CS-171, Intro to A.I. — Quiz#4 — Summer Quarter, 2016 — 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) _____

1.c. What score does Max expect to achieve? _____

(Max)

(Min)   (A)   (B)   (C)

(Max)

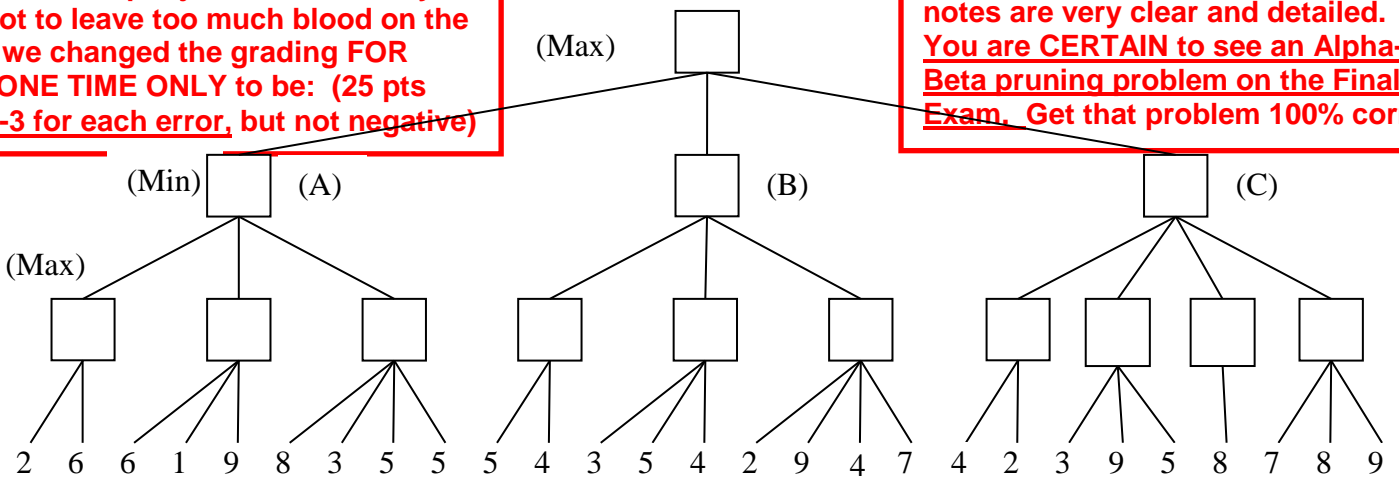2 6 6 1 9 8 3 5 5   5 4 3 5 4 2 9 4 7   4 2 3 9 5 8 7 8 9
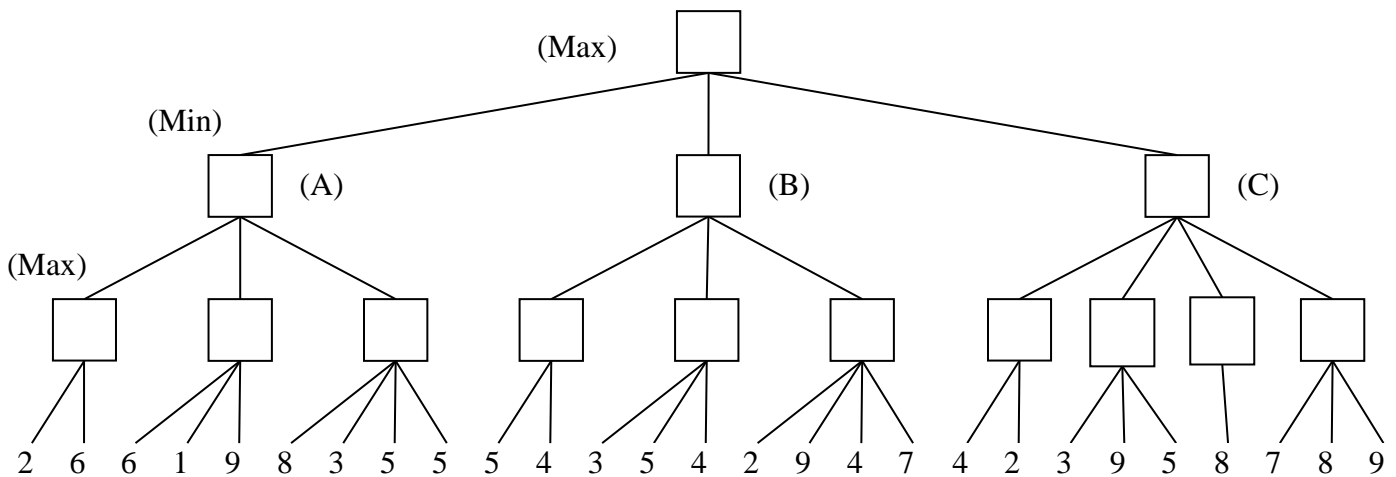
2. (25 pts total, -5 for each error, but not negative) ALPHA-BETA PRUNING. Process the tree left-to-right. This is the same tree as above (1.a). You do not need to indicate the branch node values again.
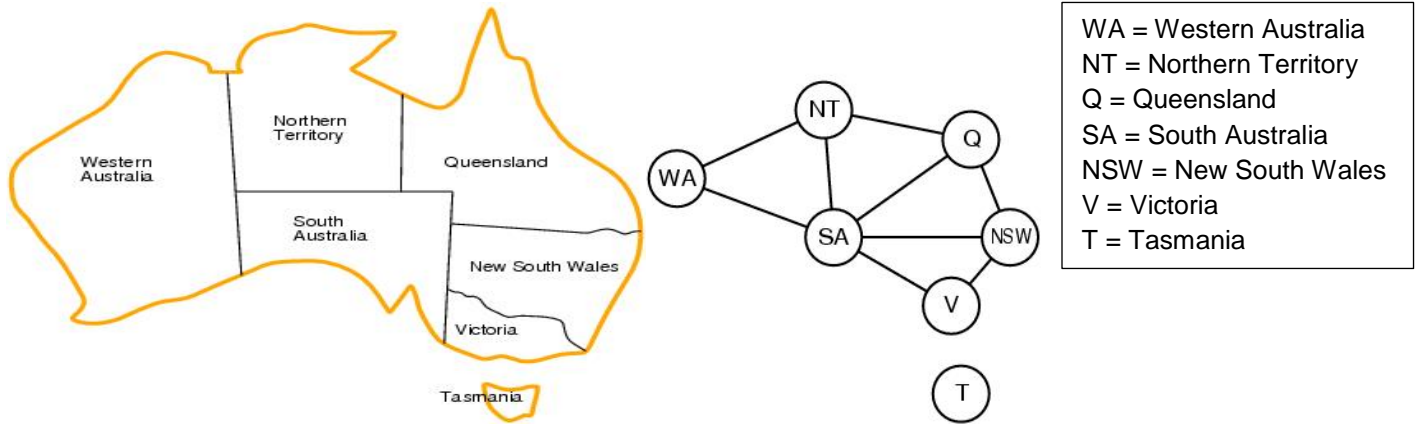
Cross out each leaf node that will be pruned by Alpha-Beta Pruning

In order to temper justice with mercy, and not to leave too much blood on the floor, we changed the grading FOR THIS ONE TIME ONLY to be: (25 pts total, <u>-3 for each error</u>, but not negative)

Surprisingly, many students had difficult with this problem. PLEASE, STUDY IT CAREFULLY. The lecture notes are very clear and detailed. <u>You are CERTAIN to see an Alpha-Beta pruning problem on the Final Exam.</u> Get that problem 100% correct.

(Max)

(Min)   (A)   (B)   (C)

(Max)

2 6 6 1 9 8 3 5 5   5 4 3 5 4 2 9 4 7   4 2 3 9 5 8 7 8 9

**** TURN PAGE OVER AND CONTINUE ON THE OTHER SIDE ****

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

WA = Western Australia
NT = Northern Territory
Q = Queensland
SA = South Australia
NSW = New South Wales
V = Victoria
T = Tasmania

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

3.a. (10 pts) FORWARD CHECKING.
Variable NT has been assigned a value as shown, but <u>no</u> constraint propagation has been done. Cross out all values that would be eliminated by Forward Checking.

WA	NT	Q	SA	NSW	V	T
R G B	G	R G B	R G B	R G B	R G B	R G B

3.b. (10 pts) ARC CONSISTENCY.
Variables WA and NT have been assigned values as shown, but <u>no</u> constraint propagation has been done. Cross out all values that would be eliminated by Arc Consistency (AC-3 in your book).

WA	NT	Q	SA	NSW	V	T
B	G	R G B	R G B	R G B	R G B	R G B

3.c. (10 pts) MINIMUM-REMAINING-VALUES HEURISTIC. Consider the assignment below. WA is assigned and constraint propagation <u>has</u> been done. List all unassigned variables that might be selected by the Minimum-Remaining-Values (MRV) Heuristic:_____.

WA	NT	Q	SA	NSW	V	T
R	G B	R G B	G B	R G B	R G B	R G B

3.d. (10 pts) DEGREE HEURISTIC. Consider the assignment below. (It is the same assignment as in problem 3.c. above.) WA is assigned and constraint propagation <u>has</u> been done. List all unassigned variables that might be selected by the Degree Heuristic:_____.

WA	NT	Q	SA	NSW	V	T
R	G B	R G B	G B	R G B	R G B	R G B

3.e. (10 pts) MIN-CONFLICTS HEURISTIC. Consider the complete but inconsistent assignment below. SA has just been selected to be assigned a new value during local search for a complete and consistent assignment. What new value would be chosen below for SA by the Min-Conflicts Heuristic?_____.

WA	NT	Q	SA	NSW	V	T
R	B	G	?	G	B	B