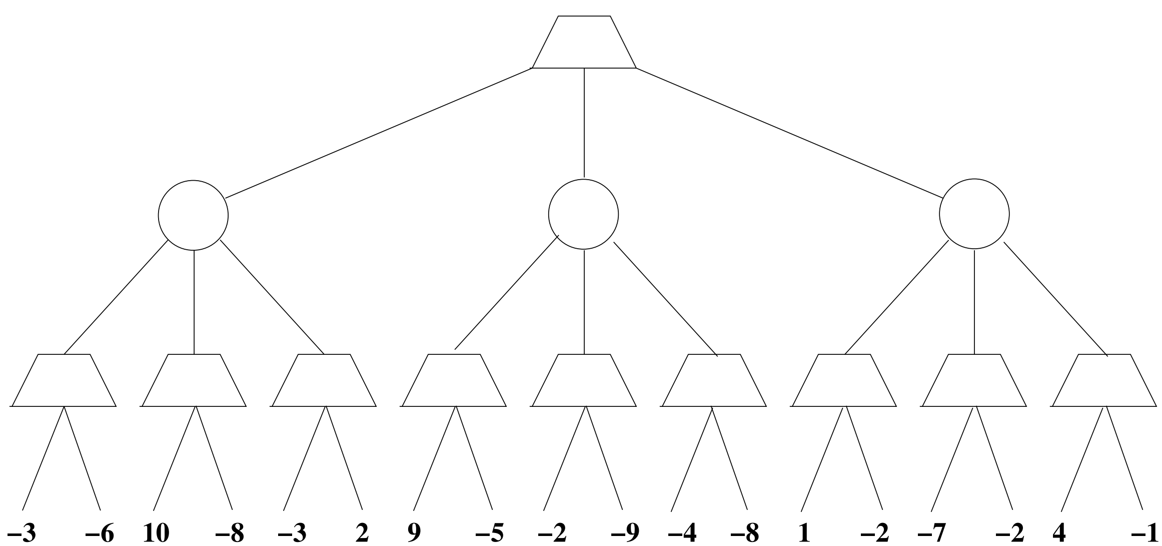
CS 6300 **HW03: Expectimax and Probability** **Due February 1**

Please use LaTeX to produce your writeups. See the Homework Assignments page on the class website for details.

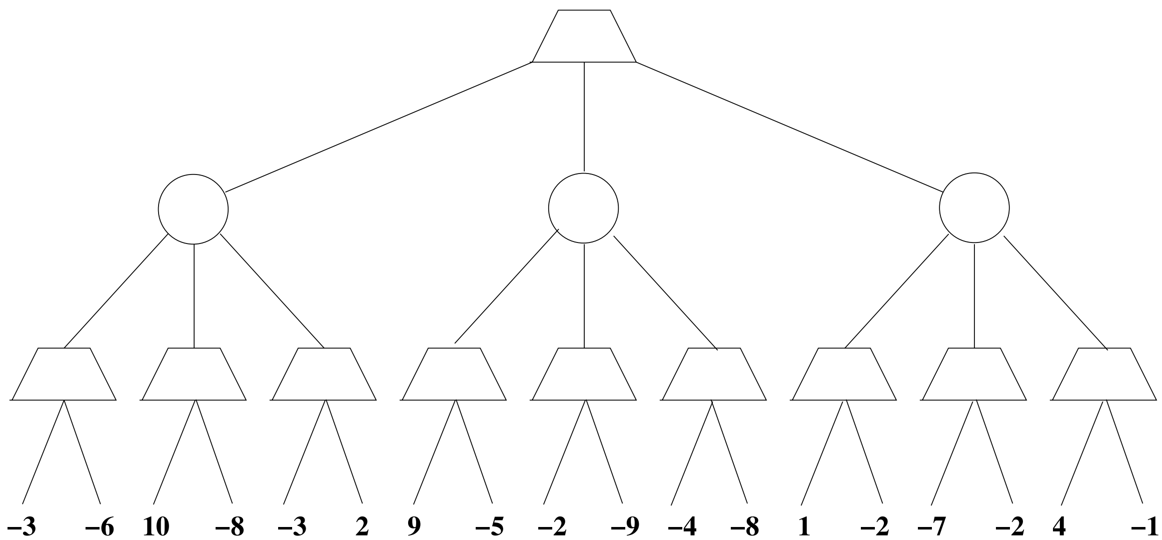
1 Expectimax

Consider the zero-sum expectimax game tree below. Circles represent chance nodes. Trapezoids that point up represent choices for the player seeking to maximize. Outcome values for the maximizing player are listed for each leaf node.

1. First, assume that each chance node chooses uniformly between available moves. Assuming optimal play, carry out the expectimax search algorithm and write the value of each node inside the corresponding trapezoid. What is the expected value of this game assuming optimal play? What is the optimal move to make at each node? Fill in the node values using a drawing program.



2. Now, assume that each chance node plays the leftmost move with probability 0.5, the middle move with probability 0.25, and the rightmost move with probability 0.25. Assuming optimal play, what is the expected value of this game? What is the optimal move to make? Fill in the node values using a drawing program.



2 Probability

Consider the following probability tables for variables A, B, C.

A	$P(A)$
+a	0.3
-a	0.7

B	A	$P(B\|A)$
+b	+a	0.7
+b	-a	0.6

C	A	$P(C\|A)$
+c	+a	0.2
+c	-a	0.9

1. Derive $P(A, B)$ by filling in the entries below. What formula are you using?

A	B	$P(A, B)$
+a	+b	
+a	-b	
-a	+b	
-a	-b	

2. Derive $P(A|C)$ by filling in the entries below. What formula are you using?

A	C	$P(A\|C)$
+a	+c	
+a	-c	
-a	+c	
-a	-c	

3. Suppose B and C are conditionally independent given A. What is the formula you would use? Then derive the full joint distribution $P(A, B, C)$ by filling in the entries below.

A	B	C	$P(A, B, C)$
+a	+b	+c	
+a	+b	-c	
+a	-b	+c	
+a	-b	-c	
-a	+b	+c	
-a	+b	-c	
-a	-b	+c	
-a	-b	-c	

4. Use the full joint distribution you computed in problem 3 to derive the conditional distribution $P(A| + b, -c)$. What formula would you use? Then fill in the table below.

A	B	C	$P(A\| + b, -c)$
+a	+b	-c	
-a	+b	-c	