

LAMC Intermediate Group

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## Intro to Python

On the positive side:

- Python – an industrial-grade yet easy to learn programming language. If the only thing you know is coding in Python, you already can get a job.
- Takes much less code than C, C++, and Java to program the same task.
- Runs without changes on all major platforms. Moving a Python program from Linux to Windows most often takes no more than copying the file from one computer to the other.
- Python programs can use and can be used by programs written in C/C++.

On the negative side:

- For large computations, Python can be much slower than C/C++.

**The book:** *Hacking Math Class with Python* by Peter Farrell,  
<http://www.farrellpolymath.com>

**IDLE** – Integrated DeveLopment Environment, a Python shell

## The Turtle Module

**Problem 1** *Type in the following commands. Hit ENTER after entering each command. See what happens.*

```
>>> from turtle import *
>>> fd(100)
>>> rt(90)
>>> fd(200)
```

You can clear the above picture using the following prompt.

```
>>> clear()
```

Note that the *clear()* command clears the picture, but does not revert the turtle to the original position. The *reset()* command does just that.

**A loop:** to draw a square, do the following.

```
>>> for i in range(4):
    fd(100)
    rt(90)
```

Then press ENTER twice.

**Problem 2** *In the Turtle module, draw an equilateral triangle.*

**Problem 3** *In the Turtle module, draw a beautiful picture of your own.*

## A Function

Let us define a function *square*.

```
>>> def square() :  
>>>     for i in range(4):  
           fd(100)  
           rt(90)
```

**Problem 4** Enter the prompt `>>> square()` and see what happens.

**Problem 5** Type the following few lines of code. What do you think is going to happen when you hit ENTER twice? Discuss your idea with the class before drawing the picture.

```
>>> for i in range (36):  
           square()  
           rt(10)
```

**Question 1** What if we want the turtle to draw a square with a side length different from 100 units?

## A Variable

Let us use the variable *side* for the purpose. Please type in the following code

```
>>> def square(side) :
```

The code continues to the next page.

```
for i in range(4):  
    fd(side)  
    rt(90)
```

and hit ENTER twice. Now you can draw squares with various side lengths.

**Problem 6** *Run the following prompts.*

```
>>> square(80)  
>>> square(100)  
>>> square(120)
```

We can also change the value of a variable inside a loop.

**Problem 7** *Type in the following lines of code.*

```
>>> side=20  
>>> for i in range(30):  
    square(side)  
    rt(5)  
    side=side+10
```

*Then hit ENTER two times and see what happens.*

**Problem 8** *Now try this line. >>> square()*

*What's wrong? How can we fix it?  
(The answer is on the next page. )*

The command `def square(side=100)` saves the day. Now if you set the value of the variable `side`, the program will use that value. It will use the value `side = 100` otherwise.

**Problem 9** Let  $n$  be the number of sides of a regular  $n$ -gon with a side length  $s$ . Define `polygon(s, n)` as a function of the variables  $s$  and  $n$ . Use the function to draw a regular

- `pentagon`,
- `hexagon`.

In the Turtle mode, there exists a command `circle(r)` that draws a circle of radius  $r$ .

**Problem 10** Assume that the command `circle(r)` does not exist. Define a function `circle(r)` that draws a circle of radius  $r$  yourself.

## The Math Module

**Problem 11** Type in the following commands. Hit `ENTER` after entering each prompt. See what happens.

```
>>> from math import *
>>> sqrt(81)
>>> log(8,2)
>>> cos(pi/3)
```

*The problem continues to the next page.*

```
>>> degrees(pi/2)
>>> floor(3.62)
>>> ceil(4.12)
```

**Problem 12** Use the *Math* module to solve the following quadratic equation.

$$3.84x^2 + 8.26x - 11.76 = 0$$

**Problem 13** Use the *Turtle* module to draw the first six shapes from page 19 of the course book. If you do not finish the task in class, this becomes your homework.