

Name : _____
Section TA: _____

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- **DEVICES:** If your cell phone, pager, PDA, beeper, iPod, or similar item goes off during the exam, you will lose 10 points on this exam. Turn all such devices off and put them away now. You cannot have them on your desk.
- **ACADEMIC MISCONDUCT:** Academic misconduct will not be tolerated. You are to uphold the honor and integrity bestowed upon you by the Georgia Institute of Technology.
 - Keep your eyes on your own paper.
 - Do your best to prevent anyone else from seeing your work.
 - Do NOT communicate with anyone other than a proctor for ANY reason in ANY language in ANY manner.
 - Do NOT share ANYTHING during the exam. (This includes no sharing of pencils, paper, erasers).
 - Follow directions given by the proctor(s).
 - Stop all writing when told to stop. Failure to stop writing on this exam when told to do so is academic misconduct.
 - Do not use notes, books, calculators, etc during the exam.
- **TIME:** Don't get bogged down by any one question. If you get stuck, move on to the next problem and come back once you have completed all of the other problems. This exam has 6 questions on 9 pages including the title page. Please check to make sure all pages are included. You will have 50 minutes to complete this exam.

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. I have also read and understand the requirements outlined above.

Signature: _____

Question	Points	Score
1. Vocabulary	9	
2. Multiple Choice	9	
3. Functional Choices	4	
4. Find The Errors	8	
5. Box Packer	12	
6. Marks The Spot	15	
Total:	57	

1. (9 points)

For each of the following vocabulary terms, write a concise 1-2 sentence definition. Be brief, and to the point.

- (a) [3 pts] argument

Solution: argument - A value provided to a function when the function is called. This value is assigned to the corresponding parameter in the function.

- (b) [3 pts] aliases

Solution: Two variables that point to the same data.

- (c) [3 pts] semantic error

Solution: An error (in code) that leads to unexpected behavior. The program functions correctly (does what the code says) but the code does not actually perform the action that the programmer intended.

2. (9 points)

For each of the following multiple choice questions, indicate the most correct answer! Indicate your selected answer by circling it.

- (a) [1 pt] Convert
- 69_{10}
- to binary (base 2):

A. 01000100 **B. 01000101** C. 11000101 D. 01000111 E. 01001101
F. 01010101

- (b) [1 pt] Which of the following is true about the keys in a dictionary?

A. An integer can be a key.
B. A list can be a key.
C. A dictionary can be a key.
D. All keys must be mutable.
E. All of the above are False.

- (c) [1 pt] Examine the following code:

```
aDict = {'GT Baseball': ['8 wins', '5 losses'],
        'GT Mascot Challenge': '13-0', 'GT Basketball': '11-5',
        'GT Football': '8-4'}
```

```
keys = aDict.keys()
```

```
values = aDict.values()
```

Using the `keys` variable, how does one put every key from the dictionary, `aDict`, into a list?

- A. Use the `has_key()` method to move keys into a list.
 - B. Iterate through keys and append each item to an originally empty list.**
 - C. Set a variable equal to `keys.list()`
 - D. Set a variable equal to `keys.getList()`.
- (d) [1 pt] (continued...) The following line of code is run AFTER the three lines of code above have already ran. What does it do?

```
aDict['GT Water Polo'] = ['10 wins', '1 loss', '4 ties']
```

- A. Adds the string, 'GT Water Polo', as a value and the list ['10 wins', '1 loss', '4 ties'], as a key to `aDict`.
- B. Overwrites the old `aDict` and sets `aDict` equal to {'GT Water Polo': ['10 wins', '1 loss', '4 ties']}.
- C. Adds the string, 'GT Water Polo', as a key and the string, '10-1-4', as a value to `aDict`.
- D. Adds the string, 'GT Water Polo', as a key and the list ['10 wins', '1 loss', '4 ties'], as a value to `aDict`.**

- (e) [2 pts] Examine the following code then answer the following questions about it:

```
candyList = ["Jawbreakers", "M&Ms", "Candy Corn", "Skittles"]
```

```
newCandyList = []
```

```
for candyList[0] in candyList:
```

```
    newCandyList.append(candyList[0])
```

What is `newCandyList` after the code is ran?

- A. ["Skittles", "M&Ms", "Candy Corn", "Skittles"]
- B. ["Skittles", "Candy Corn", "M&Ms", "Jawbreakers"]
- C. ["Jawbreakers", "Jawbreakers", "Jawbreakers", "Jawbreakers"]
- D. ["Jawbreakers", "M&Ms", "Candy Corn", "Skittles"]**

What is `candyList` after the code is ran?

- A. ["Skittles", "M&Ms", "Candy Corn", "Skittles"]
- B. ["Skittles", "Candy Corn", "M&Ms", "Jawbreakers"]
- C. ["Jawbreakers", "Jawbreakers", "Jawbreakers", "Jawbreakers"]
- D. ["Jawbreakers", "M&Ms", "Candy Corn", "Skittles"]**

Use the following code to answer the next two questions.

```
aList = [5, 10, 15, 20]
bList = 2 * aList
cList = bList
```

- (f) [1 pt] What list does bList reference?
- A. [2, 5, 10, 15, 20]
 - B. [10, 20, 30, 40]
 - C. [5, 10, 15, 20, 5, 10, 15, 20]
 - D. [5, 10, 15, 20, 20, 15, 10, 5]
- (g) [1 pt] Which of the following statements is true?
- A. cList is an alias of bList**
 - B. bList is an alias of aList
 - C. cList is an alias of aList
 - D. cList is a copy of bList
- (h) [1 pt] Assume the following code has been executed by the python interpreter:

```
def mysteryFunc():
    x = 17
    return print(x)

def mysteryFunc2():
    for x in range(5,15):
        print(x)
    return x

x = [1,2,3]
x = x.append(4)
a = mysteryFunc()
b = mysteryFunc2()
```

Which of the following is correct?

- A. The value in x is [1, 2, 3, 4]
- B. The value in a is 17
- C. the value in b is 14
- D. the value in b is 15
- E. The value in b is 5**
- F. The value in b is None

3. (4 points)

For the following four situations, indicate which of the functions would be the best choice to use:

- (a) [1 pt] Lukas has a list of numbers and he wants to find the largest one.
A. map **B. reduce** C. filter D. none of these
- (b) [1 pt] Whitney wants to set the blue value on every pixel in a picture to 255.
A. map B. reduce C. filter D. none of these
- (c) [1 pt] Majorie wants to find the result of multiplying every number in a list together (the product).
A. map **B. reduce** C. filter D. none of these
- (d) [1 pt] Phil has a list of student names and their class grade. He wants to see the grades of all students whose names start with a 'J'.
A. map B. reduce **C. filter** D. none of these

4. (8 points)

The following function is supposed to take in a file name as a parameter, open the file, and print out every line of the file one at a time.

However, there are four errors in the code. Indicate what each error is, and tell us what code you would change or add to fix each error.

```
def fileReader(fileName):  
  
    f = open(fileName, 'w')  
  
    line = f.readline()  
  
    while line != '':  
        line = f.readline()  
        print(f, end='')  
  
    f.close
```

Solution: Two points for each error. One point for identifying the error, and one point for correctly fixing it.

1. The open statement should be in read mode ("r" vs "w").
2. The while loop should print the line before getting the next line! As it is, it currently skips printing the first line!
3. The print statement should say `print(line)`
4. The last line needs parenthesis to call the close method

5. (12 points)

You are an intern at BigShippingCompany Inc, and your first job is to figure out the code left for you by a previous intern. The code will pack boxes into a truck (attempting to fill as much of the empty space in the truck as possible). A small delivery truck will typically hold as many as 500 to 600 boxes, and a decision needs to be made about how to pack the boxes in less than 20 minutes.

Your boss says that the previous intern was working on a new box packing algorithm that he claimed would be better than the current algorithm, and asks you to compare the two algorithms. You try them out with different numbers of boxes to see how long they take (in seconds).

Number of Boxes	Original Runtime	New Runtime
10	50	1661
20	100	2160
30	150	2453
40	200	2660

(a) [4 pts] If the number of boxes is the input parameter (N), what is the Big O time complexity of each algorithm?

Original Algorithm _____ New Algorithm _____

(b) [4 pts] Which algorithm should you use to pack small delivery trucks, and why?

(c) [4 pts] If your boss wants to pack an entire shipping container (which typically holds 2000 to 2500 boxes), which algorithm should be used, and why?

Solution: The original algorithm is $O(N)$ while the new algorithm is $O(\log N)$. Specifically, the original algorithm is $5 * N$ while the new algorithm is $500 * \log N$

The original algorithm will be faster for 600 boxes, and be able to complete within seventeen minutes, so it should be used for small delivery trucks. The new algorithm will take 4600 seconds (or 106 minutes) so it won't be able to get done in time. (+2 points for algorithm choice, +2 points for reason)

The new algorithm will be faster for 2500 boxes, so it should be used for shipping containers. (+2 points for algorithm choice, +2 for reason)

6. (15 points)

Write a function named `marksTheSpot` that accepts a picture as a parameter. Your function should draw a black "X" over the image. You may assume that the picture object that is passed into your function is square (the width and the height are equal).

Draw a line of black pixels from the top left corner to the bottom right corner, and another line of black pixels from the top right corner to the bottom left corner. We suggest using lines that are one pixel wide.

You may not use a `Window` and/or `drawLine()`, you must manipulate the pixels' color values directly. Your function should return `None`.

Some functions that might be helpful for this question:

- `getPixels(picture)`
- `getPixel(picture, x, y)`
- `getWidth(picture)`
- `getHeight(picture)`
- `getX(pixel)`
- `getY(pixel)`
- `getRed(pixel)`
- `setRed(pixel, value)`

Solution:

```
def marksTheSpot(aPic):
    start = 0
    end = getWidth(aPic) - 1
    for y in range(getHeight(aPic) ):
        pix1 = getPixel(aPic, start, y)
        pix2 = getPixel(aPic, end, y)
        setRed(pix1, 0)
        setGreen(pix1, 0)
        setBlue(pix1, 0)
        setRed(pix2, 0)
        setGreen(pix2, 0)
        setBlue(pix2, 0)
        start = start + 1
        end = end - 1
```

Grading:

- +1 for correct header
- +2 for getting the width or height of the picture
- +3 for turning any pixels black (regardless of where they are)

+2 for having code that iterates over the pixels (either using `getPixels` or by going over the width/height with a for loop)
+3 for correctly drawing one diagonal line (of any color)
+3 for correctly drawing the other diagonal line (of any color)
+1 if they correctly return `None` (deliberately, or by default)

This page intentionally left blank. You may use it for scratch paper. If you place an answer on this page, box it, indicate which problem it is for by number, and BE SURE TO WRITE "Answer on last page" at the problem location!