Array of Objects

Objectives

basic operations supported by an array.

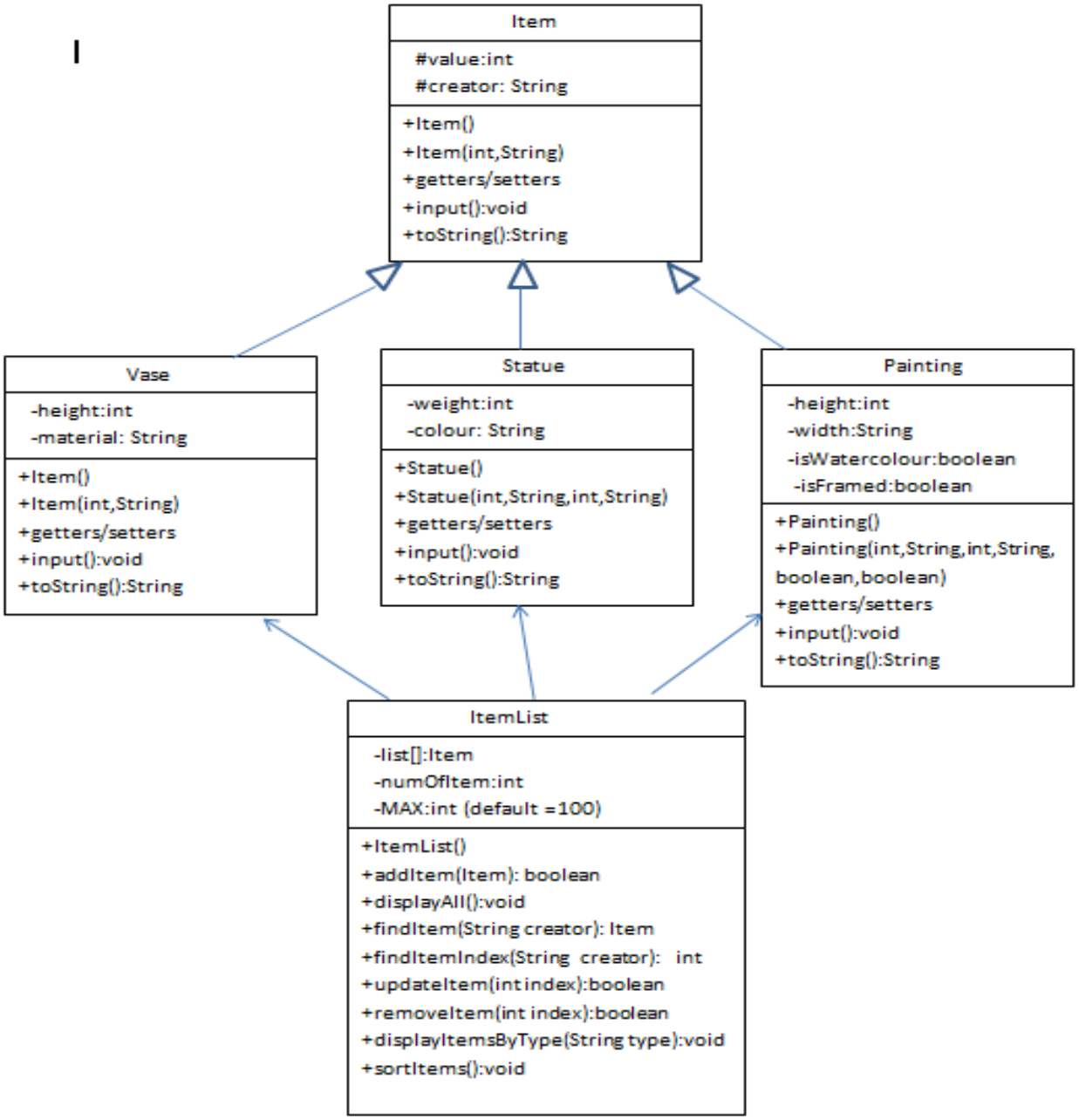
- print all the array elements(objects)
- Adds an object at the given index.
- Deletes an object at the given index.
- Searches an object using the given index or by the value.
- Updates an object at the given index.

Case study

- **Problem**: A antique shop that sells antique items, namely vases, statues, and paintings. The owner can add item to inventory. The shop will keep items in the list. The owner can add a new item to it, he search also the item,….

=>For now, we want to manage the list of objects such as vases, statues, paintings in an array.

Case study


Item
#value:int
#creator: String
+Item()
+Item(int,String)
+getters/setters
+input():void
+toString():String
Vase
-height:int
-material: String
+Item()
+Item(int,String)
+getters/setters
+input():void
+toString():String
Statue
-weight:int
-colour: String
+Statue()
+Statue(int,String,int,String)
+getters/setters
+input():void
+toString():String
Painting
-height:int
-width:String
-isWatercolour:boolean
-isFramed:boolean
+Painting()
+Painting(int,String,int,String,
boolean,boolean)
+getters/setters
+input():void
+toString():String
ItemList
-list[]:Item
-numOfItem:int
-MAX:int (default =100)
+ItemList()
+addItem(Item): boolean
+displayAll():void
+findItem(String creator): Item
+findItemIndex(String creator): int
+updateItem(int index):boolean
+removeItem(int index):boolean
+displayItemsByType(String type):void
+sortItems():void

Case study

```
public class Item
{           // declare fields
            protected int value;  // the price of a Item (>=0)
             protected String creator;  // the creator who creates  the item( is not empty)
             //constructors
            public Item(){       value=0;      creator="";    }
            public Item(int value, String creator){
                  this.value=value;
                  this.creator=creator;
            }
            //getters,setters:  you is required to add more code to get/set fields of a Item object
            //this method  is used to input all fields of a Item object
            public void input(){
               //use Scanner class to input fields
               //use try..catch/throws to handle exceptions
            }
            //this method returns a string that includes  value, creator of a Item object
            public String toString(){
              //return
            }
}
```

Case study

```
public  class Vase extends Item
{
        private  int height;//height of a vase (>=0 and <=2000)
        private String material;//material of a vase (is not empty)
        //TODO: you add more your codes
       //constructors
        //getter
        //setter
        //this method  is used to input all fields of a Vase object
        public void input(){
            //use Scanner class to input fields
           //use try..catch/throws to handle exceptions
       }
       //this method returns a string that includes  value, creator, height, material  of a vase object
       public String toString(){
          //return   ;
       }
}
```

Case study

```
public  class Statue extends Item
{
        private int weight; //the weight of a statue object (weght>=0 and <=1000)
        private  String colour; ////the colour of a statue object (is not empty)
        //You add more your code
        //constructors
        //getter
        //setter
        //this method  is used to input all fields of a statue object
        public void input(){
           //use Scanner class to input fields
           //use try..catch/throws to handle exceptions
        }
 //this method returns a string that includes  value, creator, weight, colour of a statue
object
        public String toString(){
          //return   ;
        }
}
```

Case study

```
public  class  Painting extends Item
{
        private int height; //the height of a painting object (height>=0 and <=2000)
        private  int width; //the width of a painting object (height>=0 and <=3000)
        private  boolean isWatercolour; //the painting object use s a watercolor or not
        private  boolean isFramed; //the painting object has s a frame or not
        //You add more your code
        //constructors
        //getter
        //setter
        //this method  is used to input all fields of a painting object
        public void input(){
            //use Scanner class to input fields
            //use try..catch/throws to handle exceptions
        }
 //this method returns a string that includes  all fields  of a painting object
        public String toString(){
            //return   ;
        }
}
```

Case study

```
public  class  ItemList
{
        Item [] list;   // an array to store all items
        int numOfItem;  // to store the number of items that added to the list
        final int MAX=100;   // is the size of the array
        public ItemList(){
                list=new Item[MAX];
                numOfItem=0;
            }
         //this mothod add an Item object to the list
         //input: a new item that needs to add
        //output: return true/false
        public boolean addItem(Item item){
                if( item==null || numOfItem>=MAX)
                   return false;
                list[numOfItem]=item;
                numOfItem++;
                return true;
       }
```

Case study

```
//this method prints out information of all items
public void displayAll(){
        if(numOfItem==0)
            System.out.println("the list is empty");
        for(int i=0; i< numOfItem; i++){
             System.out.println(list[i]);
     }
   }
   //this method finds the item by its creator
   //return the item that is found of the first occurrence.
   pulic Item findItem(String creator){
      for(int i=0; i< numOfItem; i++)
          if( list[i].getCreator().equals(creator))
              return list[i];
      return null;
   }
```

Case study

```
//this method returns the zero_based index of the first occurrence.
    pulic int findItemIndex(String creator){
        for(int i=0; i< numOfItem; i++)
            if( list[i].getCreator().equals(creator))
                return i;
        return -1;
    }
    //this method updates the item at the specified position in this list
    //input: the index you wish to update

    pulic boolean updateItem(int index){
        if( index >= 0 && index < numOfItem){
              list[i].input();
              return true;
        }
        return false;
    }
```

Case study

```
 //this method removes the item at the specified position in this list.
//Shifts any subsequent elements to the left
//input: the index you wish to remove
pulic boolean removeItem(int index){
    if( index >= 0 && index < numOfItem){
          for(int j=index; j< numOfItem; j++ ){
              list[j]=list[j+1];
           }
          numOfItem --;
          return true;
    }
    return false;
}
```

Case study

```
 //this method prints out all items that belong to the given type in the list.
public void displayItemsByType(String type){

    if (type.equals("Vase")){
      for(int i=0; i < numOfItem; i++)
         if ( list[i] instanceof Vase) System.out.println( list[i]);
    }
    else if (type.equals("Statue")){
      for(int i=0; i < numOfItem; i++)
         if ( list[i] instanceof Statue) System.out.println( list[i]);
    }
    else {
       for(int i=0; i < numOfItem; i++)
         if ( list[i] instanceof Painting) System.out.println( list[i]);
    }
}
```

Case study

```
//this method sorts items in ascending order based on their values.
   public void sortItems(){
       for(int i=0; i< numOfItem; i++)
           for(int j=numOfItem-1; j>i ;j--){
               if( list[i].getValue()< list[j-1].getValue()){
                   Item tmp=list[j];
                   list[j]=list[j-1];
                   list[j-1]=tmp;
                }
           }

   }

}//end class
```

Case study

```
public class antiqueShop{
    public static void main(String[] args){
        Scanner sc=new Scanner(System.in);
        int choice=0;
        do{
            System.out.println("1. add a new vase");
            System.out.println("2. add a new statue");
            System.out.println("3. add a new painting");
            System.out.println("4. display all items");
            System.out.println("5. find the items by the creator ");
            System.out.println("6. update the item by its index");
            System.out.println("7. remove the item by its index");
            System.out.println("8. display the list of vase items ");
            System.out.println("9. sorts items in ascending order based on their values ");
            System.out.println("10. exit");
            System.out.println("input your choice:");
            choice=sc.nextInt();
            switch(choice){
```

Case study

```
            case 1:
                    Item tmp=new Vase();
                      tmp.input();
                      if(obj.addItem(tmp)){
                         System.out.println("added");
                      }
                      break;
            case 2:
                        …..
                      break
            case 3:
                        ….
                        break;
             …..
      }//end switch
   } while(choice<=9);          //end while
}  //end class
```