

# Calculator: Shared C libraries in Python

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**Abstract**—This manual shows how to build a calculator using Python and shared C libraries. Through this, even beginners can learn how to build some simple software applications with graphical user interfaces (GUIs).

### 1 PYTHON CALCULATOR

**Problem 1.** Download the python code from [1] and execute it.

### 2 SHARED LIBRARIES IN GCC

**Problem 2.** Write a C function to multiply two given numbers. Save it in the file titled as **mul.c**

**Solution:**

```
//function to multiply two numbers

float mul(float num1, float num2)
{
    return num1*num2; //function
    returns multiplication of
    num1 and num2
}

//Run the following commnad for
generating the .so file
//cc -fPIC -shared -o mul.so mul.c
```

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**Problem 3.** Open the Terminal and go to the directory where the **mul.c** file is saved.

**Problem 4.** Type the following command in the Terminal.

**Solution:**

```
cc -fPIC -shared -o mul.so mul.c
```

**Problem 5.** Type the following program in **main.c**

**Solution:**

```
#include <stdio.h>

float mul(float , float );

int main(void)
{
    printf("%f\n", mul(4,5));
    return 0;
}

//gcc main.c mul.so -Wl,-rpath=$(
pwd)
```

**Problem 6.** Run the above program

**Solution:**

```
gcc main.c mul.so -Wl,-rpath=$(pwd
)
./a.out
```

The advantage of using **mul.so** is that the multiplication function needs to be compiled only once. It can then be used in any C program.

**Problem 7.** Repeat the above exercises for adding two numbers.

**Problem 8.** Write all the required C routines for the calculator in Problem 1 and generate the shared libraries.

### 3 SHARED LIBRARIES IN PYTHON

**Problem 9.** Write a Python script to multiply two numbers using C function.

**Solution:**

```
#Calling C function in Python
from ctypes import *

#load the shared object file
multip = CDLL( './mul.so' )

a=2.0
b=8.0

#Find multiplication of floats

mul = multip.mul
mul.restype = c_float

print (a,"x",b,"=", mul(c_float(a)
    , c_float(b)))
```

**Problem 10.** Call the function written above in the Python GUI calculator to perform multiplication.

**Solution:** Download **calc\_mul\_root.py** file from the [2] and save it in directory where **mul.c** is saved. Execute **calc\_mul.py**.

**Problem 11.** Use C routines in **calc\_mul\_root.py** for all arithmetic operations in the calculator.

### 4 INTEGER TRIANGLES

**Problem 12.** Given the perimeter of a triangle (it should be an integer) write a C program to find all the possible triangles with integer sides. You just have to print the lengths of the sides of each such triangle.

**Problem 13.** Create a GUI application in Python for the previous problem.

### REFERENCES

- [1] A. Deep. (2018) Python Calculator. [Online]. Available: <https://github.com/gadepall/EE1083/blob/master/calculator/codes/solution/pythonprogs/tkcalc.py>
- [2] H. Kumar. (2018) Python Calculator using Shared Libraries. [Online]. Available: [https://github.com/gadepall/EE1083/blob/master/calculator/codes/solution/pythonprogs/calc\\_mul\\_root.py](https://github.com/gadepall/EE1083/blob/master/calculator/codes/solution/pythonprogs/calc_mul_root.py)