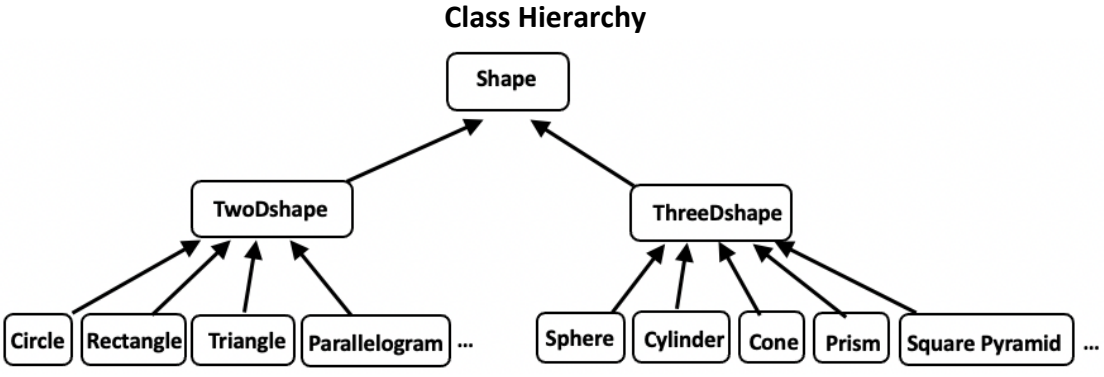
Class Hierarchy (Hint: which class(es) should be abstract or interface and which should be concrete?)



Requirements

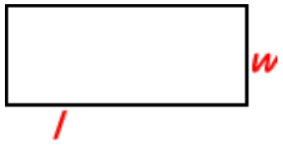
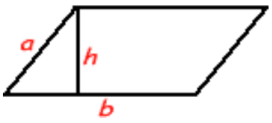
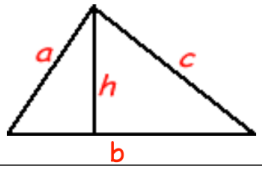
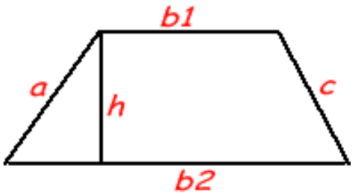
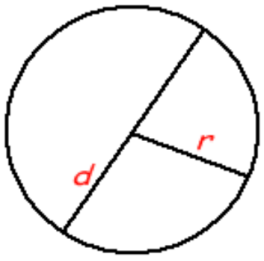
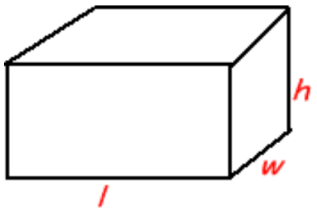
You are required to define **at least three 2D classes** and **at least three 3D classes** in the lowest level of the class hierarchy above. These classes may be different from the ones shown in the hierarchy. The formulae for common 2D (area and perimeter) and 3D shapes (surface area and volume) can be found below.

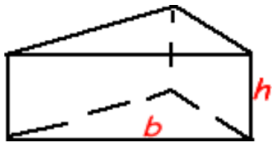
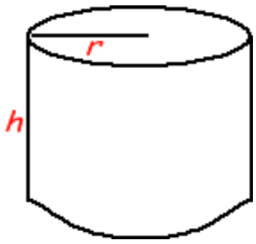
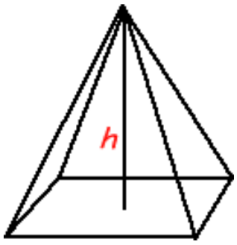
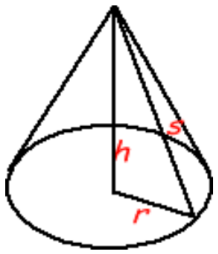
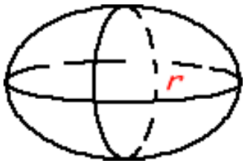
Note: You should consider having a main() in each class and to test the methods in each class independently to make sure the class works as intended. You should also consider having a ShapeCollection class as the driver class.

Your program will use **only one ArrayList** of Shape references. Make sure to include appropriate constructor(s), instance variable(s), and instance methods specific to each class. The program should continually allow the users to do the following until s/he wants to quit.

- add a specific shape to the collection (i.e. the ArrayList)
    - The user should be allowed to indicate the type of shape and to enter the dimensions required for calculating the area and perimeter (for 2D shapes) or the surface area and volume (for 3D shapes) for the specific shape. The area and perimeter of the newly created 2D shape or the surface area and volume for the newly created 3D shape must be displayed.
- display the information (area and perimeter for 2D shapes or surface area and volume for 3D shapes) of all the shapes in the collection
- display the information of all the 2D shapes
- display the information of all the 3D shapes
- display the information of all instances of a specific shape, e.g., circles, prism, etc.
- remove just one specific shape (e.g., by location) in the collection

FORMULAE FOR AREA, PERIMETER, SURFACE AREA, AND VOLUME

Shapes	Formulas
	**Rectangle** **Area** = Length X Width A = *lw* **Perimeter** = 2 X Lengths + 2 X Widths P = *2l + 2w*
	**Parallelogram** **Area** = Base X Height A = *bh* **Perimeter** = add the length of all sides P = *2a + 2b*
	**Triangle** **Area** = 1/2 of the base X the height A = $\frac{1}{2}$ *bh* **Perimeter** = *a + b + c* (add the length of the three sides)
	**Trapezoid** **Area** = 1/2 of the base X the height A = $(\frac{b1+b2}{2})h$ **Perimeter** = add lengths of all sides P = *a + b1 + b2 + c*
	**Circle** **Radius** = the distance from the center to a point on the circle (r). **Diameter** = the distance between two points on the circle through the center (d = 2r). **Circumference** = the distance around the circle (C = $\pi d = 2\pi r$). (Assume $\pi \approx 3.14$) **Area** = πr^2
	**Rectangular Solid** **Volume** = Length X Width X Height V = *lwh* **Surface** = *2lw + 2lh + 2wh*

	**Prisms** **Volume** = Base X Height V = *bh* **Surface** = *2b + Ph (b is the area of the base P is the perimeter of the base)*
	**Cylinder** **Volume** = πr^2 X height V = $\pi r^2 h$ **Surface** = 2π radius X height S = $2\pi rh + 2\pi r^2$
	**Pyramid** **Volume** = 1/3 area of the base X height V = $\frac{1}{3}bh$ b is the area of the base **Surface Area:** Add the area of the base to the sum of the areas of all of the triangular faces. The areas of the triangular faces will have different formulas for different shaped bases.
	**Cones** **Volume** = 1/3 area of the base x height V= $\frac{1}{3}\pi r^2 h$ **Surface** S = $\pi r^2 + \pi rs$ $=\pi r^2 + \pi r\sqrt{r^2 + h^2}$
	**Sphere** **Volume** V = $\frac{4}{3}\pi r^3$ **Surface** S = $4\pi r^2$