CS-171, Intro to A.I. — Quiz#2 — Winter Quarter, 2012 — 20 minutes

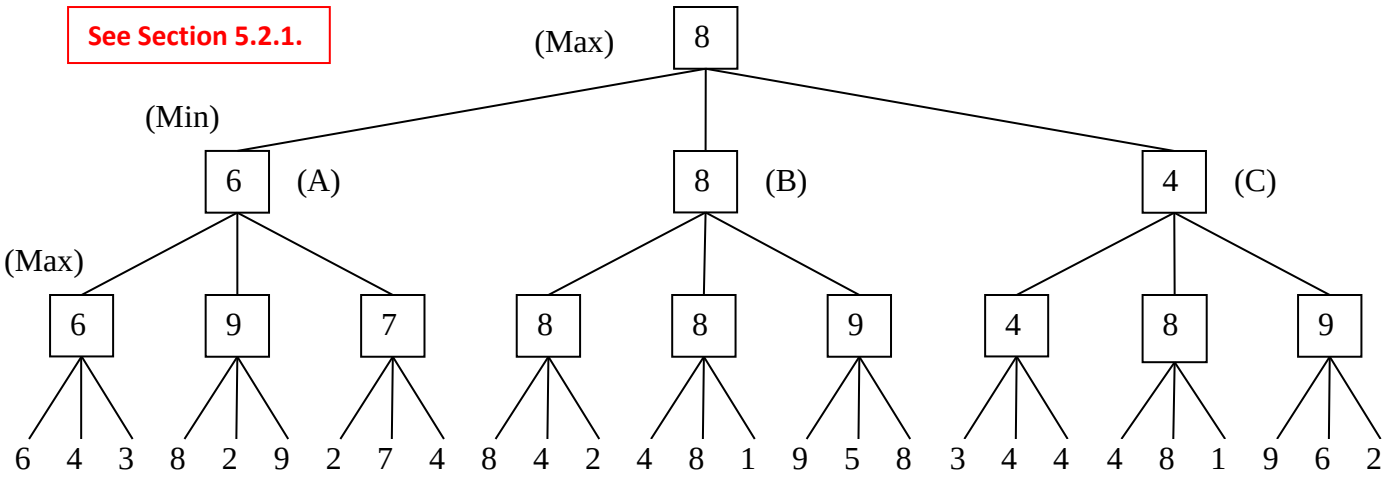
YOUR NAME AND EMAIL ADDRESS: _____

YOUR ID: _____ ID TO RIGHT:_____ ROW:_____ NO. FROM RIGHT:_____

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

1.a. The game tree below illustrates a position reached in the game. It is **Max**'s turn to move. Inside each leaf node is the estimated score of that resulting position returned by the heuristic static evaluator.
FILL IN EACH BLANK SQUARE WITH THE PROPER MINI-MAX SEARCH VALUE.

See Section 5.2.1.

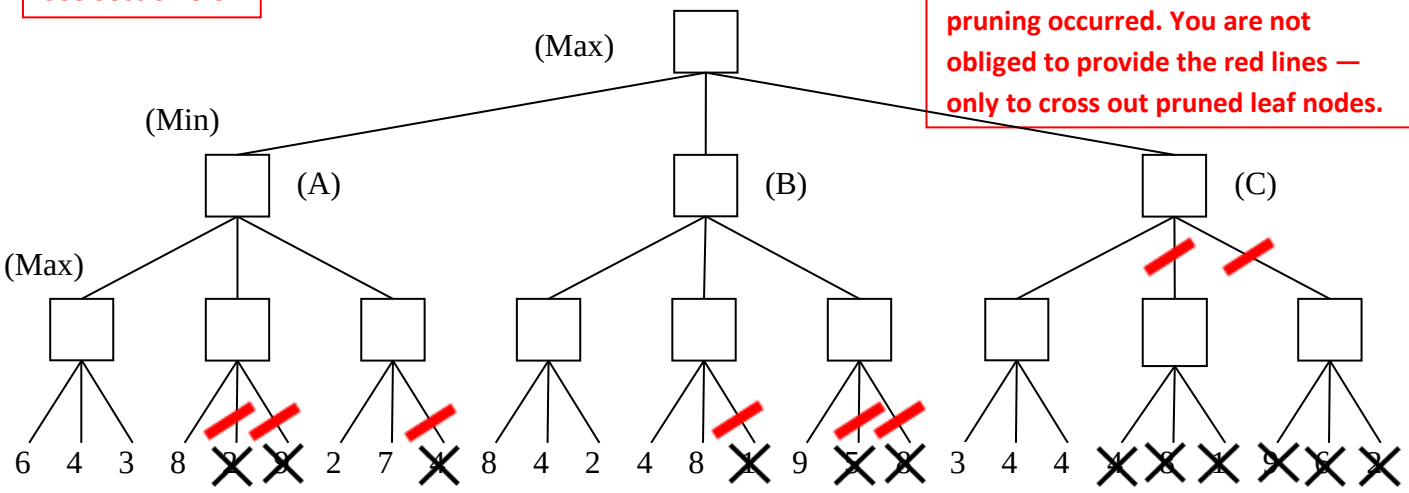


1.b. What is the best move for Max? (write A, B, or C) _____B_____

2. (25 pts max, -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.

See Section 5.3.

Red lines indicate where in the tree pruning occurred. You are not obliged to provide the red lines — only to cross out pruned leaf nodes.



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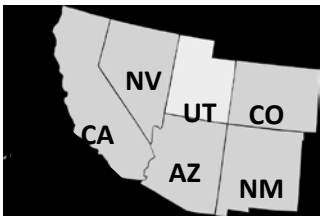
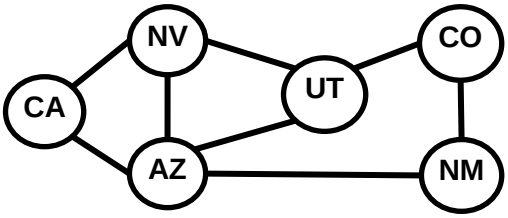
3. (10 points each, 10 pts each) Constraint Satisfaction Problems





You are a map-coloring robot assigned to color this Southwest USA map. Adjacent regions must be colored a different color (R=Red, B=Blue, G=Green). The constraint graph is shown. (Note that "adjacent" means to share a border, so AZ:CO and UT:NM are **not** adjacent.)

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

See Section 6.3.2.

CA	NV	AZ	UT	CO	NM
~~R~~ G B	~~R~~ G B	R	~~R~~ G B	R G B	~~R~~ G B

3b. (10 pts total, -5 each wrong answer, but not negative) ARC CONSISTENCY. CA and AZ have been assigned values, but no constraint propagation has been done. Cross out all values that would be eliminated by Arc Consistency (AC-3 in your book).

See Section 6.3.2.

CA	NV	AZ	UT	CO	NM
B	~~B~~ G ~~B~~	R	~~B~~ ~~B~~ G B	R G ~~B~~	~~B~~ G B

3c. (10 pts total, -5 each wrong answer, but not negative) MINIMUM-REMAINING-VALUES HEURISTIC. Consider the assignment below. NV is assigned and constraint propagation has been done. List all unassigned variables that might be selected by the Minimum-Remaining-Values (MRV) Heuristic: **CA, AZ, UT** .

See Section 6.3.1.

CA	NV	AZ	UT	CO	NM
R B	G	R B	R B	R G B	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.) NV is assigned and constraint propagation has been done. List all unassigned variables that might be selected by the Degree Heuristic: **AZ** .

See Section 6.3.1.

CA	NV	AZ	UT	CO	NM
R B	G	R B	R B	R G B	R G B

3e. (10 pts total) MIN-CONFLICTS HEURISTIC. Consider the assignment below. AZ has been selected to be assigned a new value. What new value would be chosen below for AZ by the Min-Conflicts Heuristic? **R**

See Section 6.4.

CA	NV	AZ	UT	CO	NM
B	G	**?**	G	G	B