K.G.C.E.
Karjat - Raigad

Alphabeta pruning

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- Alpha Beta Pruning :-

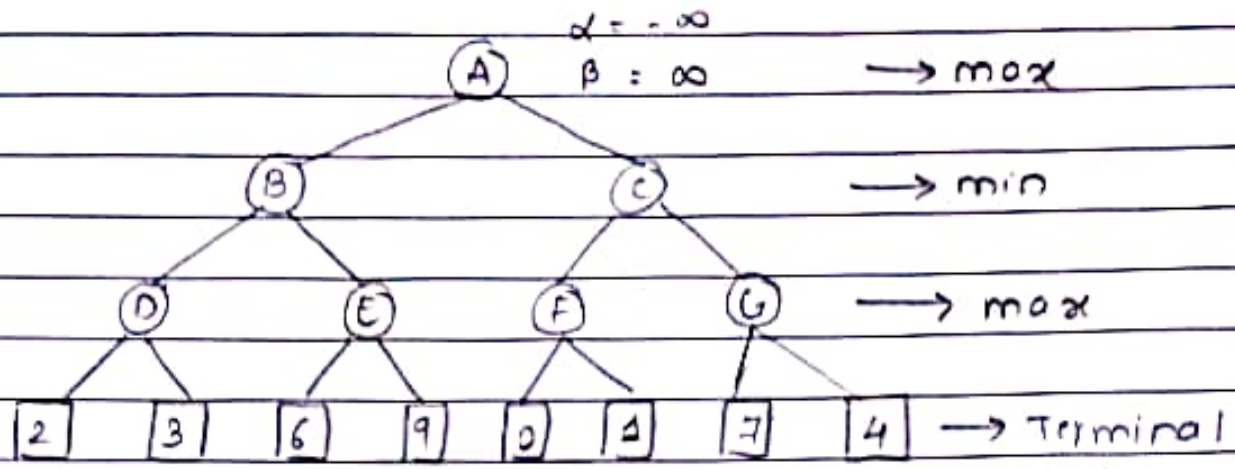
- It is a modified Version of minmax algorithm. It is an optimization technique for minmax algorithm.

- There is a technique by which without checking each other node of game tree we can compute correct minmax decision and this technique is called pruning. This involves two threshold parameter Alpha and beta for future expansion. So it is called Alpha-Beta Pruning.

- Alpha :-
  The best (highest value) choice we have found so far at any point along the path of maximizer (max. player).
  The initial value of alpha is $-\infty$.

- Beta :-
  The best (lowest value) found in the path in or at minizer $+\infty$. (min player).

- It removes all the nodes which are not really affecting the final decision.



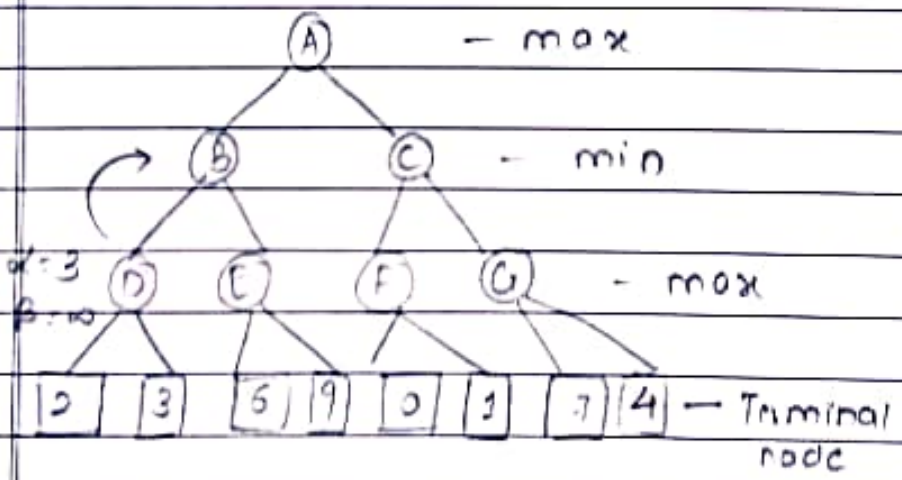
- While backtracking, node values will be passed to upper nodes instead of value of alpha and beta.

- We will only pass alpha, beta values to child nodes.

* Explanation :-

step 1 :-

max(2,3) = 3, So node D value will also be 3, α = 3



Step 2 :-

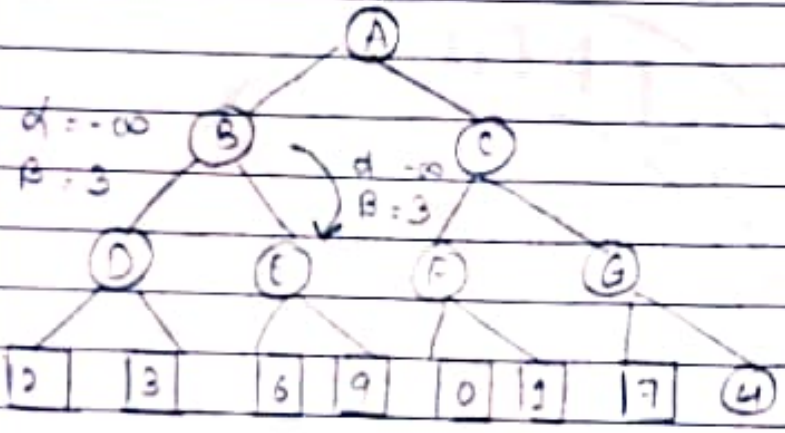
for backtracking,

$\alpha = -\infty$

$\beta = \min(3, \infty)$

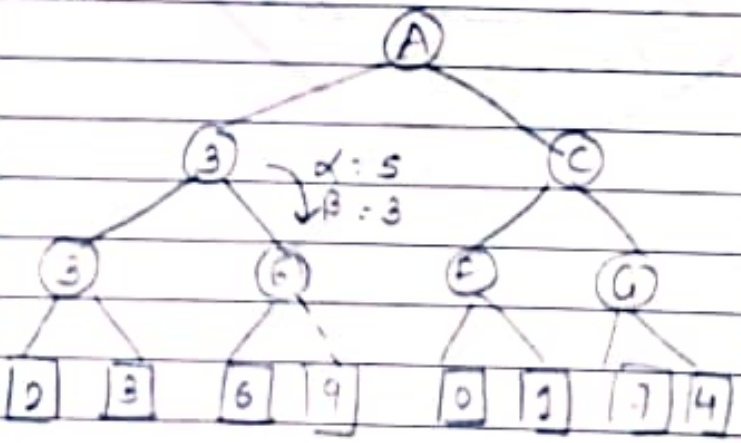
↑ inital value

In min, β changes



Step 3 :-

So,



While doing max, α value changes

$\max(-\infty, 6) = 6$

$\alpha = 6$ $\boxed{\alpha \geq \beta}$

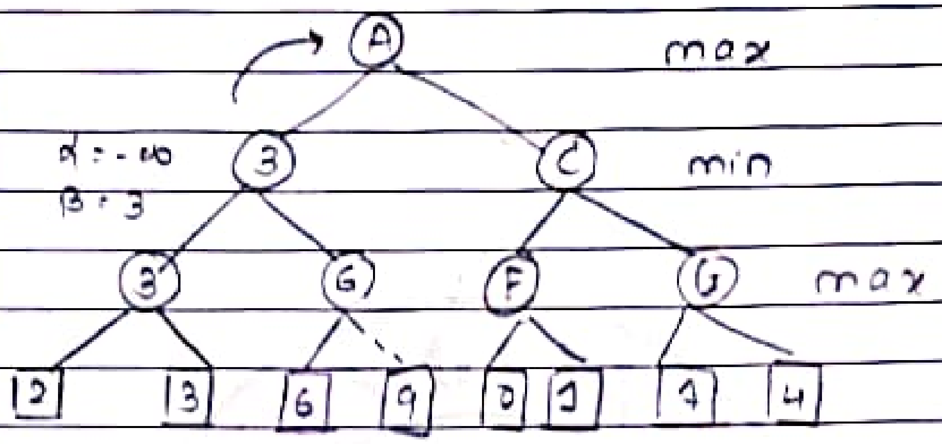
$\max(-\infty, 6) = 6$

$\therefore \alpha = 6$

$\therefore \boxed{\alpha \geq \beta}$

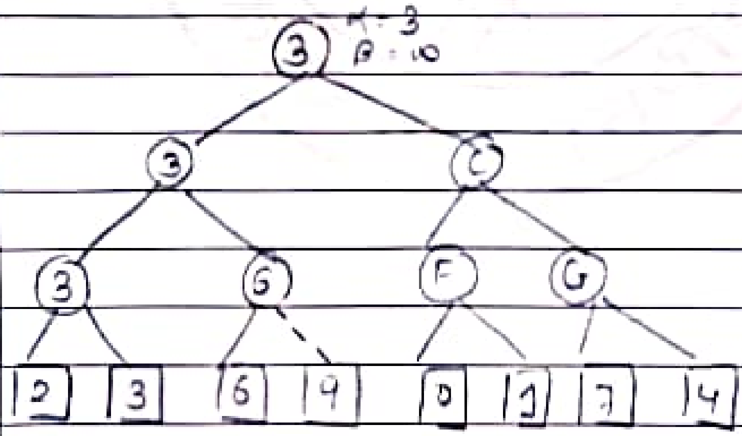
Here, pruning process occurs

Step 4 :-

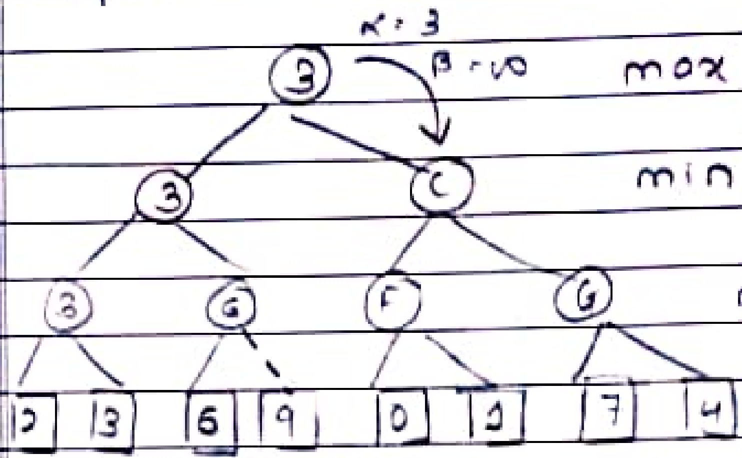


Now, we are moving from B to A i.e 3 to A
That is we are backtracking it,

$\alpha = max(-\infty, 3) = 3$
$\alpha = 3$

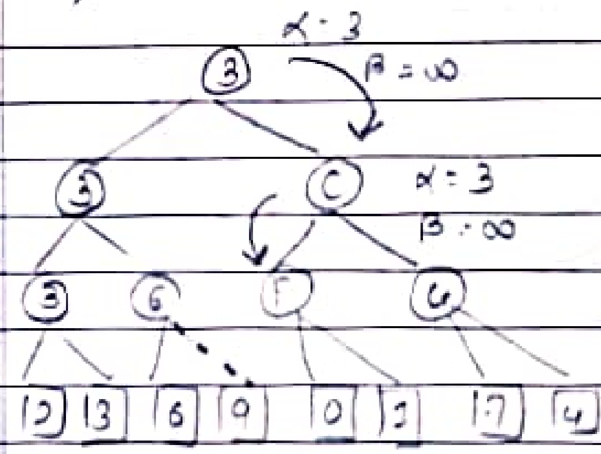


Step : 5

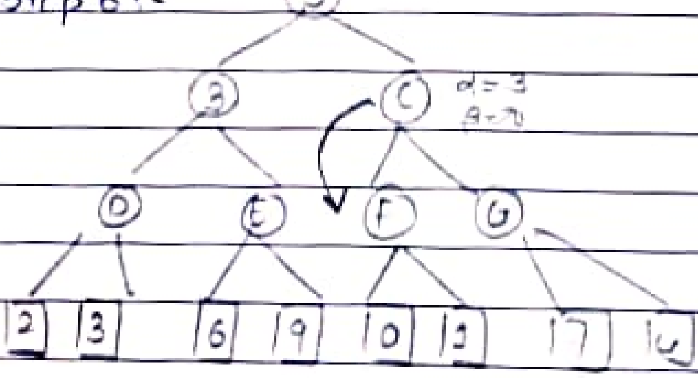


Now, we will only pass alpha and beta values to child nodes, that is node C.

So,



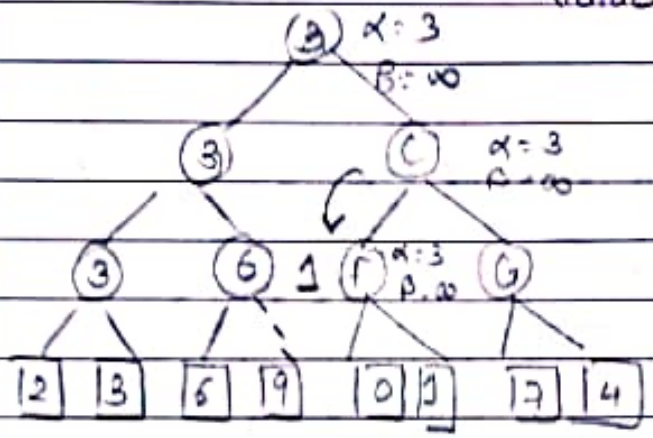
Step 6 :-



For, C to F

max (0, 3) = 3

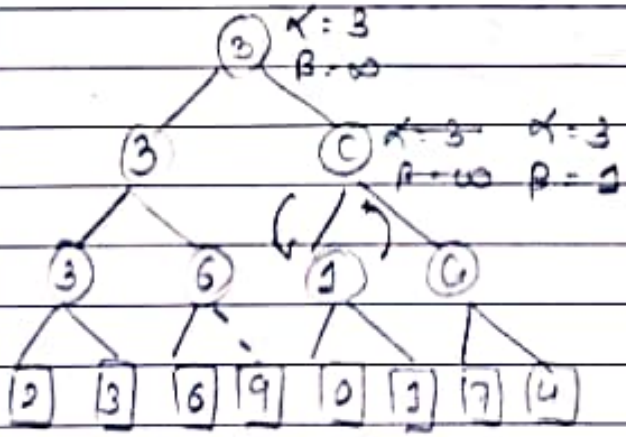
max (1, 3) = 3, maximum value is 1, so value of node F will be 1.



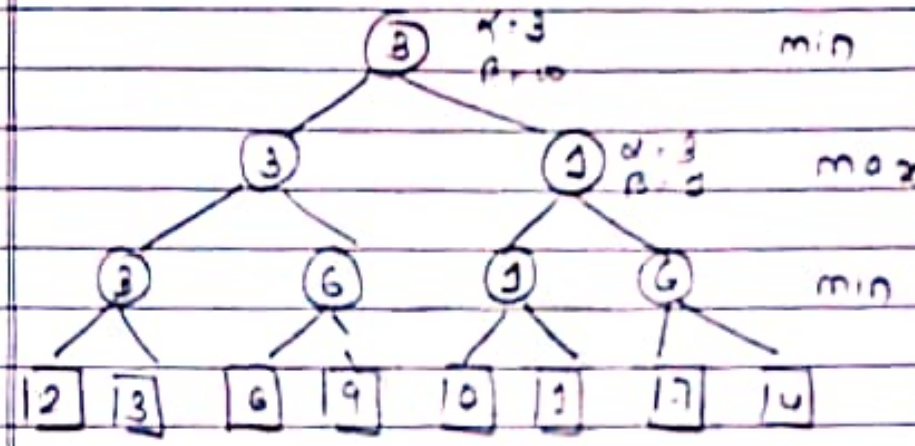
For, F to C, that is backtracking

β = min (1, ∞) = 1

α = 3, β = 1



Step 7,

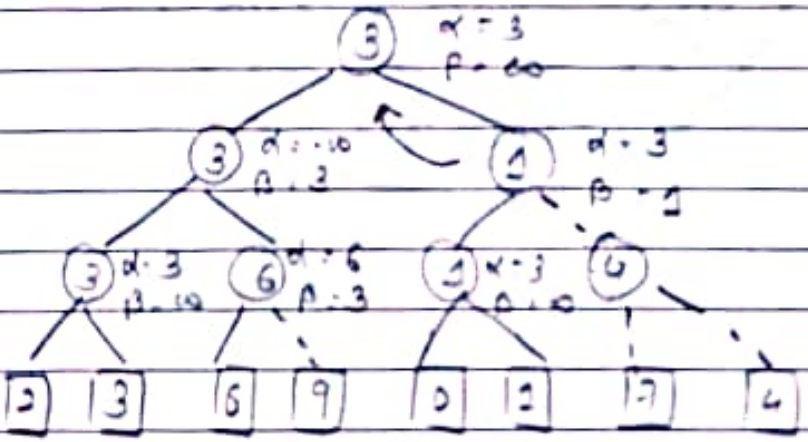


Here,

$\alpha \geq \beta$

Hence, Pruning process occurs

Step 8, we get,



For, C to A.

max ($\alpha = 3, \beta = \infty$)

∴ Node A will be 3.

Alpha-Beta Pruning Practice

αβ Cutoff