

Name _____

CSCI 150
Final Exam
May 12, 2016

The exam has 10 questions, worth 10 points each. Remember to write the Honor Pledge on the last page when you have finished the exam.

1. What will this program print? Read it carefully.

```
def F(x):
    total = 0
    for i in range(1, x):
        total = total + i
    print( G(total) )

def G(x):
    return x*x

def main():
    L = [2, 3, 1]
    for x in L:
        F(x+1)

main()
```

2. What will this print? Again, read it carefully.

```
def F(x):
    if x == 1:
        return x
    elif x%2 == 0:
        return G(x)
    else:
        return F(x-2)

def G(x):
    if x == 0:
        return x
    elif x%2 == 0:
        return G(x-2)
    else:
        return F(x)

def main():
    for i in range(0, 6):
        print(i, F(i))

main()
```

3. The following program tries to give its own function for changing the contents of a list. The call `change(L, "add", 5)` should append the value 5 onto list L; the call `change(L, "remove", 5)` should remove all instances of value 5 from L.

```
def change( L, operation, value):  
    if operation == "add":  
        L.append(value)  
    elif operation == "remove":  
        L1 = []  
        for x in L:  
            if x != value:  
                L1.append(x)  
        L = L1
```

```
def main():  
    myList = []  
    change( myList, "add", 3 )  
    change( myList, "add", 5 )  
    change( myList, "add", 3 )  
    change( myList, "remove", 3 )  
    change( myList, "add", 7 )  
    change( myList, "remove", 5 )  
    change( myList, "add", 9 )  
    print( myList )
```

```
main()
```

- a) What will this program print?
- b) Explain your answer to (a). One sentence should be sufficient.

4. When I run the following program it incorrectly says
The string 'bob' does not contain a vowel.

Fix this program so that the HasVowel(s) function correctly determines whether string s contains a vowel. Note that I'm not asking you to explain the mistake; just say how to fix it. You can write directly over my code.

```
def IsVowel(x):
    if x in "aeiou":
        return True
    else:
        return False

def HasVowel(s):
    for letter in s:
        if IsVowel(letter):
            return True
        else:
            return False

def main():
    if HasVowel( "bob" ):
        print( "The string 'bob' contains a vowel." )
    else:
        print( "The string 'bob' does not contain a vowel." )

main()
```

5. I want a program that will give the user at most 5 guesses of my name. If they don't get it right in 5 guesses the program should halt. Here is an attempt at writing that program:

```
def main():
    done = False
    while not done:
        for turn in range(0, 5):
            guess = input( "What is my name? " )
            if guess == "bob":
                print( "Yess!!!" )
                done = True

main()
```

- a) What will this program do if I guess "bob" on the 3rd guess?

- b) What will this program do if I guess incorrectly 5 times?

- c) Write a correct program that will give the user at most 5 guesses of my name.

6. The following program tries to build a class structure that will contain animals and the sounds they make. The lines

```
c = Cow( )  
print(c)
```

in main() should produce the output

The cow says 'moo'.

Unfortunately, this gets an error message: 'Cow' object has no attribute 'species'.

```
class Animal:  
    def __init__(self, species):  
        self.species = species  
        self.voice = ""  
  
    def __str__(self):  
        return "The %s says '%s'"%(self.species, self.voice)  
  
class Cow(Animal):  
    def __init__(self):  
        self.voice = "moo"  
  
def main():  
    c = Cow()  
    print(c)  
  
main()
```

- a) Explain in English what the error message means.

- b) Modify the code so this will print: The cow says 'moo'. You can write over my code.

7. **Write a function `sumFactors(n)` that returns the sum of the positive factors of number `n`** (i.e., all of the numbers that evenly divide into `n`), **including 1 and `n`**. For example, `sumFactors(10)` is 18 because $1+2+5+10$ is 18. Similarly, `sumFactors(12)` is 28 because $1+2+3+4+6+12$ is 28 and `sumFactors(6)` is 12 because $1+2+3+6$ is 12. Remember that we can tell if number `d` divides evenly into `n` by checking if `n%d` is 0.

8. File "words.txt" contains a few thousand words, one word per line. I am interested in words with duplicated letters: "elephant" has a duplicated 'e', "bumblebee" has both 'b' and 'e' duplicated. **Write a program that reads file "words.txt" and prints the letter that is duplicated in the most words.** If there is a tie you can print any one of the most frequently duplicated letters. For example, if the only words in the file were "elephant", "bumblebee", and "corkscrew" the winner would be 'e', since 'e' is duplicated in 2 of the words, while 'b', 'c', and 'r' are duplicated in 1.

9. **Write a recursive function `isSorted(L)`** that returns True if list L is ordered from smallest to largest and False otherwise. For example, `isSorted([1,2,2,3,5,6,6,6,7])` should return True, while `isSorted([1,2,2,3,2,5,6])` should return False. If you don't see how to do this recursively you will get some credit for doing it with a loop.

10. For this question you need to **write two classes** that together drill students in addition problems.

class Problem represents a single addition problem:

- The constructor takes no arguments and makes two random numbers between 1 and 100.
- Method Answer() returns the sum of the numbers created in the constructor.
- Method Pose() prints the problem, gets a response from the user, and returns this response.

For example, if the two numbers are 23 and 45, Pose() might print $23 + 45 =$ and then return whatever the user types, which hopefully will be 68, which is what is returned by Answer().

class Exam gives problems and keeps track of how many of the user's answers were correct.

- The constructor takes as an argument the number of problems to give. Exam(10) should give 10 questions.
- Method GiveQuestion() constructs a Problem, Poses it, and checks the user's answer against the correct answer.
- Method GiveExam() calls GiveQuestion() the number of times listed in the constructor.
- Method Report() prints the number of questions asked and the number of correct answers.

You only need to write the classes, but a typical application program might be:

```
def main():  
    e = Exam(10)  
    e.GiveExam()  
    e.Report()
```

You can use this page for extra space for any question.

Please write and sign the Honor Pledge when you have finished the exam.