

**CS 202: Introduction to Computation
Fall 2011: Exam #1**

Name: _____

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: Truth or Consequences

Consider whether each of the following statements is True or False. Circle the correct answer.

- True False The purpose of a CAPTCHA is to distinguish humans from computers.
- True False Computers can visually identify objects better than humans can.
- True False A recipe is an algorithm.
- True False Scratch is an algorithm.
- True False A flowchart can be used to express an algorithm.
- True False A program may return different outputs given different inputs.
- True False Different programs can be constructed from the same set of blocks or instructions.
- True False In Scratch, the Stage can have scripts associated with it.
- True False In Scratch, each script runs to completion before the next script is started.
- True False In Scratch, multiple scripts from the same Sprite may run concurrently.
- True False In Scratch, multiple scripts from different Sprites may run concurrently.
- True False Initializing variables is important when a program ends.
- True False A variable can be thought of as a container in memory holding different values over time.
- True False In Scratch, a variable can contain only strings (that is, words, letters, or characters).
- True False If a race condition exists, two Sprites asking the same question can obtain different answers.
- True False The best way for one Sprite to tell another Sprite to do something is to broadcast a message.
- True False A Sprite should not receive a message that it itself broadcast.
- True False According to Professor Ben Snyder (our 1st guest lecturer), computation can help decipher ancient texts.
- True False According to Professor Bilge Multu (our 2nd guest lecturer), robots should have manners.
- True False According to the definition given in lecture, tic-tac-toe is a strategy game.
- True False According to the definition given in lecture, poker is a strategy game.
- True False The minimax algorithm is named as such because it minimizes the number of states in the game tree and maximizes the computer's probability of winning.

Question 3: Some of these things are not like the others...

Assume you have a cat Sprite that is running the following script.

```

when green flag clicked
hide
switch to costume costume1
show
repeat 4
  play sound meow until done
  wait 1 secs
  next costume
  
```

For each of the following scripts activated by “When Green Flag clicked”, circle those that result in the same behavior as the original script. Cross out those scripts that result in different behavior.

```

when green flag clicked
hide
switch to costume costume1
show
repeat 4
  play sound meow until done
  wait 1 secs
  switch to costume costume2
  
```

```

when green flag clicked
hide
switch to costume costume1
show
repeat 2
  play sound meow until done
  wait 1 secs
  next costume
  play sound meow until done
  wait 1 secs
  next costume
  
```

```

when green flag clicked
hide
switch to costume costume1
show
set count to 4
repeat count
  play sound meow until done
  wait 1 secs
  next costume
  
```

```

when green flag clicked
hide
next costume
show
repeat 4
  play sound meow until done
  wait 1 secs
  next costume
  
```

```

when green flag clicked
hide
switch to costume costume1
show
repeat 4
  if 1 = 1
    play sound meow until done
    wait 1 secs
    next costume
  
```

```

when green flag clicked
hide
switch to costume costume1
show
set count to 0
repeat until count = 4
  play sound meow until done
  wait 1 secs
  next costume
  change count by 1
  
```

```

when green flag clicked
hide
switch to costume costume1
show
repeat 4
  play sound meow until done
  wait 1 secs
  switch to costume costume2
  play sound meow until done
  wait 1 secs
  switch to costume costume1
  
```

```

when green flag clicked
hide
switch to costume costume1
show
repeat 4
  next costume
  wait 1 secs
  play sound meow until done
  
```

```

when green flag clicked
hide
switch to costume costume1
show
set count to 0
forever if count = 4
  play sound meow until done
  wait 1 secs
  next costume
  change count by 1
  
```

Question 4: How do the variables vary?

Consider the following Script which uses three variables called X, Mystery, and counter.

```

when clicked
ask What is x? and wait
set X to answer
set Mystery to 1
set counter to 0
repeat until X = 1
  set Mystery to Mystery * X
  change X by -1
  change counter by 1
say Mystery
  
```

For the following input values of x, fill in the 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.

A) x=3

Loop #	Mystery	X	counter
1			
2			
3			
4			

B) x=4

Loop #	Mystery	X	counter
1			
2			
3			
4			

C) x=5

Loop #	Mystery	X	counter
1			
2			
3			
4			

D) This script makes an assumption about the value of X that the user specifies as input. A user could break this script by giving certain values of X. For what initial values of X would the “repeat until” loop never terminate?

Question 5: Your Guess is as Good as Mine

Consider the script included in the last part of the appendix attached to this exam. The script can be used to calculate the probability of all the coins showing as Heads when a coin is flipped a specified number of times. (It is the same script that was shown in lecture.)

- A) Imagine you want to calculate the probability of flipping 3 (three) HEADS in a row – that is, if you flip a fair coin three times, the probability that all three flips turn up heads. How would you specify the inputs “Trials” and “Flip Count” for the script to perform this calculation for you? Give precise numbers!

- B) This script only works correctly if the call to “pick random HEADS to TAILS” returns a random stream of HEADS (0) or TAILS (1). Imagine that the Scratch instruction block “pick random” is broken and always returns HEADS (0). When you use the script, what will it calculate as the probability of flipping three HEADS in a row?

- C) Imagine the block “pick random” is broken and always returns TAILS (1). When you use the script, what will it calculate as the probability of flipping three HEADS in a row?

- D) Imagine the block “pick random” is broken and it returns numbers in the strictly alternating series: HEADS (0), TAILS (1), HEADS (0), TAILS (1), HEADS (0), TAILS (1), and so forth. When you use the script, what will it calculate as the probability of flipping three HEADS in a row?

- E) Imagine the block “pick random” is broken and it returns numbers in groups of three: HEADS (0), HEADS (0), HEADS (0), then TAILS (1), TAILS (1), TAILS (1), and then HEADS (0), HEADS (0), HEADS (0), then TAILS (1), TAILS (1), TAILS (1), and so forth. When you use the script, what will it calculate as the probability of flipping three HEADS in a row?

Code Appendix for Question 2. This page may be removed for reference.

```
when clicked
  say You dropped food on the floor and wonder if you should eat it... for 2 secs
  ask Did anyone see you? and wait
  if letter 1 of answer = Y
    broadcast Saw You
  else
    broadcast Didn't See You

when I receive Saw You
  ask Can you cut out the part that touched the floor? and wait
  if letter 1 of answer = Y
    broadcast Eat It
  else
    broadcast Your call

when I receive Didn't See You
  ask Was the food sticky? and wait
  if letter 1 of answer = Y
    broadcast Sticky
  else
    broadcast Eat It

when I receive Eat It
  say Eat It! for 2 secs

when I receive Not Steak
  ask Did the cat lick it? and wait
  if letter 1 of answer = Y
    broadcast Cat Licked
  else
    broadcast Eat It

when I receive Sticky
  ask Is it a raw steak? and wait
  if letter 1 of answer = Y
    broadcast Steak
  else
    broadcast Not Steak

when I receive Steak
  ask Are you a puma? and wait
  if letter 1 of answer = Y
    broadcast Eat It
  else
    broadcast Don't Eat It

when I receive Don't Eat It
  say Don't eat it! for 2 secs

when I receive Your call
  say Your call! for 2 secs

when I receive Cat Licked
  ask Is your cat healthy? and wait
  if letter 1 of answer = Y
    broadcast Eat It
  else
    broadcast Your call
```

Code Appendix for Question 5. This page may be removed for reference.

```
when green flag clicked
  set HEADS to 0
  set TAILS to 1
  set Successes to 0
  ask Trials? and wait
  set Trials to answer
  ask Flip Count? and wait
  set Flip Count to answer
  repeat Trials
    set Head Count to 0
    repeat Flip Count
      if pick random HEADS to TAILS = HEADS
        change Head Count by 1
    if Head Count = Flip Count
      change Successes by 1
  say Successes / Trials
```

The image shows a Scratch script for a coin flip simulation. It starts with a 'when green flag clicked' event. The script initializes variables: HEADS to 0, TAILS to 1, and Successes to 0. It then asks the user for the number of trials and the number of flips per trial. A 'repeat' loop runs for the number of trials. Inside this loop, it sets 'Head Count' to 0 and runs another 'repeat' loop for the number of flips. In the inner loop, it uses a 'pick random' block to choose between HEADS and TAILS. If the result is HEADS, it increments 'Head Count' by 1. After the inner loop, it checks if 'Head Count' equals the 'Flip Count'. If true, it increments 'Successes' by 1. Finally, it says the ratio of 'Successes' to 'Trials'.

