For each question on Quiz #4, “Zero” gives the percentage of students who received zero, “Partial” gives the percentage who received partial credit, and “Full” gives the percentage who received 100%. (Due to rounding, numbers shown below are only an approximate estimate.)

Problem 1:
full credit: ~94.8% (~55 students)
partial credit: ~5.2% (~3 students)
zero credit: ~0% (~0 students)

Problem 2:
full credit: ~34.5% (~20 students)
partial credit: ~50% (~29 students)
zero credit: ~15.5% (~9 students)

Problem 3:
full credit: ~50% (~29 students)
partial credit: ~50% (~29 students)
zero credit: ~0% (~0 students)

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: _____

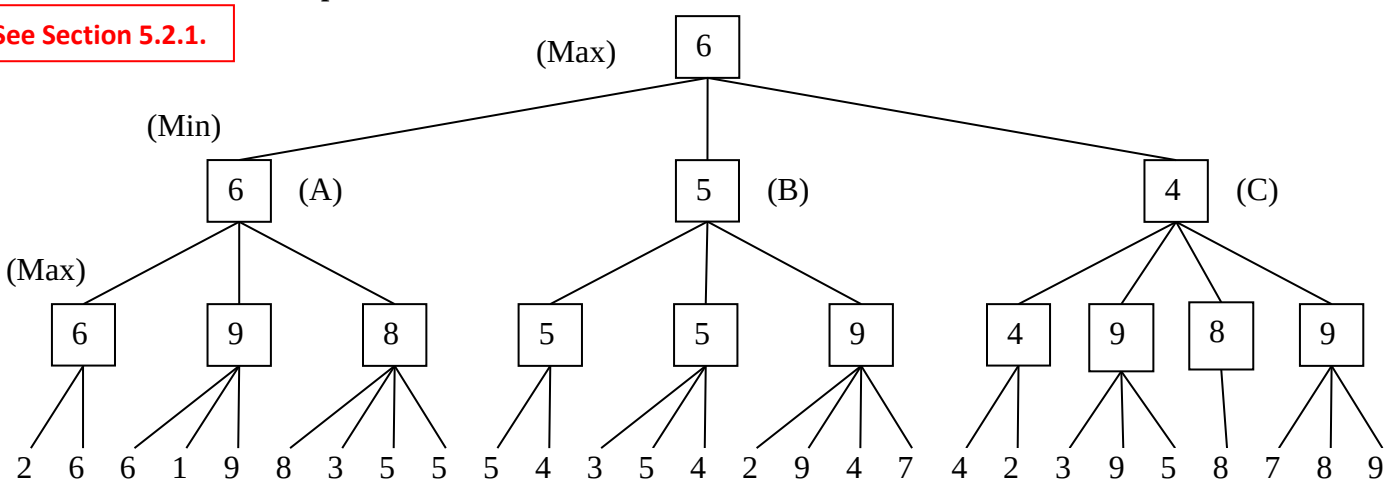
1. (25 pts total, -5 pts for each error, but not negative) MINI-MAX SEARCH IN GAME TREES.
The game tree below illustrates a position reached in the game. Process the tree left-to-right. It is **Max**'s turn to move. At each leaf node is the estimated score returned by the heuristic static evaluator.

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) A

1.c. What score does Max expect to achieve? 6

See Section 5.2.1.



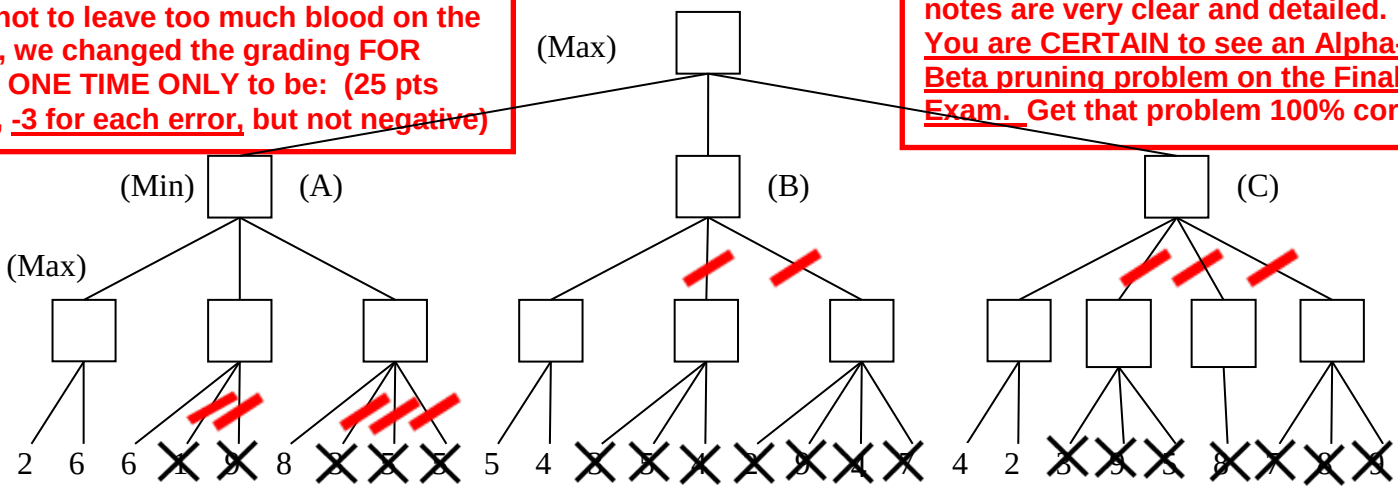
Red lines indicate where in the tree pruning occurred. You are not obliged to provide the red lines — only to cross out pruned leaf nodes.

2. (25 pts total, -5 for e… A PRU… See Section 5.3. …tree left-to-right. This is the same tr… …e the branch node values again.

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

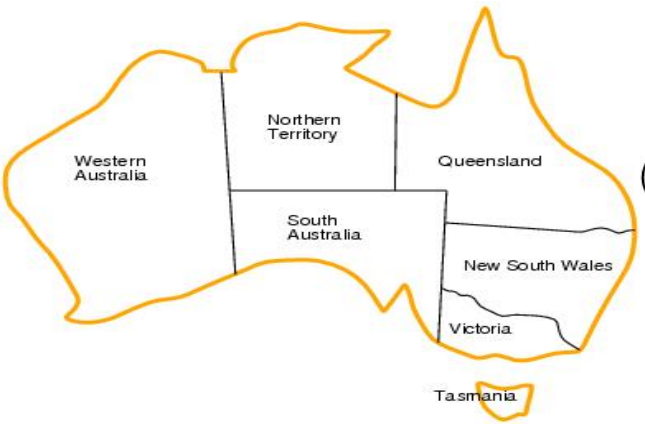
In order to temper justice with mercy, and not to leave too much blood on the floor, we changed the grading FOR THIS ONE TIME ONLY to be: (25 pts total, -3 for each error, but not negative)

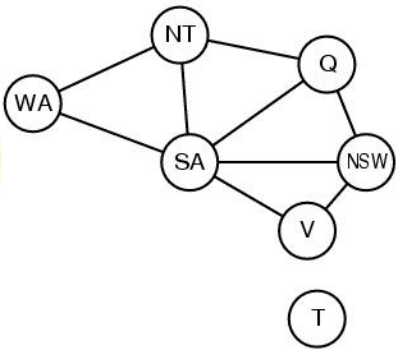
Surprisingly, many students had difficult with this problem. PLEASE, STUDY IT CAREFULLY. The lecture notes are very clear and detailed. You are CERTAIN to see an Alpha-Beta pruning problem on the Final Exam. Get that problem 100% correct.



****** 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 no constraint propag[illegible]e. Cross out all values that would be eliminated by Forward Checking.

See section 6.3.2.

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 no cons[illegible] has been done. Cross out all values that would be eliminated by Arc Consistency (AC-3 in your book).

See section 6.2.2.

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 has been done. List all unassigned variables that might be selected by the Minimum-Remaining-Values (MRV) Heuristic: NT, SA

See section 6.3.1.

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 has been done. List all unassigned variables that might be selected by the Degree Heuristic: SA

See section 6.3.1.

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? R .

See section 6.4.

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