```java
/*Write a program which has an abstract class Solid and implements cylinder, cone and
sphere by inheriting from solid to find surface area and volume.*/

import java.util.*;
import static java.lang.Math.sqrt;


abstract class Solid {
    double r, h;

    abstract void areavolume();
}

class cylinder extends Solid {
    void areavolume() {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter radius and height of the cylinder");
        r = ss.nextInt();
        h = ss.nextInt();
        double surfacearea;
        double volume;
        surfacearea = (2 * 3.14 * r * h) + (2 * 3.14 * r * r);
        volume = (3.14 * r * r * h);
        System.out.println("The surface area of cylinder is " + surfacearea);
        System.out.println("The volume of cylinder is " + volume);
    }
}

class cone extends Solid {
    void areavolume() {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter radius and height of the cone");
        r = ss.nextInt();
        h = ss.nextInt();
```

```java
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter radius and height of the cone");
        r = ss.nextInt();
        h = ss.nextInt();
        double surfacearea;
        double volume;
        surfacearea = (3.14 * r) * (r + sqrt((h * h) + (r * r)));
        volume = (3.14 * r * r * h) / 3.0;
        System.out.println("The surface area of cone is " + surfacearea);
        System.out.println("The volume of cone is " + volume);
    }
}

class sphere extends Solid {
    void areavolume() {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter radius of sphere");
        r = ss.nextInt();
        double surfacearea;
        double volume;
        surfacearea = 4 * 3.14 * r * r;
        volume = (4 * 3.14 * r * r * r) / 3.0;
        System.out.println("The surface area of circle is " + surfacearea);
        System.out.println("The volume of circle is " + volume);
    }
}

class Solidmain {
    Run | Debug
    public static void main(String args[]) {
        int ch;
        Scanner ss = new Scanner(System.in);
        cylinder cv = new cylinder();
```

```java
class Solidmain {
    Run | Debug
    public static void main(String args[]) {
        int ch;
        Scanner ss = new Scanner(System.in);
        cylinder cy = new cylinder();
        cone co = new cone();
        sphere sp = new sphere();
        while (true) {
            System.out.println("Enter the choice of shape whose surface area and volume has to be calculated");
            System.out.println("1.Cylinder\n2.Cone\n3.Sphere\n4.Exit");
            ch = ss.nextInt();
            switch (ch) {
                case 1:
                    cy.areavolume();
                    break;
                case 2:
                    co.areavolume();
                    break;
                case 3:
                    sp.areavolume();
                    break;
                case 4:
                    System.exit(0);
                    break;
                default:
                    System.out.println("Invalid choice!");
            }
        }
    }
}
```

```
E:\jdk8\bin\ooj lab>javac E1-w8.java

E:\jdk8\bin\ooj lab>java Solidmain
Enter the choice of shape whose surface area and volume has to be calculated
1.Cylinder
2.Cone
3.Sphere
4.Exit
1
Enter radius and height of the cylinder
3 4
The surface area of cylinder is 131.88
The volume of cylinder is 113.03999999999999
Enter the choice of shape whose surface area and volume has to be calculated
1.Cylinder
2.Cone
3.Sphere
4.Exit
2
Enter radius and height of the cone
3 4
The surface area of cone is 75.36
The volume of cone is 37.68
Enter the choice of shape whose surface area and volume has to be calculated
1.Cylinder
2.Cone
3.Sphere
4.Exit
3
Enter radius of sphere
3
The surface area of circle is 113.03999999999999
The volume of circle is 113.04
Enter the choice of shape whose surface area and volume has to be calculated
1.Cylinder
2.Cone
3.Sphere
4.Exit
4

E:\jdk8\bin\ooj lab>javac E2-w8.java
```