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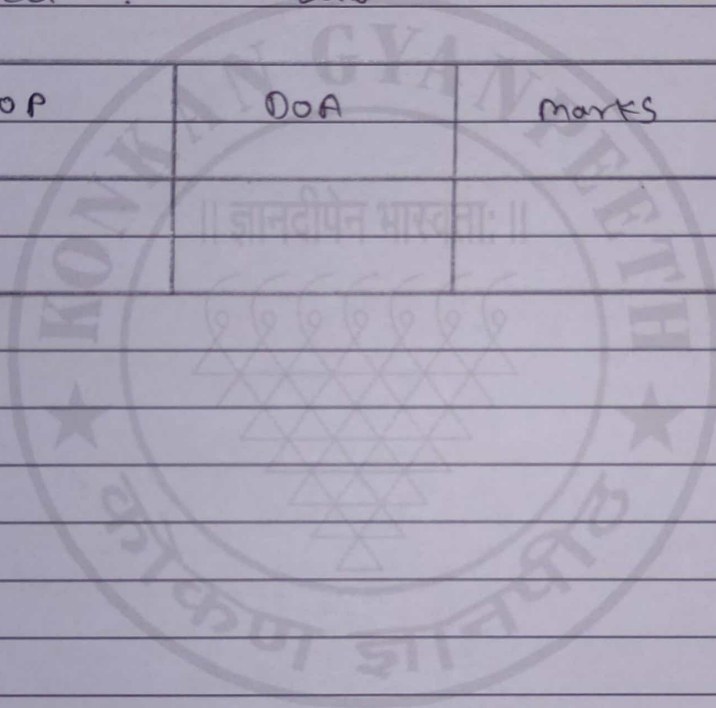
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## Min-Max Algorithm:

### → Min max Algorithm:

It is recursive algo which is used in decision making and game theory. It provides an optimal move for player assuming that opponent is also playing optimally.

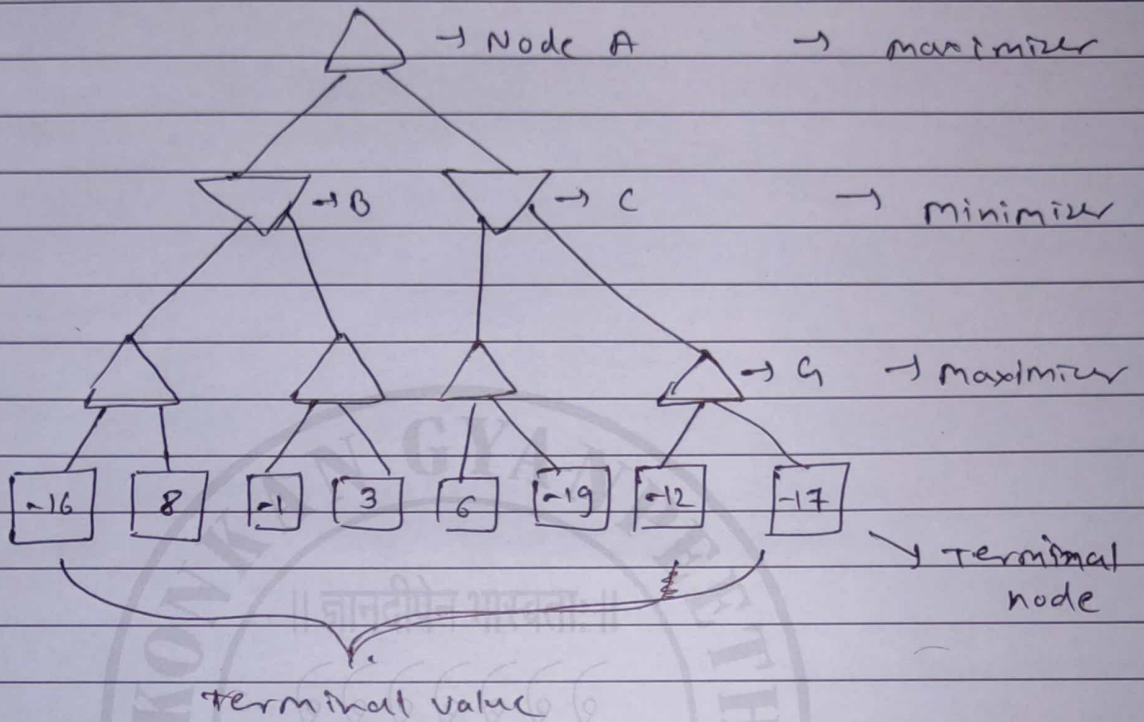
Min max algo uses recursion to search through game tree.

In this algo 2 player play game, one is called max and other is min. Min-Max algo is used for game playing in AI.

### \* Step 1

Let's take A is initial state of tree. Suppose Maxim takes first two or which has worst case initial value =  $-\infty$  and min will take next two which has worst case initial value =  $+\infty$ .





Step 2 :-

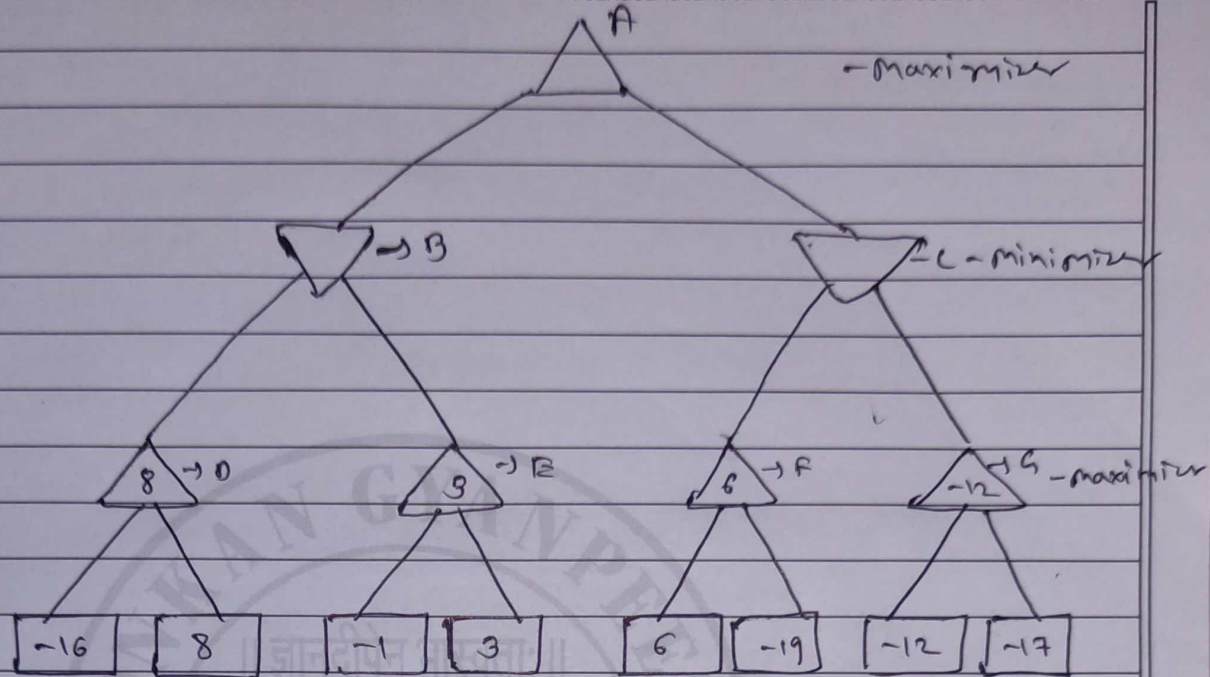
First we find utilities value for maximizer its initial value is  $-\infty$  so we will compare each value in terminal state with initial value of maximizer and determines higher need values. It will find max. among all.

For Node D:  $\max(-16, -\infty) \rightarrow \max(-16, 8) = 8$

For Node E:  $\max(-1, -\infty) \rightarrow \max(-1, 3) = 3$

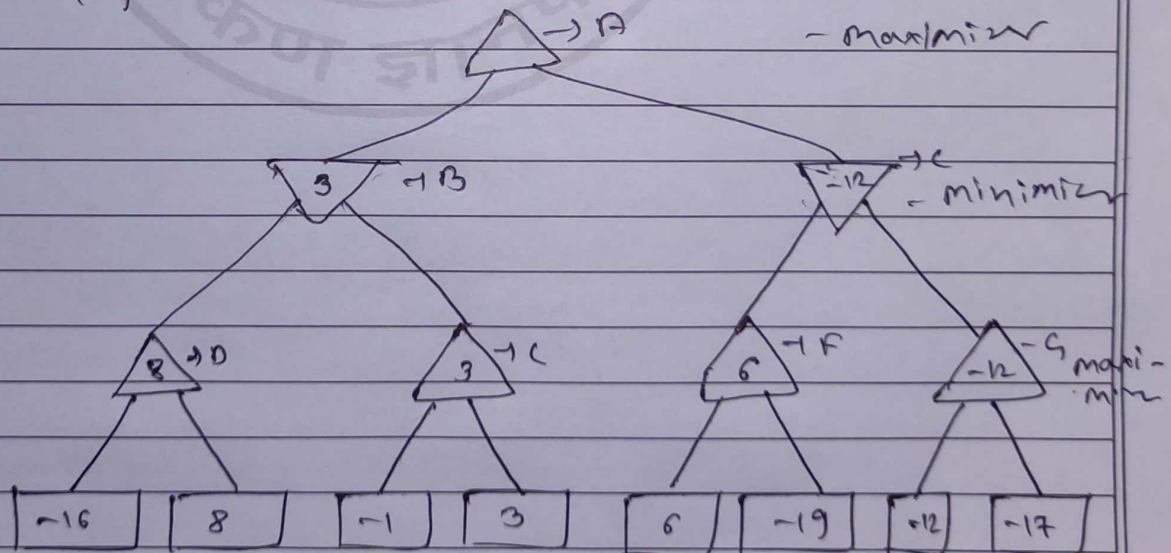
For node F:  $\max(s, -\infty) \rightarrow \max(6, -19) = 6$

For Node G:  $\max(-12, -\infty) \rightarrow \max(-12, -17) = -12$



- Step 3 :

In next step its turn for minimizer, so it will compare all nodes value with 2 or will find 3rd player node value.



For Node B :  $\min(8, 3) = 3$

for node c :  $\min(0, -12) = -12$



now its turn for maximizer and it will again choose maximum of all nodes values and find maximum all node values or find max-value for root node

Diagram illustrating a minimax tree structure for a game:

- Root Node (Maximizer):** Triangle labeled 3, with  $\rightarrow A$  and  $- \text{maximizer}$ .
- Level 1 (Minimizer):**
  - Triangle labeled 3, with  $\rightarrow B$  and  $- \text{minimizer}$ .
  - Triangle labeled -12, with  $\rightarrow C$  and  $- \text{minimizer}$ .
- Level 2 (Maximizer):**
  - Triangle labeled 8, with  $\rightarrow D$  and  $- \text{maximizer}$ .
  - Triangle labeled 3, with  $\rightarrow E$  and  $- \text{maximizer}$ .
  - Triangle labeled 6, with  $\rightarrow F$  and  $- \text{maximizer}$ .
  - Triangle labeled -12, with  $\rightarrow G$  and  $- \text{maximizer}$ .
- Level 3 (Leaf Nodes):** Rectangles containing values: -16, 8, -1, 3, 6, -19, -12, -17.

Arrows indicate the flow of the game from the leaf nodes up to the root.

Hence, it was complete work flow of minmax algorithm with two play games.