

CSE 20

Beginning Programming in Python

Programming Assignment 3

In this assignment, you will write a Python program called `Formulas.py` containing functions, each of which performs some intermediate task in the overall computation. You will write 4 functions that compute volume and surface area of certain 3-dimensional geometric figures.

The functions will be called

```
sphere_volume(r)
sphere_area(r)
cylinder_volume(r, h)
cylinder_area(r, h)
```

and will compute the volume and surface areas of a sphere of radius r , and cylinder of radius r and height h , respectively. The relevant formulas can be found at

<https://sciencenotes.org/surface-area-formulas-volume-formulas/>

You will also write 2 more functions called

```
print_sphere(r)
print_cylinder(r, h)
```

that print out the volume and surface areas of a sphere and cylinder, respectively, in a format that is consistent with the examples below.

When you run your program in a bash shell, a typical session will look like

```
$ python3 Formulas.py
Enter three numbers:
first number: 1
second number: 2
third number: 3
```

```
The volume of the sphere with radius 1.0 is: 4.1887902047863905
The surface area of the sphere with radius 1.0 is: 12.566370614359172
```

```
The volume of the sphere with radius 2.0 is: 33.510321638291124
The surface area of the sphere with radius 2.0 is: 50.26548245743669
```

```
The volume of the sphere with radius 3.0 is: 113.09733552923254
The surface area of the sphere with radius 3.0 is: 113.09733552923255
```

```
The volume of the cylinder with radius 1.0 and height 2.0 is: 6.283185307179586
The surface area of the cylinder with radius 1.0 and height 2.0 is: 18.84955592153876
```

```
The volume of the cylinder with radius 2.0 and height 3.0 is: 37.69911184307752
The surface area of the cylinder with radius 2.0 and height 3.0 is: 62.83185307179586
```

```
The volume of the cylinder with radius 3.0 and height 1.0 is: 28.274333882308138
The surface area of the cylinder with radius 3.0 and height 1.0 is: 75.39822368615503
```

```
$
```

Note that the dollar signs `$` represent the bash prompt. You do not type them, and they are not produced by your program. The prompts `"first number: "`, `"second number: "` and `"third number: "` are printed by your program. However the values next to these prompts are user input. Observe also that there are blank lines printed between text outputs, and at the very end, before the last bash prompt. To get full credit, your program must match this format exactly.

This program is a little more complicated than `pa1`, so will take more time to code. **Hint:** emulate the examples `circle2.py` and `circle3.py` in the examples section of the course webpage. As always, start early, test your program thoroughly and verify the results by hand. Attach the file `Formulas.py` to the assignment `pa3` on Gradescope before the due date.