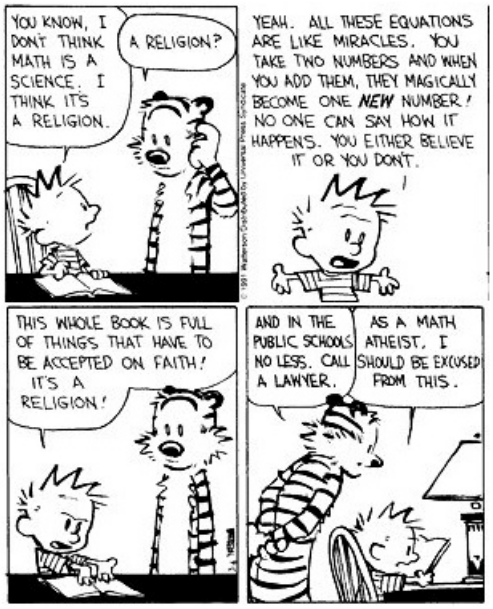
CS150 - Sample Midterm

Name: _____

This exam is closed book, closed notes, closed computer, closed calculator, etc. Read the problem descriptions carefully and write your answers clearly and *legibly* in the space provided. You may use extra sheets of paper if you need more room, as long as the problem number is clearly labeled and your name is on the paper.

You do not need to include comments or constants in your code.



For grading:

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Total	54	

1. **[18 points]** Warming up

   (a) **[2 points]** An object is made up of two main components, what are they?
   Objects have data AND the methods that operate on that data, called using the dot notation '.'

   (b) **[3 points]** The function below *could* enter an infinite loop and never finish depending on the value the function is called with. State what conditions would cause it to enter an infinite loop assuming `num` is a number.

```
def first(num):
   while num != 0:
      print num
      num = num - 1
```

   num < 0

   (c) **[4 points]**If we had the following program in a file and we "ran" the program using the green arrow in Wing, what would you see displayed?

```
def mystery(a_string):
    return a_string + a_string

def mystery2(a_string):
    print a_string * 2

mystery("CS150 is good ")
mystery2("CS150 is great ")
```

   The first call doesn't print anything since the function just returns a value!
   The second line prints: CS150 is great CS CS150 is great

(d) **[5 points]** DNA is made up of four different bases, abbreviated A, C, G and T. A DNA sequence consists of some combination of these letters. Write a function called `random_DNA` that generates a random DNA sequence. Your function should take a single parameter that is the length of the sequence to generate.

```
from random import randint

def random_DNA(length):
    sequence = ""

    for i in range(length):
        pick = randint(1,4)

        if pick == 1:
            sequence += "A"
        elif pick == 2:
            sequence += "C"
        elif pick == 3:
            sequence += "G"
        else:
            sequence += "T"

    return sequence
```

(e) **[4 points]** Draw the resulting memory diagram (i.e. objects and references) after the following statements are executed:

```
a = 10
b = [1, 2, 3, 4, 5]
c = a
d = c
```

d ————∨
a ———> 10
c ————∧
b ———> [1, 2, 3, 4, 5]

2. [**10 points**] Turtle fun

Draw below what the following program would draw on the screen assuming the screen width and height are 700 (-350 to 350). For clarity, feel free to include lines marking the x and y axes. The `circle` function draws a circle starting the very bottom of the circle.

```
from turtle import *

X_MIN = -300 # the smallest x value on the screen
X_MAX = 300 # the largest x value on the screen

def draw_pattern(radius):
    x = X_MIN

    while x < X_MAX:
        pu()
        goto(x, 0)
        pd()

        if x < 0:
            begin_fill()
            circle(radius)
            end_fill()
        else:
            circle(radius)

        x += 2*radius

draw_pattern(50)
```

Just copy and paste and run this one to see the solution :)

3. **[15 points]** Strings and Lists

(a) **[6 points]** Write a Python function `stringToIntList` that takes a string representing a number and returns a list of ints representing the individual digits. For example:

```
>>> stringToIntList("80345")
[8, 0, 3, 4, 5]
```

```
def stringToIntList(string):
    list = []

    for i in range(len(string)):
        list.append(int(string[i]))

    return list
```

(b) **[6 points]** Suppose that `fruits` is initialized as follows:

```
fruits = ['kiwi', 'banana', 'papaya', 'mango', 'melon']
```

What would the following statements print (make sure to be clear what the type of the thing is, i.e. string vs. list):

- `print fruits[1]`
  banana
- `print fruits[:1]`
  ['kiwi']
- `print fruits[-3:-1]`
  ['papaya', 'mango']
- `print fruits[2][4]`
  y
- `print fruits[1:3] * 2`
  ['banana', 'papaya', 'banana', 'papaya']
- `print fruits[1] * 2`
  bananabanana

(c) **[3 points]** What would the following function return if called with "computer science" as the argument (i.e. `hmm("computer science")`):

```
def hmm(phrase):
    output = ""

    for i in range(len(phrase)):
        if output.find(phrase[i]) == -1:
            output = output + phrase[i]

    return output
```

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4. **[6 points]** Conditionals

(a) **[3 points]** Two of the following three functions do the same thing. Identify the two that are the same:

```
def a(x, y):
   if (x < 0 and y < 0) or (x > 0 and y > 0):
       return x * y
   else:
       return 0

def b(x, y):
   if x < 0 and y < 0:
        return x * y
   elif x < 0:
       return 0
   else:
        return x * y

def c(x, y):
   if x < 0 and y < 0:
        return x * y
   elif x > 0 and y > 0:
        return x * y
   else:
        return 0
```

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(b) **[3 points]** The following function checks to see whether two numbers are within 10 of each other. The function works correctly, but could be written much more elegantly. Rewrite the function to be more elegant.

```
def within_10(a, b):
    if abs(a - b) <= 10:
        return True
    elif abs(a - b) > 10:
        return False

def within_10(a,b):
    return abs(a-b) <= 10
```

5. **[5 points]** File processing

Write a function called `every_other_line` that takes as a parameter a filename and reads *every other line* from the file into a list and returns that list. The function should start with the first line, that is add the first line, the third line, the fifth line, etc into the list

```
def every_other_line(filename):
    file = open(filename, "r")
    data  = []
    count = 0

    for line in file:
        if count % 2 == 0:
            data.append(line.strip())

        count += 1

    return data
```