**CSC248 – Fundamentals of Data Structure**

**Academic Session October 2023 – February 2024**

**Lab Assignment 2 – ArrayList (Built-in Method)**

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

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

1. Add new element into a list
2. Delete element from a list
3. The number of elements in a list
4. To determine either the name exist or not in a list
5. Sort the list of names in ascending order
6. 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.

1. Declare two sequential lists named listProduct1 and listProduct2.
2. Insert 10 (ten) products into listProduct1.
3. Find and display the record based on productName. If the record does not exist display an appropriate message.
4. 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.
5. 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();

    }

}

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";

    }

}