Session 3. Reading Documentation and Debugging (Solutions Only)

Q1. Mortgage Calculator I

Write a function `numberMonths` that 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

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

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

```
[1]: 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)
```

```
[5]: print('Number of years needed to pay off mortgage:', numberMonths(500000,4000)/12)
```

```
Number of years needed to pay off mortgage: 13.833333333333334
```

```
[2]: print('Updated number of years:', numberMonths(500000,4000,interest=0.05)/12)
```

```
Updated number of years: 14.75
```

Q2. 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.

```
[29]: 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)
```

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

```
2459.7
```

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

```
2684.11
```