CS 202: Introduction to Computation
Fall 2010: Practice Exam #1

Name: _____

Question	Possible Points	Received Points
1		
2		
3		
4		
5		
6		
Total	100	

This exam is closed notes.

You have 50 minutes to complete the 6 questions on this exam.

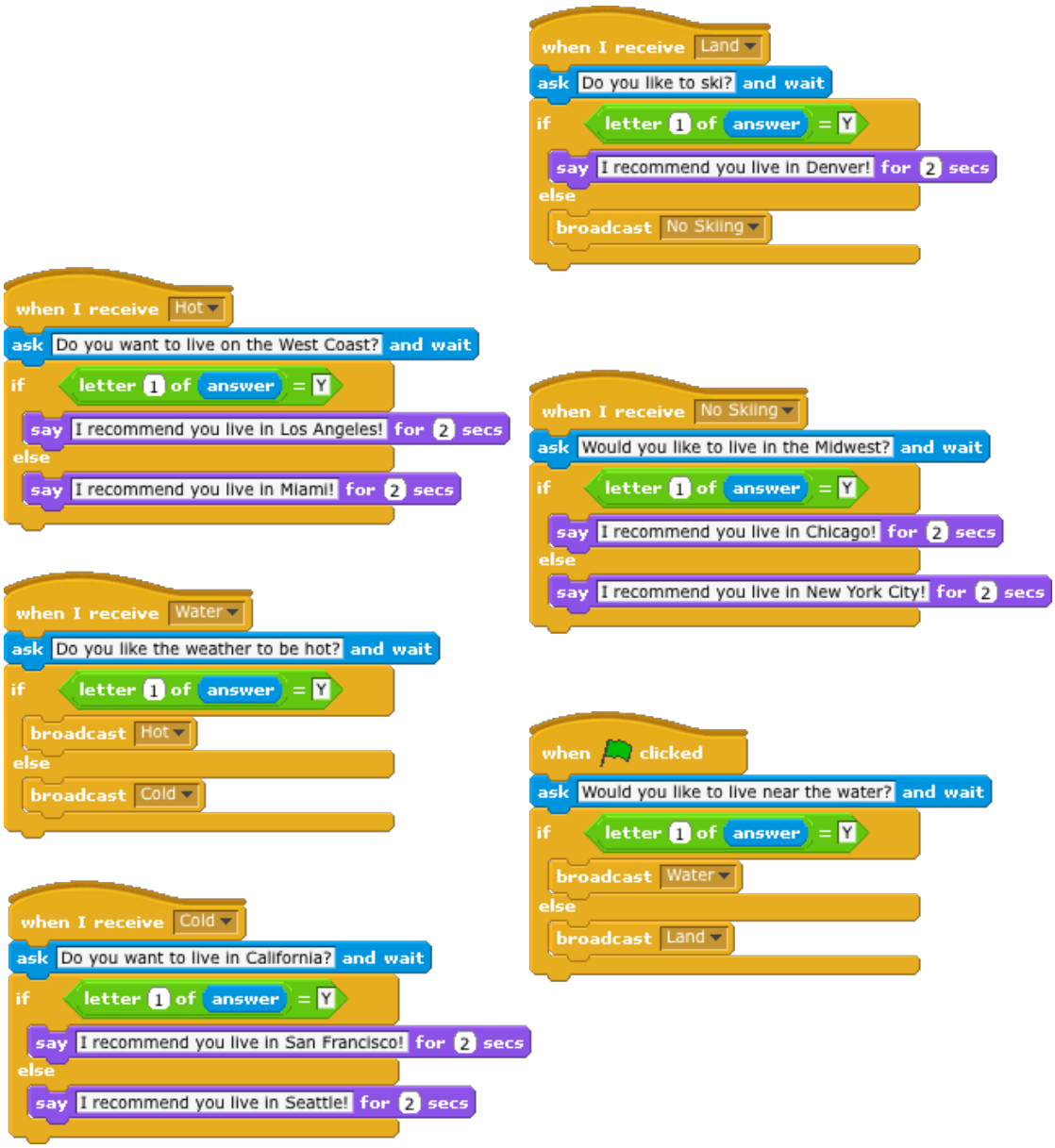
Please write your answers clearly.

Good luck!

The questions on this practice exam are only representative of the questions you are likely to see on the real exam. The questions on the real exam may be substantially different than the ones here.

Question 1: Just pick Madison!

A) The following scripts help someone choose a city in the U.S. where they might like to live. On the back of the previous page, draw the **decision tree** that corresponds to the scripts. Be sure to give a descriptive name to each node of the tree, label the transitions between nodes, and give the outputs of the program.



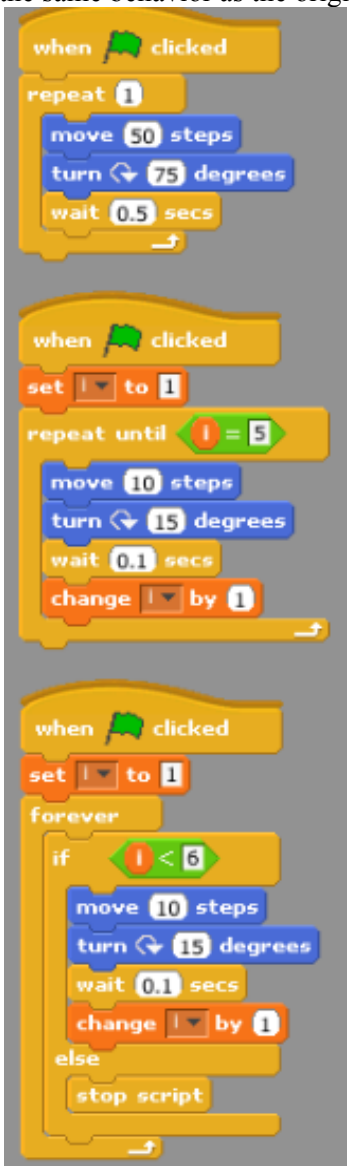
B) In any one run of the program, what is the fewest number of questions the user could be asked?

C) In any one run of the program, what is the greatest number of questions the user could be asked?

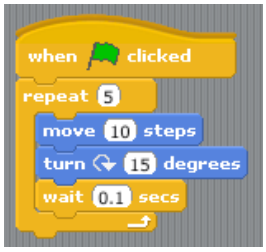
Question 2: Some of these things are not like the others…

A) You have a cat who is running the following scripts. Assume the cat begins by facing right. Draw a simple diagram showing what the cat does.

B) For each of the following scripts activated by "When Green Flag clicked", say whether or not it results in the same behavior as the original script. If it has different behavior, state how the behavior is different.



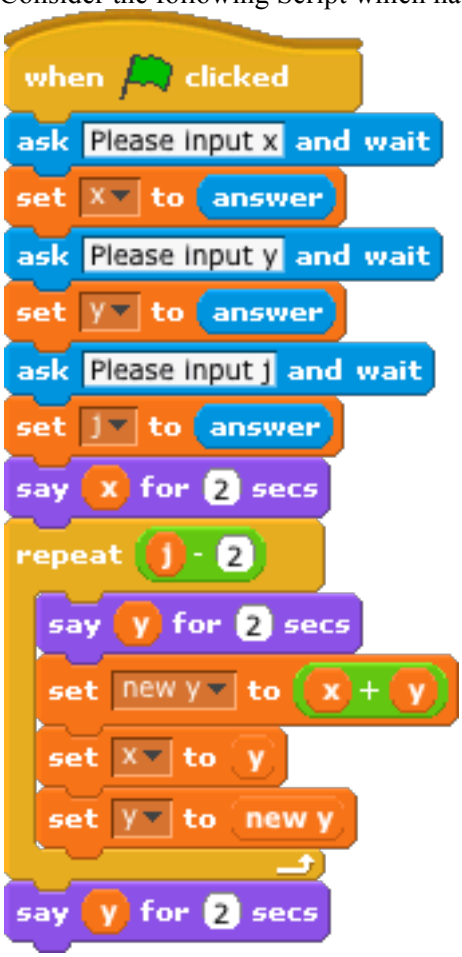
Original code (again):



B Continued). For each of the following scripts, say whether or not it results in the same behavior as the original script. If it has different behavior, state how the behavior is different.

Question 3: How do the variables vary?

Consider the following Script which has access to four variables called x, y, j, and new y.



A) Assume the user enters x=1, y=2, and j=6. How many times will the repeat loop execute?

B) Fill in the following table to show the value of each variable at the end of each iteration of the repeat loop. You may not need all of the rows of the table. You may find it useful to show the initial values of each variable in the header row of the table.

Loop #	**j**	**new y**	**x**	**y**
1				
2				
3				
4				
5				
6				
7				

C) What are all of the statements the Sprite has said by the time it finishes the script?

Question 4: Do you know a little bit?

Specify whether each of the following statements is true or false. Feel free to explain your answer if you desire.

_____ The binary number 00100 is 4 in decimal

_____ The decimal number 10 is 00110 in binary

_____ The binary number 001000 is the same as the binary number 1000

_____ The largest (unsigned) integer that can be represented in 3 bits is 8 (decimal)

_____ The largest (unsigned) integer that can be represented in 5 bits is 31 (decimal)

_____ The largest (unsigned) integer that can be represented in N bits is 2^N

_____ The largest (unsigned) integer that can be represented in N bits is $(2^N)-1$

_____ The largest (unsigned) integer that can be represented in N bits is $2^{(N-1)}$

_____ The number 0110 is larger in base 4 than in base 2.

_____ The binary number 0010 multiplied by 2 (decimal) is 0100.

_____ The binary number 0100000 multiplied by 2 (decimal) is 1000000.

_____ The binary number 0011 multiplied by 2 (decimal) is 1110.

_____ The binary number 011001001 multiplied by 2 (decimal) is 110010010.

_____ A truth table with 4 inputs requires 8 rows to enumerate all input combinations.

_____ A truth table with 5 inputs requires 31 rows to enumerate all input combinations.

_____ Any truth table can be converted into a combinational circuit.

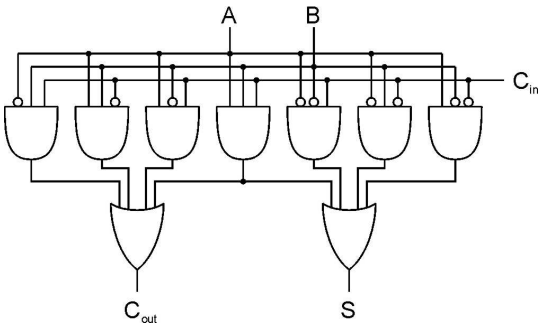
_____ A combinational circuit can have feedback or loops.

_____ A sequential circuit can remember values.

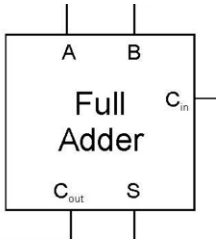
_____ A sequential circuit is a function of only the current inputs.

Question 5: Is the sum greater than its parts?

A full one-bit adder is constructed as follows:



but can be represented more simply with the following diagram:



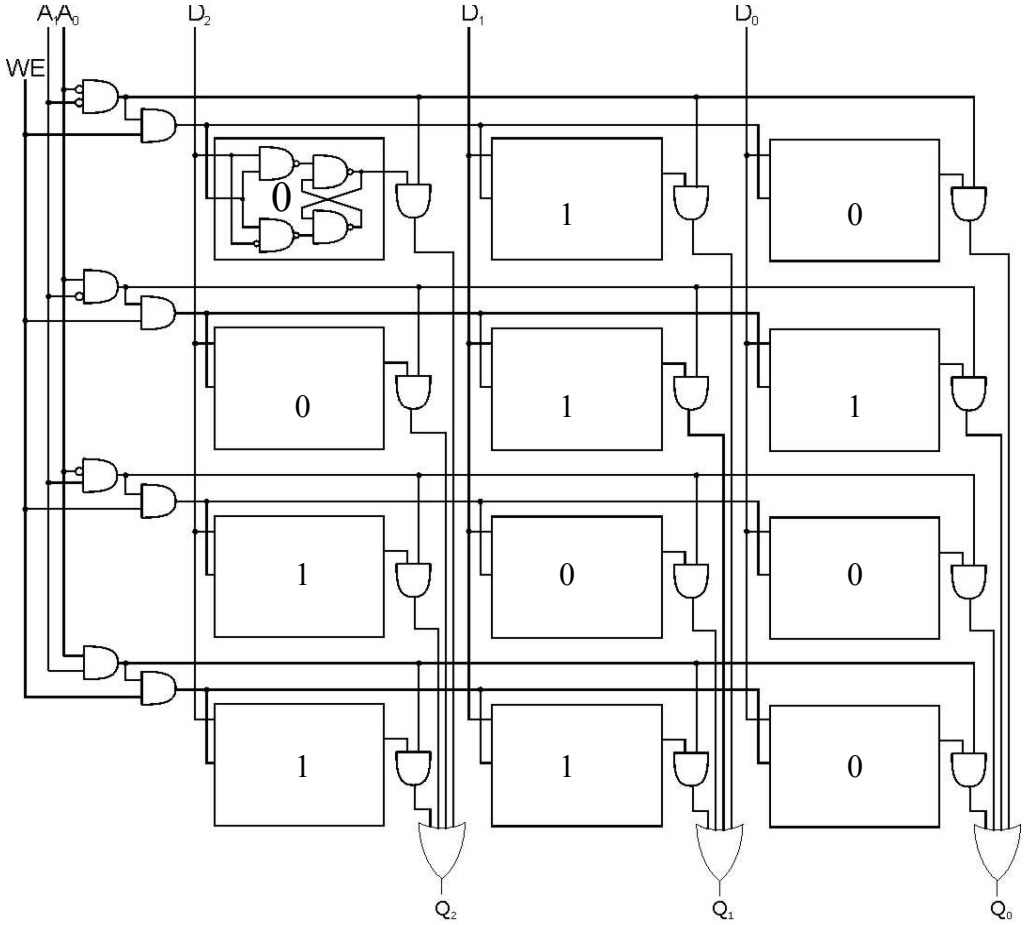
A) Draw a diagram showing how a **four bit adder** can be constructed from four full one-bit adders (you can use the simpler representation in your diagram). Your adder should take as input two four bit numbers: $A_3A_2A_1A_0$ and $B_3B_2B_1B_0$ and produce as output C_{out} and $S_3S_2S_1S_0$. Be sure your diagram shows the correct input and output to all lines and how all of the full one-bit adders are connected.

B) Given the following input to your four bit adder, what would be the observed output?

A_3	A_2	A_1	A_0	B_3	B_2	B_1	B_0	C_{out}	S_3	S_2	S_1	S_0
0	0	1	0	0	0	0	1					
0	1	0	1	0	0	1	0					
0	1	1	1	0	1	1	1					
1	1	1	1	1	0	1	1					

Question 6: Do you remember me?

Imagine you have 4x3 bit DRAM with the following contents:



A) Imagine the following commands are sent to DRAM. What will be the output of the circuit in each case?

WE	**A_1**	**A_0**	**D_2**	**D_1**	**D_0**	**Q_2**	**Q_1**	**Q_0**
0	**0**	**0**	**0**	**0**	**0**			
0	**1**	**0**	**1**	**1**	**1**			
0	**1**	**1**	**0**	**0**	**0**			
1	**0**	**0**	**1**	**1**	**0**			
1	**1**	**0**	**0**	**1**	**0**			
0	**0**	**0**	**1**	**1**	**1**			