Computer Applications

CISCE

Academic Year: 2023-2024
(English Medium)
Date & Time: 13th March 2024, 11:00 am

Duration: 2h **Marks: 100**

1. Answers to this Paper must be written on the paper provided separately.
2. You will not be allowed to write during the first 15 minutes.
3. This time is to be spent reading the question paper.
4. The time given at the head of this Paper is the time allowed for writing the ans wers.
5. This Paper is divided into two Sections.
6. Attempt all questions from Section A and any four questions from Section B.
7. The intended marks for questions or parts of questions are given in brackets [].

SECTION-A (40 Marks) (Attempt all questions from this Section.)

Q1. Choose the correct answers to the questions from the given options. (Do not copy the questions, write the correct answer only.)

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

1. Polygon is the object and the pictures are classes
2. Both polygon and the pictures are classes
3. Polygon is the class and the pictures are objects
4. Both polygon and the pictures are objects

Solution

Polygon is the class, and the pictures are objects

Explanation:

The class is a polygon, and its types include triangle, parallelogram, and pentagon. As a result, they fall under the Polygon class.

1.2. int x = 98; char ch = (char)x; what is the value in ch?

1. b
2. A
3. B
4. 97

Solution

b

Explanation:

'A' has an ASCII value of 97; hence, ' B' has an ASCII value of 98.

1.3. The output of the statement "CONCENTRATION" indexOf('T') is _____.

1. 9
2. 7
3. 6
4. (-1)

Solution

The output of the statement "CONCENTRATION" indexOf('T') is **6**.

Explanation:

The index position of 'T' in "CONCENTRATION" is 6.

1.4. The access specifier that gives least accessibility is _____.

1. Package
2. Public
3. Protected
4. Private

Solution

The access specifier that gives least accessibility is **private**.

Explanation:

The private access specifier restricts access to the class solely, providing the least amount of accessibility.

1.5. The output of the statement "talent". compareTo("genius") is _____.

1. 11
2. -11
3. 0
4. 13

Solution

The output of the statement "talent". compareTo("genius") is **13**.

Explanation:

ASCII value of 't' - ASCII value of 'g' = 116 − 103 = 13.

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

1. /n
2. \t
3. /t
4. //n

Solution

\t

Explanation:

Every other option is incorrect.

1.7. If (a>b&&b>c) then largest number is _____.

1. b
2. c
3. a
4. Wrong expression

Solution

If (a>b&&b>c) then largest number is **a**.

Explanation:

a is greater than b, and b is greater than c, so a is the greatest.

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

1. 10.0
2. 11.0
3. 12.0
4. 9.0

Solution

11.0

Explanation:

Mathi.ceil() returns the next higher number. (6.0 + 5.0).

1.9. What is the method to check whether a character is a letter or digit?

1. isDigif(char)
2. isLetterOrDigit()
3. isLetterOrDigit(char)
4. isLETTERorDIGIT(char)

Solution

isLetterOrDigit(char)

Explanation:

isLetterOrDigit() determines whether a character is a letter, digit, or none of the above.

1.10. The extension of a Java source code file is _____.

1. exe
2. obj
3. jvm

4. java

Solution

The extension of a Java source code file is **java**.

Explanation:

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

1.11. The number of bytes occupied by a character array of four rows and three columns is _____.

1. 12
2. 24
3. 96
4. 48

Solution

The number of bytes occupied by a character array of four rows and three columns is **24**.

Explanation:

- The size of the char data type is 2 bytes.
- Thus, 2 * 4 * 3 = 24.

1.12. Which of the following data type cannot be used with switch case construct?

1. int
2. char
3. String
4. Double

Solution

Double

Explanation:

- The data type double is incompatible with all versions of Java.

- There's a doubt. The string data type is also not usable in Java versions prior to 7.0, but it works in switches from 7.0 and above.

1.13. Which of the following are entry-controlled loops?

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

1. Only 1
2. 1 and 2
3. 1 and 3
4. 3 and 4

Solution

1 and 2

Explanation:

The for loop and while loop are entry-controlled loops that check the condition before entering the loop body.

1.14. Method which reverses a given number is _____:

1. Impure method
2. Pure method
3. Constructor
4. Destructor

Solution

Method which reverses a given number is **pure method**:

Explanation:

The procedure of reversing a number generates a new number that is the reverse of the original number but does not modify the original number.

1.15. If the name of the class is "Yellow", what can be the possible name for its constructors?

1. yellow

2. YELLOW
3. Yell
4. Yellow

Solution

Yellow

Explanation:

The constructor will have the same name as the class itself.

1.16. Invoking a method by passing the objects of a class is termed as _____.

1. Call by reference
2. Call by value
3. Call by method
4. Call by constructor

Solution

Invoking a method by passing the objects of a class is termed as Call by reference.

Explanation:

Passing an argument as an object acts as a call by reference since only one copy of the object is shared by both the caller and the called method.

1.17. The correct statement to create an object named mango of class fruit:

1. Fruit Mango = new fruit();
2. fruit mango = new fruit();
3. Mango fruit = new Mango();
4. fruit mango = new mango();

Solution

fruit mango = new fruit();

Explanation:

The class and object names should be the same, as specified in the query.

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

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

1. Assertion and Reason both are correct.
2. Assertion is true and Reason is false.
3. Assertion is false and Reason is true.
4. **Assertion and Reason both are false.**

Solution

Assertion and Reason both are false.

Explanation:

The static method can only access itself, whereas an instance variable can be accessed through a class object. Thus, we can conclude that static methods cannot access instance variables without the assistance of an object.

In contrast, static variables can be immediately accessed by both static and instance methods.

1.19. What is the output of the Java code given below?

String color [J = {"Blue", "Red", "Violet"}; System.out.println(color[2].length();

1. **6**
2. 5
3. 3
4. 2

Solution

6

Explanation:

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

1.20. Which of the following mathematical methods returns only an integer?

1. Math.ceil(n)

2. Math.sqrt(n)
3. Math.floor(n)
4. Math.round(n)

Solution

Math.round(n)

Explanation:

This method rounds up/down a supplied decimal value to a whole number. For example, Math.round(5.5) = 6, but Math.round(5.4) = 5.

Q2.

2.1. Write Java expression for:

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

Solution

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

2.2. Evaluate the expression when x is 4:

```
x + = x + + * + + x %2;
```

Solution

```
x += x++ * ++x%2, x=4
x = x+ (x++ * ++x%2)
4 + (4*6%2)
4 + (4 * 0)
4 + 0 = 4
```

2.3. 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);
```

2.4. 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);
```

Solution

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

2.5. What is value of x?

```
String s1= "45.50";String s2="54.50";
double d1=Double.parseDouble(s1);
double d2=Doub1e.parseDouble(s2);
int x=(int)(d1+d2)
```

Solution

```
double d1=45.50
double d2=54.40
int x = (int) (45.5+54.5) = 100
value of x = 100
```

2.6. 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 × 3, i.e. 4 rows and 3 columns

b.

```
x[0][0] = 4, x[2][2] = 10
So, the result is 14
```

2.7. Differentiate between boxing and unboxing.

Solution

- Boxing is the process of changing a primitive datatype into an object of a corresponding wrapper class, whereas
- Unpacking is the process of returning a wrapper class object to its primitive state.

2.8. 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.

```
void calculate()
  {
  String a="KING",b="KINGDOM";
  boolean x=a.compareTo(b);
  system.out.println(x);
  }
```

Solution

-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.

2.9. 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

2.10. 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);
```

SECTION-B (60 Marks) (Answer any four questions from this Section.)

'The answers in this section should consist of the programs in either BlueJ environment or any program environment with Java as the base.

Each program should be written using variable description/mmemonic codes so that the logic of the program is clearly depicted. Flowcharts and algorithms are not required.

Q3. 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	

Solution

```
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 parcel in kilograms:");
 weight=sc.nextDouble();
 Sytem.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:

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: 55.0 kilograms

Address of the recipient: New Delhi

Type of the parcel: D

Amount to be paid: 30000.0

Q4. 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 π rl $l = \sqrt{r^2 + h^2}$
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

Solution

```
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");
      }
}
```

Output:

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

Q5. 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

Solution

```
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");
    }
}
```

Output:

Enter a positive number: 121

It is an EvenPal number 121

Enter a positive number: 123

It is not an EvenPal number

Q6. 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

Solution

```
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)
         Id+=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");
   }
}
```

Output:

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

Q7. 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

Solution

```
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]+" ");
     }
   }
}
```

Output:

Array elements after the sorting

110001 110006 110019 110023 110029 110033 110055 110061

Q8. 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@gmail.com is a valid gmail id.

Solution

```
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
```

```
  }
  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 valid gmail id");
```

```
      else
        System.out.println(mail+" is an invalid gmail id");
    }
    else
        System.out.println(mail+"is an invalid gmail
        id");
    }
}
```

Output:

Enter a valid gmail id

icse2024@gmail.com

icse2024@gmail.com is a valid gmail id

Enter a valid gmail id

abc123@gmail.com.net

abc123@gmail.net is an invalid gmail id