

## Variables & Math Module

## Lab Activity

### Objectives

In this lab, you will:

1. Learn to create new **.py** files, write Python codes, save and run the codes.
2. Learn how to use the interactive shell and open and run files in IDLE.
3. Learn to import **math** module and use mathematical functions and values from that module.

### Getting Started

Find your partner and introduce yourself to them. Decide who will start as the driver and who will start as the observer. Switch roles every 10 minutes or so. Have the driver login and open **Python 3 IDLE**. Create 4 blank **.py** files with names: L1, L2, L3, L4.

To modify the Python files, you can use any text editor that you like or simply use IDLE. When you are done with your code, you will use the interactive shell to open and run the Python files.

### Part I: Tutorial

#### A: Write Comments

Writing comments is a necessary and important task in programming. In Python, we use **#** sign to add comments to our codes. Lines that begin with **#**, are ignored by Python.

**Try:**

```
# the authors' name are:
```

Note that, all your codes must have authors' names as a comment prior to any lines of codes.

#### B: Variables

Open **L1.py** and write the following and save it:

```
x = 3
print(x)
y = x*5 + x
print("The calculated amount is ", y)
print(int(False))=0
print(float(True))=1.0
z = 1.2
print(int(z))
```

**Explain:**

```
z = 1.2
print(int(z))
```

**Explain:**

1. What does the = symbol do? *It assigns a statement to a value*
2. What did the int in the last statement do?

**Predict:** Using IDLE, from **file** tab, open L1.py file. Before running the file, predict what you will see on the screen. Run the code now and see if you were right.

*3*  
*18*  
*The calculated amount is 18*  
*0*  
*1.0* |  
*1*

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### C: Math Module

We want to write some codes in L2.py file, therefore open it with PyCharm or any text editor or in **IDLE**. **Try:**

```
import math
x = math.pi
y = math.sin(x)
z = x/4
answer = 2 * y + 3**2 * math.cos(z)
print("x = ", x) x=π
print("y = ", y) y=1.22
print("z = ", z) z=π/4
print(answer) 6.36
```

**Predict:** Use IDLE, open L2.py file. Before running the file, predict what you will see on the screen. Run the code now and see if you were right.

### D: Math Module

Open L3.py file, with PyCharm or any text editor or simply **IDLE**, and write a code, consisting of several statement lines and functions, that prints the following value:

$$\text{value} = \frac{\sqrt{\tan(\pi/4) + 1}}{\sqrt{\tan(\pi/3) + \sin(\pi/3)}} = 0.877 \quad (1)$$

You may assign the values;  $\pi/4$  and  $\pi/3$ , to two different variables and use them in your code.

**Hint:** To solve this problem, consider multiple steps. First try to find each of the tan, and sin values. Then try to find the numerator and after that the denominator, and finally divide them by each other. You may have something like the following:

```
a = math.tan(math.pi / 4)
```

```
a = math.tan(math.pi / 4)
```

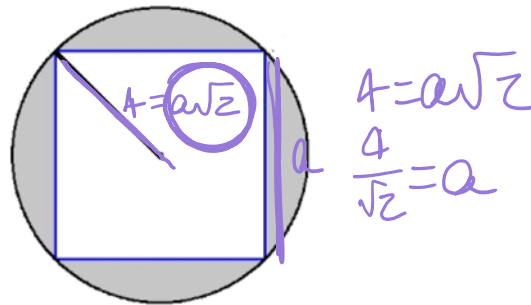
```
numerator = math.sqrt(a + 1)
```

Now, do the same thing for the denominator and find the value by dividing numerator by denominator. And finally print the value.

**Open and Run your code:** Use IDLE, open L3.py file. Before running the file, predict what you will see on the screen. Run the code now and see if you were right.

### E: Math Module

Look at the following figure. If the radius is 4, write a python code that evaluate and print the area enclosed between the square and circle.



Write and save your code in L4.py. Open and Run it.

Hint: On a piece of paper, write down the steps that you need to follow to calculate the shadow area. Talk to your coding partner, what is the first step, what is the second step, what is the third step and so on.

Hint: The diagonal of a square of length  $a$  is equal to  $a\sqrt{2}$ .

Hint: You may use the following formulas:

area of a square of length  $a = a \times a$

area of a circle with radius  $r = \pi r^2$

Handwritten purple notes:

$$\text{area} = \pi r^2 - a^2$$
$$\pi (4)^2 - \left(\frac{4}{\sqrt{2}}\right)^2$$

Below the equations, there are handwritten purple notes: "1/π" and "a".

area of a circle with radius  $r = \pi r^2$

$$\pi(4)^2 - \left(\frac{4}{\sqrt{2}}\right)^2$$
$$16\pi - 8$$

Well done!

```
import math
a = 4/math.sqrt(2)
r = 4
area = math.pi * r**2 - a**2
print(area)
```

42.265