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Debugging Quiz

The program below is meant to calculate the population of a city given the starting population, the growth rate and an amount of time. The exp function is the natural exponential, so exp(rate*time) is $e^{rate*time}$.

```
1  from math import exp
2
3  start_pop = input('What is the starting population? ')
4  rate = input('What is the rate of population growth as a percentage? ')
5  time = input('How long do you want to wait? '
6
7  end_pop = start_pop*exp(rate*time)
8
9  print("The population after ",times," years will be ",end_pop)
```

The first time you try to run the program, you get an "Invalid Syntax" dialog box, and when you close it, end_pop in line 7 is highlighted. Where is the error and how can you fix it?

```
The issue is that you are importing the wrong way making the program crash
on line 7. Instead of:
1 from math import exp
It should be
1 import exp from math
```

No, Line 1 is fine.

You have fixed the syntax error and now when you run the program, you get the following error message after you have entered proper input:

```
Traceback (most recent call last):
   File "/Users/markschmitt/Dropbox/2014-2015/Computer
Science/Quizzing/Debugging_Practice.py", line 7, in <module>
     end_pop = start_pop*exp(rate*time)
TypeError: can't multiply sequence by non-int of type 'str'
```

What change(s) must you make to eliminate this TypeError? (Rewrite only the lines that need to be changed. Make sure to show their line numbers.)

```
The there are 3 errors they are on line 3, 4, and 5. You need to convert the inputs
to floats so you are able to use them in math equations. Right now start_pop time
and rate are both strings to fix this you could do:

3  start_pop = float(input('What is the starting population? '))
4  rate = float(input('What is the rate of population growth as a percentage? '))
5  time = float(input('How long do you want to wait? ' ))

This turns them into strings letting you use them in the exp function getting rid of
the error.
```

1-t *numbers*

+8

You have now eliminated all the TypeErrors. Your program runs, and after you give proper input, you get the following error message:

```
Traceback (most recent call last):
  File "/Users/markschmitt/Dropbox/2014-2015/Computer
Science/Quizzing/Debugging_Practice.py", line 9, in <module>
    print("The population after ",times," years will be ",end_pop)
NameError: name 'times' is not defined
```

What change(s) must you make to eliminate this NameError? (Rewrite only the lines that need to be changed. Make sure to show their line numbers.)

```
9 print("The population after ",time," years will be ",end_pop)
```

+5

You have fixed the NameError, and now when you give the program the following inputs you receive the following output:

```
What is the starting population? 10000
What is the rate of population growth as a percentage? 10
How long do you want to wait? 10
The population after  10  years will be  2.6881171418161358e+47
```

That answer does not seem reasonable. It is much too big. How can you fix the program to get a more reasonable answer? (Rewrite only the lines that need to be changed. Make sure to show their line numbers.)

```
7  end_pop = start_pop*exp(rate/100*time)
```

+5

You have fixed the math error. Now, when you run the program, you get:

```
What is the starting population? 10000
What is the rate of population growth as a percentage? 10
How long do you want to wait? 10
The population after  10  years will be  27182.818284590452
```

This is much more reasonable, but the output just doesn't seem right. How can we get rid of the decimal in the answer? (Rewrite only the lines that need to be changed. Make sure to show their line numbers.)

```
7   end_pop = int(start_pop*exp(rate/100*time))
```

+5