

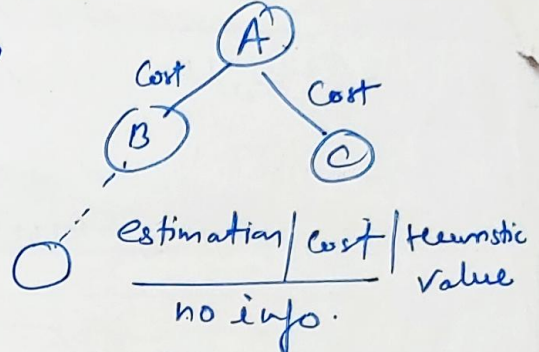
# DFS (Depth First Search)

① Uninformed Search technique

② Stack (LIFO)

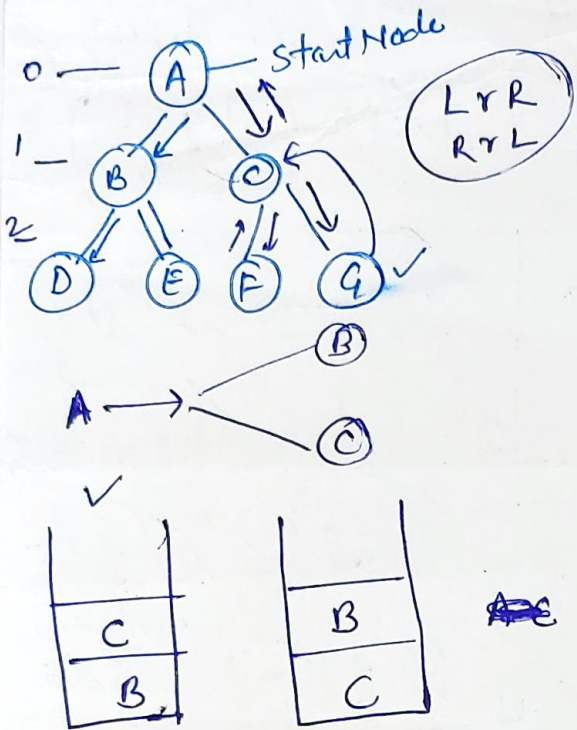
③ Present Knowledge  
no domain level knowledge

④



⑤

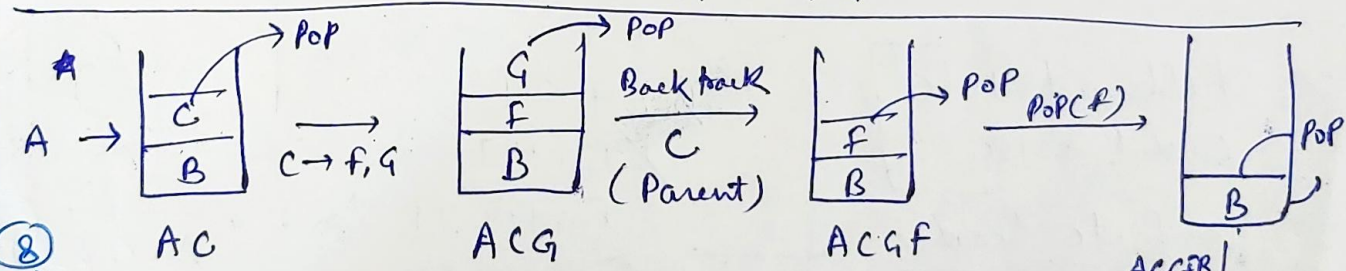
Brute force / Blind Search



⑥ Work on Deepest Node

⑦ first go to Deepest Node → Not found goal state

Other direction → Other direction → Back track



⑧ It is → may be it will not give soln or output

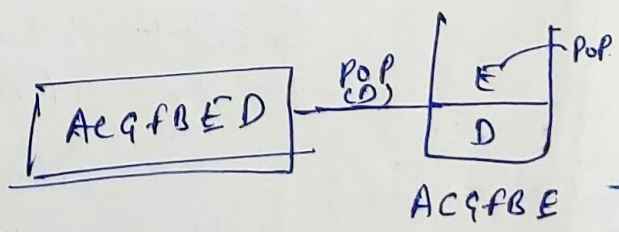
Incomplete → infinite move  
in one direction

→ cycle (loop)

→ infinite search space

↳ move in one direction

↳ may be goal state in other direction



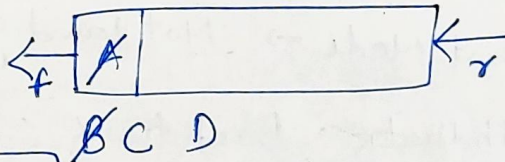
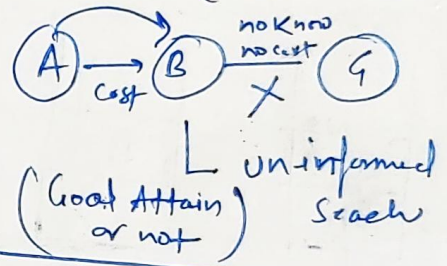
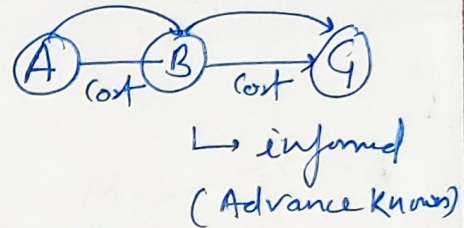
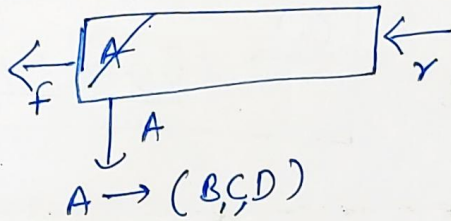
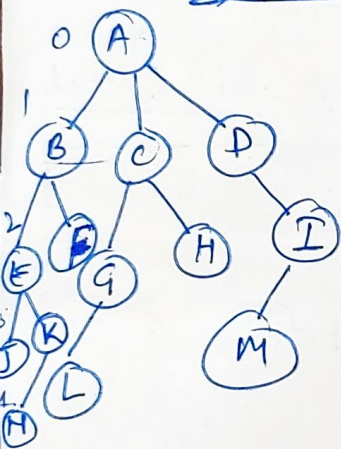
Not optimal: —  $Sol_1(Cost) > Sol_2(Cost)$  X (cost same)  
X (cost diff) ②

Time complexity: —  $O(V+E)$   $O(bd)$  b — branching — 2  
d — depth — 2

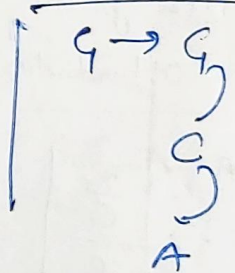
G Search (4 searches need to find goal state)

BFS → (Breadth first Search)

- Uninformed Search
- FIFO (Queue)



~~B C D~~  
~~DEF~~  
~~DEFGH~~  
~~EFGHI~~  
~~F G H I J K~~  
~~G H I J K~~  
~~H I J K L~~  
~~I J K L~~  
~~J K L M~~



A C G

- Shallowest Node
- level wise
- Complete Search

→ optimal →  $\sqrt{\text{cost (same)}}$  ? both same  
 $\times \text{cost (diff)}$

→ Time complexity —  $O(V+E)$

$S(G) \rightarrow b \rightarrow 3$   
 $d \rightarrow 2$   
 $3^2 = (9)$

$O(bd)$  — narrow tree  
 b — branch factor  
 d — depth

~~K L M~~  
~~K L M~~  
~~M N~~  
~~N~~



# 8- Puzzle Problem without Heuristic

(3)  
BFS

→ Blind Search (Uninformed)

→ BFS

→  $O(b^d)$

→ 4 moves (up, down, left, right)

tile

1	2	3
	4	6
7	5	8

1	2	3
4	5	6
7	8	

R S U D

1	2	3
4		6
7	5	8

	2	3
1	4	6
7	5	8

1	2	3
7	4	6
	5	8

$$\begin{matrix} 3 \\ 3^3 = 9 \end{matrix}$$

D L R

1	2	3
4	5	6
7		8

1	2	3
	4	6
7	5	8

1	2	3
4	6	
7	5	8

1		3
4	2	6
7	5	8

b → branching  
d - depth

Complex

$$3^{20}$$

3.5 billion  
Search

1	2	3
4	5	6
	7	8

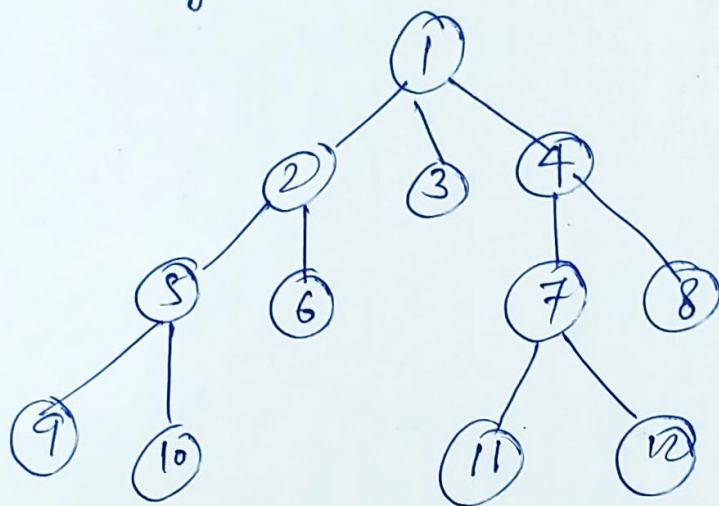
1	2	3
4	5	6
7	8	

.	x	.
x		x
.	x	.

$$\text{branching} = 2 \times 4 + 4 \times 3 + 1 \times 4 = \frac{24}{9} = \sqrt{2.67} = 3$$

## Question for Practise

- ①. Find DFS & BFS of the give Problem. Also state which is optimal if equal weights are given as cost to each edge.



- ②. Solve the 8 Puzzle Problem Using Uniform Search strategy: -

1	2	3
5	6	
7	8	4

S

1	2	3
5	8	6
	7	4

G.