Adversarial search. Alpha-Beta pruning

We consider this state in which the White player (Max) needs to make the next move. Because the state space is very big, we will have a limited depth for exploration. If we reach it and we are not in a terminal state, we will have to use an evaluation function. So, for non-terminal states we will use this evaluation function:

$$Eval(s) = \sum_{piece \in White} Value(piece) - \sum_{piece \in Black} Value(piece)$$

If we are in a terminal state, Eval will return **100 for a win, 0 for a tie, -100 for a loss**. Note that the function interprets the results for the White player (Max)!

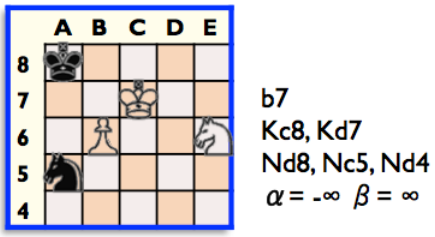
The piece values and notations:

Piece	Notation	Figure	Value
King	K		Number of legal moves of the king (not being in check and not being next to the other king). **Note that NOT MOVING is not a legal move.**
Queen	Q		9
Bishop	B		3
Knight	**N**		3
Rook	R		5
Pawn	-blank-		1

The chess notations for a move: The first letter indicates the piece. For pawns we omit the capital letter. Next, we have the square to which the piece moves. Example: Kd7 = King moves to square d7 (column D, row 7). Attention, the Knight has notation N!
For a pawn that gets on the last row and change to a different piece, the first 2 characters indicate the square to which it moves and the last character is the piece to which he changes. Example: b8R means that the pawn moved to the b8 square and changed to a Rook.

On the right of each node we will write:

- The name of the node
- The list of all possible moves from its state (underlined ones are already expanded, either already explored or currently being explored)



Remember that for the Max-player we always need

to compute alpha as the maximum min-value of its children and for the min-player we need to compute beta as the minimum max-value of its children.
We consider the step in which we finished exploring the entire subtree with root C (nodes are highlighted in black) and we just returned back to node B (highlighted in red).
Answer the following questions: