**CSC248 – Fundamentals of Data Structure**
**Academic Session October 2023 – February 2024**
**Lab Assignment 2 – ArrayList (Built-in Method)**

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| Course Outcomes (CO) | LO1 | LO2 | LO3 |
|---|---|---|---|
| CO1 | | | |
| CO2 | √ | √ | √ |
| CO3 | | | |

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Answer **ALL** Questions by using built-in method `ArrayList`.

Question 1

Declare a list to hold integer numbers. Then you have to do the following operation

i. Add new element into a list
ii. Delete element from a list
iii. The number of elements in a list
iv. Calculate the total of number in a list
v. Print all elements in a list

Write a program to solve the problem by using *ArrayList* class. Use an appropriate menu selection to perform the option as given above.

```
import java.util.ArrayList;
import java.util.Scanner;

public class ArrayLists {
    public static void main(String[] args) {
        Scanner strInput = new Scanner(System.in);
        Scanner intInput = new Scanner(System.in);

        ArrayList<Integer> numbers = new ArrayList<Integer>();
        numbers.add(1);
        numbers.add(2);
        numbers.add(3);

        System.out.println("The elements are: " + numbers);

        System.out.println();

        System.out.print(
```

```
                "1. Add new elements into the ArrayList\n2. Delete element
from the ArrayList\n3. The number of elements in the list\n4. Calculate
the sum of all elements in the list\n6. Exit\n\nEnter your choice: ");
        int choice = intInput.nextInt();

        while (choice != 6) {
            switch (choice) {
                case 1:
                    System.out.print("Enter the number of elements to be
added: ");
                    int num = intInput.nextInt();
                    for (int i = 0; i < num; i++) {
                        System.out.print("Enter the number: ");
                        int number = intInput.nextInt();
                        numbers.add(number);
                    }
                    System.out.println("The elements are: " + numbers);
                    break;
                case 2:
                    System.out.print("Enter the index of the element to be
deleted: ");
                    int index = intInput.nextInt();
                    try {
                        numbers.get(index);
                    } catch (IndexOutOfBoundsException e) {
                        System.out.println("Invalid index!");
                        break;
                    }
                    System.out.println("Before removing element at index "
+ index + ": " + numbers);
                    numbers.remove(index);
                    System.out.println("After removing element at index "
+ index + ": " + numbers);
                    break;
                case 3:
                    System.out.println("The number of elements in the
list: " + numbers.size());
                    break;
                case 4:
                    int sum = 0;
                    for (int i = 0; i < numbers.size(); i++) {
                        sum += numbers.get(i);
                    }
```

```
                    System.out.println("The sum of all elements in the
list: " + sum);
                    break;
                default:
                    System.out.println("Invalid choice!");
                    break;
            }
            System.out.print(
                    "\n1. Add new elements into the ArrayList\n2. Delete
element from the ArrayList\n3. The number of elements in the list\n4.
Calculate the sum of all elements in the list\n6. Exit\n\nEnter your
choice: ");
            choice = intInput.nextInt();
        }

        System.out.println("Thank you for using this program!");

        strInput.close();
        intInput.close();
    }
}
```

**Question 2**

Declare a list to hold a collection string of name. Then you have to do the following operation

i. Add new element into a list
ii. Delete element from a list
iii. The number of elements in a list
iv. To determine either the name exist or not in a list
v. Sort the list of names in ascending order
vi. Print all the name in a list

Write a program to solve the problem by using *ArrayList* class. Use an appropriate menu selection to perform the option as given above.

```
import java.util.ArrayList;
import java.util.Scanner;

public class ArrayLists {
    public static void main(String[] args) {
        Scanner strInput = new Scanner(System.in);
        Scanner intInput = new Scanner(System.in);


        ArrayList<String> names = new ArrayList<String>();
        names.add("Hazeeq");
        names.add("Khairul");
        names.add("Redza");

        System.out.println("Current ArrayList: " + names);

        System.out.print("1. Add new elements to the ArrayList\n2. Delete
element from a list\n3. The number of elements in the list\n4. To
determine either the name exist or not in a list\n6. Exit\nEnter your
choice: ");
        int choice = intInput.nextInt();
        while (true) {
            if (choice == 1) {
                System.out.print("Enter the number of elements: ");
                int num = intInput.nextInt();
                for (int i = 0; i < num; i++) {
                    System.out.print("Enter the name: ");
                    String name = strInput.nextLine();
                    names.add(name);
                }
                System.out.println("The elements are: " + names);
```

```
            } else if (choice == 2) {
                System.out.print("Enter the index of the element to be
removed: ");
                int index = intInput.nextInt();
                try{
                    names.get(index);
                } catch (IndexOutOfBoundsException e) {
                    System.out.println("Index out of bounds!");
                    continue;
                }
                names.remove(index);
                System.out.println("After removing element at index " +
index + ": " + names);
            } else if (choice == 3) {
                System.out.println("The number of elements in the list: "
+ names.size());
            } else if (choice == 4) {
                System.out.print("Enter the name to be searched: ");
                String name = strInput.nextLine();
                System.out.println("Does the name exist in the list? " +
names.contains(name));
            } else if (choice == 6) {
                break;
            } else {
                System.out.println("Invalid input!");
            }
            System.out.print("1. Add new elements to the ArrayList\n2.
Delete element from a list\n3. The number of elements in the list\n4. To
determine either the name exist or not in a list\n6. Exit\nEnter your
choice: ");
            choice = intInput.nextInt();

        }
    }
}
```

**Question 3**

Given the following `Product` and `ArrayList` ADTs:

```
public class Product
{
     private String productName;
     private double price;
     private int quantity;

     public Product(String pn, double p, int q)  {…}
public void setProductName(String pn)  {…}   public
void setPrice (double p) {…}       public void
setQuantity (int q) {…}       public String
getProductName()  {…}    public double getPrice()
{…}  public int getQuantity()  {…}
     public String toString() {…}

}
public class ArrayList
{
     //default constructor public
     ArrayList ()
     //insert at back
     public boolean add (Object elem)   //remove
element based on object  public boolean remove
(Object elem)  //return element from the
specified location  public Object get (int index)
     //replace with specified element at specified location
public Object set (int index, Object elem)
     //return size of list public
     int size();

     //definition for other methods

}
```

Write a complete program for the `Product` ADT. Then, by using the `ArrayList` ADT as given above, write a java application to solve the following problems.

a) Declare two sequential lists named `listProduct1` and `listProduct2`.

b) Insert 10 (ten) products into `listProduct1`.

c) Find and display the record based on `productName`. If the record does not exist display an appropriate message.

d) Update the record where the `productName` is equal to `Pen`. If the record exists replace its current value of `quantity` with `30` and `price` with `RM 1.00` respectively, otherwise display an appropriate message.

e) Remove all records for total price is more than RM 1000 and store them into `listProduct2`. Total price is calculated by `quantity` multiply by `price`. f) Display all records from `listProduct1` and `listProduct2`.

Main

```
import java.util.Scanner;
import java.util.ArrayList;

public class Main {
    public static void main(String[] args) {
        Scanner strInput = new Scanner(System.in);
        Scanner intInput = new Scanner(System.in);

        ArrayList<Product> listProduct1 = new ArrayList<Product>();
        ArrayList<Product> listProduct2 = new ArrayList<Product>();

        // insert ten products into listProduct1
        listProduct1.add(new Product("Pen", 9.99, 100));
        listProduct1.add(new Product("Eraser", 0.99, 10000));
        listProduct1.add(new Product("Pencil", 1.99, 300));
        listProduct1.add(new Product("Ruler", 2.99, 259));
        listProduct1.add(new Product("Sharpener", 3.99, 500));
        listProduct1.add(new Product("Scissor", 4.99, 50));
        listProduct1.add(new Product("Paper", 5.99, 99));
        listProduct1.add(new Product("Book", 6.99, 369));
        listProduct1.add(new Product("Bag", 7.99, 20));
        listProduct1.add(new Product("Pencil Case", 8.99, 10));

        // display all records in listProduct1
        System.out.println("List of products in listProduct1: ");
        for (int i = 0; i < listProduct1.size(); i++) {
            System.out.println(listProduct1.get(i).getProductName());
        }

        System.out.println();
```

```
        System.out.print("Enter product name to be searched: ");
        String productName = strInput.nextLine();

        // search for the product
        int index = -1;
        for (int i = 0; i < listProduct1.size(); i++) {
            if
(listProduct1.get(i).getProductName().equalsIgnoreCase(productName)) {
                index = i;
                break;
            }
        }

        System.out.println();
        if (index == -1) {
            System.out.println("Product not found!");
        } else {
            System.out.println("Product found!");
            System.out.println("\nProduct details:\n" +
listProduct1.get(index));
        }

        System.out.println();

        System.out.println("Press enter to continue...");
        strInput.nextLine();

        // clear terminal
        System.out.print("\033[H\033[2J");
        System.out.flush();

        System.out.println("Finding product name that is pen and update
quantity to 30 and price with rm1.00");
        System.out.println();

        System.out.println("Before update product details:");
        for (int i = 0; i < listProduct1.size(); i++) {
            if
(listProduct1.get(i).getProductName().equalsIgnoreCase("pen")) {
                System.out.println(listProduct1.get(i));
                break;
            }
        }
```

```
        System.out.println();

        // find productName that is pen and update quantity to 30 and
price with rm1.00
        boolean found = false;
        for (int i = 0; i < listProduct1.size(); i++) {
            if
(listProduct1.get(i).getProductName().equalsIgnoreCase("pen")) {
                listProduct1.get(i).setQuantity(30);
                listProduct1.get(i).setPrice(1.00);
                System.out.println("Updated product details:\n" +
listProduct1.get(i));
                found = true;
                break;
            }
        }

        if (!found) {
            System.out.println("Product not found!");
        }

        System.out.println();

        System.out.println("Press enter to continue...");
        strInput.nextLine();

        // clear terminal
        System.out.print("\033[H\033[2J");
        System.out.flush();

        System.out.println("Removing all records for total price more than
rm1000 and store into listProduct2");

        // remove all records for total price more than rm1000 and store
into
        // listProduct2
        System.out.println("Removed product details:");
        System.out.println();
        for (int i = 0; i < listProduct1.size(); i++) {
            double totalPrice = listProduct1.get(i).getPrice() *
listProduct1.get(i).getQuantity();
            if (totalPrice > 1000) {
                listProduct2.add(listProduct1.get(i));
```

```
                System.out.println(listProduct1.get(i));
                listProduct1.remove(i);
                i--;
            }
        }

        System.out.println();

        System.out.println("Press enter to continue...");
        strInput.nextLine();

        // clear terminal
        System.out.print("\033[H\033[2J");
        System.out.flush();

        // display all records in listProduct1 and listProduct2
        System.out.println("List of products in listProduct1:\n");
        for (int i = 0; i < listProduct1.size(); i++) {
            System.out.println(listProduct1.get(i));
        }

        System.out.println("List of products in listProduct2:\n");
        for (int i = 0; i < listProduct2.size(); i++) {
            System.out.println(listProduct2.get(i));
        }

        System.out.println("Press enter to end program...");
        strInput.nextLine();

    }
}
```

Arraylists

```
import java.util.Scanner;
import java.util.ArrayList;

public class ArrayLists {
    public ArrayLists() {

    }

    // insert at back
    public boolean add(ArrayList<Product> list, Product product) {
        return list.add(product);
    }

    // remove element based on object
    public boolean remove(ArrayList<Product> list, Product product) {
        return list.remove(product);
    }

    // return element from the specified location
    public Product get(ArrayList<Product> list, int index) {
        return list.get(index);
    }

    // replace with specified element at the specified location
    public Product set(ArrayList<Product> list, int index, Product
product) {
        return list.set(index, product);
    }

    // return size of the list
    public int size(ArrayList<Product> list) {
        return list.size();
    }

}
```

```java
public class Product{
    private String productName;
    private double price;
    private int quantity;

    public Product(String productName, double price, int quantity){
        this.productName = productName;
        this.price = price;
        this.quantity = quantity;
    }


    public String getProductName() {
        return this.productName;
    }

    public void setProductName(String productName) {
        this.productName = productName;
    }

    public double getPrice() {
        return this.price;
    }

    public void setPrice(double price) {
        this.price = price;
    }

    public int getQuantity() {
        return this.quantity;
    }

    public void setQuantity(int quantity) {
        this.quantity = quantity;
    }

    public String toString(){
        return "Product Name: " + this.productName + "\nPrice: " +
this.price + "\nQuantity: " + this.quantity + "\n";
    }
}
```