

Session 2: Reading Documentation and Debugging (Solutions Only)

A. Exploring Existing Functions

```
[2]: # Command to print a formatted output
print(f'Output:\n\ttotal: {total},\n\tcount: {count} \n\t\
average (2 decimal places): {total/count:.2f}.')
```

Output:

```
total: 16,
count: 3
average (2 decimal places): 5.33.
```

Case 3a. Mortgage Calculator I

Write a function `numberMonths` calculates how many months it would take to pay off a mortgage given the monthly payment. The function has four input arguments: `total`, `monthly`, `annualInterest`, and `downpay`. Let the default values for interest be 0.0425 and for downpay be 0. Label the four arguments T , M , I , D respectively. The number of months needed N is given by the formula

$$N = \text{ceil} \left(\frac{-\log(1 - \frac{i(T-D)}{M})}{\log(1+i)} \right),$$

where $i = I/12$ is the monthly interest rate and `ceil` is the `math.ceil` function.

```
[9]: import math
def numberMonths(total,monthly,interest=0.0425,downpay=0):
    i=interest/12
    A=i*(total-downpay)/monthly
    top=-math.log(1-A)
    bottom=math.log(1+i)
    return math.ceil(top/bottom)
```

```
[10]: numberMonths(500000,4000)/12
```

13.833333333333334

```
[11]: numberMonths(500000,4000,interest=0.05)/12
```

14.75

B. Debugging

C. Correcting the logic (this time building up one component at a time)

```
[16]: T=500000
M=4000
I=0.0425
D=0
i=I/12
A=i*(T-D)/M
```

```

top=-math.log(1-A)
bottom=math.log(1+i)
N=math.ceil(top/bottom)
N

```

166

D. Putting correct logic back into function

(Optional: Shortening the code to work with original named variables directly.)

```

[17]: import math
def numberMonths(total,monthly,interest=0.0425,downpay=0):
    i=interest/12
    A=i*(total-downpay)/monthly
    top=-math.log(1-A)
    bottom=math.log(1+i)
    return math.ceil(top/bottom)
numberMonths(500000,4000)/12

```

13.833333333333334

Case 3b. Mortgage Calculator II

Write a function `monthlyPayment` that calculates the monthly payment needed to pay off a mortgage in a given number of months. The function has four input arguments: `total`, `months`, `interest`, and `downpay`. Let the default values for `interest` be 0.0425 and for `downpay` be 0. Label the four arguments T , N , I , D respectively. The monthly payment M is given by the formula

$$M = \frac{(1+i)^N}{(1+i)^N - 1} i(T - D),$$

where $i = I/12$ is the monthly interest rate. Round the answer to two decimal places using the `round` function.

```

[13]: def monthlyPayment(total,months,interest=0.0425,downpay=0):
    i=interest/12
    top=(1+i)**months*i*(total-downpay)
    bottom=(1+i)**months-1
    return round(top/bottom,2)

```

```

[14]: monthlyPayment(500000,12*30)

```

2459.7

```

[15]: monthlyPayment(500000,12*30,interest=0.05)

```

2684.11