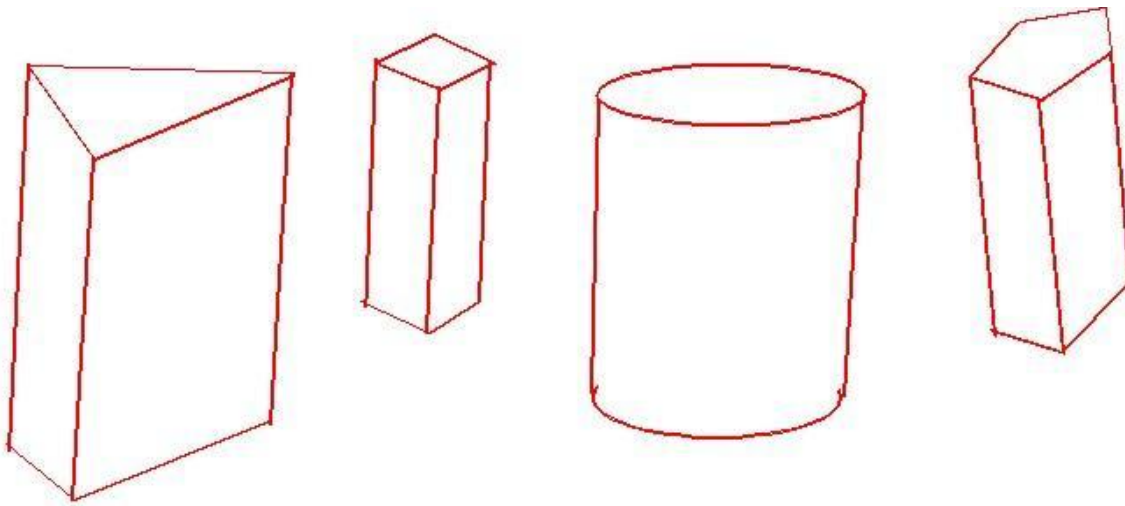


## Container Class



### UML class diagram

Read the program description below and create a UML class diagram before start writing your code. Submit your diagram with your source code and output worksheet. The diagram can be a pdf file, screen shot, or a link to an online diagram.

### Coding

Create a program that can compute the Surface Area and Volumes of various containers that are all "Right Prisms". This means that the ends of the container are identical and the sides are perpendicular to the ends.

1. Create a common **abstract Container class**. Container class contains: (some of the methods are abstract)
  - height
  - calcTopArea() method to calculate top area
  - calcTopPerimeter() method to calculate top area
  - calcVolume() method to calculate the volume of the container.  
 $\text{volume} = \text{height} * \text{top area}$
  - calcSurfaceArea() method to calculate the surface area of the container.  
 $\text{surface area} = 2 * \text{top area} + \text{height} * \text{top perimeter}$

2. Create **CircularContainer**, **RectangularContainer**, **TriangularContainer**, and **RegularPolygonContainer** classes. All of these containers are derived from the Container class.
  - Each container class should have their own additional attribute/s.
  - Each container class should have their own constructor:
    - CircularContainer(height, radius)
    - RectangularContainer(height, width, length)
    - TriangularContainer(height, sideA, sideB, sideC)
    - RegularPolygonContainer(height, side, numSides)
  - Each container class should have their own toString method
3. Use the provided ContainerDemo code to test run your program. Copy and paste the results in the appropriate section of the machine problem worksheet.

\*The geometric equations for area and perimeter are provided for the required shapes as follows:  
Perimeter Calculations (for your calcTopPerimeter methods)

- **Circle-**  
 $2 * \text{PI} * \text{radius};$
  - **Rectangle-**  
 $2 * (\text{width} + \text{length});$
  - **Triange-**  
 $\text{sideA} + \text{sideB} + \text{sideC};$
  - **Regular Polygon-**  
 $\text{numbSides} * \text{side};$
- 

Area Calculations (for your calcTopArea methods)

- **Circle-**  
 $\text{PI} * \text{radius} * \text{radius};$
- **Rectangle-**  
 $\text{width} * \text{length};$
- **Triange-**  
 $s = (\text{sideA} + \text{sideB} + \text{sideC})/2.0$   
 $\text{sqrt}(s * (s - \text{sideA}) * (s - \text{sideB}) * (s - \text{sideC}))$

- ***Regular Polygon-***  
$$\text{numbSides} * \text{side} * \text{side} / (4 * \text{Math.tan}(\text{Math.PI} / \text{numbSides}));$$