

ICSE COMPUTER APPLICATION

2023-2024

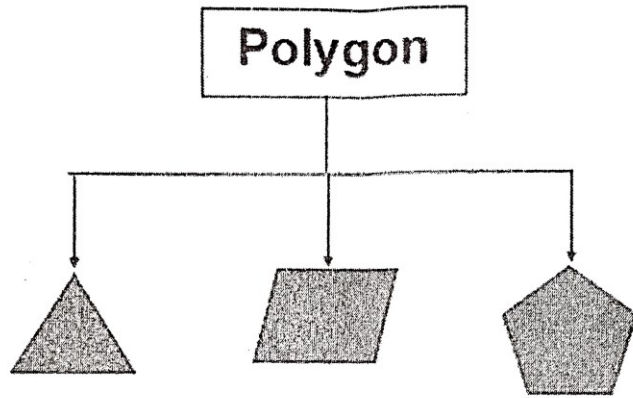
SOLUTION PAPER

Question 1

Choose the correct answers to the questions from the given options.

(Do not copy the questions, write the correct answers only.)

(i)



Consider the above picture and choose the correct statement from the following:

- (a) Polygon is the object and the pictures are classes
- (b) Both polygon and the pictures are classes
- (c) Polygon is the class and the pictures are objects
- (d) Both polygon and the pictures are objects

Answer:

Option (c) Polygon is the class and the pictures are objects

Explanation: Polygon is the class whereas triangle, parallelogram and pentagon are types of Polygon. Hence, they are objects of the class Polygon.

(ii) `int x = 98; char ch = (char)x;` what is the value in ch?

(a) b

(b) A

(c) B

(d) 97

Answer:

Option (a) b

Explanation: 'a' has an Ascii value of 97 thus, 98 is the Ascii value of 'b'

(iii) The output of the statement `"CONCENTRATION".indexOf('T')` is:

(a) 9

(b) 7

(c) 6

(d) (-1)

Answer:

Option (c) 6

Explanation: The index position of 'T' in "CONCENTRATION" is 6

(iv) The access specifier that gives least accessibility is:

- (a) package
- (b) public
- (c) protected
- (d) private

Answer:

Option (d) private

Explanation: The private access specifier restricts access within the class only thus giving the least accessibility.

(v) The output of the statement `"talent".compareTo("genius")` is:

(a) 11

(b) -11

(c) 0

(d) 13

Answer:

Option (d) 13

Explanation: Ascii value of 't' – Ascii value of 'g' = 116 – 103 = 13

(vi)

Which of the following is an escape sequence character in Java?

- (a) /n
- (b) \t
- (c) /t
- (d) //n

Answer:

Option (b) \t

Explanation: All other options are incorrect

(vii) if $(a > b \& \& b > c)$ then largest number is:

(a) b

(b) c

(c) a

(d) wrong expression

Answer:

Option (c) a

Explanation: a is greater than b and b is greater than c thus a is the greatest

(viii) What is the output of `Math.ceil(5.4)+Math.ceil(4.5)`?

- (a) 10.0
- (b) 11.0
- (c) 12.0
- (d) 9.0

Answer:

Option (b) 11.0

Explanation: `Math.ceil()` returns the next higher number. $(6.0+5.0)$

(ix) What is the method to check whether a character is a letter or digit?

- (a) `isDigit(char)`
- (b) `isLetterOrDigit()`
- (c) `isLetterOrDigit(char)`
- (d) `isLETTERorDIGIT(char)`

Answer:

Option (c) `isLetterOrDigit(char)`

Explanation: `isLetterOrDigit()` checks whether the character is a letter or digit or none of them.

(X) The extension of a Java source code file is:

(a) exe

(b) obj

(c) jvm

(d) java

Answer:

Option (d) java

Explanation: The source code extension is .java, bytecode extension is .obj

- (xi) The number of bytes occupied by a character array of four rows and three columns are:
- (a) 12
 - (b) 24
 - (c) 96
 - (d) 48

Answer:

Option (b) 24

Explanation: The size of the char data type is 2 bytes. Thus $2*4*3 = 24$

- (xii) Which of the following data type cannot be used with switch case construct?
- (a) int
 - (b) char
 - (c) String
 - (d) double

Answer:

Option (d) double

Explanation: double is the data type which is not workable in any version of Java.

There is a doubt. The string data type is also not applicable in Java versions before 7.0 but it works in switch from 7.0 version and above.

(xiii) Which of the following are entry controlled loops?

1. for
2. while
3. do..while
4. switch

- (a) only 1
- (b) 1 and 2
- (c) 1 and 3
- (d) 3 and 4

Answer:

Option (b) 1 and 2

Explanation: for loop and while loop are entry-controlled loops where the condition is checked before entering the loop body.

(xiv) Method which reverses a given number is:

- (a) Impure method
- (b) Pure method
- (c) Constructor
- (d) Destructor

Answer:

Option (b) Pure method

Explanation: The method of doing the reverse of a number will create a new number that will be the reverse of the number but will not change the original number itself.

(xv) If the name of the class is “Yellow”, what can be the possible name for its constructors?

- (a) yellow
- (b) YELLOW
- (c) Yell
- (d) Yellow

Answer:

Option (d) Yellow

Explanation: Constructor will have the same name as that of the class itself.

(xvi) Invoking a method by passing the objects of a class is termed as:

- (a) Call by reference
- (b) Call by value
- (c) Call by method
- (d) Call by constructor

Answer:

Option (a) Call by reference

Explanation: In passing a parameter as an object works as a call by reference because there exists only one copy of the object shared in both the caller and called methods.

- (xvii) The correct statement to create an object named mango of class fruit:
- (a) Fruit Mango= new fruit();
 - (b) fruit mango = new fruit();
 - (c) Mango fruit=new Mango();
 - (d) fruit mango= new mango();

Answer:

Option (b) fruit mango = new fruit();

Explanation: The class name and the object name should be the same as mentioned in the question.

(xviii) **Assertion (A):** Static method can access static and instance variables.

Reason (R): Static variable can be accessed only by static method.

- (a) Assertion and Reason both are correct.
- (b) Assertion is true and Reason is false.
- (c) Assertion is false and Reason is true.
- (d) Assertion and Reason both are false.

Answer:

Option (d) Assertion and Reason both are false.

Explanation: The static method can only access the static method directly whereas it can access an instance variable using an object of the class. Thus, we can say that static methods cannot access instance variables without the help of an object.

On the other hand, static variables can be accessed by a static method as well as an instance method directly.

(xix) What is the output of the Java code given below?

```
String color [] = {"Blue", "Red", "Violet"};
```

```
System.out.println(color[2].length());
```

(a) 6

(b) 5

(c) 3

(d) 2

Answer:

Option (a) 6

Explanation: The array element at index position 2 i.e. color[2] is “Violet” and the number of characters in “Violet” is 6.

(xx) Which of the following mathematical methods returns only an integer?

- (a) `Math.ceil(n)`
- (b) `Math.sqrt(n)`
- (c) `Math.floor(n)`
- (d) `Math.round(n)`

Answer:

Option (d) `Math.round(n)`

Explanation: This method rounds up/down a given decimal number and returns a whole number.

For example, `Math.round(5.5) = 6` and `Math.round(5.4) = 5`

Question 2

(i) Write Java expression for:

$$\frac{|a + b|}{\sqrt{a^2 + b^2}}$$

Solution:

(i) `double d = Math.abs(a+b)/(Math.sqrt(a*a+b*b));`

(ii) Evaluate the expression when x is 4:

$$x += x++ * ++x \% 2;$$

Solution:

(ii) `x += x++ * ++x \% 2, x=4`

$$x = x + (x++ * ++x \% 2)$$

$$4 + (4 * 6 \% 2)$$

$$4 + (4 * 0)$$

$$4 + 0 = 4$$

(iii) Rewrite the following *do while* program segment using for:

```
x = 10; y = 20;  
  
do  
  
{  
  
    x++;  
  
    y++;  
  
} while (x<=20);  
  
System.out.println(x * y );
```

Solution:

```
int x,y;  
for(x=10, y=20; x<=20; x++, y++);  
System.out.println(x*y);
```

(iv) Give the output of the following program segment. How many times is the loop executed?

```
for(x=10; x>20;x++)  
  
System.out.println(x);  
  
System.out.println(x*2);
```

Output:

The for loop will run 0 times as the condition is false and the loop is entry-controlled.

(v) String s1 = "45.50"; String s2 = "54.50";

double d1=Double.parseDouble(s1);

double d2=Double.parseDouble(s2);

int x= (int)(d1+d2);

What is value of x?

Solution:

double d1= 45.50

double d2= 54.40

int x = (int) (45.5+54.5) = 100

Value of x = 100

(vi) Consider the following two-dimensional array and answer the questions given below:

```
int x[ ][ ] = {{4,3,2}, {7,8,2}, {8, 3,10}, {1, 2, 9}};
```

- (a) What is the order of the array?
- (b) What is the value of $x[0][0]+x[2][2]$?

Solution:

- (a) Order of the array 4 x 3 i.e. 4 rows and 3 columns
- (b) $x[0][0] = 4$, $x[2][2] = 10$
So, the result is 14

(vii) Differentiate between boxing and unboxing.

(viii) The following code to compare two strings is compiled, the following syntax error was displayed – incompatible types – int cannot be converted to boolean. Identify the statement which has the error and write the correct statement. Give the output of the program segment.

Solution:

(vii) Boxing vs Unboxing

Boxing is the process of converting a primitive datatype into an object of a corresponding wrapper class whereas unboxing is the process of converting a wrapper class object back to its primitive value.

(viii) -4

Reason: `compareTo()` gives the ASCII difference between the first two dissimilar characters present in the string, but if any one of the strings ends early, then it returns the difference of the length.

(ix) Consider the given program and answer the questions given below:

```
class temp
{
    int a;
    temp()
    {
        a=10;
    }
    temp(int z)
    {
        a=z;
    }
    void print()
    {
        System.out.println(a);
    }
    void main()
    {
        temp t = new temp();
        temp x = new temp(30);

        t.print();

        x.print();
    }
}
```

(a) What concept of OOPs is depicted in the above program with two constructors?

(b) What is the output of the method main()?

Solution:

(a) Polymorphism. Having two constructors in a class represents constructor overloading which is a part of polymorphism.

(b) 10
30

(x) Primitive data types are built in data types which are a part of the wrapper classes. These wrapper classes are encapsulated in the java.lang package. Non primitive datatypes like Scanner class are a part of the utility package for which an object needs to be created.

- (a) To which package the Character and Boolean classes belong?
- (b) Write the statement to access the Scanner class in the program.

Solution:

(a) java.lang

(b) Scanner sc=new Scanner(System.in);

Question 3

DTDC a courier company charges for the courier based on the weight of the parcel. Define a class with the following specifications:

class name: courier

Member variables: name – name of the customer
weight – weight of the parcel in kilograms
address – address of the recipient
bill – amount to be paid
type – 'D'- domestic, 'I'- international

Member methods:

void accept () – to accept the details using the methods of the *Scanner class* only.

void calculate () – to calculate the bill as per the following criteria:

Weight in Kgs	Rate per Kg
First 5 Kgs	Rs.800
Next 5 Kgs	Rs.700
Above 10 Kgs	Rs.500

An additional amount of Rs.1500 is charged if the type of the courier is I (International)

void print () – To print the details

void main () – to create an object of the class and invoke the methods

```
import java.util.*;
class DTDC
{
    String name, address;
    double weight, bill;
    char type;

    public void accept()
    {
        Scanner sc=new Scanner(System.in);
        System.out.print("Enter the name of the customer:");
        name=sc.nextLine();
        System.out.print("Enter the weight of the parcel in kilograms:");
        weight=sc.nextDouble();
        System.out.print("Enter the address of the recipient:");
        address=sc.nextLine();
        System.out.print("Enter the type: D for domestic and I for international:");
        type=(char)sc.next().charAt(0);
    }
}
```

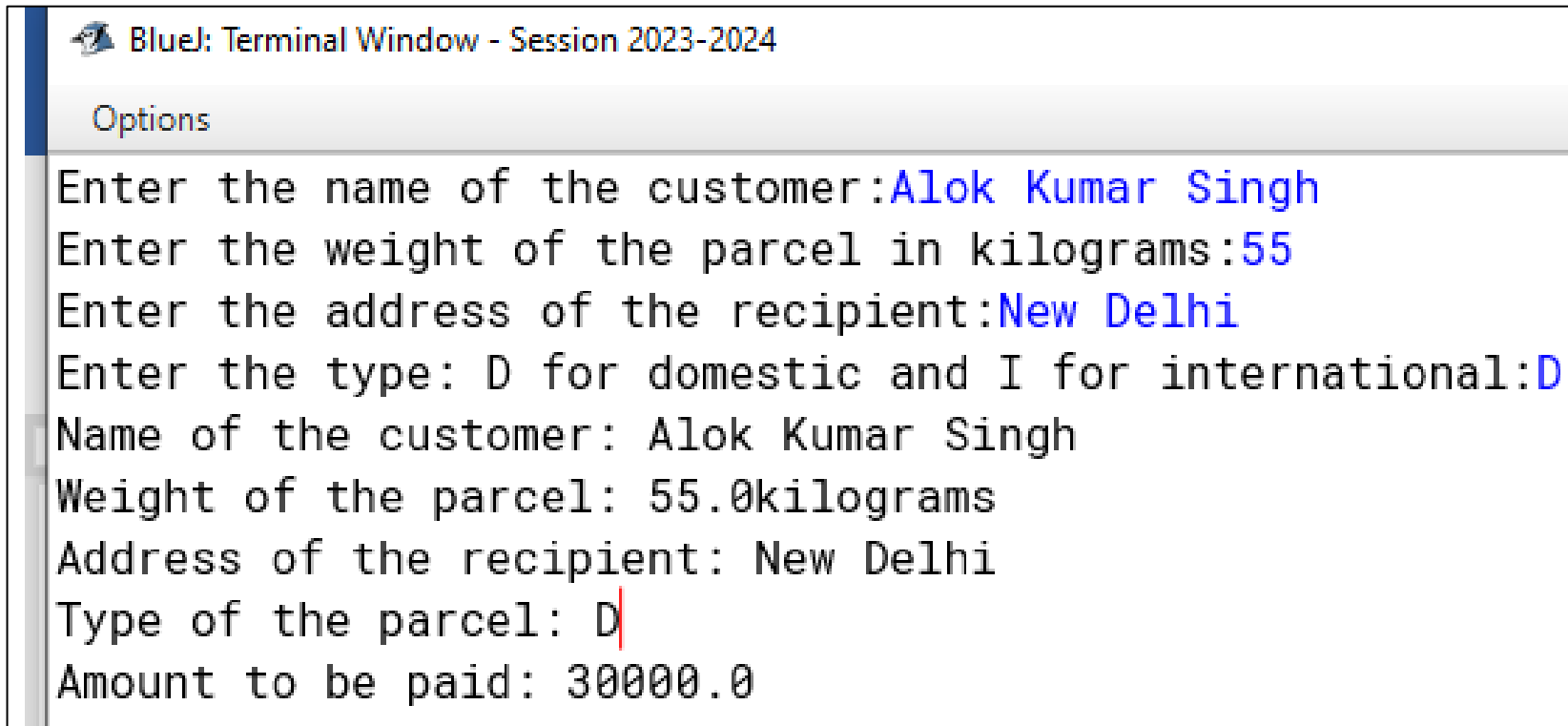
```
public void calculate()
```

```
{  
    if(weight>0)  
    {  
        if(weight<=5)  
            bill=800*weight;  
        else if(weight<=10)  
            bill=5*800+700*(weight-5);  
        else  
            bill=5*800+5*700+500*(weight-10);  
        if(type=='I')  
            bill+=1500;  
    }  
    else  
        System.out.println("Invalid weight given");  
}  
public void print()  
{  
    System.out.println("Name of the customer: "+name);  
    System.out.println("Weight of the parcel: "+weight+" kilograms");  
    System.out.println("Address of the recipient: "+address);  
    System.out.println("Type of the parcel: "+type);  
    System.out.println("Amount to be paid: "+bill);  
}
```



```
public static void main(String arg[])  
{  
    DTDC obj=new DTDC();  
    obj.accept();  
    obj.calculate();  
    obj.print();  
}  
}
```

Output:



A terminal window titled "Blue: Terminal Window - Session 2023-2024" with an "Options" menu. The output of the program is displayed in a monospaced font. The user has entered "Alok Kumar Singh" for the customer name, "55" for the weight in kilograms, "New Delhi" for the recipient address, and "D" for the parcel type. The program has calculated and displayed the amount to be paid as 30000.0.

```
Blue: Terminal Window - Session 2023-2024  
Options  
Enter the name of the customer:Alok Kumar Singh  
Enter the weight of the parcel in kilograms:55  
Enter the address of the recipient:New Delhi  
Enter the type: D for domestic and I for international:D  
Name of the customer: Alok Kumar Singh  
Weight of the parcel: 55.0kilograms  
Address of the recipient: New Delhi  
Type of the parcel: D  
Amount to be paid: 30000.0
```

Question 4

Define a class to overload the method perform as follows:

double perform (double r, double h)

to calculate and return the value of
Curved surface area of cone

$$CSA = \pi r l \quad l = \sqrt{r^2 + h^2}$$

void perform (int r, int c)

Use NESTED FOR LOOP to generate the
following format

r = 4, c = 5 output – 1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

void perform (int m, int n, char ch)

to print the quotient of the division of m and
n if ch is Q else print the remainder of the
division of m and n if ch is R

```
class Overloading
{
    double perform(double r, double h)
    {
        double l=Math.sqrt(r*r+h*h);
        double csa=3.142*r*l;
        return csa;
    }
    void perform(int r, int c)
    {
        for(int i=1;i<=r;i++)
        {
            for(int j=1;j<=c;j++)
                System.out.print(j+" ");
            System.out.println();
        }
    }
    void perform(int m, int n, char ch)
    {
        if(ch=='Q')
            System.out.println("Quotient="+m/n);
        else if(ch=='R')
            System.out.println("Remainder="+m%n);
        else
            System.out.println("Invalid operation");
    }
}
```

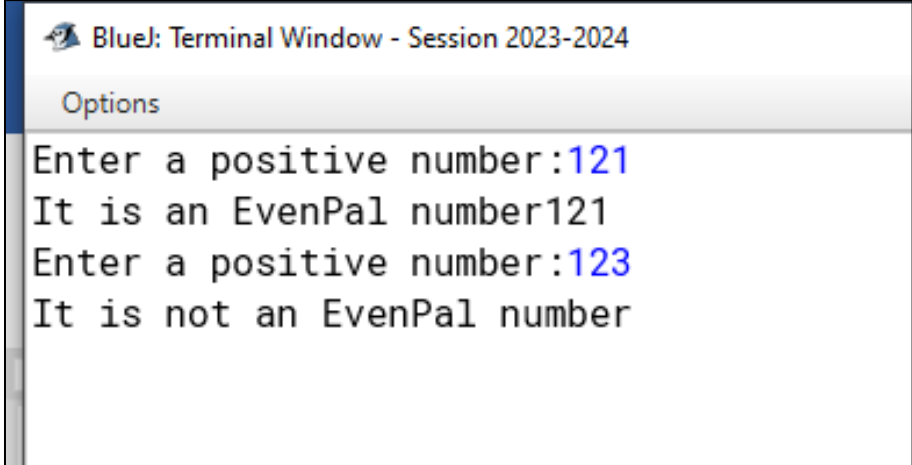
Question 5

Define a class to accept a number from user and check if it is an EvenPal number or not. (The number is said to be EvenPal number when number is palindrome number (a number is palindrome if it is equal to its reverse) and sum of its digits is an even number.)

Example: 121 – is a palindrome number

Sum of the digits – $1+2+1 = 4$ which is an even number

```
import java.util.*;
class EvenPal
{
    public static void main(String arg[])
    {
        Scanner sc=new Scanner(System.in);
        System.out.print("Enter a positive number:");
        int num=Math.abs(sc.nextInt());
        int rev=0,sum=0,temp=num;
        while(temp>0)
        {
            int r=temp%10;
            temp=temp/10;
            rev=rev*10+r;
            sum+=r;
        }
        if(rev==num && sum%2==0)
            System.out.println("It is an EvenPal number"+num);
        else
            System.out.println("It is not an EvenPal number");
    }
}
```



Blue: Terminal Window - Session 2023-2024

Options

```
Enter a positive number:121
It is an EvenPal number121
Enter a positive number:123
It is not an EvenPal number
```

Question 6

Define a class to accept values into an integer array of order 4 x 4 and check whether it is a **DIAGONAL** array or not. An array is **DIAGONAL** if the sum of the left diagonal elements equals the sum of the right diagonal elements. Print the appropriate message.

Example:

3 4 2 5

Sum of the left diagonal elements =

2 5 2 3

$3 + 5 + 2 + 1 = 11$

5 3 2 7

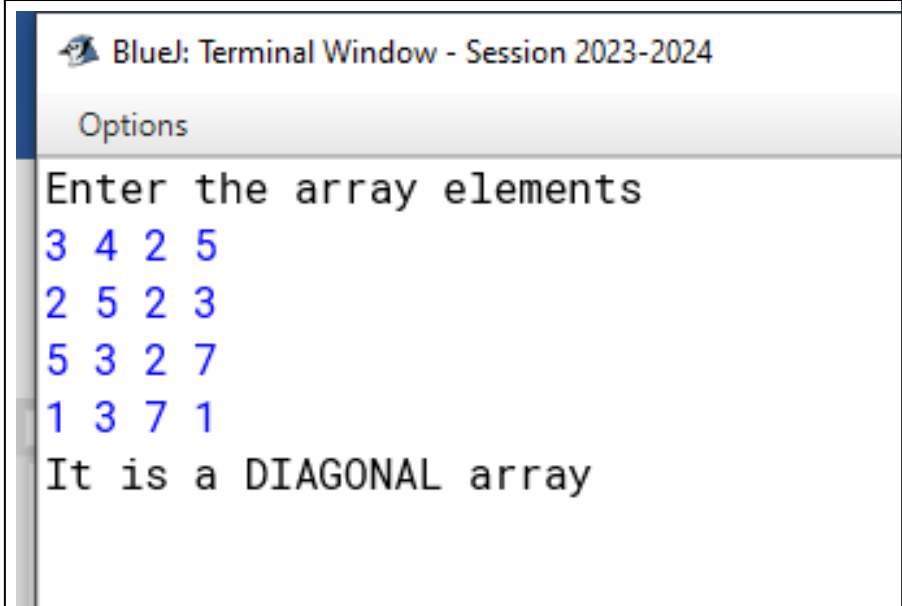
Sum of the right diagonal elements =

1 3 7 1

$5 + 2 + 3 + 1 = 11$

```
import java.util.*;
class DiagonalArray
{
    public static void main(String arg[])
    {
        Scanner sc=new Scanner(System.in);
        int mat[][]=new int[4][4];
        int i,j;
        //initializing the array
        System.out.println("Enter the array elements");
        for(i=0;i<4;i++)
        {
            for(j=0;j<4;j++)
                mat[i][j]=sc.nextInt();
        }
        //adding both the diagonal elements
        int ld=0,rd=0;
```

```
for(i=0;i<4;i++)
{
    for(j=0;j<4;j++)
    {
        if(i==j)
            ld+=mat[i][j];
        if(i+j==3)
            rd+=mat[i][j];
    }
}
//checking both the sums
if(ld==rd)
System.out.println("It is a DIAGONAL array");
else
System.out.println("It is not a DIAGONAL array");
}
}
```



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Options

Enter the array elements

```
3 4 2 5
2 5 2 3
5 3 2 7
1 3 7 1
```

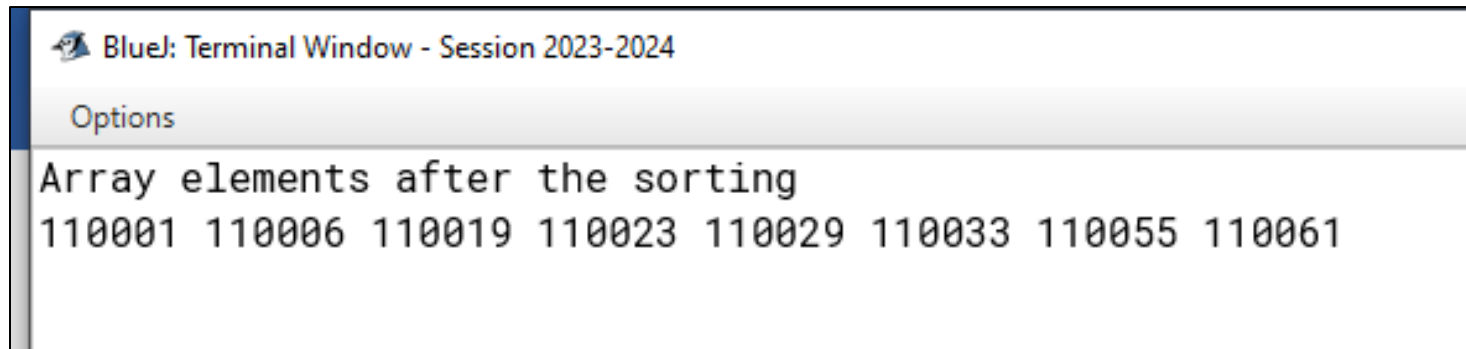
It is a DIAGONAL array

Question 7

Define a class pin code and store the given pin codes in a single dimensional array. Sort these pin codes in ascending order using the Selection Sort technique only. Display the sorted array.

110061, 110001, 110029, 110023, 110055, 110006, 110019, 110033

```
class SelectionSort
{
    public static void main(String args[])
    {
        int arr[]={110061,110001,110029,110023,110055,110006,110019, 110033};
        int len=arr.length;
        //performing selection sort in ascending order
        for(int i=0;i<len-1;i++)
        {
            int pos=i;
            for(int j=i+1;j<len;j++)
            {
                if(arr[pos]>arr[j])//finding the smallest element w.r.t. index pos. i
                    pos=j;
            }
            int temp=arr[i]; //swapping using 3rd variable
            arr[i]=arr[pos];
            arr[pos]=temp;
        }
        System.out.println("Array elements after the sorting");
        for(int i=0;i<len;i++)
        {
            System.out.print(arr[i]+" ");
        }
    }
}
```



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Options

```
Array elements after the sorting
110001 110006 110019 110023 110029 110033 110055 110061
```

Question 8

Define a class to accept the gmail id and check for its validity.

A gmail id is valid only if it has:

→ @

→ . (dot)

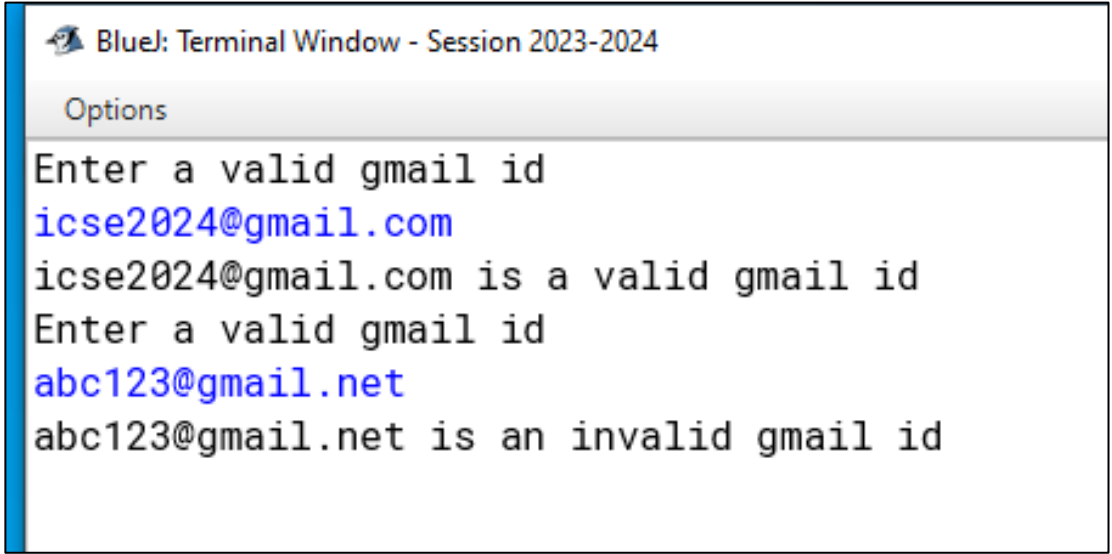
→ gmail

→ com

Example: icse2024@a@gmail.com is a valid gmail id.

```
import java.util.Scanner;
class EmailCheck
{
    public static void main(String args[])
    {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter a valid gmail id");
        String mail=sc.next().trim();
        int c1=0,c2=0;
        for(int i=0;i<mail.length();i++)
        {
            char c=mail.charAt(i);
            if(c=='@')
                c1++;
            if(c=='.')
                c2++;
        }
    }
}
```

```
if(c1==1 && c2==1)
{
    int p=mail.indexOf('@');
    int q=mail.indexOf('.');
    String subdomain=mail.substring(p+1,q);
    String domain=mail.substring(q+1);
    if(subdomain.equals("gmail") && domain.equals("com"))
        System.out.println(mail+" is a valid gmail id");
    else
        System.out.println(mail+" is an invalid gmail id");
}
else
    System.out.println(mail+" is an invalid gmail id");
}
```



```
BlueJ: Terminal Window - Session 2023-2024
Options
Enter a valid gmail id
icse2024@gmail.com
icse2024@gmail.com is a valid gmail id
Enter a valid gmail id
abc123@gmail.net
abc123@gmail.net is an invalid gmail id
```