- Create a class **IntArray** with a fixed size array (say 50), which stores integers, and with a functionality to add an element to the array (insertion takes place at the end of the array). If the array is already full, a message 'The Array is full' should be printed.

  Construct a class **SortedIntArray** that extends IntArray such that it adds an extra functionality to add the new element to the array after arranging the existing elements in sorted order from smallest to largest. This means that when an element is inserted using this extra added functionality, the element should be inserted into its sorted place, after sorting the existing array. The sorted array remains as such there, and the next operations will be performed over that.

  Write a Java program to implement an array insertion process by choosing the above two element addition methods.

  Sample input and output

  Enter the size of array: 5

  1. Add element to list 2. Add to sorted list 3. Exit
  Enter your choice: 1 Enter a number: 6

  6
  Enter your choice: 1 Enter a number: 3 63
  Enter your choice: 1 Enter the number: 10 6 3 10
  Enter your choice: 2 Enter a number: 8
  3 6 8 10
  Enter your choice: 1 Enter a number: 9
  3 6 8 10 9
  Enter your choice: 2 "The Array is Full" Enter your choice: 3

- Create a general class **ThreeDObject**, and the classes **Box**, **Cube**, **Cylinder** and **Cone** which are derived from it. The class ThreeDObject has abstract methods *wholeSurfaceArea* and *volume*. Override these two methods in each of the derived classes to calculate the volume and whole surface area of respective 3D objects. The dimensions of the objects are to be taken from the users and passed through the respective constructors of each derived class for initializing objects. Write a menu driven program to find the surface area and volume of the different 3D shapes .

  Sample input and output

  - Box 2

  - Cube

  - Cylinder

1

- Cone

- Exit

Enter your choice: 1
Enter length, breadth and height: 4 2 3 volume = 24
surface area = 52
Enter your choice: 4
Enter the base radius and height: 2 5 volume = 20.94
surface area = 46.40
Enter your choice: 5

- Create a class **Department** containing attributes *deptName* a nd *deptHead* w ith getter and setter methods. Create another class **Hostel** containing *hostelName*, *hostelLocation* and *numberofRooms*, with getter and setter methods. Then write a **Student** class which has the Hostel and Department objects. Student class contains attributes *studentName*, *registerNo*, *electiveSubject* and *avgMarks*. Write suitable *getStudent* and *printStudent* methods for this class. Write a menu driven Java program to admit a new student, migrate the existing student to a new hostel and search students. Admit new students, take student details, department details and hostel details to create a student object with these details. (see example below). Migrate student asks for the existing student's *registerNo* and the hostel name to which he is going to shift to. The search should be made on the basis of the entered *registerNo* of the student.

  Sample input and output

  1. Admit new student 2. Migrate Hostel
  3. Search a student
  4. Exit

  Enter your choice: 1
  Enter the student details : Anjali M202345CA Machine Learning 84
  Enter the department details: CS Muralikrishnan
  Enter the hostel details: MLH2 Calicut 500
  Enter your choice: 3
  Enter the registration number: M202345CA
  Anjali M202345CA Machine Learning 84 CS MLH2
  Enter your choice: 2
  Enter the student registration number and new hostel : M202345CA MLH3 Enter your choice: 3
  Enter the registration number: M202345CA
  Anjali M202345CA Machine Learning 84 CS MLH3
  Enter your choice: 4

- Write a Java program which creates a base class **Number** which contains an integer number along with a method *showNumber* w hich displays the number. Now create derived classes **BinaryNumber, DecimalNumber** and **HexadecimalNumber** and override the *showNumber* m ethod to display the binary, decimal and hexadecimal value of the number. Create a list to store the

Number objects. Write a Java program to input and output different binary, decimal and hexadecimal numbers.

Sample input and output

1. Add Binary Number
2. Add Decimal Number
3. Add Hexadecimal Number 4. Display Numbers
5. Exit

Enter your choice:1 Enter value:20

Enter your choice:2 Enter value:20

Enter your choice:3 Enter value:20

Enter your choice:4 Binary 10100 Decimal 20 Hexadecimal 14

Enter your choice:1 Enter value:8

Enter your choice:4 Binary 10100 Decimal 20 Hexadecimal 14 Binary 1000

Enter your choice:5

- Create a bill generation system for a beauty salon, which provides services and sells beauty products. It offers 3 types of memberships: Premium, Gold and Silver. Premium, gold and silver members receive a discount of 20%, 15%, and 10%, respectively, for all services provided. Customers without membership receive no discount. Your program shall consist of three classes: Customer, Service and Membership. Decide the attributes and member functions according to your assumption. Write it on a paper and submit it along with the program. The system should print the total bill if a customer avails x number of services, for a visit.

Sample input and output:

Enter Customer Details: Name:Ram Mobile:9876543210 Membership:Gold

Add Service(Y/N): Y ServiceName:FaceWash Rate:100
Add Service(Y/N): Y ServiceName:HairCut Rate:200

Add Service(Y/N): N *****BILL*****
Ram 9876543210 Gold 1. FaceWash 100
2. HairCut 200
Total: 300-45
Please Pay: 255
****