# MinMax Algorithm
(Module 3)

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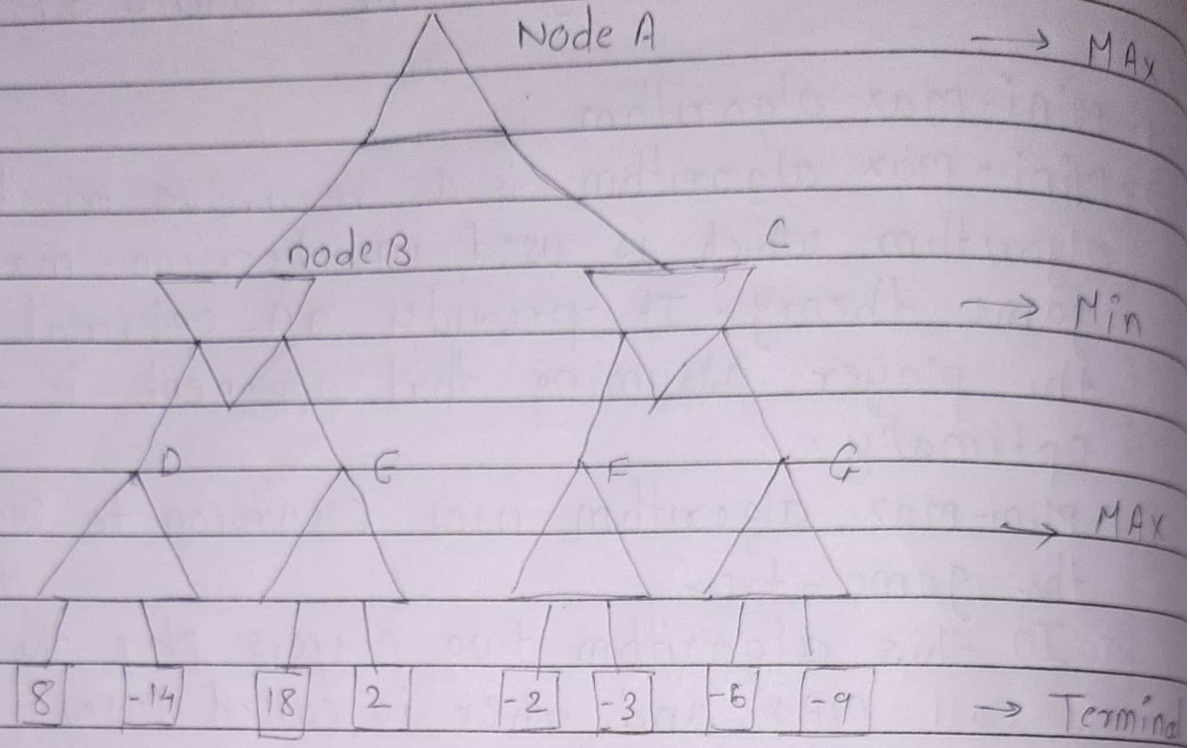
# Mini-MAX Algorithm (Module 3)

* Mini-Max algorithm

→ - Mini-Max algorithm is a recursive or backtracking algorithm which is used in decision-making and game theory. It provides an optimal move for the player assuming that apponent is also playing optimally.

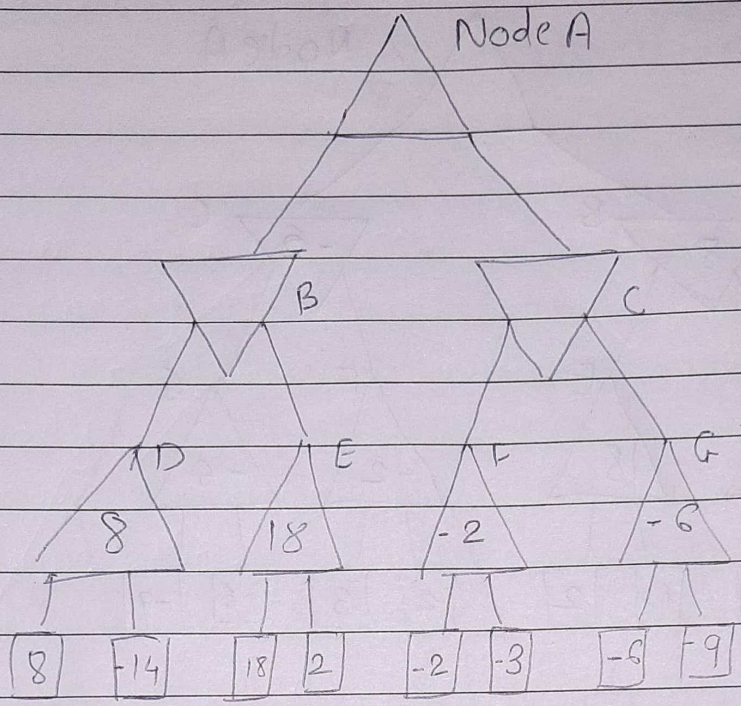
- Mini-max algorithm uses recursion to search through the game-tree
- In this algorithm two players play the game, one is call MAX and other is called MIN.
- min-Max algorithm is mostly used for game playing in AI. such as chess, checkers, tic-toc-toe. This Algorithm computes the minimax decision for the current state.

Step 1 : In the first step, the algorithm generates the entire game-tree and apply the utility function to get the utility values for the terminal states In the below tree algorithm, let's take A is the initial state of the tree. Suppose maximizer take first turn which has worst-case initial value = - infinity, and minimizere will take next turn which has worst-case initial value = + infinity.



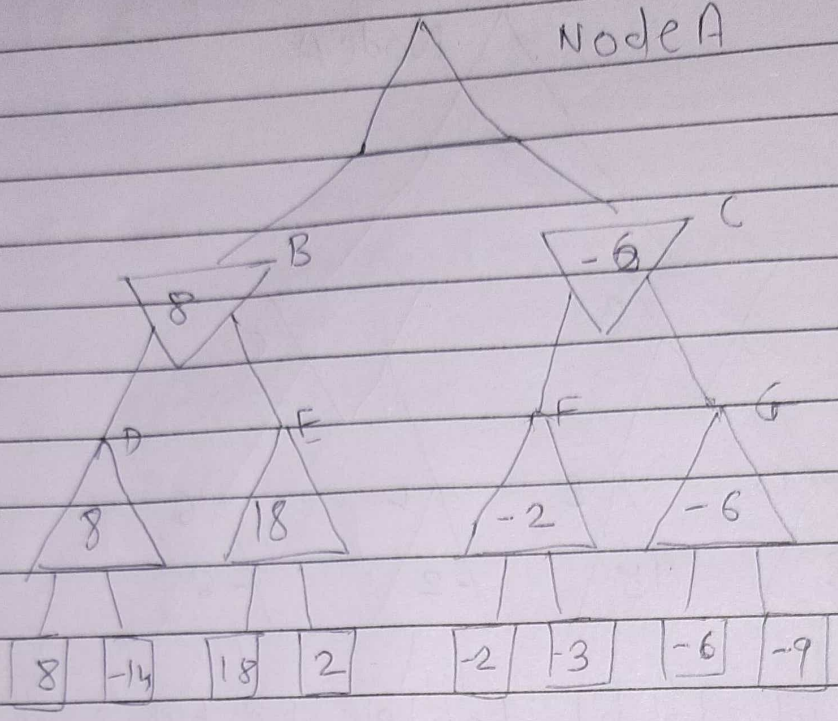

Step 2: Now, first, we find the utilities value for the maxmize, its initial value is $-\infty$, so we will compare each value in terminal state with initial value of maximizer and determines the higher nodes values. It will find the maximum among the all.

- For node D $\max(8, -\infty) \Rightarrow \max(8, -14) = 8$
- For node E $\max(18, -\infty) \Rightarrow \max(18, 2) = 18$
- For node F $\max(-2, -\infty) \Rightarrow \max(-2, -3) = -2$
- For node G $\max(-6, -\infty) \Rightarrow \max(-6, -9) = -6$



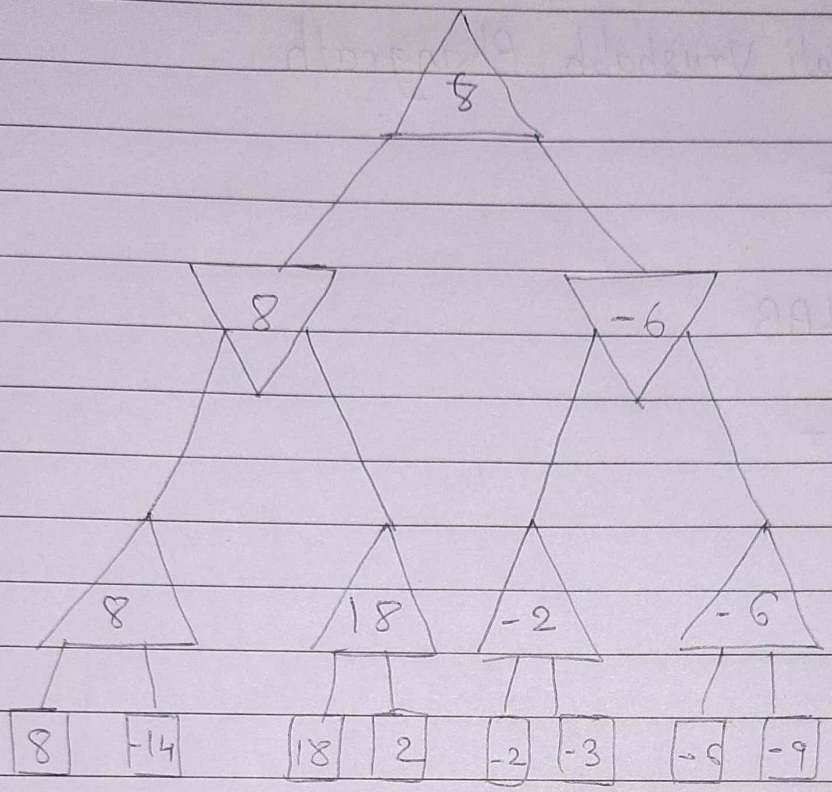

Step 3 :- In the next step its a turn for minimizer So it will compare all nodes value with +∞ and will find the 3rd layer node value

- For node B = min ( 8, 18 ) = 8
- For node C = min ( -2, -6 ) = -6




Step 4 :- Now its a turn for maximizer and it will again chose the maximum value for the root node. In this game tree, there are only 4 layers, hence we reach immediately to the root node. but in real game, there will be more than 4 layers

- For node A max (8, -6) = 8
- B




→ MAX

→ MIN

→ MAX

- Terminal noded

That was the complete workflow of the minimax algorithm with two player game.