Assignment 1

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Replit: [main.py - Assignment 1 - Replit]

A standard science experiment is to drop a ball and see how high it bounces. Once the "bounciness" of the ball has been determined, the ratio gives a bounciness index. For example, if a ball dropped from a height of 10 feet bounces 6 feet high, the index is 0.6, and the total distance traveled by the ball is 16 feet after one bounce. If the ball were to continue bouncing, the distance after two bounces would be 10 ft + 6 ft + 6 ft + 3.6 ft = 25.6 ft. Note that the distance traveled for each successive bounce is the distance to the floor plus 0.6 of that distance as the ball comes back up. Write a program that lets the user enter the initial height from which the ball is dropped and the number of times the ball is allowed to continue bouncing. Output should be the total distance traveled by the ball. (Textbook, Ch 3, pg 99 - 100)

The program should include the following:

1. Docstring with name a program description (1%)
2. User inputs for initial height and number of bounces (1%)
3. Implement the program using a FOR loop (3.5%)
4. Implement the program using a WHILE loop (3.5%)
5. Leave a comment above each loop (1%)

Procedure

In the next section, we will discuss the documentation of the code and the math involved.

- The following variables will be used for the whole code:

$index = ix = 0.6$

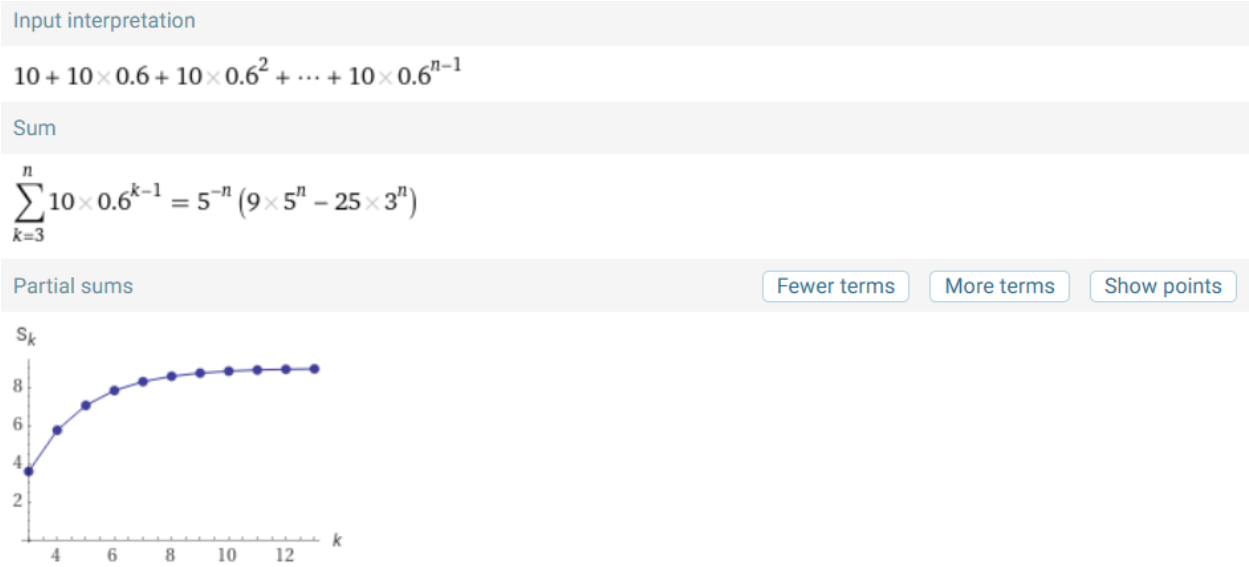
$height = h$

$number\ of\ bounes = b$

$i = 0$

- To write the Python code, we need to create the following math formula:

$succession = 10 + (10 * 0.6) + (10 * 0.6) + (10 * 0.6 * 0.6)$



Note: As we can see this is a math succession so we will try to make a formula that matches the result or at least near to n bounces, the code will have two conditions; one for just one bounce and the other for n bounces:

- $Formula\ for\ one\ bounce = h + (h * ix^b)$
- $Formula\ for\ n\ bounces = h + [b * (h * ix)] + [(b - 1) * (h * ix^b)]$

Python Code

```
def program_description():
  '''
  Standard science experiment to drop a ball and see how high it
  bounces.'''
  return None

#Allow the user to enter the numbers
print ("Enter the height and the number of bounces")
h =  float(input("Enter the height: "))
b =  int(input("Enter the number of bounces: "))

#Index
ix = 0.6

#Formula for the distance using the While and For Statement
while b == 1:
  #This part of the code calculate the distance for just one bounce
  d1 = h + (h*ix)
  print("The distance is: {} ft".format(d1))
  break
else:
  #Math formula for n bounces
  i = 0
  for i in range(b):
    dn = h + b*(h*ix) + (b-1)*(h*ix**b)
  print("The distance is: {} ft".format(dn))
```

As a result of running the code in Visual Studio Code, we get the following results:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS D:\Python Codes>  d:; cd 'd:\Python Codes'; & 'D:\Python\python.exe' 'c:\Users\santi\.vscode\extensions\ms-python.python
38' '--' 'd:\Python Codes\Assignment 1.py'
Enter the heigh and the number of bounces
Enter the height: 10
Enter the number of bounces: 2
The distance is: 25.6 ft
PS D:\Python Codes>  d:; cd 'd:\Python Codes'; & 'D:\Python\python.exe' 'c:\Users\santi\.vscode\extensions\ms-python.python
44' '--' 'd:\Python Codes\Assignment 1.py'
Enter the heigh and the number of bounces
Enter the height: 10
Enter the number of bounces: 3
The distance is: 32.32 ft
PS D:\Python Codes>  d:; cd 'd:\Python Codes'; & 'D:\Python\python.exe' 'c:\Users\santi\.vscode\extensions\ms-python.python
70' '--' 'd:\Python Codes\Assignment 1.py'
Enter the heigh and the number of bounces
Enter the height: 35
Enter the number of bounces: 6
The distance is: 169.16479999999999 ft
PS D:\Python Codes>
```