

For each question on Quiz #2, “Zero” below gives the fraction of students who scored zero, “Partial” gives the fraction who got partial credit, and “Perfect” gives the fraction who scored 100%.

**Problem 1**

Zero: 2% (~3 students), Partial: 0% (~0 students), Perfect: 98% (~176 students)

**Problem 2**

Zero: 29% (~53 students), Partial: 17% (~30 students), Perfect: 54% (~96 students)

**Problem 3**

Zero: 0% (~0 students), Partial: 33% (~60 students), Perfect: 67% (~119 students)

**CS-171, Intro to A.I. — Quiz#2 — Fall Quarter, 2014 — 20 minutes**

YOUR NAME AND EMAIL ADDRESS: \_\_\_\_\_

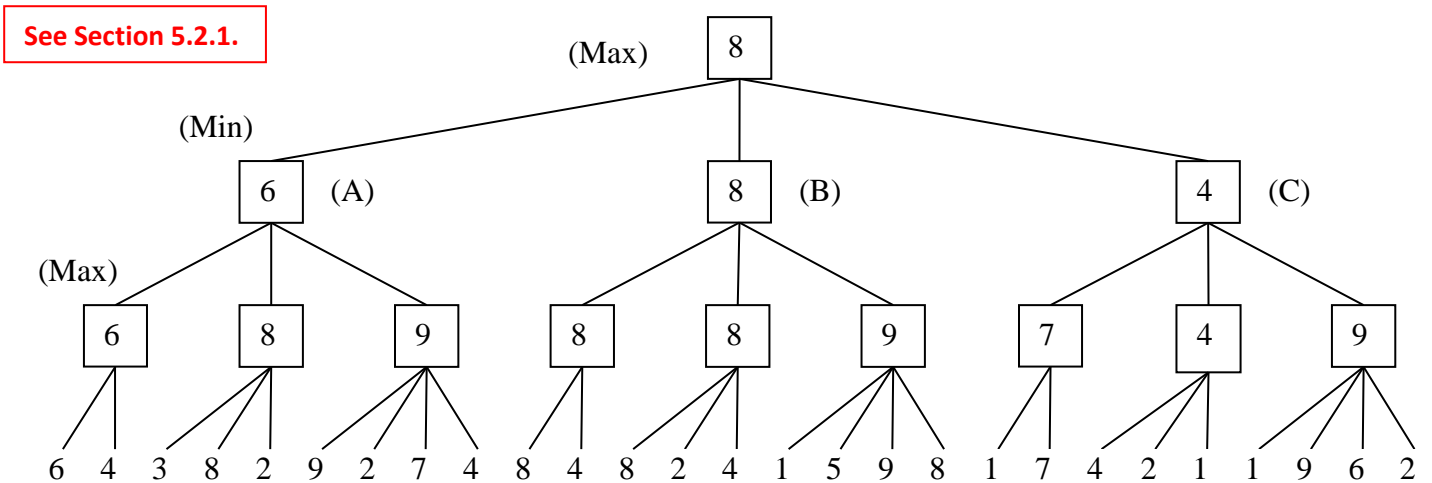
YOUR ID: \_\_\_\_\_ ID TO RIGHT: \_\_\_\_\_ ROW: \_\_\_\_\_ SEAT: \_\_\_\_\_

**1. (25 pts total, -5 pts for each error, but not negative) MINI-MAX SEARCH IN GAME TREES.**

The game tree below illustrates a position reached in the game. Process the tree left-to-right. It is **Max**'s turn to move. At each leaf node is the estimated score returned by the heuristic static evaluator.

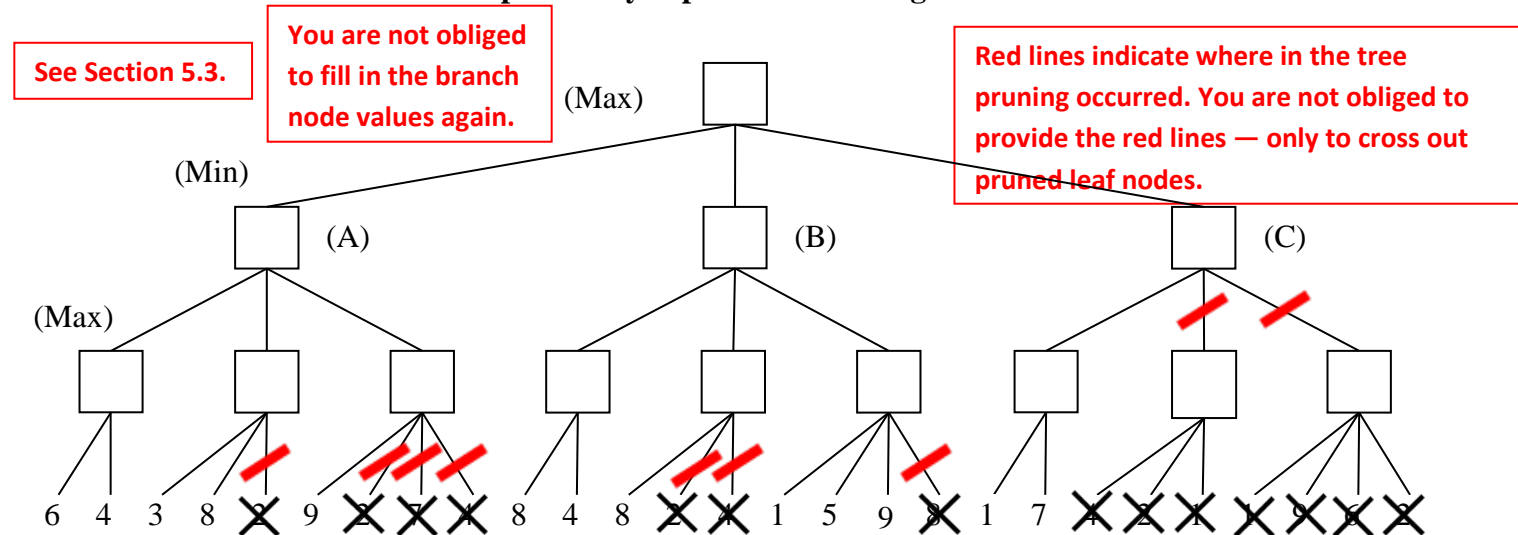
**1.a. Fill in each blank square with the proper mini-max search value.**

**1.b. What is the best move for Max? (write A, B, or C)   B**



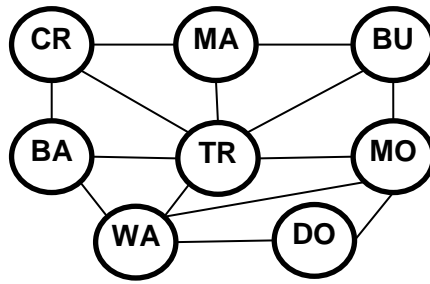
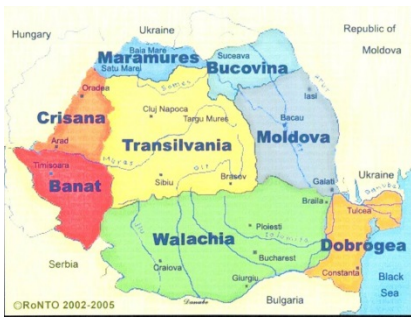
**2. (25 pts total, -5 for each error, but not negative) ALPHA-BETA PRUNING.** Process the tree left-to-right. This is the same tree as above (1.a). You do not need to indicate the branch node values again.

**Cross out each leaf node that will be pruned by Alpha-Beta Pruning.**



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### 3. (50 points each, 10 pts each) Constraint Satisfaction Problems



BA = Banat  
 BU = Bucovina  
 CR = Crisana  
 DO = Dobrogea  
 MA = Maramures  
 MO = Moldova  
 TR = Transilvania  
 WA = Walachia

You are a map-coloring robot assigned to color this map of Romania regions. Adjacent regions must be colored a different color (R=Red, B=Blue, G=Green). The constraint graph is shown.

**3a. (10 pts total, -5 each wrong answer, but not negative) FORWARD CHECKING.** TR has been assigned value R, as shown. Cross out all values that would be eliminated by Forward Checking: See Section 6.3.2.

BA	BU	CR	DO	MA	MO	TR	WA
<del>X</del> G B	<del>X</del> G B	<del>X</del> G B	R G B	<del>X</del> G B	<del>X</del> G B	R	<del>X</del> G B

**3b. (10 pts total, -5 each wrong answer, but not negative) ARC CONSISTENCY.**

BA has been assigned R and TR has been assigned B, as shown; but no constraint propagation has been done. Cross out all values that would be eliminated by Arc Consistency (AC-3) See Section 6.3.2.

BA	BU	CR	DO	MA	MO	TR	WA
R	<del>X</del> G <del>X</del>	<del>X</del> G <del>X</del>	<del>X</del> <del>X</del> B	R <del>X</del> <del>X</del>	R <del>X</del> <del>X</del>	B	<del>X</del> G <del>X</del>

**3c. (10 pts total, -5 each wrong answer, but not negative) MINIMUM-REMAINING-VALUES HEURISTIC.**

Consider the assignment below. WA has been assigned B and constraint propagation has been done, as shown. List all unassigned variables that might be selected by the Remaining-Values (MRV) Heuristic: See Section 6.3.1. BA, DO, MO, TR.

BA	BU	CR	DO	MA	MO	TR	WA
R G	R G B	R G B	R G	R G B	R G	R G	B

**3d. (10 pts total, -5 each wrong answer, but not negative) DEGREE HEURISTIC.** Consider the assignment below. (It is the same assignment as in problem 3c above.) WA has been assigned B and constraint propagation has been done, as shown. List all unassigned variables that might be selected by the Degree Heuristic: See Section 6.3.1. TR.

BA	BU	CR	DO	MA	MO	TR	WA
R G	R G B	R G B	R G	R G B	R G	R G	B

**3e. (10 pts total) MIN-CONFLICTS HEURISTIC.** Consider the complete but inconsistent assignment below. TR has been selected to be assigned a new value. What new value would be chosen below for TR by the Min-Conflicts Heuristic? See Section 6.4. B.

BA	BU	CR	DO	MA	MO	TR	WA
R	G	R	R	G	G	?	B