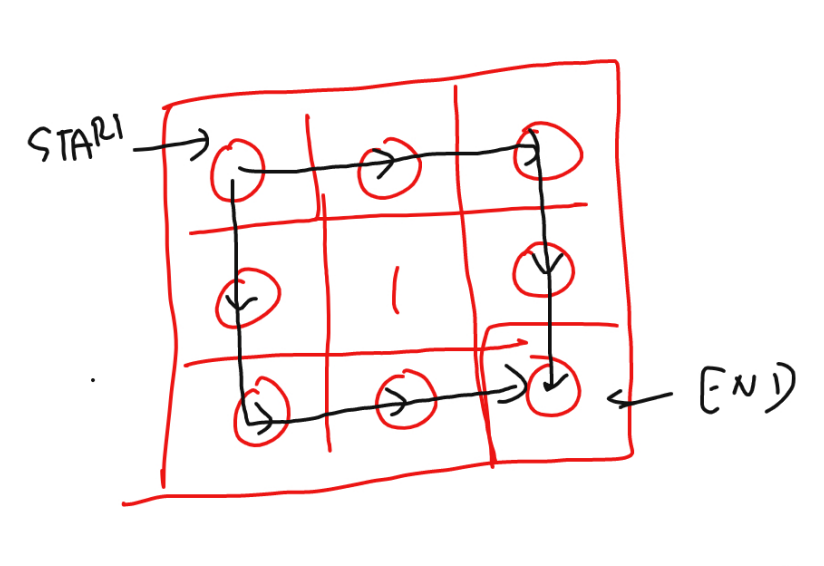


(0, 0)
(0, 1)
(1, 0)
(1, 1)
(0, 2)
(1, 1)
(1, 2)
(1, 1)
(2, 0)
(2, 1)
(1, 2)
(2, 1)
(2, 2)

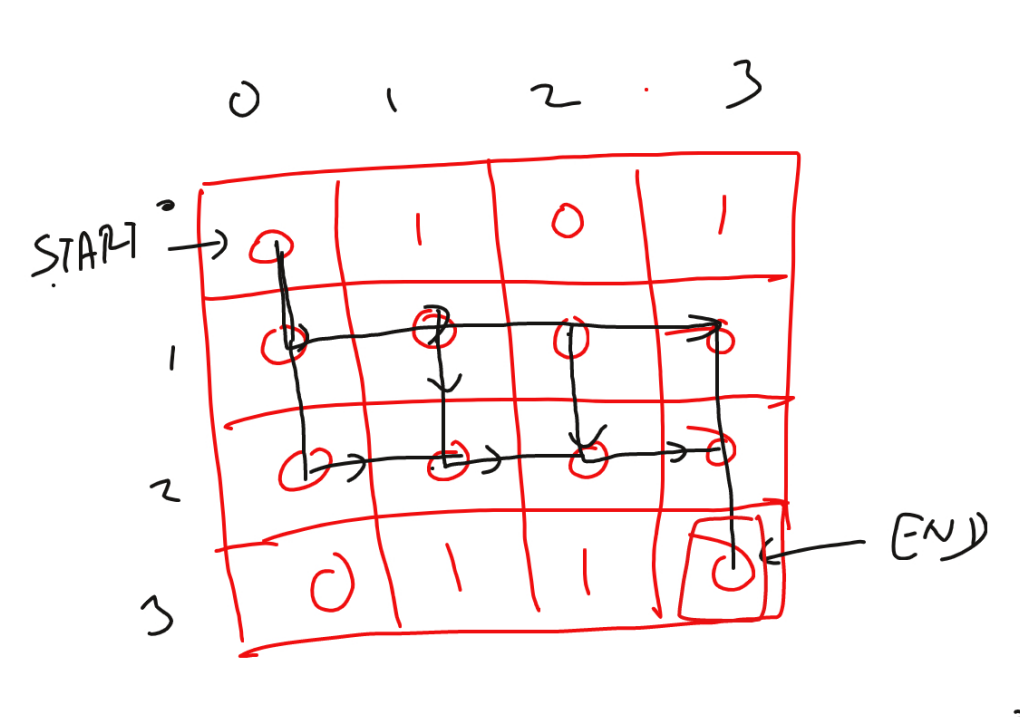




0 → Empty space
1 → Obstacle



⇒ O/P = 2



0 1 2 3
START
0 1 2 3
1 0 1
0 1 1
END

(0, 0) → (0, 1) → (1, 1) → (1, 2) → (1, 3) → (2, 3) → (3, 3)

⇒ O/P = 3

path_count_starting_from (0, 0) = path_count_starting_from (0, 1) + path_count_starting_from (1, 0)
(i, j)   (i, j+1)   (i+1, j)

⇒ BASE-CASE ⇒ if (i == n-1 && j == m-1)
⇒ return 1

(0,0) − (1,0)

mat

	0	1	2	3
0	0	⇒1	0	1
1	⇒0	0	0	0
2	0	0	0	0
3	0	1	1	0

dp

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

→ O/P

dp[i][j] == no. of paths possible to reach (i, j) from (0, 0)

$$\Rightarrow \boxed{dp[i][j] = dp[i-1][j] + dp[i][j-1]}$$

iff (i, j) is not an obstacle

otherwise, if (i, j) is an obstacle: dp[i][j] = 0

mat ⇒ 0, 0, 1, 0, 1
dp ⇒ 1, 1, 0, 0, 0