

**CS1073**  
**FR03B**  
**Assignment #4**

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## Question I:

### Source Code:

```
/**
This class represents a cylindrical cup that can hold water
@author Daniyal Khan 3765942
*/

public class CylinderCup {
    /**
    Radius of the cylindrical cup
    */
    private double radius;
    /**
    Height of the cylindrical cup
    */
    private double height;

    /**
    Constructs a cylindrical cup given the radius and height
    @param radius Radius of the cup
    @param height Height of the cup
    */
    public CylinderCup(double radius, double height) {
        this.radius = radius;
        this.height = height;
    }

    /**
    Returns the radius of the cylindrical cup
    @return Radius of the cup
    */
    public double getRadius() {
        return radius;
    }

    /**
    Returns the height of the cylindrical cup
    @return Height of the cup
    */
    public double getHeight() {
        return height;
    }
}
```

```

    }

    /**
     Returns the material required for making the cup which is the
    surface area
    @return Surface area of the cup
    */
    public double materialRequired() {
        return 2 * Math.PI * radius * (radius + height) - Math.PI *
Math.pow(radius, 2);
    }

    /**
     Returns the amount of water cup can hold which is the volume
    @return Volume of the cup
    */
    public double waterHoldAmount() {
        return Math.PI * Math.pow(radius, 2) * height;
    }
}

```

```

/**
This class represents a conical cup that can hold water
@author Daniyal Khan 3765942
*/

```

```

public class ConeCup {
    /**
     Radius of the Conical Cup
    */
    private double radius;
    /**
     Height of the Conical Cup
    */
    private double height;
    /**
     Slant Height of the Conical Cup
    */
    private double slantHeight;

    /**
     Constructs a Conical Cup given the radius and height
    */
}

```

```

@param radius Radius of the Cup
@param height Height of the Cup
*/
public ConeCup(double radius, double height) {
    this.radius = radius;
    this.height = height;
    slantHeight = Math.sqrt((Math.pow(radius, 2)) +
(Math.pow(height, 2)));
}

/**
Returns the radius of the Conical Cup
@return radius of the cup
*/
public double getRadius() {
    return radius;
}

/**
Returns the height of the Conical Cup
@return height of the cup
*/
public double getHeight() {
    return height;
}

/**
Returns the slantHeight of the Conical Cup
@return slantHeight of the cup
*/
public double slantHeight() {
    return slantHeight;
}

/**
Returns the material required for building the concical cup
which is the surface area
@return Surface area of the Cup
*/
public double materialRequired() {
    return Math.PI * radius * (radius + slantHeight) - Math.PI *
Math.pow(radius, 2);
}

```

```

/**
Returns the amount of water cup can hold which is the volume
@return Volume of the Cup
*/
public double waterHoldAmount() {
    return (double)1/3 * Math.PI * Math.pow(radius, 2) * height;
}
}

```

## Driver:

```

import java.util.Scanner;
import java.text.NumberFormat;

/**
This is a driver class which uses the CylinderCup and ConeCup
classes
@author Daniyal Khan 3765942
*/

public class Driver {

    public static void main (String[] args) {
        Scanner scan = new Scanner(System.in);
        NumberFormat format = NumberFormat.getNumberInstance();
        int input = 0;
        double largestSurfaceAreaCone = 0.0;
        double largestSurfaceAreaCylinder = 0.0;
        format.setMaximumFractionDigits(3);
        format.setMinimumFractionDigits(3);

        while (input != 3) {
            System.out.print("\nSelect one of the following options:
\n");
            System.out.print("1 - Enter the information for a conical
cup\n");
            System.out.print("2 - Enter the information for a
cylindrical cup\n");
            System.out.print("3 - Quit\n");
            System.out.print("Enter you choice: ");

```

```

input = scan.nextInt();
scan.nextLine(); // consumes the nextline character

switch (input) {
    case 1:
        System.out.print("Length of radius (cm): ");
        double radiusConical = scan.nextDouble();
        scan.nextLine(); // consumes nextline character

        System.out.print("Length of height (cm): ");
        double heightConical = scan.nextDouble();
        scan.nextLine(); // consumes nextline character

        ConeCup conical = new ConeCup(radiusConical,
heightConical);
        double surfaceAreaConical =
conical.materialRequired();
        double volumeConical = conical.waterHoldAmount();

        System.out.print("Surface area: " +
format.format(surfaceAreaConical) + "cm^2");
        System.out.println("\nVolume: " +
format.format(volumeConical) + "cm^3");

        if (surfaceAreaConical > largestSurfaceAreaCone) {
            largestSurfaceAreaCone = surfaceAreaConical;
        }
        largestSurfaceAreaCone = surfaceAreaConical;
        break;

    case 2:
        System.out.print("Length of radius (cm): ");
        double radiusCylinder = scan.nextDouble();
        scan.nextLine(); // consumes the nextline character

        System.out.print("Length of height (cm): ");
        double heightCylinder = scan.nextDouble();
        scan.nextLine(); // consumes nextline character

        CylinderCup cylindrical = new
CylinderCup(radiusCylinder, heightCylinder);
        double surfaceAreaCylinder =
cylindrical.materialRequired();

```

```

        double volumeCylinder =
cylindrical.waterHoldAmount();

        System.out.print("Surface area: " +
format.format(surfaceAreaCylinder) + "cm^2");
        System.out.println("\nVolume: " +
format.format(volumeCylinder) + "cm^3");

        if (surfaceAreaCylinder > largestSurfaceAreaCylinder)
{
        largestSurfaceAreaCylinder = surfaceAreaCylinder;
        }
        largestSurfaceAreaCylinder = surfaceAreaCylinder;
        break;

    case 3:
        break;

    default:
        System.out.println("Not an available option");
    }
}

System.out.print("\nThe cup with the largest surface area
is a " + (largestSurfaceAreaCone > largestSurfaceAreaCylinder?
"Cone" : "Cylinder"));
    System.out.println("\nThe surface area is: " +
        format.format(largestSurfaceAreaCone >
largestSurfaceAreaCylinder? largestSurfaceAreaCone :
largestSurfaceAreaCylinder) + "cm^2");
    }
}

```

**Output:**

```
java Driver

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 1
Length of radius (cm): 3
Length of height (cm): 5
Surface area: 54.955cm^2
Volume: 47.124cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 2
Length of radius (cm): 6
Length of height (cm): 3
Surface area: 226.195cm^2
Volume: 339.292cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 5
Not an available option

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 
```

```
3 - Quit
Enter you choice: 5
Not an available option

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 1
Length of radius (cm): 8
Length of height (cm): 7.5
Surface area: 275.602cm^2
Volume: 502.655cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 2
Length of radius (cm): 2.5
Length of height (cm): 4
Surface area: 82.467cm^2
Volume: 78.540cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter you choice: 3

The cup with the largest surface area is a Cone
The surface area is: 275.602cm^2
```