

**This assignment has three parts.**

**Part One:** Write an interactive program to calculate the volume and surface area of a three-dimensional object. Use the following guidelines to write your program:

1. Create a word problem that involves calculating the volume and surface area of a three-dimensional object. Choose one of the following:
  - Cube: surface area  $6s^2$ , volume  $s^3$
  - Sphere: surface area  $4\pi r^2$ , volume  $(4.0/3.0)\pi r^3$
  - Cylinder: surface area  $2\pi r^2 + 2\pi rh$ , volume  $\pi r^2 h$
  - Cone: surface area  $\pi r(r + r^2 + h^2)$ , volume  $1.0/3.0\pi r^2 h$
2. Print the description of the word problem for the user to read.
3. Ask the user to enter the information necessary to perform the calculations. For instance, the value for the radius.
4. Use 3.14 for the value of  $\pi$  as needed.
5. Print the results of each calculation.
6. Write the pseudocode for this program. Be sure to include the needed input, calculations, and output.

**Insert your pseudocode here:**

**START**

- ❖ **Import builtins**
- ❖ **Set PI to 3.14**
- ❖ **Define input with prompt as a string and defaulting to "" and default defaulting to ""**
  - **Set input to the result of `input(builtins.input(prompt).strip())`**
  - **If `input == quit`**
    - **Print Thank you for your time! GoodBye**
    - **Quit**
  - **If input is blank**
    - **Return default**
  - **Return input**
- ❖ **Define main**

- Print "You are designing a cylindrical water tank."
- Print "Calculate the volume and surface area of the tank."
- Print "Type quit to quit the program."
- Set radius to the float of the input of "Enter the radius of the cylinder (in meters): " then replacing "m" for meters
- Set height to the float of the input of "Enter the height of the cylinder (in meters): " then replacing "m" for meters
- Set volume to  $\text{PI} * \text{radius}^2 * \text{height}$
- Set surface\_area to  $2 * \text{PI} * \text{radius}^2 + 2 * \text{PI} * \text{radius} * \text{height}$
- Print "The volume of the cylinder is: {volume:.2f} cubic meters."
- Print "The surface area of the cylinder is: {surface\_area:.2f} square meters."

❖ Call main

**END**

**Part Two:** Code the program. Use the following guidelines to code your program.

1. To code the program, use the Python IDLE.
2. Using comments, type a heading that includes your name, today's date, and a short description of the program.
3. Follow the Python style conventions regarding indentation and the use of white space to improve readability.
4. Use meaningful variable names.

**Example of expected output:** The output for your program should resemble the following screen shot. Your specific results will vary depending on the choices you make and the input provided.

```
Output:

Jim is writing a report about planets. For
fun facts, he wants to calculate the volume
and surface area for a planet.

He needs your help by providing the name of
the planet and its radius.

The planet Earth
with a radius of 6371.0 kilometers,
has surface area of 509805890.96 km squared
and volume of 1.0826577771e+12 km cubed.
```

Insert a copy of your code from IDLE here:

```
# Jonathan Meyer
# 9/30/24
# An interactive program to calculate the volume and surface area of a
three-dimensional object.
import builtins
# initialize constant variables
PI = 3.14
def input(prompt:str="",default=""):
    input = builtins.input(prompt).strip()
    # if the input equals quit quit the program
    if (input == "quit"):
        print("Thank you for your time! Goodbye :)")
        quit()
    # if input is blank return the default value
    if (input==""):
        return default
    return input
def main():
    # print the problem description
```

```

print("You are designing a cylindrical water tank.")
print("Calculate the volume and surface area of the tank.")
print("Type quit to quit the program.")

# ask the user for the height and radius while respecting the units
radius = float(input("Enter the radius of the cylinder (in meters):
").replace("m", ""))
height = float(input("Enter the height of the cylinder (in meters):
").replace("m", ""))

# Calculations
volume = PI * radius**2 * height
surface_area = 2 * PI * radius**2 + 2 * PI * radius * height

# Output results
print(f"The volume of the cylinder is: {volume:.2f} cubic meters.")
print(f"The surface area of the cylinder is: {surface_area:.2f} square
meters.")

# Call the function to execute
main()

```

**Part Three:** Complete the Post Mortem Review (PMR). Write thoughtful two to three sentence responses to all the questions in the PMR chart.

Review Question	Response
What was the purpose of your program?	Its a program to calculate the volume and surface area of a three-dimensional object.

How could your program be useful in the real world?	It could be used to quickly find the volume, surface area, and any other measures that correspond with 3d objects.
What is a problem you ran into, and how did you fix it?	I didn't run into any issues while compiling nor writing my program.
Describe one thing you would do differently the next time you write a program.	Incorporate different measures and maybe conversions for the specified measure.