Based on ICSE 2024 EXAMINATION SAMPLE QUESTION PAPER COMPUTER APPLICATIONS

SOLUTION

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This Paper is divided into **two** Sections.
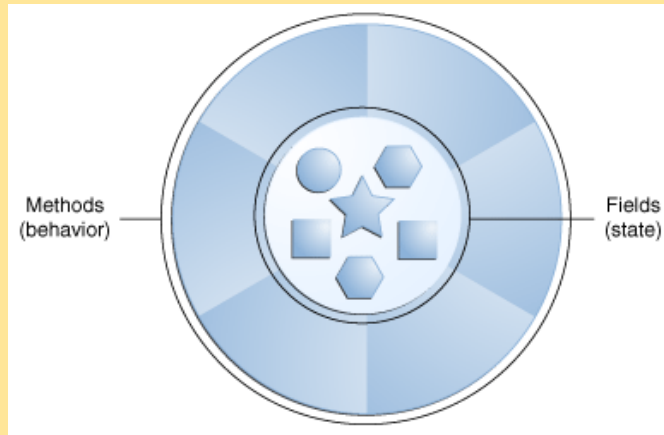
Attempt **all** questions from **Section A** and **any four** questions from **Section B.**

SECTION A

*(Attempt **all** questions from this **Section**.)*

Question 1.

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

(i) What is the above image showcasing regarding the features of OOP?

(a) Encapsulation

(b) Inheritance

(c) Abstraction
(d) Polymorphism

Answer. (a) Encapsulation
Reason: Encapsulation binds data and methods into one single unit called class.

(ii) Relational operators are :

(a) Unary operator
(b) Binary operator
(c) Ternary operator
(d) Conditional operator

Answer. (b) Binary operator
(Reason – Relational operator compares two operands and returns true or false.)

(iii) If `((a > b) && (a > c))`, then which of the following statements is true?

(a) a is the largest number.
(b) b is the largest number.
(c) c is the largest number.
(d) b is the smallest number.

Answer. (a) a is the largest number.

(Reason – Assuming that the given condition ((a > b) && (a > c)) is true, it implies that (a > b) and (a > c) both are true. Hence, a is greater than b and c.)

(iv) Which of the following might make the Java compiler report a syntax error in a particular line of a program?

      (a) The program is typed in the wrong font.

      (b) The line contains a comma(,) instead of a dot(.).

      (c) It is caused by Java runtime.

      (d) Program takes too long to complete.

Answer. (b) The line contains a comma(,) instead of a dot(.)

(Reason – In Java, a comma is used to separate items in a list, such as in method arguments or variable declarations. If a dot is expected (e.g., for method calls or accessing object members), and we use a comma instead, it would result in a syntax error.)

(v) Assume x = 1 with the following code snippet:

```
int y = --x;
```
Which one of the following is true?

a) x = 1, y = 1
b) x = 0; y = 0
c) x = 1; y = 0
d) x = 0; y = 1

Answer. (b) x=0; y=0
(Reason – Prefix decrement operator first decrements and then uses the value. Thus, the value of x will be decremented first (making x = 0), and then the value will be assigned to y (making y = 0))

(vi) Parameters in the method definition are called:

    a) actual parameters

    b) formal parameters

    c) informal parameters

    d) void parameters

Answer. (b) formal parameters.

(Reason **-** Parameters in method definition are called formal parameters.)

(vii) What will be the output of `Math.ceil(-0.6)`

     a) -1.6

     b) -1.5

     c) -1.0

     d) -0.0

Answer. (d) -0.0

(Reason - Math.ceil method returns the smallest double value that is greater than or equal to the argument and is equal to a mathematical integer. Thus, Math.ceil(-0.6) returns -0.0)

(viii) Consider the following code snippet:

```
float x = 8.25F;
int  y;
y = (int)x;
```

What are the values of x and y

a) x = 8.25, y = 8
b) x = 8.0, y = 8.0
c) x = 8, y = 8.25
d) x = 8, y = 8

Answer. (a) x = 8.25, y = 8

(Reason - float data type can store numbers with decimal and int data type stores signed/unsigned integer values. So, x = 8.25. Then, the user is declaring an int variable y and type casting the float value x to an int and assigning it to y.
When we cast x to an int, the fractional part is truncated and the int value (8) is stored in y. Thus, y = 8.)

(ix) Which operator cannot be used with the if-else statement?

    a) <=

    b) ||

    c) &&

    d) ? :

Answer. (d) ?:
    (Reason – Relational operators (<=) and logical operators (|| and &&) can be used to test a condition as they return boolean values. Ternary operator (? :) is used to assign a value to a variable based on a condition. Thus, it cannot be used with if-else statement.)

(x) Given an integer array of size 5, the last index will be:

      (a) 0th index
      (b) 2nd index
      (c) 4th index
      (d) 5th index

Answer. (c) 4th index
(Reason – The index starts from 0, so the last index comes at 4.)

(xi) Which of the following statements is true?

    a) Binary search is less efficient than a linear search.
    b) Binary search is more efficient than linear search.
    c) Binary search is as efficient as linear search.
    d) There is no comparison between binary search and linear search.

Answer. (b) Binary search is more efficient than the linear search.
    (Reason- With more number of inputs, Binary search is more efficient than linear search as it requires lesser number of comparisons to find an element in an array compared to linear search)

(xii) JVM converts bytecode directly into _____.

    a)   machine code
    b)   another byte code
    c)   High-level code
    d)   Temporary code

Answer. (a) Machine code

(Reason - JVM converts bytecode directly into machine code as it is responsible for interpreting or compiling Java bytecode into machine code that is executed by the host computer's CPU.)

(xiii) What is the value returned by function compareTo( ), if the invoking string is less than the string compared?

a) zero
b) value less than zero
c) value greater than zero
d) ASCII sum of the characters

Answer. (b) value less than zero.

(Reason - The compareTo() method compares two strings lexicographically, and returns a value based on the following logic:

If string1 > string2, the result will be a positive integer, i.e., result > 0
if string1 < string2, the result will be a negative integer, i.e., result < 0
if string1 = string2, the result will be 0, i.e., result = 0

(xiv) _____ class is used to convert a primitive data type to its corresponding object.

       a) String
       b) Wrapper
       c) System
       d) Math

Answer. (b) Wrapper
      (Reason- Wrapper class is used to convert a primitive data type to its corresponding object.)

(xv) Which of the following is a valid character constant:

1. '4'
2. "A"
3. 'A1'
4. "four"

(a) Only 1.

(b) 1. and 3.

(c) 2. and 4.

(d) 1. and 2.

Answer. (a) Only 1
    (Reason – Character data must be a single character enclosed with single quotes)

(xvi) Which of these data type value is returned by equals() method of string class?

(a) char

(b) int

(c) boolean

(d) String

Answer. (c) boolean

(Reason- equals() method checks if contents of two strings are same or not. The result is true if the contents are same otherwise it is false.)

(xvii) Assertion (A):   In Java, no two identifiers can use the same name.

    Reason (R):   Identifiers are case-sensitive.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not a correct explanation of Assertion (A)

(c) Assertion (A) is true and Reason (R) is false

(a) Assertion (A) is false and Reason (R) is true

Answer. (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not a correct explanation of Assertion (A)

    (Reason-Both (A) and (R) are two different statements)

(xviii) Read the following text and choose the correct answer:

Function overloading is the only way to exhibit polymorphism in Java.

What is Polymorphism?

(a) To exhibit in more than one form.
(b) Inheriting the features of one class by another class.
(c) Binding data and methods into one unit.
(d) Hiding the background details from the user.

Answer. (a) To exhibit in more than one form.

(Reason- Polymorphism is exhibited in Java only through function overloading)

(xix)   Assertion (A):   Constructors are used to initialise the data members at the time of object creation.

Reason (R):   Constructors cannot be called explicitly.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not a correct explanation of Assertion (A)

(c) Assertion (A) is false and Reason (R) is true

(a) Assertion (A) is false and Reason (R) is true

Answer. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A)

(Reason: As constructors cannot be called explicitly, they are invoked only at the time of object creation.)

(xx) What will be the output for:

System.out.print(Character.isLowerCase('L'));

(a) 0
(b) 1
(c) true
(d) false

Answer. (d) false
(Reason- method isLowerCase() returns a boolean value as true or false and here in the above statement the letter is in upper case so output will be false.)

Question 2		
(i)	What will be the output of the following statements? int a = 3; System.out.println(" " + (1 + a)); System.out.println(" " + 1 + a);
(ii)	Find the output of the following code. String str = "I Love My Family"; System.out.println(Integer.toString(str.length())); System.out.println(str.substring(12));

Answer.

(i)   4

     13

Explanation: System.out.println(" " + (1 + a)); — This expression adds 1 and the value of a, which is 3, first. So, (1 + a) equals 4. After that, the + operator outside the parentheses performs string concatenation. Therefore, the output will be " 4" (a space followed by the number 4).

System.out.println(" " + 1 + a); — In this statement, the + operator is evaluated from left to right. So, " " + 1 is evaluated first. It concatenates the string " " with the number 1, resulting in the string " 1". Then, it concatenates this string with the value of a, which is 3. Therefore, the output for this line will be " 13" (a space followed by the numbers 1 and 3).

(ii)   16

     mily

Explanation

The length of the string "I Love My Family" is 16 characters. Then, we use Integer.toString() to convert this length to a string before printing it. So, the output of this line will be "16" as a string.

The substring(12) method will extract the portion of the string starting from index 12 till the end of the string. So, the output of this line will be "mily," as it is the substring that starts from the character 'm' and extends to the end of the original string.

| (iii) | Write a Java statement for the following mathematical expression :

$V = 2/3\pi r^2 h$ | [2] |

Answer:

V = 2.0 / 3.0 * 22.0/7.0 * r * r * h;

(iv) Write the value of n and m after execution of the following code. [2]

```
int m;
int n;
m = 5;
n = (5 * ++m) % 3;
System.out.println("n = " + n + " m =" + m);
```

Answer.

n = 0 m = 6

Explanation

The statement n = (5 * ++m) % 3; is evaluated as follows:

n = (5 * ++m) % 3; [m = 5]

⇒ n = (5 * 6) % 3; [Prefix operator first increments the value and then uses it. So, m = 5 + 1 = 6 and then it is used in the expression]

⇒ n = 30 % 3;

⇒ n = 0;

So, the final value of m is 6 and n is 0.

(v) **Predict the output** [2]

(a) Math.pow(3.4, 2) + 2 * Math.sqrt(64)

(b) Math.ceil(3.4) + 2 * Math.floor(3.4) + 2

Answer.
(a) 27.56
(b) 12.0

(a) Math.pow(x, y) method returns the value of x raised to the power of y. Math.sqrt() method returns the square root of an argument. Thus, the given expression is evaluated as follows:
Math.pow(3.4, 2) + 2 * Math.sqrt(64) $\Rightarrow$ 11.56 + 2 * 8.0 $\Rightarrow$ 27.56

(b) Math.ceil() method returns the smallest double value that is greater than or equal to the argument and is equal to a mathematical integer. Math.floor() method returns the largest double value that is less than or equal to the argument and is equal to a mathematical integer. Thus, the given expression is evaluated as follows: Math.ceil(3.4) + 2 * Math.floor(3.4) + 2 $\Rightarrow$ 4.0 + 2 * 3.0 + 2 $\Rightarrow$ 4.0 + 6.0 + 2 $\Rightarrow$ 12.0

(vi)	If a = 24, b = 15, find the value of: a += b++ * 5 / a++ + b	[2]
(vii)	Give the prototype of a function search, which receives a sentence sent and a word wrd and returns 1 or 0.	[2]

Answer.
(vi) a += b++ * 5 / a++ + b
⇒ a = a + (b++ * 5 / a++ + b) [a = 24, b = 15]
⇒ a = 24 + (15 * 5 / a++ + b) [a = 24, b = 16]
⇒ a = 24 + (15 * 5 / 24 + 16) [a = 25, b = 16]
⇒ a = 24 + (75 / 24 + 16)
⇒ a = 24 + (3 + 16)
⇒ a = 43
Hence, the final value of a is 43

(vii) int search(String sent, String wrd)

(viii) How many times will the following loop execute? **[2]**

```
int x = 2, y = 50;
do
{
    ++x;
    y -= x++;
} while (x <= 10);
return y;
```

Answer.
The given loop will execute 5 times.

Iteration	x	y	Remarks	
	2	50	Initial values	
1	4	47	++x $\Rightarrow$ x = 3 x = 4	y = y - x++ $\Rightarrow$ y = 50 - 3 $\Rightarrow$ y = 47
2	6	42	++x $\Rightarrow$ x = 5 x = 6	y = y - x++ $\Rightarrow$ y = 47 - 5 $\Rightarrow$ y = 42
3	8	35	++x $\Rightarrow$ x = 7 x = 8	y = y - x++ $\Rightarrow$ y = 42 - 7 $\Rightarrow$ y = 35
4	10	26	++x $\Rightarrow$ x = 9 x = 10	y = y - x++ $\Rightarrow$ y = 35 - 9 $\Rightarrow$ y = 26
5	12	16	++x $\Rightarrow$ x = 11 x = 12	y = y - x++ $\Rightarrow$ y = 26 - 11 $\Rightarrow$ y = 15

(ix)	If int a[] = {7, 3, 4, 8, 9, 2}; what are the values of x and y? (a) x = a[1] * a[0] + a[3]; (b) y = a.length;	[2]
(x)	Write the return types of the following library functions: (a) isLetterOrDigit(char) (b) replace(char, char)	[2]

Answer:
(xi)
(a) Since array index begin from 0, the given expression is
evaluated as follows:
x = a[1] * a[0] + a[3]
$\Longrightarrow$ x = 3 * 7 + 8
$\Longrightarrow$ x = 29

(x)
(a) boolean
(b) String

SECTION B

*(Attempt **any four** questions from this **Section**.)*

Question 3
Define a class Student described as below

Data members/instance variables
name, age, m1, m2, m3 (marks in 3 subjects), maximum, average

Member methods
(i) Student (...) : A parameterised constructor to initialise the data members.

(ii) compute() : To compute the average and the maximum out of three marks.

(iii) display() : To display the name, age, marks in three subjects, maximum and average.

Write a main method to create an object of a class and call the above member methods.

Solution:

```java
import java.util.Scanner;
public class Student
{
    private String name;
    private int age;
    private int m1;
    private int m2;
    private int m3;
    private int maximum;
    private double average;
    public Student(String n, int a, int s1,
    int s2, int s3) {
        name = n;
        age = a;
        m1 = s1;
        m2 = s2;
        m3 = s3;
    }
    public void compute() {
        average = (m1 + m2 + m3) / 3.0;
        maximum = Math.max(m1, m2);
        maximum = Math.max(maximum, m3);
    }
```

```java
    public void display() {
        System.out.println("Name: " + name);
        System.out.println("Age: " + age);
        System.out.println("Subject 1 Marks: " + m1);
        System.out.println("Subject 2 Marks: " + m2);
        System.out.println("Subject 3 Marks: " + m3);
        System.out.println("Maximum Marks: " + maximum);
        System.out.println("Average Marks: " + average);      }

    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        System.out.print("Enter name: ");
        String n = in.nextLine();
        System.out.print("Enter age: ");
        int a = in.nextInt();
        System.out.print("Enter Subject 1 Marks: ");
        int sm1 = in.nextInt();
        System.out.print("Enter Subject 2 Marks: ");
        int sm2 = in.nextInt();
        System.out.print("Enter Subject 3 Marks: ");
        int sm3 = in.nextInt();
        Student obj = new Student(n, a, sm1, sm2, sm3);
        obj.compute();
        obj.display();      }
}
```

Question 4

Define a class to accept a number and check whether the number is Neon or not. A number is said to be Neon if sum of the digits of the square of the number is equal to the number itself.

E.g.
Input: 9

Output:
9 * 9 = 81, 8 + 1 = 9
9 is Neon number.

Solution:

```java
import java.util.Scanner;
public class NeonNumber
{
    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        System.out.print("Enter the number to check: ");
        int n = in.nextInt();
        int sq = n * n;
        int sqSum = 0;

        while (sq != 0) {
            int d = sq % 10;
            sqSum += d;
            sq /= 10;
        }

        if (sqSum == n)
            System.out.println("Neon Number");
        else
            System.out.println("Not a Neon Number");
    }
}
```

Question 5

Define a class to input 15 integer elements in an array and sort them in ascending order using the bubble sort technique.

Solution:

```java
import java.util.Scanner;
public class BubbleSort
{
    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        int arr[] = new int[15];
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < 15; i++) {
            arr[i] = in.nextInt();
        }
        for (int i = 0; i < 14; i++) {
            for (int j = 0; j < 14 - i; j++) {
                if (arr[j] > arr[j + 1]) {
                    int t = arr[j];
                    arr[j] = arr[j+1];
                    arr[j+1] = t;
                }
            }
        }
        System.out.println("Sorted Array:");
        for (int i = 0; i < 15; i++) {
            System.out.print(arr[i] + " ");
        }
    }
}
```

Question 6

Define a class to overload the method display as follows:

void display(): To print the following format using nested loop

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

void display(int n): To check and display if the given number is a Perfect number or not. A number is said to be perfect, if sum of the factors of the number excluding itself is equal to the original number.

E.g.
6 = 1 + 2 + 3, where 1, 2 and 3 are factors of 6 excluding itself.

Solution:

```java
public class Overload
{
    public void display() {
        for (int i = 0; i < 5; i++) {
            for (int j = 5 - i; j <= 5; j++) {
                System.out.print(j + " ");
            }
            for (int k = 4 - i; k > 0; k--) {
                System.out.print("5 ");
            }
            System.out.println();
        }
    }
    public void display(int n) {
        int sum = 0;
        for (int i = 1; i <= n / 2; i++) {
            if (n % i == 0)
                sum += i;
        }
        if (n == sum)
            System.out.println(n + " is a perfect number");
        else
            System.out.println(n + " is not a perfect number");
    }
```

Question 7

Define a class to enter a sentence from the keyboard and count the number of times a particular word occurs in it. Display the frequency of the search word.

E.g.
Input : Enter the sentence:
Hello, this is wow world
Enter the word:
wow

Output:
Searched word occurs 1 times.

Solution:

```java
import java.util.Scanner;
public class WordFrequency
{    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        System.out.print("Enter the sentence : ");
        String str = in.nextLine()+ " ";
        System.out.print("Enter the word : ");
        String ipWord = in.nextLine();
        String word = "";
        int count = 0, len = str.length();
        for (int i = 0; i < len; i++) {
            if (str.charAt(i) == ' ') {
                if (word.equalsIgnoreCase(ipWord))
                    count++ ;
                word = "";
            }
            else
                word += str.charAt(i);
        }
        if (count > 0)
            System.out.println("Searched word occurs " + count + " times.");
        else
            System.out.println("Search word is not present in sentence.");
    }
}
```

```
            if(p==0)
                System.out.println("Duck number");
            else
                System.out.println("Not a duck number");
    } //end of outer if block
    else
        System.out.println("Invalid number");
    }
}
```

Question 8

Define a class to accept 5 names in one array and their respective telephone numbers into a second array. Search for a name input by the user in the list. If found, display "search successful" and print the name along with the telephone number, otherwise display "Search unsuccessful: Name not enlisted".

```java
import java.util.Scanner;
public class TelephoneNos
{   public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        String names[] = new String[5];
        String numbers[] = new String[5];
        for (int i = 0;  i < 5; i++) {
            System.out.print("Enter Name: "); names[i] = in.nextLine();
            System.out.print("Enter Telephone number : "); numbers[i] = in.nextLine();
        }
        System.out.print("Enter name to be searched : ");
        String name = in.nextLine();
        int idx;
        for (idx = 0;  idx < n; idx++) {
            if (name.compareToIgnoreCase(names[idx]) == 0)
                break;
        }
        if (idx < n) {
            System.out.println("Search Successful");
            System.out.println("Name: " + names[idx]+ "\nTelephone Number: " + numbers[idx]);
        }
        else
            System.out.println("Search Unsuccessful : Name not enlisted");
    }
}
```

Thank You

For patience watching

&

All the best for your examinations.