

CS 403/503 Assignment #6 – Spring 2023

Project Overview: In this project, you will use **Smalltalk** to complete the same shape project done previously. The difference is you have to write everything from scratch by yourself. You will implement one base class (Shape) and four (4) derived classes (Sphere, Cylinder, Torus, and Box). They need to be saved into five different files, `shape.st`, `sphere.st`, `cylinder.st`, `torus.st`, and `box.st` respectively.

You also need to write the `main.st` file that will read the shapes from a file with its filename furnished as a command line argument. You can download from Blackboard a sample shapes file named `shapes.dat`, as shown below. Each shape occupies one line in the file and two attribute values of a shape will be separated by one or more spaces. The number of shapes in the file is unknown in advance.

```
Cube#1 box 1 1 1
Cube#2 box 2 2 2
Donut#1 torus 1 1
Cyl#1 cylinder 1 1
Case#1 box 2 4 6
Case#2 box 10.5 21 10.5
UnitSphere sphere 1
LargeSphere sphere 100
Donut#2 torus 3 7
Cyl#2 cylinder 1 2
```

The user can execute your program using the following command, assuming `shapes.dat` is the shapes file.
gst shape.st sphere.st cylinder.st torus.st box.st -f main.st shapes.dat

If the user does not provide a filename, please print out a usage message and quit. If the file can't be opened for reading, print out an error message to indicate that and quit. If the file can be opened, you can assume it follows the correct format and each shape contains correct attributes.

The user can then issue one of the following queries: `count`, `countN`, `print`, `printN`, `min`, `minN`, `max`, `maxN`, `total`, `totalN`, `avg`, `avgN`. Here `N` is a positive integer to indicate the number of test conditions to be furnished next with the query. Without `N`, the query will be unconditional (performed on all the shapes). If `N` appears, the user will enter `N` test conditions one by one, and the query will be performed on the shapes that satisfy all the `N` test conditions.

Each test condition will be in the `<name> <op> <value>` format. The `<name>` string can be "type", "area" or "volume" (without the quotation marks). The `<op>` string can be one of the six relational operators ("`==`", "`!=`", "`>=`", "`<=`", "`>`", and "`<`"). The `<value>` string is the reference value to be compared with. For example, `type > cyl`, `area <= 1000`, and `volume > 100.5` are three examples of test conditions.

The user can keep issuing the queries until the user enters the `quit` command. Please see the sample execution at the end for details on how the user enters a query. You can assume the user will enter the queries and the test conditions correctly.

It is not required, but it might be a good idea to define another class in `main.st` to represent a list of shapes and the class can respond to the messages that correspond different queries issued by the user (i.e. `count` `print` `min` `max` `total` `avg`).

What You Need To Do

- Create a directory named **project6** for this assignment. Download **shapes.dat** from Blackboard to the **project6** directory.
- Create five classes to be saved in `shape.st`, `sphere.st`, `cylinder.st`, `torus.st`, and `box.st` respectively.
- Create another file named `main.st` to read the shapes file, and to accept and answer the queries issued by the user.
- When you are ready to submit your project, compress your **project6** directory into a single (compressed) zip file, **project6.zip**. **No other compressed files will be accepted.**
- Once you have a compressed zip file named **project6.zip**, submit that zip file to Blackboard.
- Your submission will be graded on **cs-parallel.ua.edu**. Make sure to test it on that machine before submission.
- Make sure to follow the above instructions exactly. Otherwise we may not be able to grade your submission.

Assignment #6 is due at 11:59pm on Wednesday, April 5. Late projects are not accepted.

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**You may not post this document or a portion of this document to a site
such as chegg.com without prior written authorization.**

An assignment shall be completed individually, with no sharing of code or solutions.

All submissions will go through MOSS (Measure Of Software Similarity) for similarity check.

The University of Alabama's Code of Academic Conduct will be rigorously enforced.

Sample executions of the program

```
gst shape.st sphere.st cylinder.st torus.st box.st -f main.st
```

```
Usage: shape.st sphere.st cylinder.st torus.st box.st -f main.st shape_file
```

```
gst shape.st sphere.st cylinder.st torus.st box.st -f main.st xxxx.dat
```

```
Unable to open xxxx.dat for reading
```

```
gst shape.st sphere.st cylinder.st torus.st box.st -f main.st shapes.dat
```

```
Enter a command: print
```

```
Box: Cube#1, Length=1.00, Width=1.00, Height=1.00
```

```
      Surface Area: 6.00, Volume: 1.00
```

```
Box: Cube#2, Length=2.00, Width=2.00, Height=2.00
```

```
      Surface Area: 24.00, Volume: 8.00
```

```
Torus: Donut#1, Small Radius=1.00, Big Radius=1.00
```

```
      Surface Area: 39.48, Volume: 19.74
```

```
Cylinder: Cyl#1, Radius=1.00, Height=1.00
```

```
      Surface Area: 12.57, Volume: 3.14
```

```
Box: Case#1, Length=2.00, Width=4.00, Height=6.00
```

```
      Surface Area: 88.00, Volume: 48.00
```

```
Box: Case#2, Length=10.50, Width=21.00, Height=10.50
```

```
      Surface Area: 1102.50, Volume: 2315.25
```

```
Sphere: UnitSphere, Radius=1.00
```

```
      Surface Area: 12.57, Volume: 4.19
```

```
Sphere: LargeSphere, Radius=100.00
```

```
      Surface Area: 125663.71, Volume: 4188790.20
```

```
Torus: Donut#2, Small Radius=3.00, Big Radius=7.00
```

```
      Surface Area: 829.05, Volume: 1243.57
```

```
Cylinder: Cyl#2, Radius=1.00, Height=2.00
```

```
      Surface Area: 18.85, Volume: 6.28
```

```
Enter a command: print2
```

```
Enter test condition #1: type == box
```

```
Enter test condition #2: area >= 88
```

```
Box: Case#1, Length=2.00, Width=4.00, Height=6.00
```

```
      Surface Area: 88.00, Volume: 48.00
```

```
Box: Case#2, Length=10.50, Width=21.00, Height=10.50
```

```
      Surface Area: 1102.50, Volume: 2315.25
```

```
Enter a command: count1
```

```
Enter test condition #1: type > cyl
```

```
There are 6 shapes.
```

```
Enter a command: count1
```

```
Enter test condition #1: type == box
```

```
There are 4 shapes.
```

```
Enter a command: quit
```