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**Departamento de Sistemas Informáticos y Computación  
Escuela Técnica Superior de Ingeniería Informática  
Universitat Politècnica de València**

# **SOLUTIONS TO COLLECTION OF EXERCISES INTELLIGENT SYSTEMS**

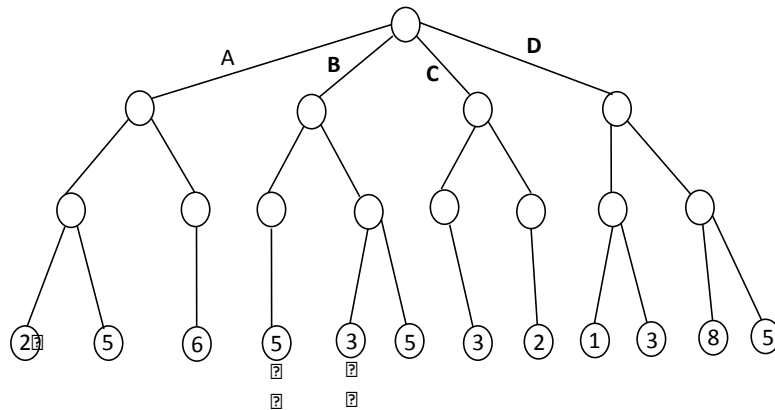
## **Block 1: Adversarial Search**

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**September 2019**

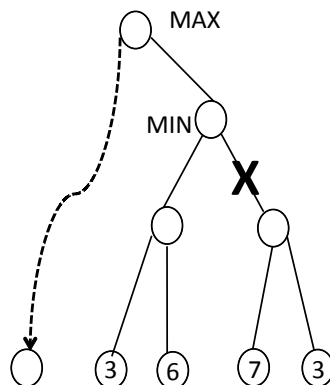
## MULTIPLE CHOICE QUESTIONS

- 1) Given the following game search space, which is the best move for the root MAX node if we apply an alpha-beta algorithm?



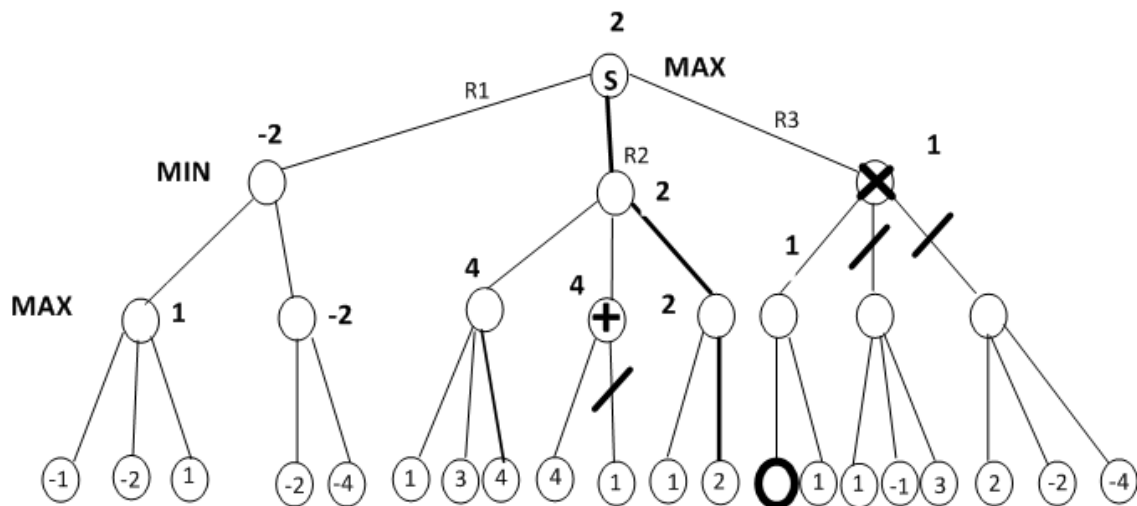
- A. Branch A
- B. Branch B
- C. Branch C
- D. Branch D

- 2) Given the following partial tree of an alpha-beta algorithm, which provisional backed up value should the node MAX have for that the cut-off is produced?



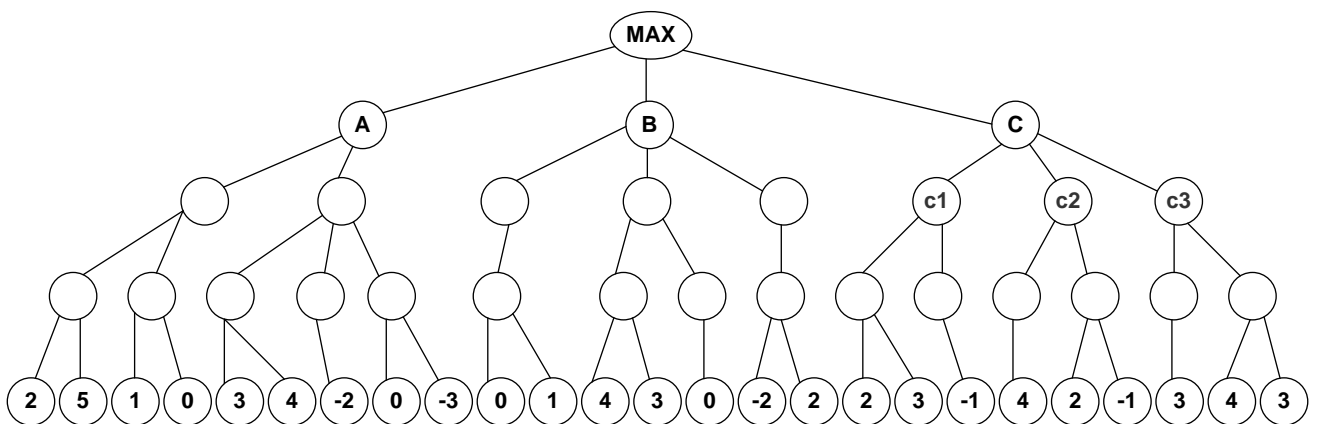
- A. 7
- B. Higher or equal than 6
- C. Lower or equal than 6
- D. Lower than 3

- 3) Given the search space of a game shown in the figure, which value should the terminal node in bold type have?



- A.  $[-\infty, 1]$
- B. 1
- C.  $[2, +\infty]$
- D. It is not possible to determine the value of the terminal node with the available data

4) Given the game tree of the figure, which is the best move for MAX (root node) if we apply an alpha-beta procedure?

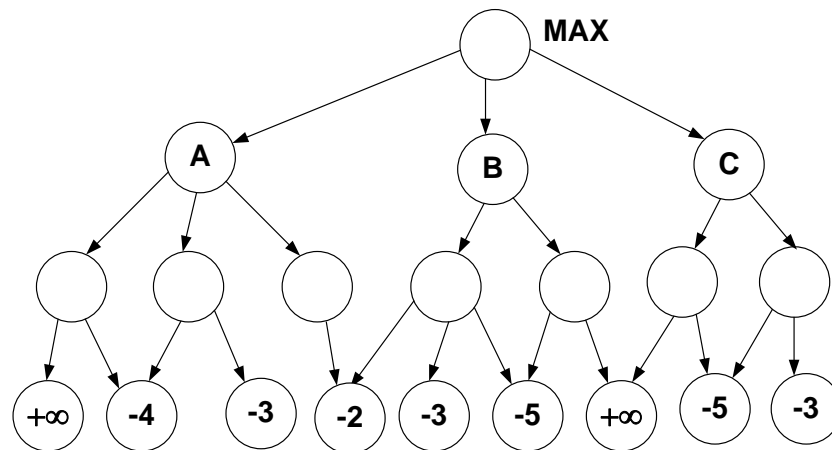


- A. Branch A
- B. Branch B
- C. Branch C
- D. Branch A or branch B

5) Given the game tree of the figure and assuming we apply an alpha-beta procedure:

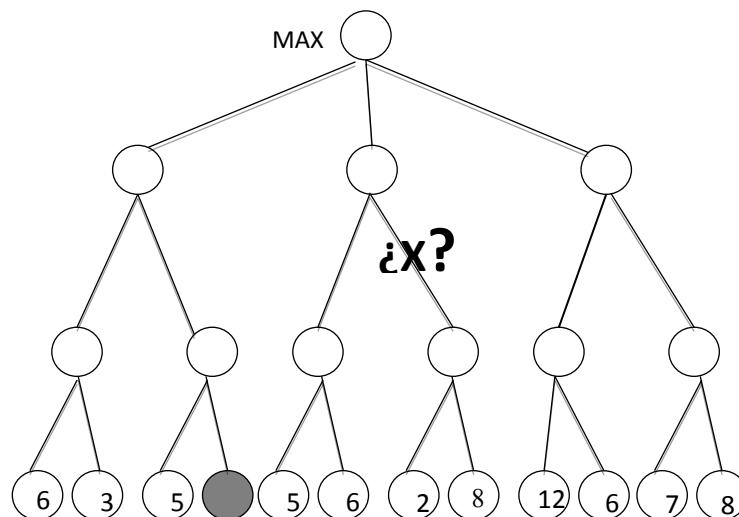


- 7) Given the game tree of the figure, where MAX is the initial player and assuming we apply an alpha-beta procedure, mark the CORRECT statement:



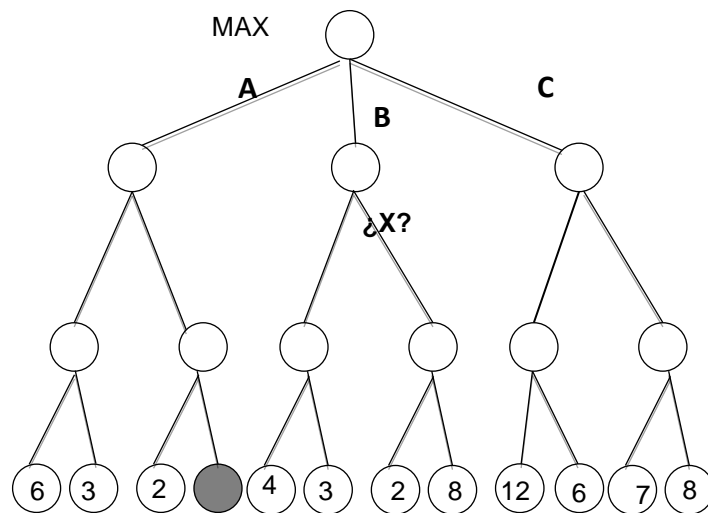
- A. MAX will choose any of the three branches because all of them lead to a winning position for MAX
- B. MAX will choose the branch A
- C. MAX will choose the branch B
- D. MAX will choose the branch C

- 8) Assuming we apply an alpha-beta procedure to the game tree of the figure, which is the value that the shadowed node should have in order to get the cut-off of the figure?



- A. Any value
- B. A value lower than 6
- C. A value higher or equal than 6
- D. The cut-off would never be produced (none of the above answers)

9) Given the game tree of the figure and assuming we apply an alpha-beta algorithm:



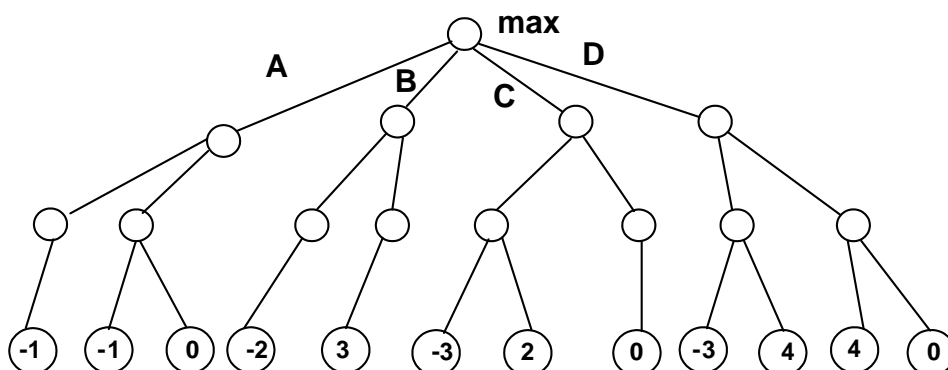
which is the value that the shadowed node should have in order to get the cut-off of the figure?

- A. Any value
- B. A value lower than 3
- C. A value higher or equal than 4
- D. The cut-off would never be produced (or none of the above answers)

10) Given the game tree of the above figure and assuming the cut-off is produced, after applying an alpha-beta algorithm:

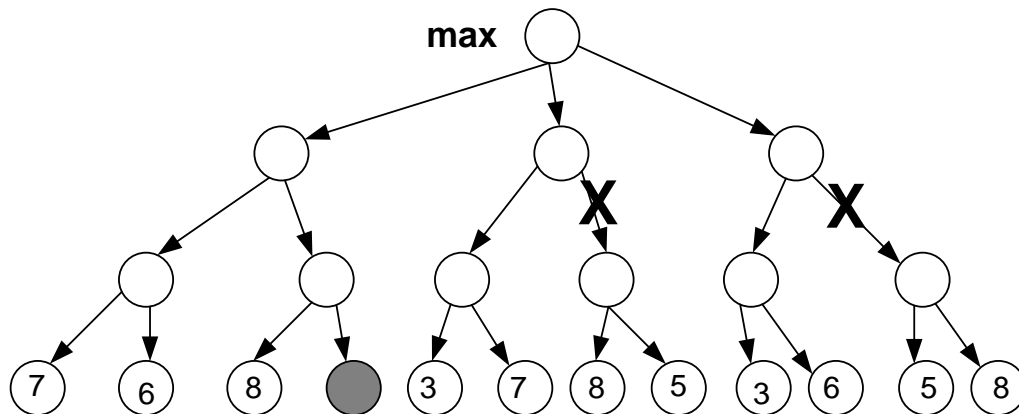
- A. MAX will choose branch A
- B. MAX will choose branch B
- C. MAX will choose branch C
- D. MAX will choose either branch A or B

11) Assuming we apply an ALPHA-BETA algorithm on the game tree of the figure, how many nodes do we save with compared to MINIMAX?



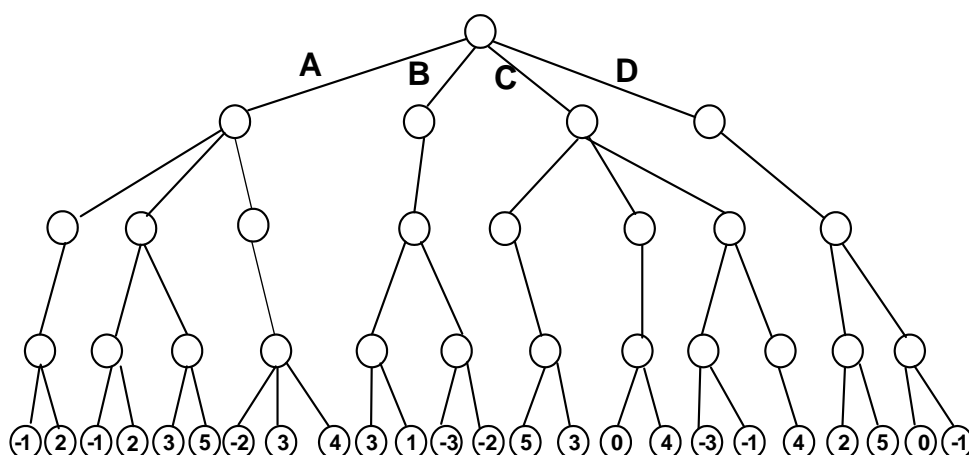
- A. 3
- B. 4
- C. 5
- D. 6

12) Assuming we apply an ALPHA-BETA procedure on the game tree of the figure, which value should the shadowed node have to provoke the shown cut-offs?



- A. Equal or higher than 7
- B. Equal or higher than 8
- C. Equal or lower than 7
- D. Any value would provoke the cut-offs

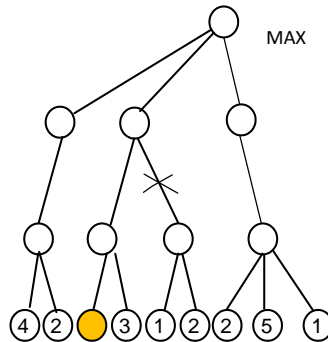
13) Which branch of the game tree of the figure below will be chosen if we apply the MINIMAX algorithm?



- A. A
- B. B
- C. C
- D. D

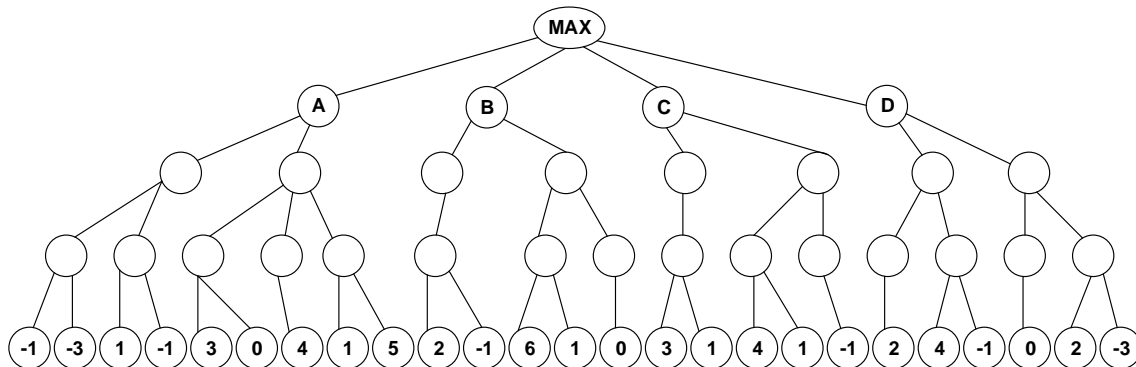


14) Which values should the shadowy node have so that the cutoff of the figure is always produced?



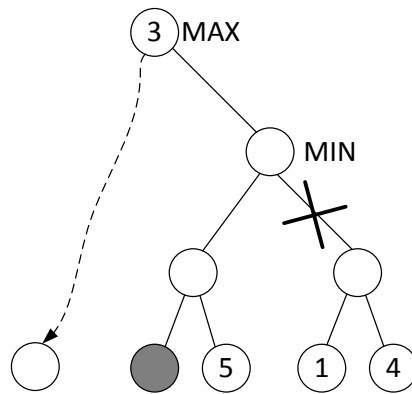
- A. Any value in  $[-\infty 4]$ .
- B. Any value.
- C. Any value in  $[4 +\infty]$ .
- D. The cutoff can never happen.

15) Show the branch that will be selected after applying the  $\alpha$ - $\beta$  pruning to the game tree of the figure:



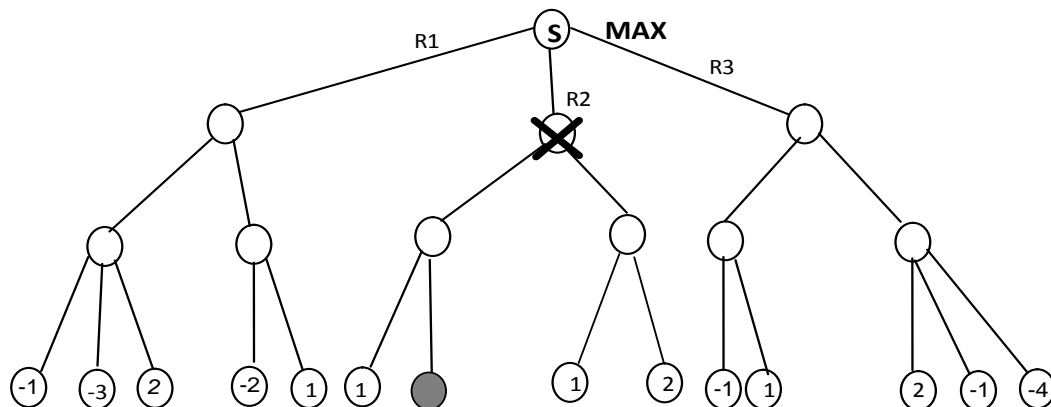
- A. A
- B. B
- C. C
- D. D

16) Which provisional value should the shadowy mode have in order to get the cutoff shown in the figure?



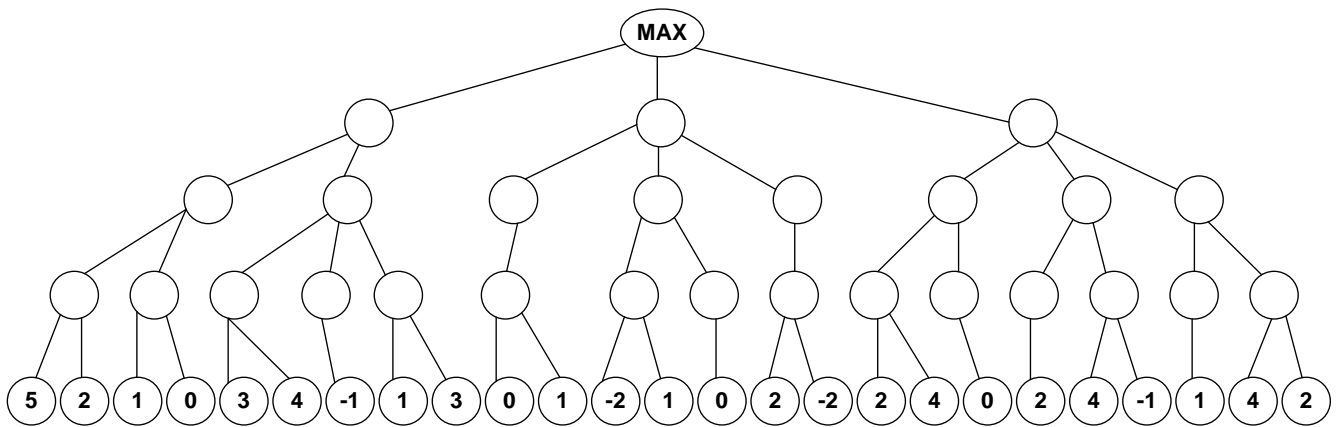
- A.  $[-\infty, 2]$
- B.  $[-\infty, 3]$
- C.  $[-\infty, 5]$
- D. The cutoff is not feasible

17) The figure below shows a game search tree. If we apply an alpha-beta procedure, which value should the shadowy node take on so that the cutoff in branch R2 is produced?



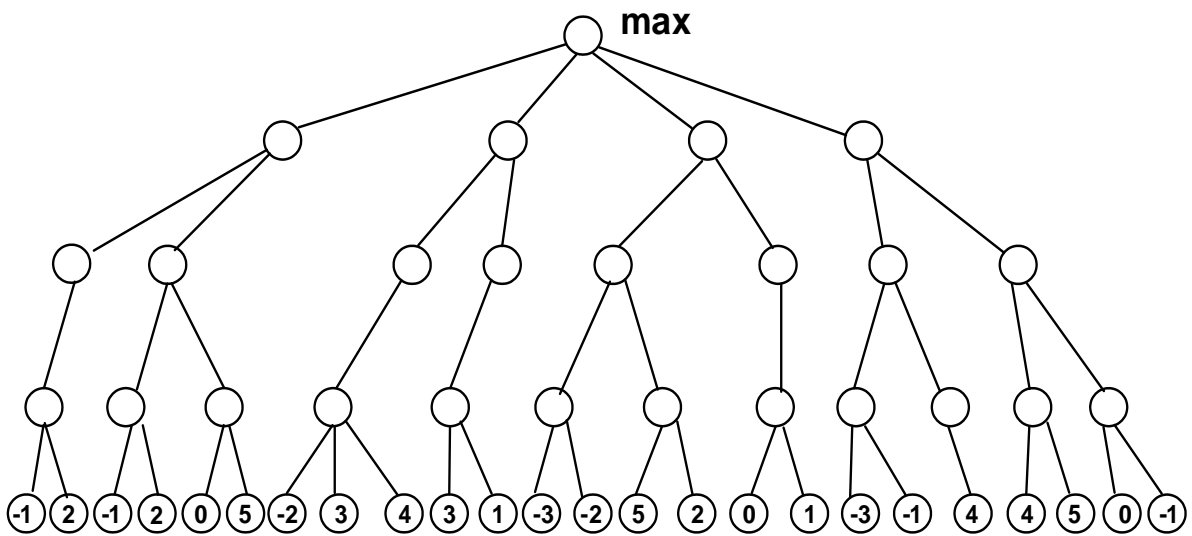
- A. Any value in  $[-\infty, 1]$
- B. Any value in  $[1, +\infty]$
- C. The shadowy node can only take on the value 1.
- D. The cutoff of the figure cannot be produced.

18) Given the below game search tree and assuming we apply an alpha-beta procedure, how many terminal nodes do not need to be generated?



- A. 13
- B. 15
- C. 16
- D. 17

19) Show how many terminal nodes would be generated if we apply an alpha-beta procedure to the game tree of the figure:



- A. 13
- B. 12
- C. 11
- D. 14

