Exercise 1: Numbers, math and variables

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Now that we have understood how the python language can be installed, a program can be run in the terminal window line by line or as one file and how commenting works. We can move on to clearing the basics of the language further.

We must think of a programming language as a tool which takes input as something (text, photos, database, and even music signals) and provide us with the desired output. We will think of python also as a tool and nothing else. We can do a lot of things using a programming language but at its root, it takes an input and gives some output (taking input using keyboard will be discussed in later classes). Remember programming is a tool to make your life easier.

The most basic kind of operations that we can do using python is operations on numbers which includes 'binary' operators like addition, subtraction, multiplication, division, etc. Let us take a look at what binary mathematical operations python can handle.

Table 2.1

+	plus
-	minus
/	slash
*	asterisk
%	percent
<	less-than
>	greater-than
<=	less-than-equal
>=	greater-than-equal

These are the various mathematical operators python can handle. Let us complete with the lecture and then we can move on to the exercises.

Let us take a look at a new thing called 'variable'. A variable is nothing but a name given to 'something'. That 'something' can be any text, number or even a sentence. A simple example can be `age = 23`. The word 'age' here is a variable which is the name given to something. The something here is a number which is 23. Using variable names, you can make your code readable. The variables once assigned can be used anywhere in the program. Now that you know about mathematical operations and variables, let us jump to the exercises for this lecture. There are two exercises for these two concepts that we just studied about. Technically, variables 'store' the values inside them.

Exercise 1: Mathematical operators

1. Create a python file called **ex1.py** and write the following code in it.

```
print "I will now count my chickens:"
print "Hens", 25 + 30 / 6
print "Roosters", 100 - 25 * 3 % 4
print "Now I will count the eggs:"
print 3 + 2 + 1 - 5 + 4 % 2 - 1 / 4 + 6
print "Is it true that 3 + 2 < 5 - 7?"
print 3 + 2 < 5 - 7
print "What is 3 + 2?", 3 + 2
print "What is 5 - 7?", 5 - 7
print "Oh, that's why it's False."
print "How about some more."
print "Is it greater?", 5 > - 2
print "Is it greater or equal?", 5 >= - 2
print "Is it less or equal?", 5 <= - 2
```

2. Above each line write a comment (#) explaining what the line does.

3. Use the above mathematical operators to calculate the simple interest where the principal = Rs. 100, rate = 10 % per annum and time = 2 years. The formula for calculating simple interest is SI = (P x R x T) divided by 100.

3. Find something that you need to calculate and write the code for it in calculate.py file. You can calculate anything, e.g. area of a circle. Be creative.

4. Notice the math seems “wrong”? There are no fractions, only whole numbers. Find out why by researching what a “floating point” number is.

5. Rewrite ex1.py to use floating point numbers so it’s more accurate (hint: 20.0 is floating point).

Exercise 2: Variables and Names

1. Create a python file called **ex2.py** and write the following code in it:

```
cars = 100
space_in_a_car = 4.0
drivers = 30
passengers = 90
cars_not_driven = cars - drivers
cars_driven = drivers
carpool_capacity = cars_driven * space_in_a_car
average_passengers_per_car = passengers / cars_driven
print "There are", cars, "cars available."
print "There are only", drivers, "drivers available."
print "There will be", cars_not_driven, "empty cars today."
print "We can transport", carpool_capacity, "people today."
print "We have", passengers, "to carpool today."
print "We need to put about", average_passengers_per_car, "in each car."
```

2. I used 4.0 for space_in_a_car, but is that necessary? What happens if it’s just 4?

3. Remember that 4.0 is a “floating point” number. Find out what that means.

4. Write comments above each of the variable assignments.

5. Make sure you know what = is called (equals) and that it’s making names for things.

5. Remember that _ is an underscore character.

6. Try running Python as a calculator like you did before and use variable names to do your calculations. Popular variable names are also i, x, and j.

BONUS QUESTION: When I said 'binary' operators, what do you understand by it?