Assignment 1

Data Structures and Algorithms

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Question 1

Write a java code to create an array of strings {“Implement”, “a”, “java”,”code”}. Write a function to display the array elements.

```java
/* *
* q1
*/
public class q1 {

    // making array of strings
    public static String[] arr = { "Implement", "a", "java", "code" };

    // a function to display the array elements
    public static void display() {
        for (int i = 0; i < arr.length; i++) {
            System.out.print(arr[i] + " ");
        }
        System.out.println();
    }

    public static void main(String[] args) {
        // display the array elements
        System.out.println("Array elements:");
        display();
    }

}
```

Explanation:

- Made an array arr tp host the array elements given in question.
- A display function to display the array with for loop.
- A main method to get the desired output!

OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bin/env /
home/naylak15/.config/Code/User/workspaceStorage/2a84b38008fdb12a
Array elements:
Implement a java code
```

Question 2

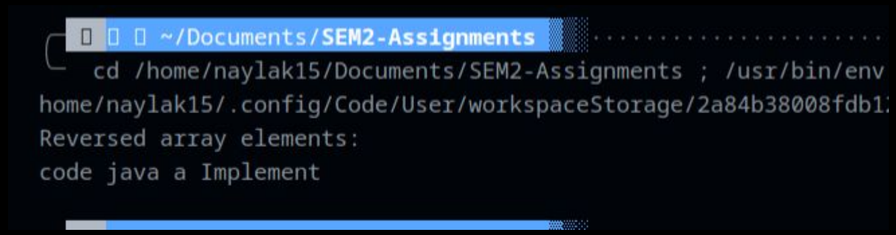
Write a function to reverse the array and display it.

```java
public class q2 {
  //get array from q1.java
   public static String[] arr = q1.arr;
   //a function to reverse the array elements
   public static void reverse() {
       for (int i = arr.length - 1; i >= 0; i--) {
           System.out.print(arr[i] + " ");
       }
       System.out.println();
   }
   public static void main(String[] args) {
       //reverse the array elements
       System.out.println("Reversed array elements:");
       reverse();
   }
}
```

Explanation:

- Took the array from previous question
- A reverse function to display the array in reverse order with for loop, the i- - assigns the last element to the first element of the new array.
- A main method to get the desired output!

OUTPUT



Question 3

Write a function to concatenate any two array elements and display the output.

```java
public class q3 {
    //q1 array
    public static String[] arr = q1.arr;
    //a function to concatenate any 2 array elements
    public static void concat() {
        for (int i = 0; i < arr.length; i++) {
            for (int j = i + 1; j < arr.length; j++) {
                System.out.print(arr[i] + arr[j] + " ");
            }
        }
        System.out.println();
    }
    public static void main(String[] args) {
        //concatenate any 2 array elements
        System.out.println("Concatenated array elements:");
        concat();
    }
}
```

Explanation:

- Took the array from question 1.
- A concat function to display the array in concatted form . For loops first accesses the i element and the next for loop access j element which is the i+1 element.
- Then prints out the i and i+1 element .
- A main method to get the desired output!

OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bin/env /usr/lib/jvm/java-18-
home/naylak15/.config/Code/User/workspaceStorage/2a84b38008fdb12ad9f6a6f93d8d41bf/rec
Concatenated array elements:
Implementa Implementjava Implementcode ajava acode javacode
```

Question 4

Write a function to replace the array element “java” with “JAVA” and display the array elements.

```java
public class q4 {
    //q1 array
    private static String[] arr = q1.arr;
    }
 //a function to find java and replace with JAVA
    public static void replace() {
        for (int i = 0; i < arr.length; i++) {
            if (arr[i].equals("java")) {
                arr[i] = "JAVA";
            }
            System.out.print(arr[i] + " ");
        }
        System.out.println();
    }
    public static void main(String[] args) {
        //replace java with JAVA
        System.out.println("Replaced array elements:");
        replace();

    }
}
```

Explanation:

- Took the array from question 1.
- A replace function to replace the word “java” with “JAVA”.
- The for loop helps look up to all array elements.
- The if case helps us to find the word “java” and replace that i element with “JAVA”.
- A main method to get the desired output!

OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bin/env /us
home/naylak15/.config/Code/User/workspaceStorage/2a84b38008fdb12ad9
Replaced array elements:
Implement a JAVA code
```

Question 5

Write a function to insert empty space between array elements and display the output.

```
public class q5 {
    //q1 array
    private static String[] arr = q1.arr;
    //a function to insert empty space
between the array elements
    public static void insert() {
        for (int i = 0; i < arr.length; i++)
{
            System.out.print(arr[i] + " ");
            for (int j = 0; j < i; j++) {
                System.out.print(" ");
            }
        }
        System.out.println();
    }
    public static void main(String[] args) {
        //insert empty space between the
array elements
        System.out.println("Inserted array
elements:");
        insert();
    }
}
```

Explanation:

- Took the array from question 1.
- A insert function to insert an space between array elements.
- The for loop with i variable helps look up to all array elements.
- The j variable makes space for every iteration of j.
- A main method to get the desired output!

OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bi
home/naylak15/.config/Code/User/workspaceStorage/2a84b3800
Inserted array elements:
Implement a  java   code
```

Question 6

Receive input from user and replace the initial array with another 4 new words. Display the output.

```java
import java.util.Scanner;

public class q6 {
    //q1 array
    private static String[] arr = q1.arr;
    //input from user and replace the initial array with another
4 new words.
    public static void replace() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter 4 new words:");
        for (int i = 0; i < arr.length; i++) {
            arr[i] = sc.next();
        }
        System.out.println("Replaced array elements:");
        display();
    }
    public static void main(String[] args) {
        System.out.println("Replaced array elements:");
        replace();
    }
}
```

Explanation:

- Took the array from question 1.
- A replace function to replace the 4 words already in the array.
- Used Scanner to get the user input .
- With each iteration , the words entered by the user gets into the array by using the for loop.
- A main method to get the desired output!

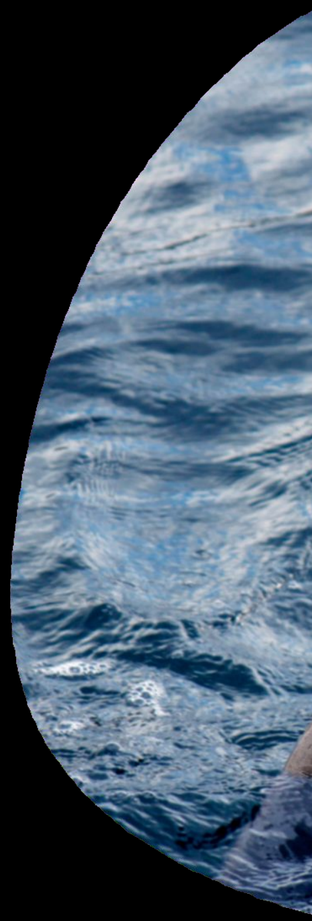
OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments
home/naylak15/.config/Code/User/workspaceStorage
Original array elements:
Implement a java code
Replaced array elements:
Enter 4 new words:
This
is
DSA
Assignment1
Replaced array elements:
This is DSA Assignment1
```

Question 7

Define an array which has ‘n’ elements with unique numbers (no duplicates).
a. Take two index locations ‘i’ and ‘j’ (i != j) and perform a subtraction operation
b. Display the output of the operation if it’s a positive number
c. Display an output if its negative numbers

```java
import java.util.Arrays;
import java.util.Scanner;

/**
* q6_a
*/
public class q7 {

    //an array with unique numbers
    private static int[] arr = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
    //a function to display the array elements
    public static void display() {
        for (int i = 0; i < arr.length; i++) {
            System.out.print(arr[i] + " ");
        }
        System.out.println();
    }
    /**
     * @subquestion_1
     */
    //get user values for i and j
    public static int subpos() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter i and j:(i should not be equal to j)");
        int i = sc.nextInt();
        int j = sc.nextInt();
        if (i == j) {
            System.out.println("i and j should not be equal");
            subpos();
        }
        int sub = arr[i]-arr[j];
        if (sub>0) {
            System.out.println(sub);
        }
        return sub; }
    public static int subneg(){
        //get user values for i and j
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter i and j:(i should not be equal to j)" );
        int i = sc.nextInt();
        int j = sc.nextInt();
        if (i == j) {
            System.out.println("i and j should not be equal" );
            subneg();
        }
        int sub = arr[i]-arr[j];
        if (sub<0) {
            System.out.println(sub);
        }
        return sub;

    }
    public static void main(String[] args) {
        //ask user to choose between subpos and subneg
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter 1 for subpos and 2 for subneg" );
        int choice = sc.nextInt();
        if (choice == 1) {
            System.out.println("Subtraction gives positive output :" );
            subpos();
        } else if (choice == 2) {
            System.out.println("Subtraction gives negative output :" );
            subneg();
        } else {
            System.out.println("Invalid input");
        }
    }
}
```



Explanation:

- First made an array with 10 unique numbers without duplicates.
- And made a function to display the array.
- Made an method subpos which subtracts indices i and j and gives positive output (Question&_b).
- And an method subneg which subtracts and displays negative output(Question7_c).
- We get i and j from user .
- The if condition makes sure that the i and j elements are not equal.
- In the main function we give a choice to user to select between question7_b and Question7_c.
- User can enter 1 for Question7_b and 2 for Question7_c.
- Both the methods subpos, subneg returns the subtracted value as integer.

OUTPUT

For 7_b

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignment
home/naylak15/.config/Code/User/workspaceStorag
Array elements:
1 2 3 4 5 6 7 8 9 10
Enter 1 for subpos and 2 for subneg
1
Subtraction gives positive output :
Enter i and j:(i should not be equal to j)
5
3
2
```

i=j case

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ;
home/naylak15/.config/Code/User/workspaceStorage/2a
Array elements:
1 2 3 4 5 6 7 8 9 10
Enter 1 for subpos and 2 for subneg
1
Subtraction gives positive output :
Enter i and j:(i should not be equal to j)
5
5
i and j should not be equal
Enter i and j:(i should not be equal to j)
```

For 7_c

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignments ;
home/naylak15/.config/Code/User/workspaceStorage/2
Array elements:
1 2 3 4 5 6 7 8 9 10
Enter 1 for subpos and 2 for subneg
2
Subtraction gives negative output :
Enter i and j:(i should not be equal to j)
6
7
-1
```

Question 8

Write a java code to find the pair of array elements whose sum will be equal to a given number

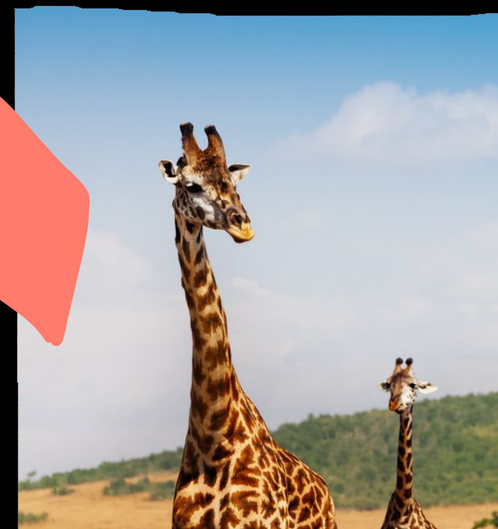
```java
import java.util.Scanner;

public class q8 {
   //getting a number from the user
   public static int getNum() {
       Scanner sc = new Scanner(System.in);
       System.out.println("\n Enter a number: the maximum and minimum sum is 19 and 3
respectively");
       int num = sc.nextInt();
       return num;
   }
   //find the pair of array elements whose sum will be equal to a given number
   public static void findPair(int[] arr, int num) {
       for (int i = 0; i < arr.length; i++) {
           for (int j = i+1; j < arr.length; j++) {
               if (arr[i]+arr[j] == num) {
                   System.out.println("(" + arr[i] + "," + arr[j] + ")");
               }
           }
       }
   }
   public static void main(String[] args) {
       int[] arr = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
       //printing array elements
       System.out.println("Array elements:");
       for (int i = 0; i < arr.length; i++) {
           System.out.print(arr[i] + " ");
       }
       //get a number from the user
       int num = getNum();
       //find the pair of array elements whose sum will be equal to a given number
       findPair(arr, num);
   }
}
```

Explanation:

- Function getNumber , helps the user to input a sum whose pairs will be found by the code.
- We first display the array and then ask the user the input the sum, between 3 and 19.
- It gives the output pairs depending on the availability of the pair.
- A main method to get the desired output!

OUTPUT

```
~/Documents/SEM2-Assignments
cd /home/naylak15/Documents/SEM2-Assignment
home/naylak15/.config/Code/User/workspaceStorag
Array elements:
1 2 3 4 5 6 7 8 9 10
 Enter a number: the maximum and minimum sum is
6
(1,5)
(2,4)
```



Question 9

Create an array with duplicate elements. Write a code to display unique subarray elements in the same order as it is in the array.

```
import java.util.Arrays;

public class q9 {
    //an array with duplicate elements numbers
    public static int[] arr = {1, 2, 3, 4, 5, 6, 7, 8,
9, 10, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10};

    //display unique subarray elements
    public static void display() {
        for (int i = 0; i < arr.length; i++) {
            for (int j = i + 1; j < arr.length; j++) {
                if (arr[i] == arr[j]) {
                    System.out.print(arr[i] + " ");
                }
            }
        }
        System.out.println();
    }
    public static void main(String[] args) {
        //display original array
        System.out.println("Original array elements:"
+ Arrays.toString(arr));
        //display unique subarray elements
        System.out.println("Unique subarray
elements:");
        display();
    }
}
```

Explanation:

- The first for loop with i traverses through the array, and the for loop with j will have i+1 element so that we can check whether the numbers are duplicates or not.
- The display function displays the subarray.

OUTPUT

```
~/Documents/SEM2-Assignments
 cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bin/env /usr/lib/jvm/java-18-openjdk-am
home/naylak15/.config/Code/User/workspaceStorage/2a84b38008fdb12ad9f6a6f93d8d41bf/redhat.java/j
Original array elements:[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Unique subarray elements:
1 2 3 4 5 6 7 8 9 10
```

Question 10

Create an array with 15 integer elements (unique elements). Find the subarray of length 3 (consecutive 3 elements), whose sum is largest. Display the subarray.

```
public class q10 {

   //Create an array with 15 integer elements (unique elements).
Find the subarray of length 3 (consecutive 3 elements), whose
sum is largest. Display the subarray.
   public static void main(String[] args) {
       //an array with 15 integer elements from 20 to 35
       int[] arr = new int[15];
       for (int i = 0; i < arr.length; i++) {
           arr[i] = 21 + i;
       }

       int max = 0;
       int start = 0;
       int end = 0;
       for (int i = 0; i < arr.length - 2; i++) {
           int sum = 0;
           for (int j = i; j < i + 3; j++) {
               sum += arr[j];
           }
           if (sum > max) {
               max = sum;
               start = i;
               end = i + 2;
           }
       }
       System.out.println("The subarray is: ");
       for (int i = start; i <= end; i++) {
           System.out.print(arr[i] + " ");
       }
       System.out.println();
   }}
```

Explanation:

- Made an array from 21 to 35
- Using the first for loop we traverse to the array.
- The condition to the loop os because we need sum of 3 elements
- The condition in second loop is to stop the loop when 3 consecutive numbers reached.
- We then interchange the sum with max.
- Start is the first element in the 3 consecutive row and end is the final element.
- We then print the subarray.

OUTPUT

```
~/Documents/SEM2-Assignments
 cd /home/naylak15/Documents/SEM2-Assignments ; /usr/bin/env /usr/lib/jvm/java-
home/naylak15/.config/Code/User/workspaceStorage/2a84b38008fdb12ad9f6a6f93d8d41bf/
Array elements:
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 66
69
72
75
78
81
84
87
90
93
96
99
102
The subarray is:
33 34 35
```

The Sum of all possible
3 consecutive elements

Thank You