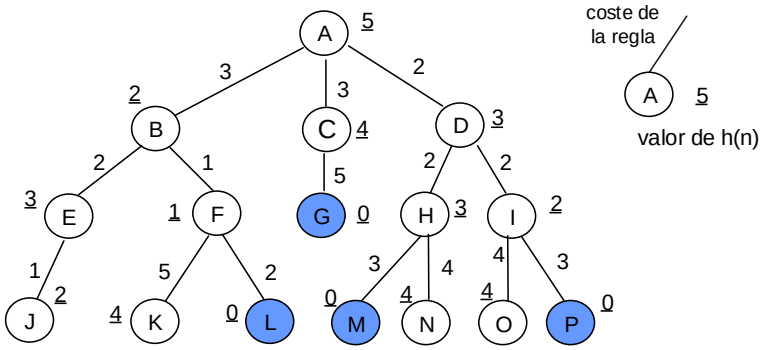
# Intelligent Systems – Exam Block 1, 27th January 2022
# Test (1.75 points) score: max (0, (#correct_answers – errors/3)*1.75/6)

| **Surname**: | | | | | | | **Name**: |
|---|---|---|---|---|---|---|---|
| **Group**: | A | B | C | D | E | F | G | 4IA |

1) Assume that we apply an algorithm of type A to the search space of the figure (in case of two nodes with the same f-value, expand first the node that comes alphabetically before). Show the **CORRECT** answer:




A. The application of a breadth-first algorithm returns the optimal solution
B. The solution found by the algorithm of type A is node P.
C. The solution found by the algorithm of type A is node M.
D. The solution found by the algorithm of type A is node L.

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2) Let be a search problem in which the operators have different cost. There is a solution node, G1, at level d1 of the search tree and a solution node, G2, at level d2 such that d2 > d1 (there is no solution at a level lower than d1 and besides G1 and G2 are the only solutions at their respective levels). We know that f(G2)<f(G1) and that G2 is an optimal solution. Show the **INCORRECT** choice:

A. The time complexity of a breadth-first strategy with respect to the number of generated nodes is $O(b^{d1+1})$
B. A depth-first strategy will never return the solution G1
C. An iterative deepening strategy will always return the solution G1
D. A uniform-cost strategy will always return the solution G2

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3) Let be a search process of type A (f(n)=g(n)+h(n)) where h(n) is admissible and consistent. The algorithm returns a solution path from the initial state **A** to the goal state **G** through a node **n1**. Show the **CORRECT** assertion:

A. f(G) < f(A)
B. f(G) < f(n1)
C. f(G)= g(G)
D. None of the above answers is correct.

4) Let be a RBS with initial working memory WMinitial={(lista 4 5 6 6 6 8 4 8)}, and the rules:

```
(defrule R1                                  (defrule R2
   ?f <- (lista   $?x   ?z   ?y   $?w)          ?f <- (lista   $?x  ?z   ?   ?y   $?w)
   (test (<>  ?z  ?y))                          (test (> ?z ?y))
=>                                           =>
   (assert (lista   $?x   ?z   ?y   $?w)))      (assert (lista   $?x    ?z    $?w)))
```

What are the contents of the Agenda after the first pattern matching?

A. Five instances of R1 and one instance of R2
B. Four instances of R1 and no instance of R2
C. Five instances of R1 and no instance of R2
D. Four instances of R1 and one instance of R2

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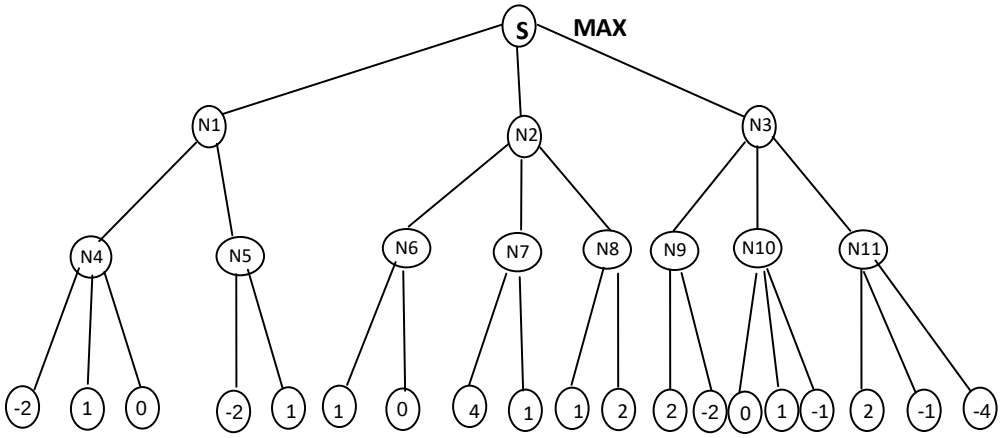
5) Assume we apply an alpha-beta procedure to the game space of the figure. Show the **CORRECT** answer:




A. A cut-off is produced in node N5
B. A cut-off is produced in node N6
C. A cut-off is produced in node N7
D. A cut-off is produced in node N10

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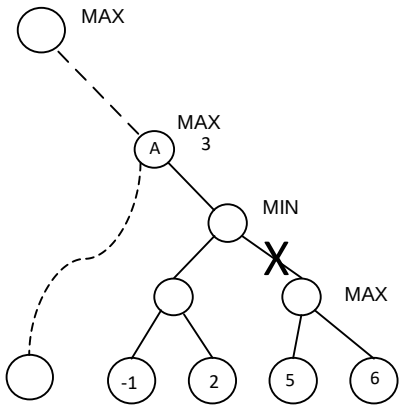
6) Given the partial alpha-beta of the figure below, show the CORRECT answer:




A. The cutoff of the figure can never be produced.
B. If the value -1 would be replaced by 4 then the cutoff would be produced
C. If the value 2 would be replaced by 4 then the cutoff would be produced
D. None of the above answers is correct.

## Intelligent Systems – Exam Block1 1, 27th January 2022
## Problem: 2 points

Let it be a CLIPS pattern that represents a list of lists. Each of the lists is an ordered series of at least two integer numbers without repeated elements. The first element is 0 and the last element is 100 for all the lists. The pattern follows this syntax:

`(list-of-lists [list 0 num`$^{m}$ `100]`$^{m}$`)`  num ∈ INTEGER

By using CLIPS, answer the following questions:

1) (0.25 points) Write the following Initial Working Memory: three ordered lists of integer numbers, one lists contains the numbers (0 4 7 8 16 34 100), another list is (0 2 8 18 22 40 52 100) and the third lists is (0 8 10 21 55 62 70 88 100).
2) (1 point) Given an integer number 'n' by means of a fact that follows the pattern (`numero n`$^{s}$), where n ∈ [1,…, 99}], write a rule that inserts the number 'n' in any of the lists keeping the order of the elements and provided that the list does not already contain such a number. NOTE: the number 'n' will never be introduced as the first or last element of the list as it must be a value between 1 and 99; therefore, 'n' will be always introduced in an intermediate position of the list.
3) (0.75 points) Write a rule that orders the lists from the fewest to the highest number of elements.

NOTE: the predicate `(numberp ?x)` TRUE if the value bound to the variable ?x is a number.