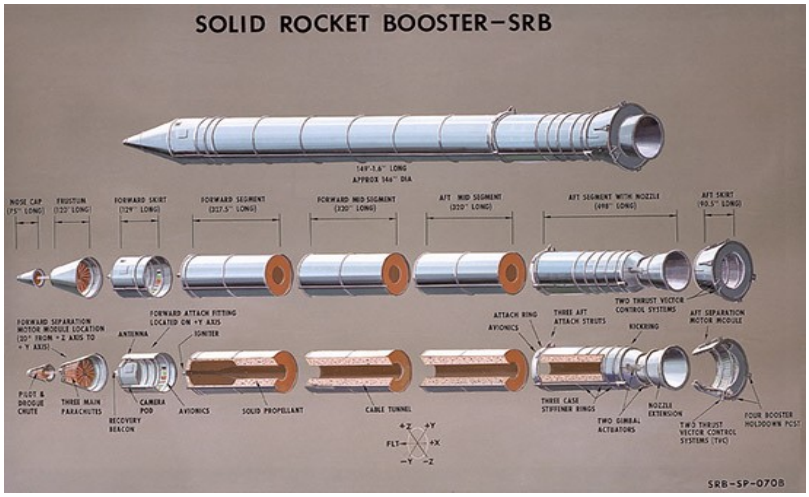
CS118
SRB2

According to NASA[1], the shuttle's solid rocket boosters were each 149.16 feet long and 12.17 feet in diameter. They each contained 1,100,000 pounds of propellant.



While you were working at NASA, the SRB manager asked you to figure what amount of propellant would be required if they changed the dimensions of the booster. Write a Python3 program that computes the mass of propellant required for different lengths and diameters (both in feet) provided by the user. These values should be obtained from the user using the `input()` function, but you *must* verify that they are positive, non-zero values.

Collect both values first. If both are legitimate values, have the program finish the task; otherwise, if either or both value(s) is/are not legitimate, print out an error message indicating what was entered incorrectly (length and/or diameter). If both values are in error, then your program should display two error messages. After your error message(s) display, the program should come to an end. Do this by having the program run out of code to execute – do not use the return() statement and **DO NOT USE ANY** TABOO ITEMS**!**

In the event that the user provides good values, collect a descriptive name from the user for the new values (such as "`My New SRB Design`") and then compute the mass of propellant. For all calculations, assume the SRB is a perfect cylinder, and the density of the propellant is constant for all configurations of the booster.

Use Rapid Table Construction to create a **nicely laid-out** summary of the original information and the user-provided information, including calculated values for both **– follow the format shown in the examples**. Use the user-provided description as the title for the user-provided column. Display the mass of propellant in the original and new configurations as both pounds and kilograms. Report distances to two decimal places and masses as whole numbers. See the back for some example runs.

Constraints:

- **Your program code must include your Standard Format algorithm with code fitting the algorithm.**
- **Make variables for every rocket attribute.**
- **Conversion factors should be stored in variables before being used.**
- **Your program must calculate all values from raw numbers – you cannot externally compute a value and use it in the program. All calculated values should be stored in appropriately-named variables.**
- **Use the built-in `math` module constant `pi` for the calculations.**

Identify the known/provided information and what are the desired outputs, then manually solve the problem. After you can do that, lay out the algorithm that follows the steps you took when you manually solved the problem. Make the program work with legitimate values first; then modify the program to handle illegitimate values.

1 http://science.ksc.nasa.gov/shuttle/technology/sts-newsref/srb.html

Example program runs:

Run 1:

```
New length (ft > 0): 175

New diameter (ft > 0): 10

Name for new booster? My New SRB Design

                          Original Values       My New SRB Design
                        --------------------    --------------------
Length                          149.16 feet             175.00 feet
Diameter                         12.17 feet              10.00 feet
Propellant (lb)                 1100000 lb               871359 lb
Propellant (kg)                  500000 kg               396072 kg
```

Run 2:

```
New length (ft > 0): -25.7

New diameter (ft > 0): 10
ERROR: Length must be a positive number!
        ---> Terminating program
```

Run 3:

```
New length (ft > 0): 0

New diameter (ft > 0): -2.5
ERROR: Length must be a positive number!
ERROR: Diameter must be a positive number!
        ---> Terminating program
```

Note there are two errors but only one "Terminating program" message.

Run 4:

```
New length (ft > 0): 50

New diameter (ft > 0): 50

Name for new booster? My New SRB Design

                          Original Values       My New SRB Design
                        --------------------    --------------------
Length                          149.16 feet              50.00 feet
Diameter                         12.17 feet              50.00 feet
Propellant (lb)                 1100000 lb              6223994 lb
Propellant (kg)                  500000 kg              2829088 kg
```