CS 202: Introduction to Computation
Fall 2010: Exam #2

Name: Solutions + Grading Scale

Question	Possible Points	Received Points
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

This exam is closed notes.

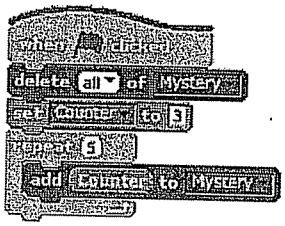
You have 50 minutes to complete the 5 questions on this exam.

Please write your answers clearly.

Good luck!

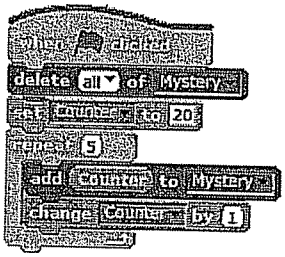
Question 1: List your complaints here — Grader: Nisha Kiran

Imagine you have eight different Scratch programs, each which manipulates a list "Mystery?" Your job is to "execute" the scripts in your head to repeat the exact same steps and operations that Scratch would. For each of the following 8 scripts, **show the contents of the List "Mystery" at the end of the script.** Be careful of the tiny but important differences across scripts!



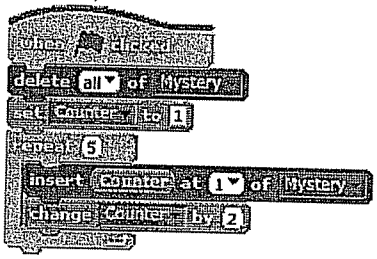
3 3 3 3 3

2 pts
No partial credit



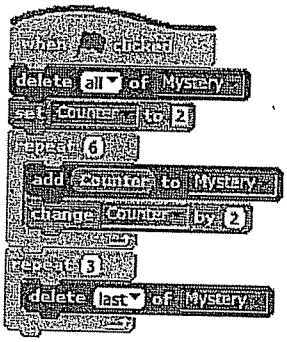
20 21 22 23 24

2 pts.
No partial credit.



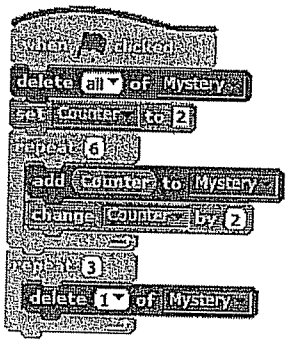
9 7 5 3 1

2 pts.
No partial credit



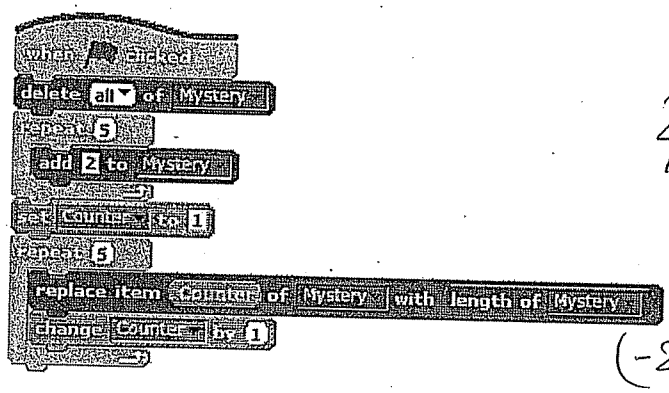
2 4 6 ~~8~~ ~~10~~ ~~12~~

2 pts.
~~Depending on the answer~~ (-1) if not completely correct.



~~2~~ ~~4~~ ~~6~~ 8 10 12

3 pts. total
-2 pt for not getting the ~~initial~~ final sequence correct

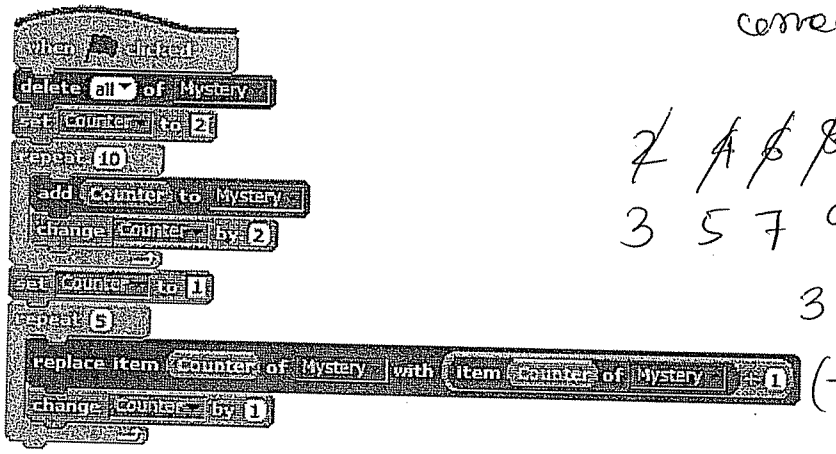


~~2~~ ~~2~~ ~~2~~ ~~2~~ ~~2~~

5 5 5 5 5

3 pts total

(-2) if the final answer is not correct and only initial is correct

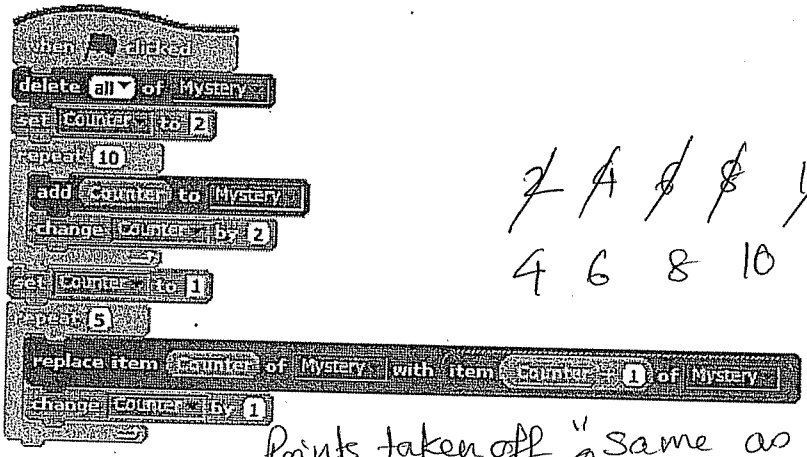


~~2~~ ~~4~~ ~~6~~ ~~8~~ ~~10~~ 12 14 16 18 20

3 5 7 9 11 " " " " "

3 pts total

(-2) if the final answer is not correct given the initial part is correct.



~~2~~ ~~4~~ ~~6~~ ~~8~~ ~~10~~ 12 14 16 18 20

4 6 8 10 12 12 14 16 18 20

3 pts.

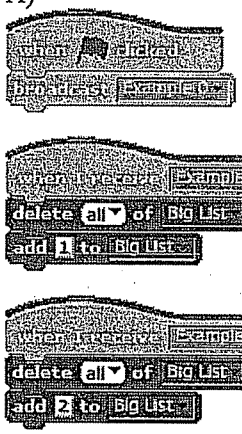
Points taken off for "same as above"

Question 2. Is there too much going on at one time? Grader: Nisha Kiran

Consider the seven sets of scripts listed below. Each set of scripts is a single (separate) program and is started when the Green Flag is clicked. Each set of scripts accesses a single shared list: Big List (which is actually not so big). You should consider how different orderings of scripts may result in items being added in different orders to the List.

For each of the seven sets of scripts, answer the following two questions. First, which scripts will run **concurrently** with one another? You should use the names "S1" "S2" and "S3" to identify each script. Second, what are all of the final values that could possibly be in Big List after the scripts in the set terminate? Make sure you show the **different order** in which the items might appear in Big List.

A)



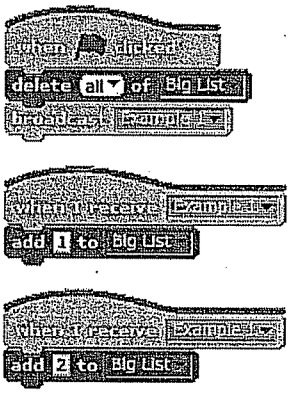
$S_2 + S_3$ concurrent – 1 pt

Big List : (1) or (2)

1 pt 1 pt

(-1) for any extra possibility

B)



$S_2 + S_3$ concurrent – 1 pt

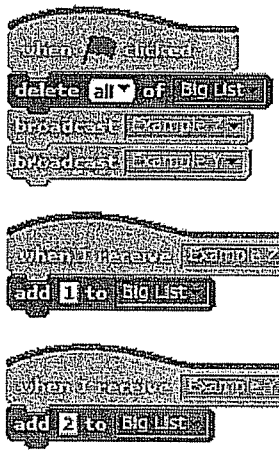
List : 1, 2 or 2, 1

↓ ↓

1 pt 1 pt.

(-1) for any extra possibility

C)

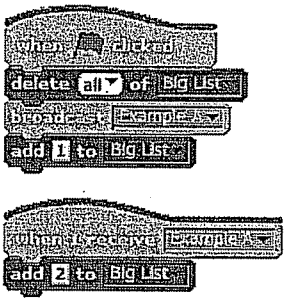


Concurrent: $S_2 + S_3$ (and technically S_1)

~~List~~: 1, 2 or 2, 1

Same as above

D)

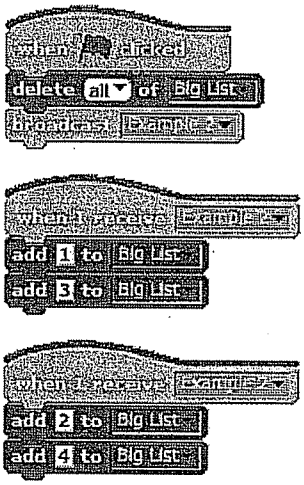


$S_1 + S_2$ concurrent

1, 2 or 2, 1

Same as above

E)

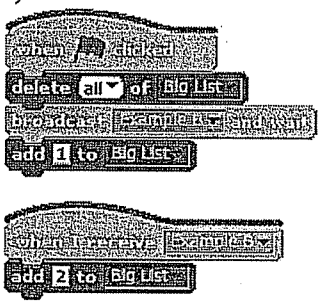


$S_2 + S_3$ concurrent

List: 1324 or 2413

Same as above

F)



No concurrency - 1 pt

List: 2, 1 - 2 pt.

3 pts total, (-1) for any extra possibility

G)

No concurrency - 1pt

List: 22221 - 1pt

(-1) for any extra possibility

Problem 3 HENG Guo

A) program 1. Line 2 change "key index" to key — 1.5point
Line 7 change "key" to "key index" — 1.5point
program 2. Line 3 broadcast and wait — 1.5point
Line 4 not key index = 0. — 1.5point

B)

Loop	index	item	greater?	lo	hi	key index
1	9	200	1	1	8	0
2	5	88	0	6	8	0
3	7	113	1	6	6	0
4	6	105	0	6	6	6

8 points in total

C)

Loop	index	item	greater?	lo	hi	key index
1	9	239	1	1	8	0
2	5	200	1	1	4	0
3	3	280	1	1	2	0
4	2	88	0	3	2	0

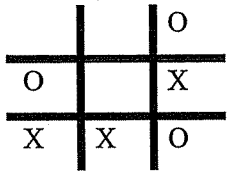
4 points

D) No, it doesn't find the index correctly.
It finds nothing in this case.
The reason is that the list is not sorted

2 points

Thea Hinkle graded this problem

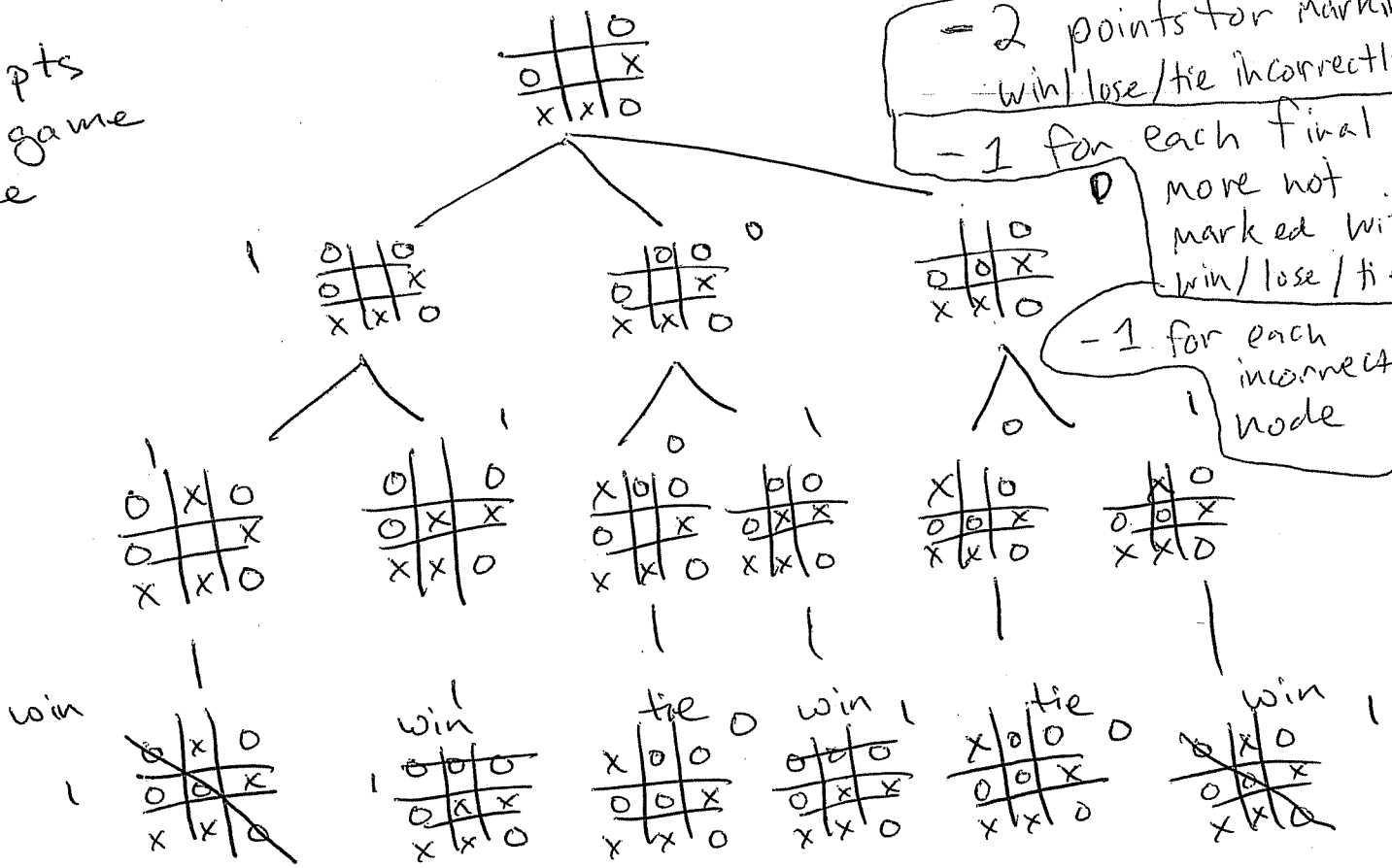
Question 4: Do you want to play a game?
Assume you are playing tic-tac-toe with your friend. You are O and your friend is X. You've each taken 3 turns and the board now looks like this:



A) To help you make your next move as O, draw the complete **game tree** for the final three moves (assuming you, O, go next). Mark whether each final board is a win, lose, or tie for O.

16 pts for game tree

-2 points for marking win/lose/tie incorrectly
-1 for each final move not marked with win/lose/tie
-1 for each incorrect node



B) Using the minimax algorithm, show the value (-1, 0, or 1) of each board position; you should propagate these values **up** the game tree to every intermediate node of the tree.

2 pts for minimax values

1/2: some values correct + propagated up tree

C) Where will you decide to place your next O? How does the game tree guide you to that decision?

2 pts

1/2: not saying how game tree helped
0/2: incorrect placement decision

- upper left corner — value of 1;
no matter what X does in response,
O is guaranteed to win.

Grader: Nisha Kiran

5) What is the meaning of Life?

Imagine you are asked to simulate the Game of Life. Remember, cells are placed on a 2-D grid; each cell can be either alive (black) or dead (white). The next generation of cells is calculated from the previous generation using a set of rules. For each cell, we can determine if it will be alive or dead in the next generation depending upon the current state of its 8 nearest neighbors (the 8 nearest neighbors are the cells directly adjacent above, below, left, right, and the four diagonal cells). We use the following rule:

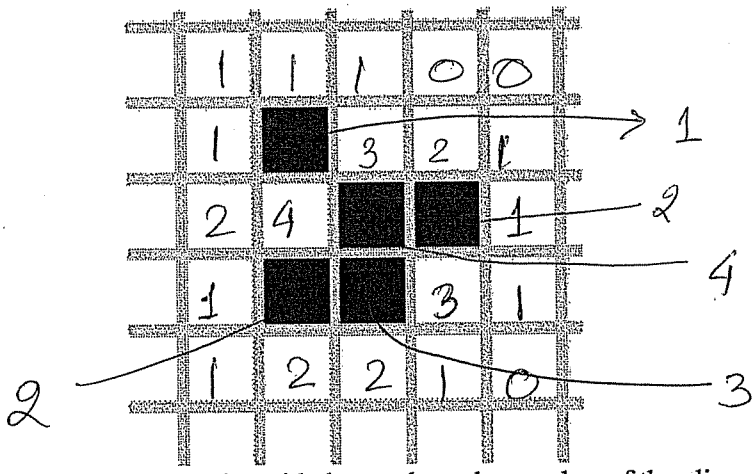
If (cell is alive)

If < 2 neighbors are alive, then the cell dies
If > 3 neighbors are alive, then the cell dies
If 2 or 3 neighbors are alive, then the cell stays alive

If (cell is dead)

if 3 neighbors are alive, then the cell becomes alive

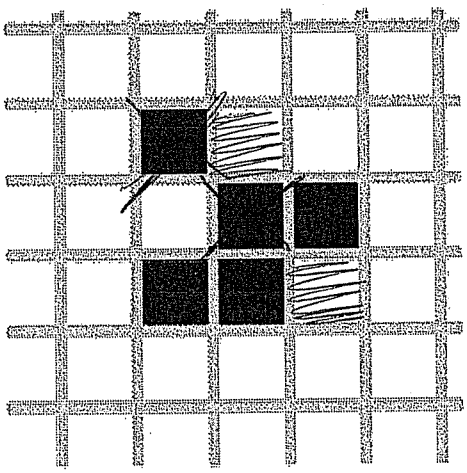
Imagine the world begins in this initial state.



12 pts total
(-1) pt for each square you left out.

A) On the grid above, show the number of the alive neighbors for each of the "interesting" cells; you do not need to report the number when there are 0 alive neighbors.

B) On the grid below, show the state of the cells in the next generation. Alive cells should be filled in with black; dead cells should be left empty or crossed out with an X.



8 pts total
(-1) for each wrong square or a square left out.