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Homework 3

CS/ECE 252 Section-2 (MWF 11:00)

Assigned on September 24th

Due on Monday, October 5th by the beginning of class (11 AM)

Submit questions 1-5 by hard copy. Typing is preferred over hand writing.

Submit questions 6-10 through the browser based infrastructure at

<https://discovering.cs.wisc.edu/homework/homework.html>

1. Consider the following snippet of code. This is a function that performs multiplication of n and m (two non-negative integers) through adding numbers successively.

a. Step through this code by filling out the table below for $m = 3$, $n = 0$. The first step has been done for you. **(1 pt)**

```
m = 3
n = 0
product = m
(i) while(n > 1):
(ii)     product = product + m
(iii)    n = n - 1
(iv) print(product)
```

Current line	Calculation performed by this line	Variables			Next line:
		m	n	product	
i	checking in $n > 1$	3	0	3	iv

b. This code snippet has an error. What is it? Identify and fix it.

(2 pts)

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2. In lecture 5 (September 14th), we have discussed building one instruction of an ISA. In lecture 8 (Sept 21st), we have discussed accessing elements of an array with the ISA. Assume that we have an array of strings as follow:

```
words = ["blithe", "alphabetic", "crocodiles", "ate", "asparagus"]
```

Can you write an ISA instruction for accessing the 9th character of the 5th string? If so, do so. If not, explain why it is difficult. **(2 pts)**

3. Use the simulator to step through the code and find all values of x that will be printed:

(1 pt)

```
x = 0
while(x < 15):
    if(x!=4 and ((x%2==0 and x%3==1) or x<5)):
        print(x)
    x = x + 1
```

4. Which of the following values will satisfy the following condition:

$((x \neq 4) \text{ and } (x \% 2 == 0 \text{ or } x \% 3 == 1) \text{ and } (x > 0 \text{ or } x < 5))$

For every value that fails to satisfy the condition, list the particular condition that it fails to satisfies. **(2 pts)**

a. 1

b. 3

c. 4

d. 10

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5. Print the outputs of the following piece of code. Be sure to understand why. **(1 pt)**

```
def bar(y):  
    print(y)  
    x = 5  
    return x  
y = 3  
print(bar(y))  
print(y)
```

6. Suppose I want to write a block of code that outputs the word “positive” if the value of the variable *number* is greater than 0, and output the words “not positive” if the value of *number* is less than or equal to 0. The block of code should print to a single line. There are 3 methods below that may or may not work. Fix it so that all 3 methods work. If they work without editing required, submit the method as is. You can initialize the variable *number* to whatever you want.

Use the browser-based simulator to write and submit. **(5 pts)**

a.

Method 1:

```
if(number > 0):  
    print("positive")  
else:  
    if(number < 0):  
        print("negative")
```

b.

Method 2:

```
if(number <= 0):  
    print("not ")  
    print("positive")
```

c.

Method 3:

```
if(number > 0):  
    print("positive")  
else:  
    print("not positive")
```

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7. Fix all the Python syntax errors below without deleting any lines of code. It does not matter what the code is trying to do, so **ignore the logic errors** and just **focus on the syntax errors** that exists. Assume there was no code before this.

Use the browser-based simulator to write and submit.

(3 pts)

```
h3110WORLD = "Hello World"
_ = "h3110WORLD"
weAreTheChampions = 1
# infinite loop to fight 'til the end
while(weAreTheCampions = 1)
    print("flgh71ng \'til the end")
int fahrenheit = -40
celsius = (9 / 5) * (fahrenheit + 32
print(Celsius)
```

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8. Use while loops and nested loops to print patterns of asterisks on the screen. Use the sample starter code at the end of this question to begin. The code should accept an input with the following prompt:

```
Enter an positive odd number: 9
```

and draw the following patterns:

```
begin printing horizontal line
*****
end printing horizontal line
begin printing vertical line
*
*
*
*
*
*
*
*
*
end printing vertical line
begin printing triangle 1
*
**
***
****
*****
*****
*****
*****
*****
end printing triangle 1
begin printing triangle 2
*
 ***
  ****
   *****
  *****
 *****
 *****
end printing triangle 2
```

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Sample starting code (the horizontal line pattern has been done for you):

```
import input
positiveOddNumberInput = input.get_num("Enter a number: ")

print("begin printing horizontal line")
lineToPrint = ""
i = 0
while(i < positiveOddNumberInput):
    lineToPrint = lineToPrint + "*"
    i = i + 1
print(lineToPrint)
print("end printing horizontal line")

print("begin printing vertical line")
# your code here
print("end printing vertical line")

print("begin printing triangle 1")
# your code here
print("end printing triangle 1")

print("begin printing triangle 2")
# your code here
print("end printing triangle 2")
```

Use the browser-based simulator to write and submit.

(7 pts)

(1 pt for vertical line, 2 pts for triangle 1, and 4 pts for triangle 2)

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9. Repeat Homework 2 Question 11, but this time store the Fibonacci numbers into an array and then print out the array at the end.

Use the browser-based simulator to write and submit.

(3 pts)

For reference, Homework 2 Question 11:

Write a program to print the first n Fibonacci numbers. (Initialize n as 15). Start with 0 and 1 as the first two numbers. The next number is created by adding the previous two numbers. Thus, the series would go like this: 0 1 1 2 3 5 8 377.

For reference, answer to Homework 2 Question 11:

```
n = 15
counter = 1
a = 0
b = 1

print(a)
while(counter < n):
    print(b)
    temp = b
    b = b + a
    a = temp
    counter = counter + 1
```

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10. Repeat Homework 2 Question 12, but use a function to convert Fahrenheit to Celsius.
Use the browser-based simulator to write and submit. **(3 pts)**

For reference, Homework 2 Question 12:

Say you wanted to print out the Celsius equivalent for all integer Fahrenheit temperatures from -50 degrees F to 50 degrees F. Write a program to print out this conversion information. The pseudocode for implementing this is given below.

The equation for converting Fahrenheit (F) to Celsius (C) is: $C = (F - 32) * \frac{5}{9}$

- i. Set F's initial value to -50 (lower bound)
- ii. While F is less than or equal to 50 (upper bound)
- iii. Convert Fahrenheit to Celsius.
- iv. If Fahrenheit and Celsius are equal
- v. print "Fahrenheit and Celsius are equal at -40 degrees!"
- vi. Else
- vii. print the number of degrees in Fahrenheit followed by the number of degrees in Celsius. This should be printed using the line

```
print("F=" + F + ", " + "C=" + C)
```
- viii. Increment F

Sample output: (do not be concerned with rounding or the number of significant figures)

```
F=-50, C=-45.55555555555556  
F=-49, C=-45  
F=-48, C=-44.44444444444444  
F=-47, C=-43.888888888888886  
F=-46, C=-43.333333333333336  
F=-45, C=-42.77777777777778  
F=-44, C=-42.22222222222222  
F=-43, C=-41.666666666666664  
F=-42, C=-41.111111111111114  
F=-41, C=-40.55555555555556  
Fahrenheit and Celsius are equal at -40 degrees!  
F=-39, C=-39.44444444444444  
F=-38, C=-38.888888888888886  
F=-37, C=-38.333333333333336  
...
```


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For reference, answer to Homework 2 Question 12:

```
F = -50
while(F <= 50):
    C = (F - 32) * 5 / 9
    if(F == C):
        print("Fahrenheit and Celsius are equal at -40 degrees!")
    else:
        print("F=" + F + ", " + "C=" + C)
    F = F + 1
```