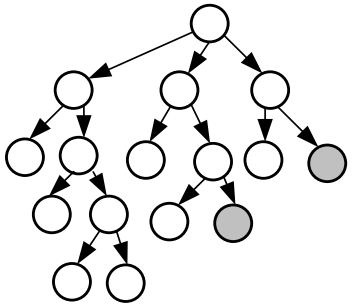
Intelligent Systems – Exam Block 1, Janaury 23th, 2020
Test (1.75 points) score: max (0, (#correct_answers – #errors/3)*1.75/6)

Last name(s):	**Name**:
Group: A B C D E F G	

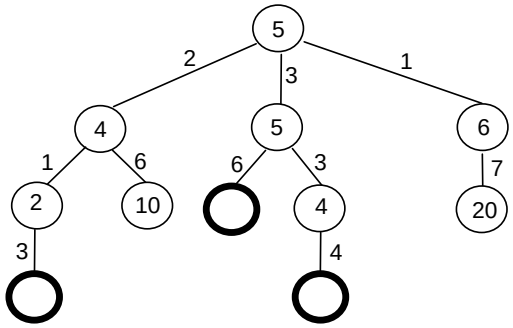
1) If we apply an Iterative Deepening (ID) search strategy to the tree shown below, which is the maximum number of nodes kept in memory? (Assume we expand first the leftmost node among the nodes that are at the same depth level)



A. 6
B. 8
C. 10
D. None of the above answers is correct.

---

2) Let be the search tree of the figure, where bold-circled nodes are goal states, the value inside a node is the heuristic value of the node and the numeric value on the arcs is the operator cost. Show the **CORRECT** answer:



A. The heuristic is admissible and consistent.
B. The heuristic is not admissible nor consistent.
C. The optimal solution is found when an algorithm of type A is applied to the tree.
D. None of the above answers is correct.

---

3) Given two evaluation functions $f1(n)=g(n)+h1(n)$ and $f2(n)=g(n)+h2(n)$, such that $h1(n)$ is admissible and $h2(n)$ is not admissible. Show the **CORRECT** answer:

A. If both functions are used in an algorithm of type A, each of them guarantees the optimal solution.
B. We can affirm that $f2(n)$ guarantees to find a smaller search space than $f1(n)$.
C. Only in the case that $h1(n)$ is a consistent heuristic, $f1(n)$ will generate a smaller search space than $f2(n)$.
D. It exists a node n for which it holds $h2(n)>h^*(n)$.

---

4) In a GRAPH-SEARCH algorithm that applies an algorithm of type A ($f(n)=g(n)+h(n)$), there is a node n in the CLOSED list and a node n' in the OPEN list such that $n'=n$. Show the **CORRECT** answer:

A. If the heuristic is admissible, it always holds $h(n) < h(n')$.
B. If the heuristic is consistent, it always holds $g(n) <= g(n')$.
C. Regardless whether the heuristic is consistent or not, it always holds $(n) <= f(n')$.
D. None of the above answers is correct.

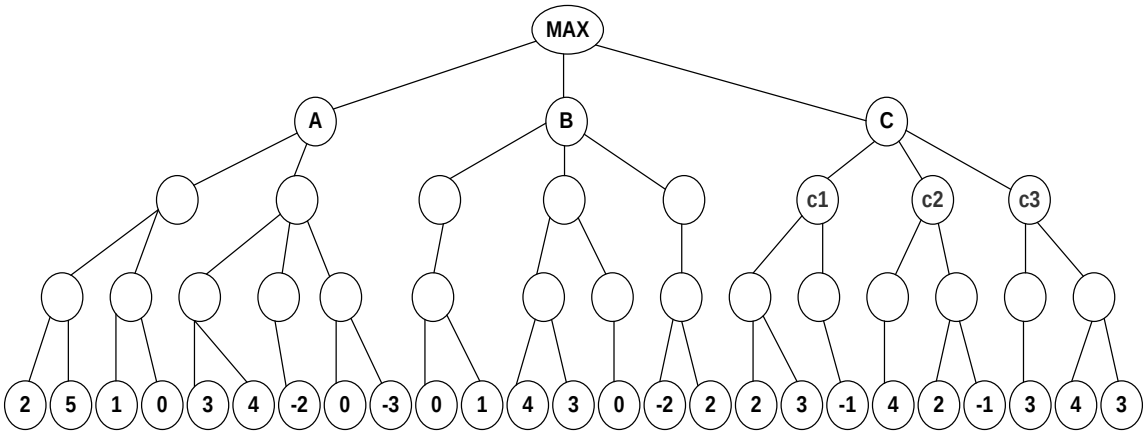
---

5) Let $n1$ and $n2$ be the only two children nodes of a MAX node n in a game tree. We assume that node $n1$ is explored first and then node $n2$. Show the **CORRECT** answer:

A. The definite value of node n is the maximum value between the definite value of $n1$ and $n2$ only when $n1$ and $n2$ are terminal nodes.
B. When the value of $n1$ is backed up to its parent n, the node n can have a previously backed up value.
C. When the value of $n1$ is backed up to its parent n, a β cut-off can be produced in node n
D. None of the above answers is correct.

---

6) Which branch will be selected when we apply the α-β algorithm to the game tree of the figure?



A. Branch A
B. Branch B
C. Branch C
D. Branch A or B

Intelligent Systems – Final exam (Block 1), Janaury 23th, 2020
Problem: 2 points

We want to form two groups of people: a group of people who speak Russian and another group who speak Chinese. Several persons attend the call and bring along certificates that confirm their proficiency in one or the two languages. The language proficiency is measured in five levels, from 1 to 5, being 1 the lowest level and 5 the highest level.

- P1 certificates Chinese level 3 and Russian level 1.
- P2 certificates Russian level 4.
- P3 certificates Russian level 1 and Chinese level 2.
- P4 certificates Chinese level 3.
- P5 certificates Russian level 3.
- P6 certificates Chinese level 2 and Russian level 5.
- P7 certificates Chinese level 4.
- P8 certificates Russian level 3 and Chinese level 2.

The pattern for group formation is:

(groups Russian p^m Chinese q^m) where $p,q \in$ {P1,P2,P3,P4,P5,P6,P7,P8}

1) (0.5 points) Write the facts of the Working Memory (WM) that represents the situation given above. Specify also the patterns that you need to represent the static information of the problem and include in the WM the facts associated to these patterns.
2) (0.8 points) Write a rule to add a person to the group of Russian or Chinese. The rule must check the person has a certificate that confirms the corresponding language proficiency at level 2 at least. The rule must also check the person did not sign up already for any group.
3) (0.7 points) Write a rule that displays a message indicating the number of people in each group when there is at least three people in each group.