CIS-298 Intro to Python
With Professor Robert Mann
HW #3
Student: Demetrius Johnson
29 January 2023
Due: 31 January 2023 at 4pm

```
#Submit your homework in a report named using the format lastname_firstname_HWnumber.
#For each of the 20 questions, enter question number, copy/paste code that solves the
question, followed by a snippet of output demonstrating your code works
```

#p58, 1-10

#1. Assume the days of the week are numbered 0,1,2,3,4,5,6 from Sunday to Saturday. Write a program that asks a

```
day number, and prints the day name (a string).
```

```
day_of_week = int(input("Enter a day of the week (0 = Sunday, 6 = Saturday): "))
DAYS_list = ["Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday"]
print(DAYS_list[day_of_week])
```

#2. You go on a wonderful holiday (perhaps to jail, if you don't like happy exercises) leaving on day number 3

```
#(a Wednesday). You return home after 137 sleeps. Write a general version of the program
which asks for the
#starting day number, and the length of your stay, and it will tell you the name of day
of the week you will return on

day_of_week = int(input("Enter a day of the week that you are leaving on (0 = Sunday, 6 =
Saturday): "))
length_of_stay = int(input("Enter the number of days you will be away: "))
DAYS_list = ["Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday"]


print("You left on: ", DAYS_list[day_of_week])
day_of_week = (day_of_week + (length_of_stay % 7)) % 7
print("You return on: ", DAYS_list[day_of_week])
```

#3. Give the logical opposites of these conditions

#(a) a > b

```
print("logical opposite of a > b --> a >= b")
```

#(b) a >= b

```
print("logical opposite of a >= b --> a < b")
```

#(c) a >= 18 and day == 3

```
print("logical opposite of a >= 18 and day == 3 --> a < 18 or day != 3")
```

#(d) a >= 18 and day != 3

```
print("logical opposite of a >= 18 and day != 3 --> a < 18 or day == 3")
```

#4. What do these expressions evaluate to?

#(a) 3 == 3

```
print("#(a) 3 == 3 --> TRUE")
```

#(b) 3 != 3

```
print("#(b) 3 != 3 --> FALSE")
```

#(c) 3 >= 4

```
print("#(c) 3 >= 4 --> FALSE")
```

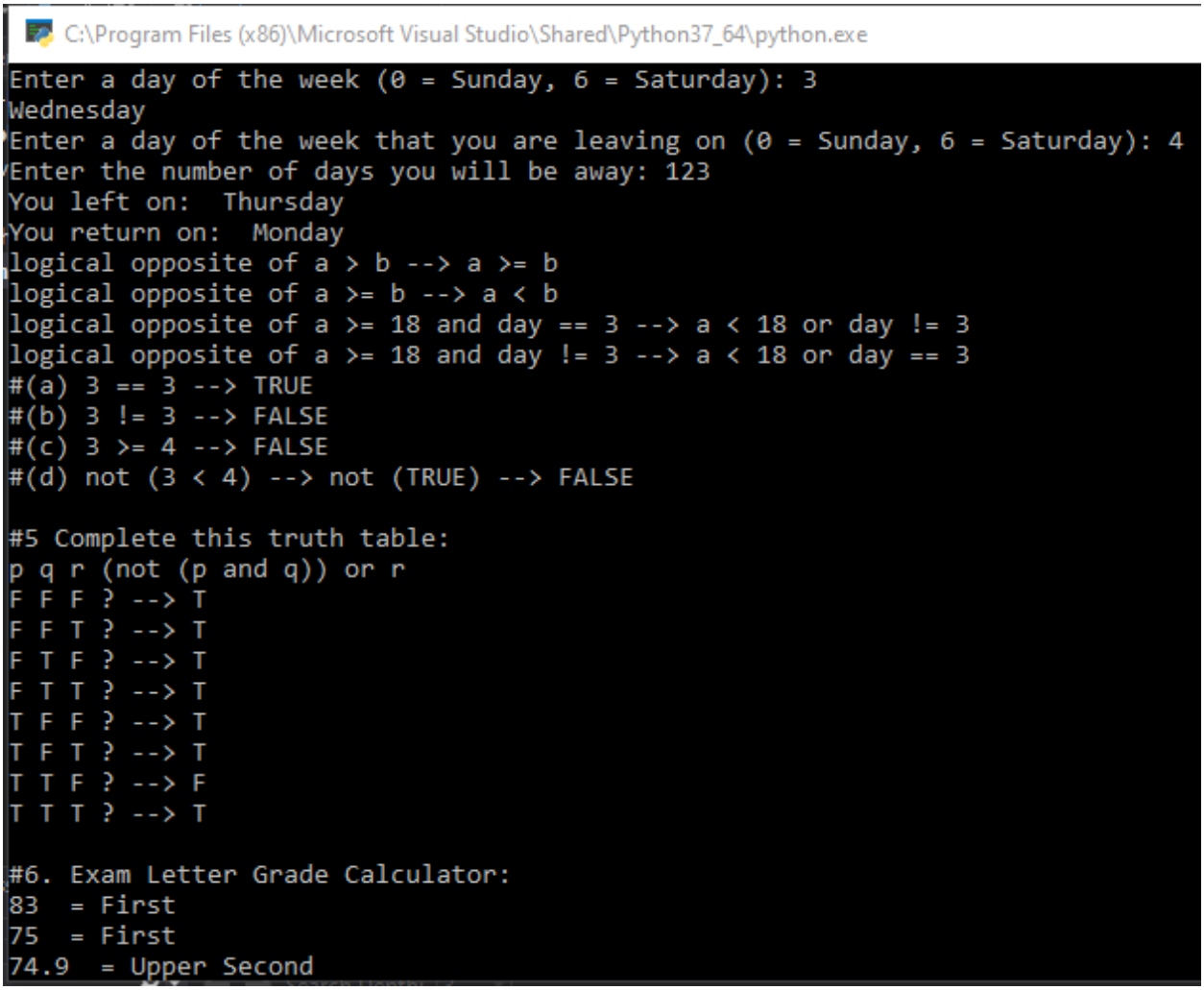
#(d) not (3 < 4)

```
print("#(d) not (3 < 4) --> not (TRUE) --> FALSE")
```

#5. Complete the truth table:

```
print("\n#5 Complete this truth table:")
print("p q r (not (p and q)) or r")
print("F F F ? --> T")
print("F F T ? --> T")
print("F T F ? --> T")
print("F T T ? --> T")
print("T F F ? --> T")
print("T F T ? --> T")
print("T T F ? --> F")
print("T T T ? --> T")
```

SCREENSHOTS FOR #'S 1-5



#6. Write a program which is given an exam mark, and it returns a string — the grade for that mark — according to

```
#this scheme:

#Mark Grade
#>= 75 First
#[70-75) Upper Second
#[60-70) Second
#[50-60) Third
#[45-50) F1 Supp
#[40-45) F2
#< 40 F3
#Test your code by printing the mark and the grade for all the elements in this list:
numbers = [83, 75, 74.9, 70, 69.9, 65, 60, 59.9, 55, 50, 49.9, 45, 44.9, 40, 39.9, 2, 0]
print("\n#6. Exam Letter Grade Calculator:")
for grade in numbers:
    if grade >= 75:
        print(grade, " = First")
    elif grade >= 70:
        print(grade, " = Upper Second")
```

```
    elif grade >= 60:
        print(grade, " = Second")
    elif grade >= 50:
        print(grade, " = Third")
    elif grade >= 45:
        print(grade, " = F1 Supp")
    elif grade >= 40:
        print(grade, " = F2")
    else:
        print(grade, " = F3")
```

#7. Write a program which, given the length of two sides of a right-angled triangle, returns the length of the hypotenuse.

```
#(Hint: x ** 0.5 will return the square root.)

L1 = float(input("Enter the length of one leg of a right triangle: "))
L2 = float(input("Enter the length of the other leg of the same right triangle from
above: "))
#Use Pythagorium Theorem L1^2 + L2^2 = H^2 --> H = sqrt(L1^2 + L2^2):
print("The length of the Hypotenuse of the right triangle is: ", "\b", (L1**2 +
L2**2)**0.5 )
```

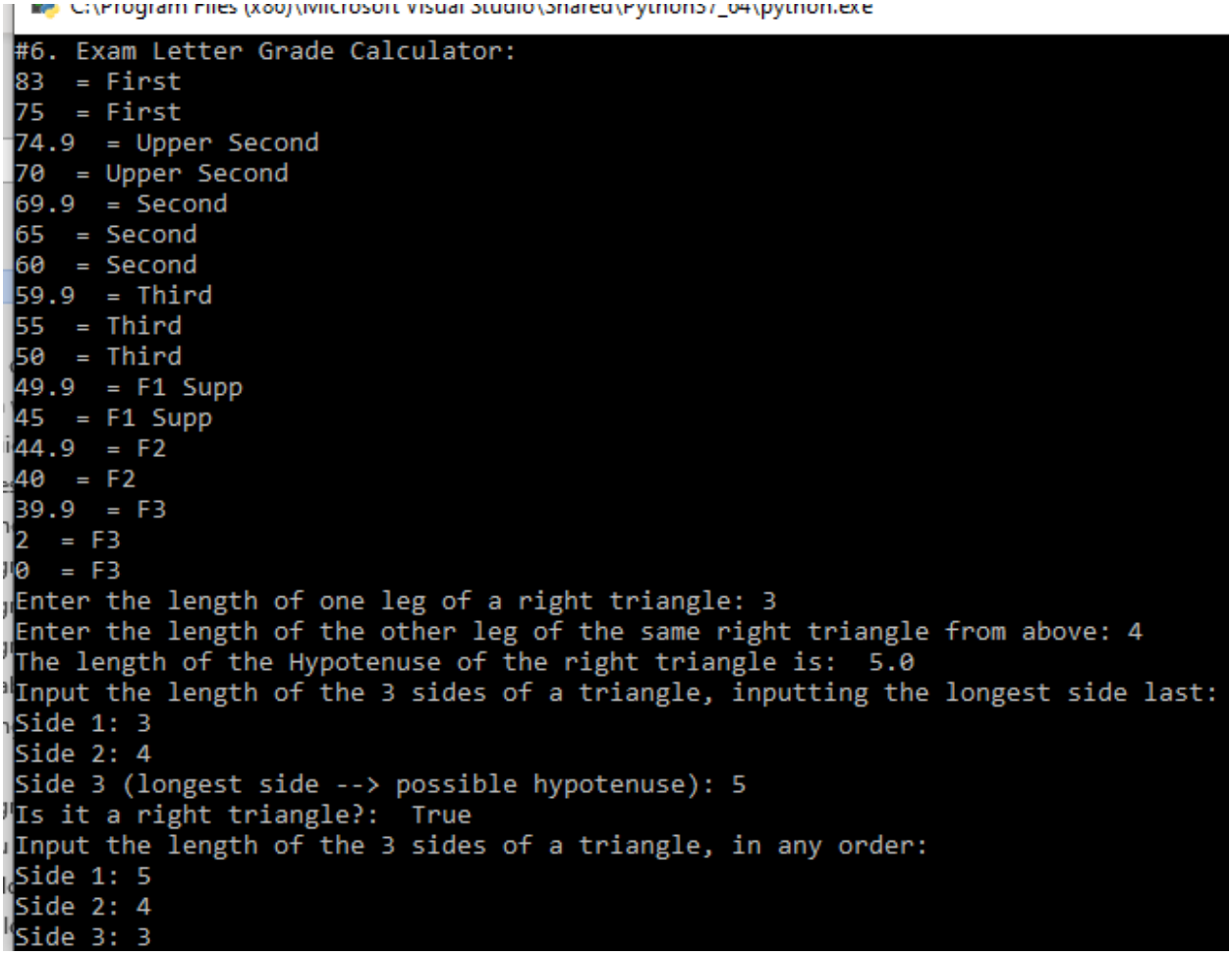
#8. Write a program which, given the length of three sides of a triangle, will determine whether the triangle is right-angled.

```
#Assume that the third argument to the function is always the longest side. It will
return True if the triangle is right-angled, or False otherwise

print("Input the length of the 3 sides of a triangle, inputting the longest side last: ")
S1 = float(input("Side 1: "))
S2 = float(input("Side 2: "))
S3 = float(input("Side 3 (longest side --> possible hypotenuse): "))
#S1 and S2 == the possible legs of the possibly right triangle
#S3 == the possible hypotenus of a possibly right triangle, also the longest side of any
right triangle
#S3^2 = S1^2 + S2^2 (Pythagorean Theorem)
#S3^2 - (S1^2 + S2^2) = 0
    #use a precision variable to compare (with some set precision) how close the
subtraction is to 0 (up to some number of decimal places)

precision = float(1e-7)
print("Is it a right triangle?: " , abs(S3**2 - (S1**2 + S2**2)) < precision  )
```

SCREENSHOTS FOR #'S 6-8



#9. Extend the above program so that the sides can be given to the function in any order.

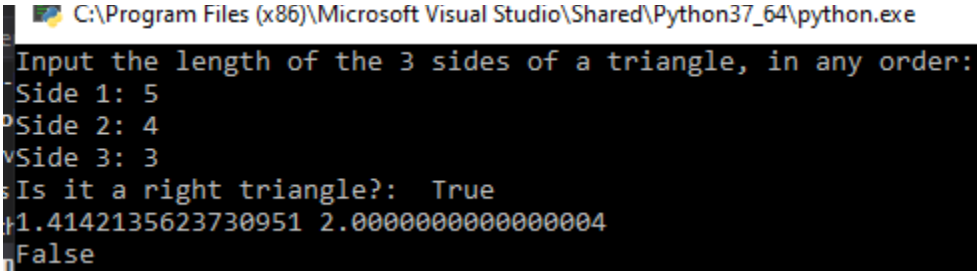
```
print("Input the length of the 3 sides of a triangle, in any order: ")
S1 = float(input("Side 1: "))
S2 = float(input("Side 2: "))
S3 = float(input("Side 3: "))
sorted_sides = sorted([S1, S2, S3]) #sort the sides of triangle in ascending order
#S1 and S2 == the possible legs of the possibly right triangle
#S3 == the possible hypotenus of a possibly right triangle, also the longest side of any
right triangle
#S3^2 = S1^2 + S2^2 (Pythagorean Theorem)
#S3^2 - (S1^2 + S2^2) = 0
    #use a precision variable to compare (with some set precision) how close the
subtraction is to 0 (up to some number of decimal places)

precision = 1e-7
print("Is it a right triangle?: " , abs(sorted_sides[2]**2 - (sorted_sides[0]**2 +
sorted_sides[1]**2)) < precision  )
```

#10 [why floating point arithmetic is sometimes innacuarte]...

```
import math
a = math.sqrt(2.0)
print(a, a*a)
print(a*a == 2.0)
```

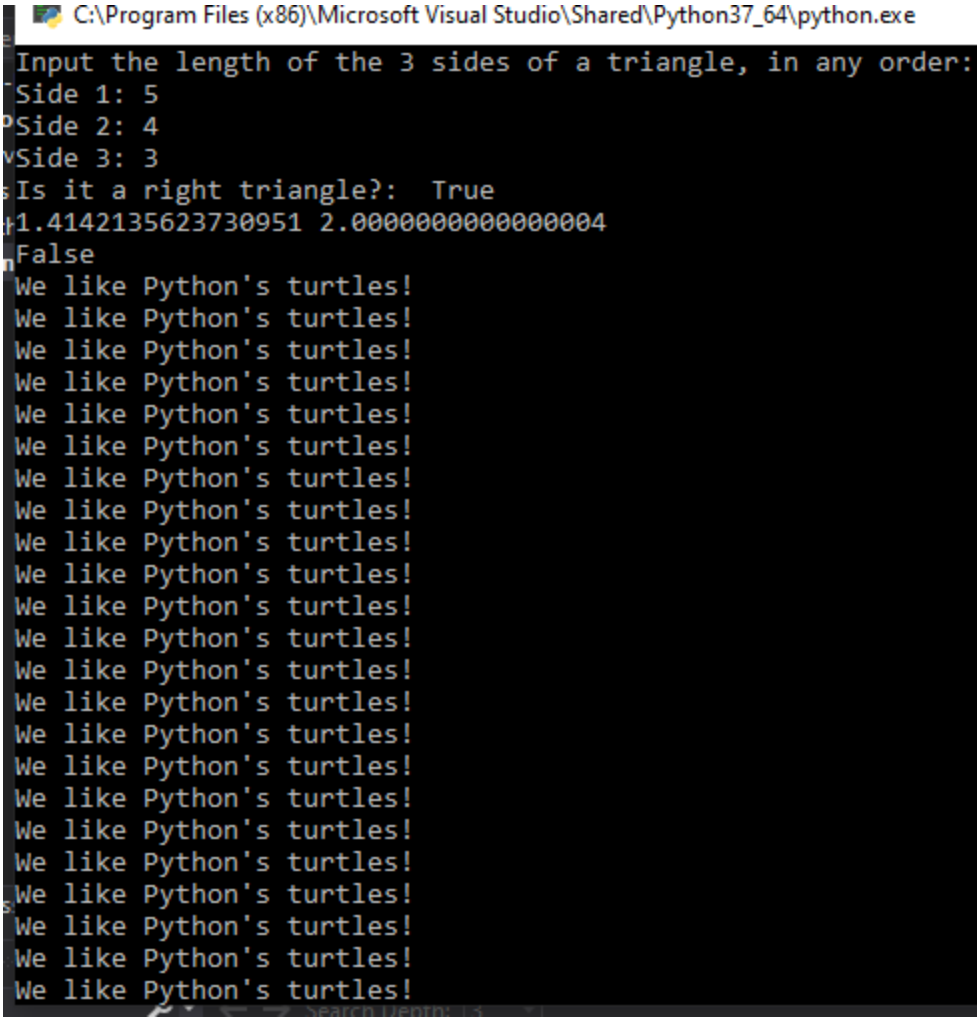
SCREENSHOTS FOR #'S 9 & 10



#p60. 1 and 4

#1. Write a program that prints We like Python's turtles! 1000 times.

```
for _ in range(1000):
    print("We like Python's turtles!")
```



#4. Assume you have the assignment numbers = [12, 10, 32, 3, 66, 17, 42, 99, 20]

```
numbers = [12, 10, 32, 3, 66, 17, 42, 99, 20]
```

#(a) Write a loop that prints each of the numbers on a new line.

```
for element in numbers:
    print(element)
```

#(b) Write a loop that prints each number and its square on a new line.

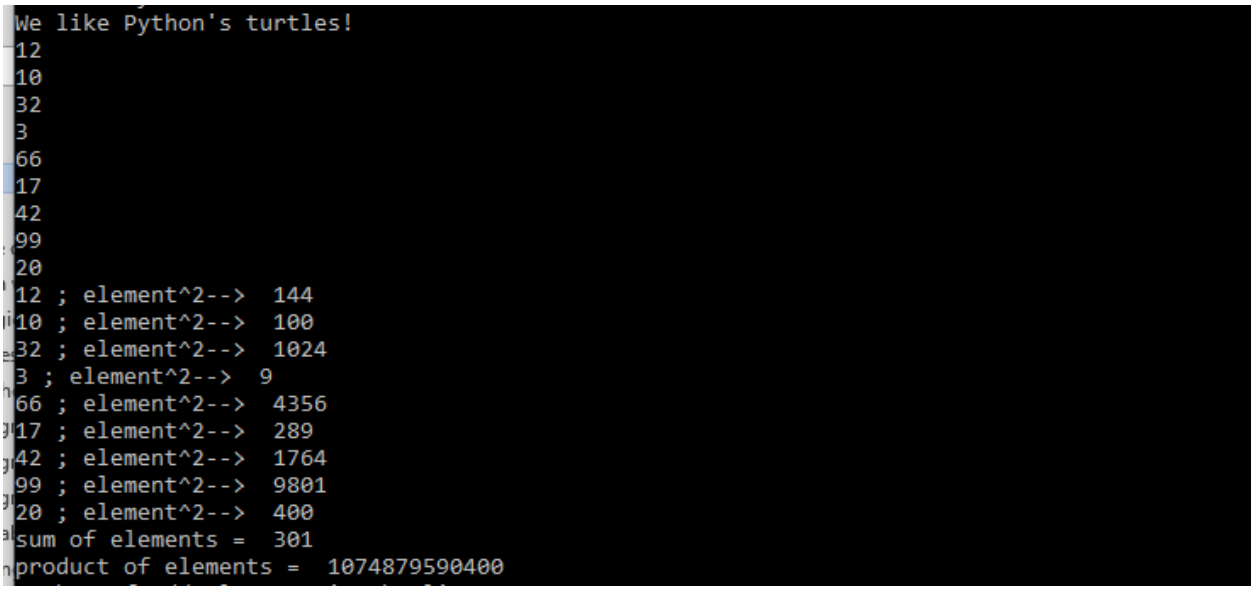
```
for element in numbers:
    print(element, "; element^2--> ", element**2)
```

```
#(c) Write a loop that adds all the numbers from the list into a variable called total.
You should set the total
#variable to have the value 0 before you start adding them up, and print the value in
total after the loop
#has completed.
total = 0
for element in numbers:
    total += element
print("sum of elements = ",total)
```

#(d) Print the product of all the numbers in the list. (product means all multiplied together)

```
total = 1 #initialize as 1 since we are doing product of all numbers in the list
for element in numbers:
    total *= element
print("product of elements = ",total)
```

Screenshots for #4 (a – d)



#p61. 1-7 (see page 52 for Newton's method), 13

```
numbers = [12, 10, -32, 3, 66, -17, 42, 99, -20] #I will use this list to test the
questions 1-7 from page 61
```

#1. Write a program to count how many odd numbers are in a list.

```
odd_elements = 0
for element in numbers:
    if (element % 2) == 1:
        odd_elements += 1 #track number of odd elements
print("Number of odd elements in the list: ", odd_elements)
```

#2. Sum up all the even numbers in a list.

```
even_elements = 0
sum_even_elements = 0
for element in numbers:
    if (element % 2) == 0:
        even_elements += 1 # track number of even elements
        sum_even_elements += element #sum even elements
print("Sum of even elements in the list: ", sum_even_elements)
```

#3. Sum up all the negative numbers in a list.

```
sum_negative_elements = 0
```

```
for element in numbers:
    if element < 0:
        sum_negative_elements += element
print("Sum of negative elements in the list: ", sum_negative_elements)
```

#4. Count how many words in a list have length 5.

```
word_list = ["TEST1", "TEST2", "TESTthree", "TESTfour"]
num_words_len_5 = 0 #use this to track number of words with length 5
for word in word_list:
    if len(word) == 5:
        num_words_len_5 += 1
```

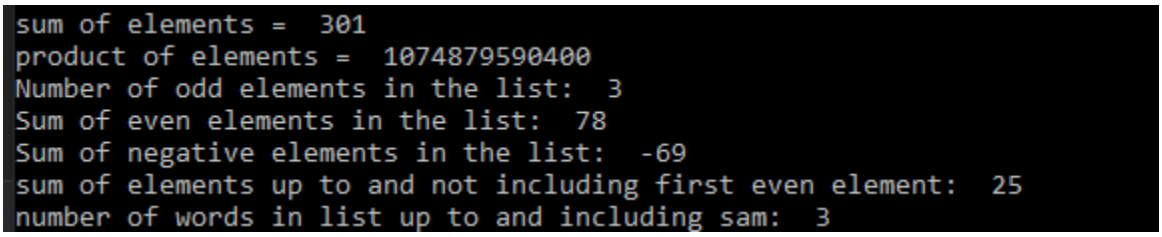
#5. Sum all the elements in a list up to but not including the first even number. (What if there is no even number?)

```
#if no even numbers, simply add all elements
numbers = [0, 1, 3, 5, 7, 9, 10, 11, 13, 15]
sum_elements_notFirstEven = 0 #use to track sum
for element in numbers:
    if (element % 2 == 1) or (element == 0): #check if element is even
       sum_elements_notFirstEven += element
    else:
        break #break if we strike an even element, which will also be the first even
element
print("sum of elements up to and not including first even element: ",
sum_elements_notFirstEven)
```

#6. Count how many words occur in a list up to and including the first occurrence of the word "sam". (What if

```
#"sam" does not occur?)
#if sam does not occur, all of the words will simply be counted
word_list = ["TEST1", "TEST2", "sam", "TESTfour"]
num_words_uptoand_sam = 0 #use to track sum
for word in word_list:
    if word != "sam":
        num_words_uptoand_sam += 1
    else:
        num_words_uptoand_sam += 1
        break
print("number of words in list up to and including sam: ", num_words_uptoand_sam)
```

Screenshots for #'S 1-6



#7. Add a print function to Newton's sqrt algorithm that prints out better each time it is calculated. Call your

```
#modified program with 25 as an argument and record the results.
print("Newton's algorithm: testing approximating sqrt(25) (threshold is 0.001)")
```

```
n = 25
threshold = 0.001
approximation = n/2 # Start with some or other guess at the answer
iteration = 0
while True:
    better = (approximation + n/approximation)/2
    if abs(approximation - better) < threshold:
        print("Iteration",iteration,": ",better)
        break
    approximation = better
    print("Iteration",iteration,": ",approximation)
    iteration += 1
```

```
Newton's algorithm: testing approximating sqrt(25) (threshold is 0.001)
Iteration 0 :  7.25
Iteration 1 :  5.349137931034482
Iteration 2 :  5.011394106532552
Iteration 3 :  5.000012953048684
Iteration 4 :  5.000000000016778
```

#13. Write a program that counts the number of even digits in n.

```
user_num_string = str(input("Input a number, and the number of even digits in the number
will be calculated: "))
num_even_digits = 0
for digit in user_num_string:
    if int(digit) % 2 == 0:
        num_even_digits += 1
print("Number of even digits in your number is: ", num_even_digits)
```

```
Input a number, and the number of even digits in the number will be calculated: 1234567890
Number of even digits in your number is:  4
Press any key to continue . . .
```