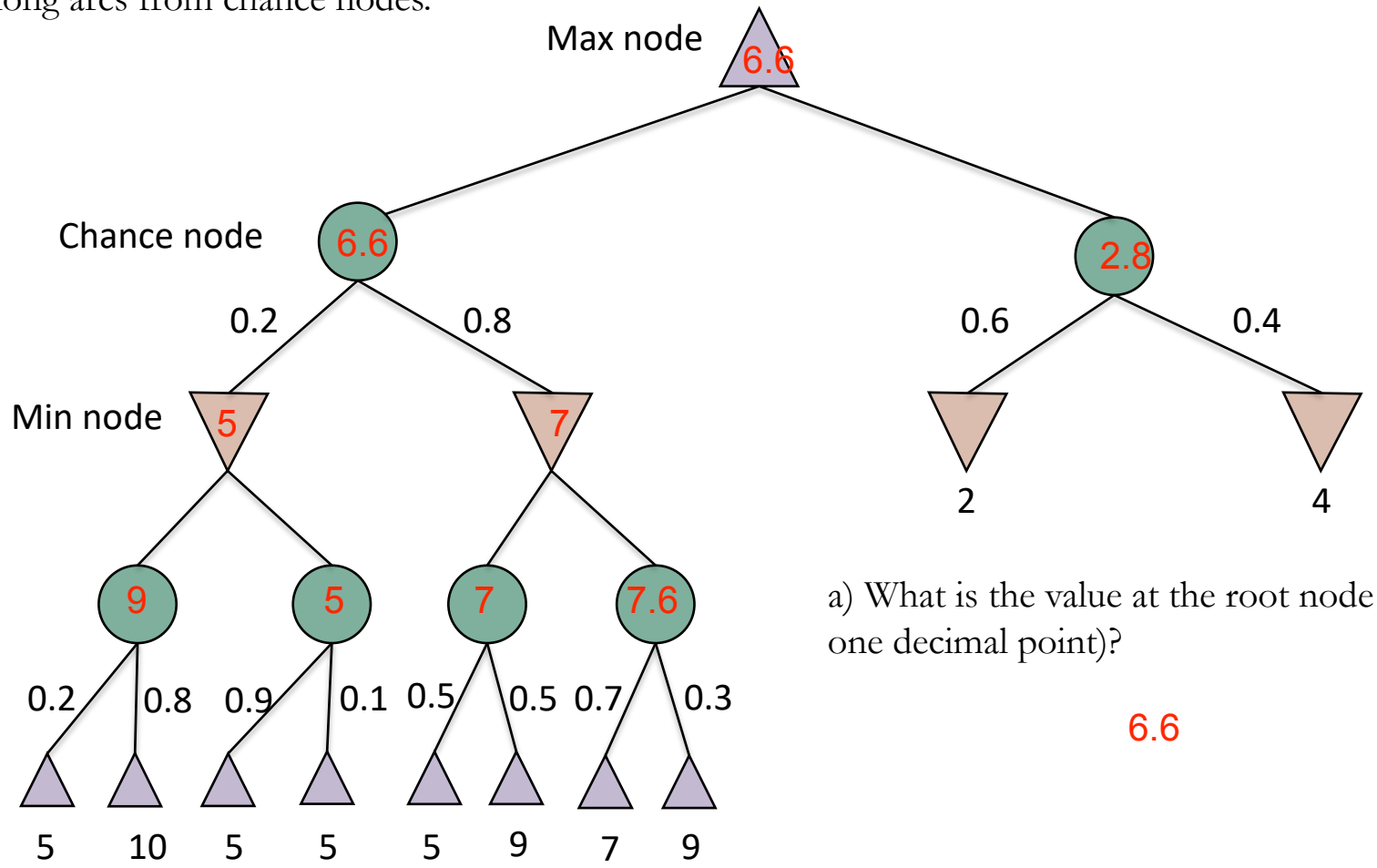
Homework Week 9

1. Consider this expectiminimax tree. Utilities are given at leaves. Probabilities are given along arcs from chance nodes.



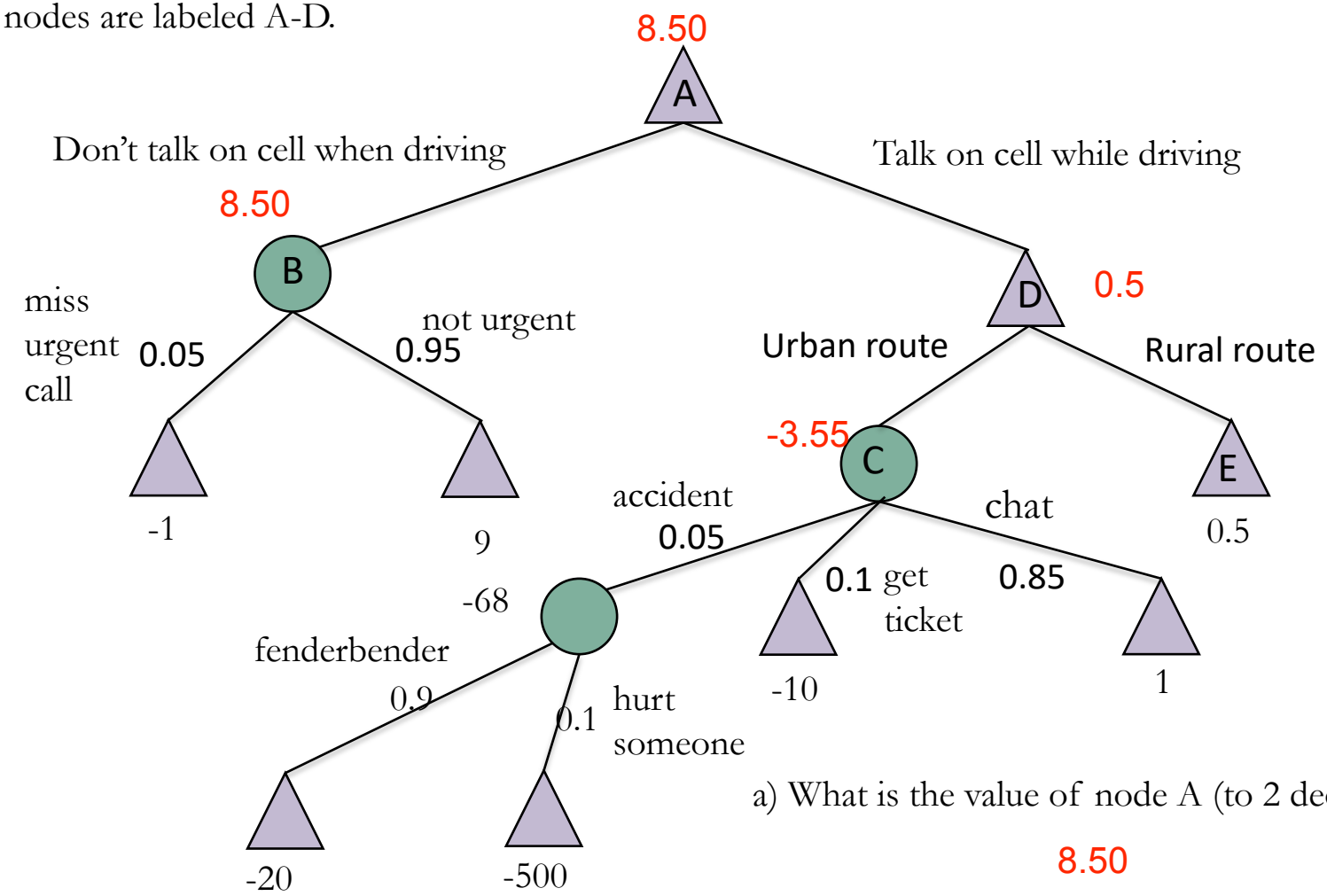
a) What is the value at the root node (Rounded to one decimal point)?

6.6

b) Which branch would you expect Max to move (left or right)?

Left

2. Consider this expectimax tree. Utilities are given at leaves. Probabilities of action outcomes are given at arcs from chance nodes. Suppose this represents a tree for deciding whether to answer a call when driving. Selected nodes are labeled A-D.



a) What is the value of node A (to 2 decimals)?

8.50

b) What is the value of node B (to two decimals)?

8.50

c) What is the value of Node C (to 2 decimals)?

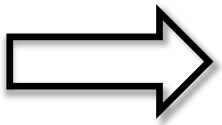
-3.55

d) Is the value of node D equal to the value of Node C or to Node E (C or E)?

Equal to value of Node E (0.5)

3. Show the result of three iterations of the value iteration algorithm beginning with the initial state on the left. The values in the squares with +1 and -1 will not change. Assume a living reward of -0.04 and a discount factor of 1, and that your agent can move up, down, left, or right to any adjacent square during each state transition. The probability of successfully moving in the intended direction is 0.8, while the probability of moving 90 degrees offset from the intended direction is 0.1.

0.0	0.0	0.0	+1
0.0		0.0	-1
0.0	0.0	0.0	0.0



	1st = -0.04 2nd = 0.5856	1st = 0.7960 2nd = 0.8672 3rd = 0.9281	+1
		1st = -0.04 2nd = 0.4936	-1

Calc next page

	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
56	**Constants**																		
57	Reward	-0.04																	
58	Discount	1																	
59	P success	0.8																	
60	P 90 fail	0.1																	
61	expected util	P (R + D(S1)																	
62																			
63																			
64		Parent	Child Right	Child Left	sum		Row1 Col2	Parent	Child Right	Child Left	sum		Row2 Col3	Parent	Child Right	Child Left			
65	1st iteration	0	1	0			1st iteration	0	0	0			1st iteration	0	-1	0			
66	UP	-0.032	0.1	-0.004	0.064		UP	-0.032	-0.004	-0.004	-0.04		UP	-0.032	-0.1	-0.004	-0.136		
67	2nd iteration	0.7920	1	-0.04			2nd iteration	-0.04	0.7920	-0.04			2nd iteration	0.7920	-1	-0.04			
68	UP	0.6016	0.1	-0.008	0.6936		UP	-0.064	0.0752	-0.008	0.0032		UP	0.6016	-0.1	-0.008	0.4936		
69	3rd iteration	0.8672	1	0.5856															
70	UP	0.66176	0.1	0.05456	0.8163														
71																			
72		Parent	Child Down	Child Up			Row1 Col2	Parent	Child Down	Child Up			Row2 Col3	Parent	Child Down	Child Up			
73	1st iteration	1	0	0			1st iteration	0	0	0			1st iteration	-1	0	0			
74	RIGHT	0.8	-0.004	-0.004	0.792		RIGHT	-0.032	-0.004	-0.004	-0.04		RIGHT	-0.8	-0.004	-0.004	-0.808		
75	2nd iteration	1	-0.04	0.7920			2nd iteration	0.7920	-0.0400	-0.04			2nd iteration	-1	-0.04	0.7920			
76	RIGHT	0.8	-0.008	0.0752	0.8672		RIGHT	0.6016	-0.008	-0.008	0.5856		RIGHT	-0.8	-0.008	0.0752	-0.7328		
77	3rd iteration	1	0.4936	0.8672															
78	RIGHT	0.8	0.04536	0.08272	0.9281														
79		0.8	0.04536	0.08272															
80		Parent	Child Right	Child Left			Row1 Col2	Parent	Child Right	Child Left			Row2 Col3	Parent	Child Right	Child Left			
81	1st iteration	0	1	0			1st iteration	0	0	0			1st iteration	0	-1	0			
82	DOWN	-0.032	0.1	-0.004	0.064		DOWN	-0.032	-0.004	-0.004	-0.04		DOWN	-0.032	-0.1	-0.004	-0.136		
83	2nd iteration	-0.04	1	-0.04			2nd iteration	-0.04	0.7920	-0.04			2nd iteration	-0.04	-1	-0.04			
84	DOWN	-0.064	0.1	-0.008	0.028		DOWN	-0.064	0.0752	-0.008	0.0032		DOWN	-0.064	-0.1	-0.008	-0.172		
85	3rd iteration	0.4936	1	0.5856															
86	DOWN	0.36288	0.1	0.05456	0.5174														
87																			
88		Parent	Child Down	Child Up			Row1 Col2	Parent	Child Down	Child Up			Row2 Col3	Parent	Child Down	Child Up			
89	1st iteration	0	0	0			1st iteration	0	0	0			1st iteration	0	0	0			
90	LEFT	-0.032	-0.004	-0.004	-0.04		LEFT	-0.032	-0.004	-0.004	-0.04		LEFT	-0.032	-0.004	-0.004	-0.04		
91	2nd iteration	-0.04	-0.04	0.7920			2nd iteration	-0.04	-0.04	-0.04			2nd iteration	-0.04	-0.04	0.7920			
92	LEFT	-0.064	-0.008	0.0752	0.0032		LEFT	-0.064	-0.008	-0.008	-0.08		LEFT	-0.064	-0.008	0.0752	0.0032		
93	3rd iteration	0.5856	0.4936	0.8672															
94	LEFT	0.43648	0.04536	0.08272	0.5646														
95															Row2 Col3	1st iteration	-0.04	=MAX(Z66,Z74,Z82,Z90)	
96									Row1 Col2	1st iteration	-0.04	=MAX(T90,T82,T74,T66)				2nd iteration	0.4936		
97			Row1 Col3	1st iteration	0.7920	=MAX(N90,N82,N74,N66)				2nd iteration	0.5856								
98				2nd iteration	0.8672	=MAX(N92,N84,N76,N68)													
99				3rd iteration	0.9281	=MAX(N94,N86,N78,N70)													

=K59*(K57+(K58*K65))