Analysis of Pupil Performance

COMPUTER APPLICATIONS

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This document of the Analysis of Pupils' Performance at the ISC Year 12 and ICSE Year 10 Examination is one of its kind. It has grown and evolved over the years to provide feedback to schools in terms of the strengths and weaknesses of the candidates in handling the examinations.

We commend the work of Mrs. Shilpi Gupta (Deputy Head) of the Research Development and Consultancy Division (RDCD) of the Council and her team, who have painstakingly prepared this analysis. We are grateful to the examiners who have contributed through their comments on the performance of the candidates under examination as well as for their suggestions to teachers and students for the effective transaction of the syllabus.

We hope the schools will find this document useful. We invite comments from schools on its utility and quality.

Gerry Arathoon
October 2019   **Chief Executive & Secretary**

The Council has been involved in the preparation of the ICSE and ISC Analysis of Pupil Performance documents since the year 1994. Over these years, these documents have facilitated the teaching-learning process by providing subject/ paper wise feedback to teachers regarding performance of students at the ICSE and ISC Examinations. With the aim of ensuring wider accessibility to all stakeholders, from the year 2014, the ICSE and the ISC documents have been made available on the Council's website www.cisce.org.

The documents include a detailed qualitative analysis of the performance of students in different subjects which comprises of examiners' comments on common errors made by candidates, topics found difficult or confusing, marking scheme for each question and suggestions for teachers/ candidates.

In addition to a detailed qualitative analysis, the Analysis of Pupil Performance documents for the Examination Year 2019 also have a component of a detailed quantitative analysis. For each subject dealt with in the document, both at the ICSE and the ISC levels, a detailed statistical analysis has been done, which has been presented in a simple user-friendly manner.

It is hoped that this document will not only enable teachers to understand how their students have performed with respect to other students who appeared for the ICSE/ISC Year 2019 Examinations, but also provide information on how they have performed within the Region or State, their performance as compared to other Regions or States, etc. It will also help develop a better understanding of the assessment/ evaluation process. This will help teachers in guiding their students more effectively and comprehensively so that students prepare for the ICSE/ ISC Examinations, with a better understanding of what is required from them.

The Analysis of Pupil Performance document for ICSE for the Examination Year 2019 covers the following subjects: English (English Language, Literature in English), Hindi, History, Civics and Geography (History and Civics, Geography), Mathematics, Science (Physics, Chemistry, Biology), Commercial Studies, Economics, Computer Applications, Economic Applications, Commercial Applications.

Subjects covered in the ISC Analysis of Pupil Performance document for the Year 2019 include English (English Language and Literature in English), Hindi, Elective English, Physics (Theory), Chemistry (Theory), Biology (Theory), Mathematics, Computer Science, History, Political Science, Geography, Sociology, Psychology, Economics, Commerce, Accounts and Business Studies.

I would like to acknowledge the contribution of all the ICSE and the ISC examiners who have been an integral part of this exercise, whose valuable inputs have helped put this document together.

I would also like to thank the RDCD team of Dr. M.K. Gandhi, Dr. Manika Sharma, Mrs. Roshni George and Mrs. Mansi Guleria who have done a commendable job in preparing this document.

Shilpi Gupta
October 2019   *Deputy Head - RDCD*

CONTENTS

INTRODUCTION

This document aims to provide a comprehensive picture of the performance of candidates in the subject. It comprises of two sections, which provide Quantitative and Qualitative analysis results in terms of performance of candidates in the subject for the ICSE Year 2019 Examination. The details of the Quantitative and the Qualitative analysis are given below.

Quantitative Analysis

This section provides a detailed statistical analysis of the following:

- Overall Performance of candidates in the subject (Statistics at a Glance)
- State wise Performance of Candidates
- Gender wise comparison of Overall Performance
- Region wise comparison of Performance
- Comparison of Region wise performance on the basis of Gender
- Comparison of performance in different Mark Ranges and comparison on the basis of Gender for the top and bottom ranges
- Comparison of performance in different Grade categories and comparison on the basis of Gender for the top and bottom grades

The data has been presented in the form of means, frequencies and bar graphs.
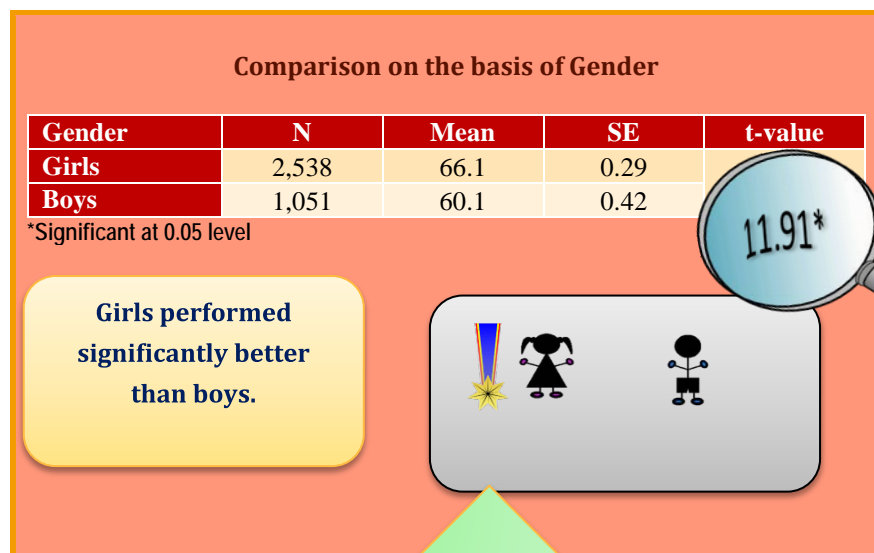
Understanding the tables

Each of the comparison tables shows N (Number of candidates), Mean Marks obtained, Standard Errors and t-values with the level of significance. For t-test, mean values compared with their standard errors indicate whether an observed difference is likely to be a true difference or whether it has occurred by chance. The t-test has been applied using a confidence level of 95%, which means that if a difference is marked as 'statistically significant' (with * mark, refer to t-value column of the table), the probability of the difference occurring by chance is less than 5%. In other words, we are 95% confident that the difference between the two values is true.

t-test has been used to observe significant differences in the performance of boys and girls, gender wise differences within regions (North, East, South and West), gender wise differences within marks ranges (Top and bottom ranges) and gender wise differences within grades awarded (Grade 1 and Grade 9) at the ICSE Year 2019 Examination.

The analysed data has been depicted in a simple and user-friendly manner.

Given below is an example showing the comparison tables used in this section and the manner in which they should be interpreted.

Comparison on the basis of Gender

Gender	N	Mean	SE	t-value
Girls	2,538	66.1	0.29	
Boys	1,051	60.1	0.42	

*Significant at 0.05 level

11.91*

Girls performed significantly better than boys.

The table shows comparison between the performances of boys and girls in a particular subject. The t-value of 11.91 is significant at 0.05 level (mentioned below the table) with a mean of girls as 66.1 and that of boys as 60.1. It means that there is significant difference between the performance of boys and girls in the subject. The probability of this difference occurring by chance is less than 5%. The mean value of girls is higher than that of boys. It can be interpreted that girls are performing significantly better than boys.

The results have also been depicted pictographically. In this case, the girls performed significantly better than the boys. This is depicted by the girl with a medal.

Qualitative Analysis

The purpose of the qualitative analysis is to provide insights into how candidates have performed in individual questions set in the question paper. This section is based on inputs provided by examiners from examination centres across the country. It comprises of question wise feedback on the performance of candidates in the form of *Comments of Examiners* on the common errors made by candidates along with *Suggestions for Teachers* to rectify/ reduce these errors. The *Marking Scheme* for each question has also been provided to help teachers understand the criteria used for marking. Topics in the question paper that were generally found to be difficult or confusing by candidates, have also been listed down, along with general suggestions for candidates on how to prepare for the examination/ perform better in the examination.
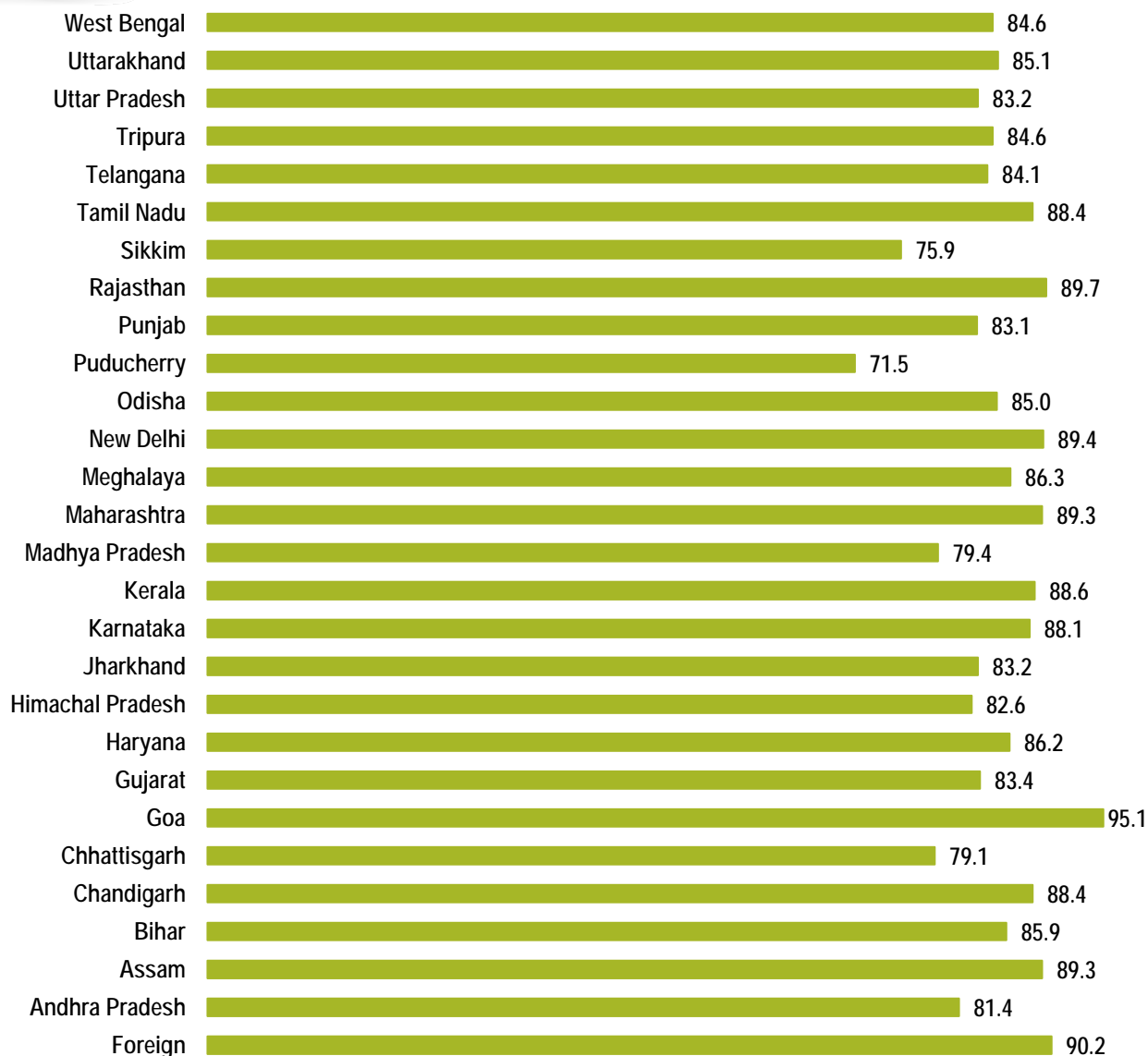
QUANTITATIVE ANALYSIS
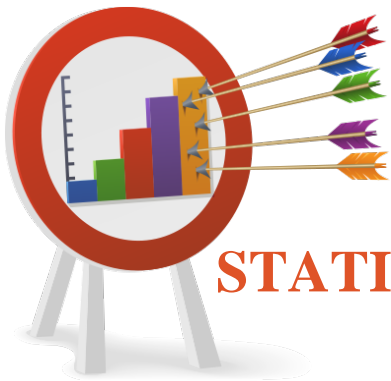
STATISTICS AT A GLANCE

Total Number of Candidates: 1,15,133

Mean Marks: 84.8

Highest Marks: 100

Lowest Marks: 01

PERFORMANCE (STATE-WISE & FOREIGN)

State/UT	Mean Marks
West Bengal	84.6
Uttarakhand	85.1
Uttar Pradesh	83.2
Tripura	84.6
Telangana	84.1
Tamil Nadu	88.4
Sikkim	75.9
Rajasthan	89.7
Punjab	83.1
Puducherry	71.5
Odisha	85.0
New Delhi	89.4
Meghalaya	86.3
Maharashtra	89.3
Madhya Pradesh	79.4
Kerala	88.6
Karnataka	88.1
Jharkhand	83.2
Himachal Pradesh	82.6
Haryana	86.2
Gujarat	83.4
Goa	95.1
Chhattisgarh	79.1
Chandigarh	88.4
Bihar	85.9
Assam	89.3
Andhra Pradesh	81.4
Foreign	90.2

The States/UTs of Goa, Rajasthan and New Delhi secured highest mean marks. Mean marks secured by candidates studying in schools abroad were 90.2.

GENDER-WISE COMPARISON

GIRLS

Mean Marks: 85.2

Number of
Candidates: 49,595

BOYS

Mean Marks: 84.6

Number of
Candidates: 65,538

Comparison on the basis of Gender

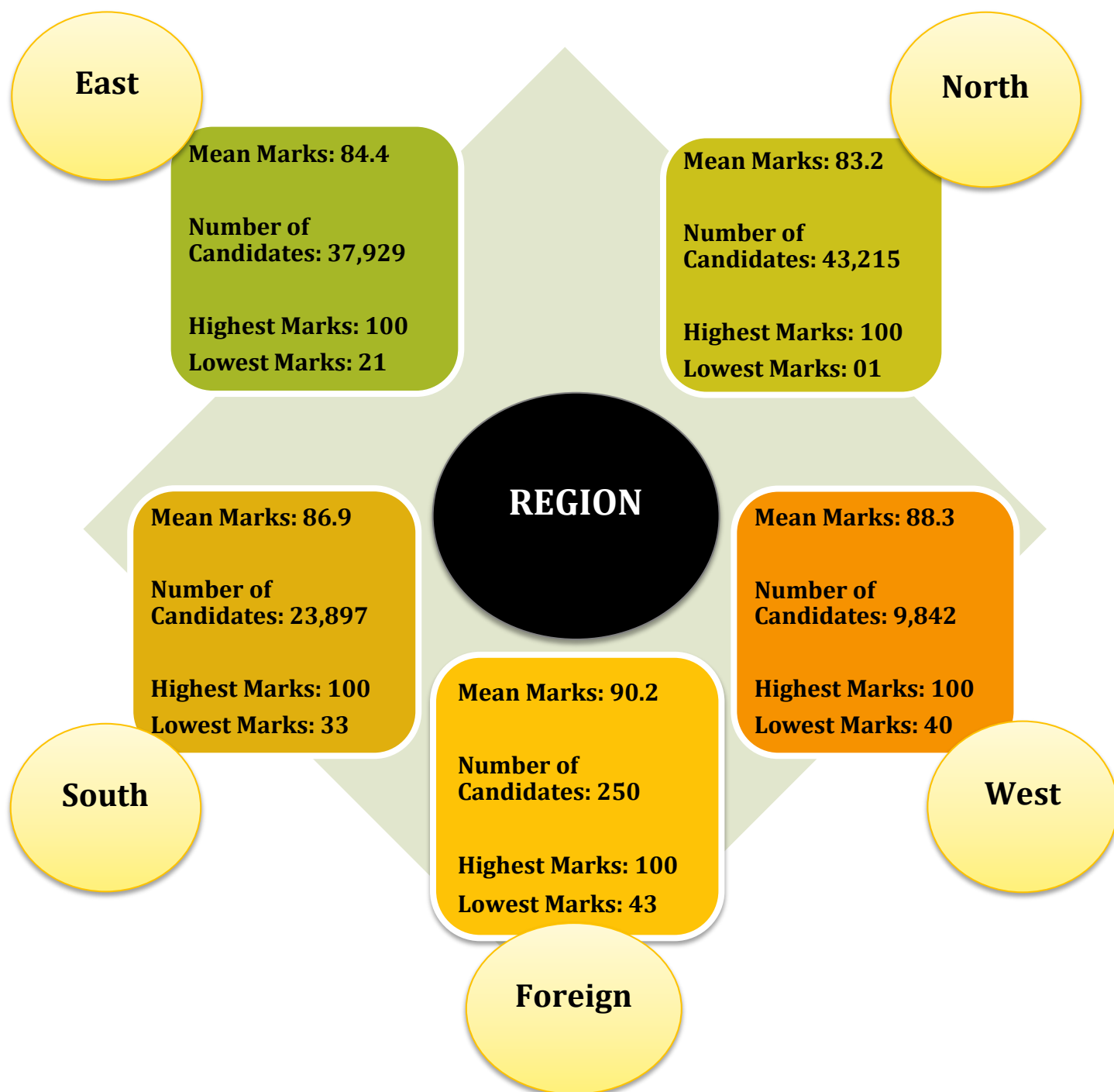| Gender	N	Mean	SE	t-value
Girls	49,595	85.2	0.06	7.51*
Boys	65,538	84.6	0.05	

*Significant at 0.05 level

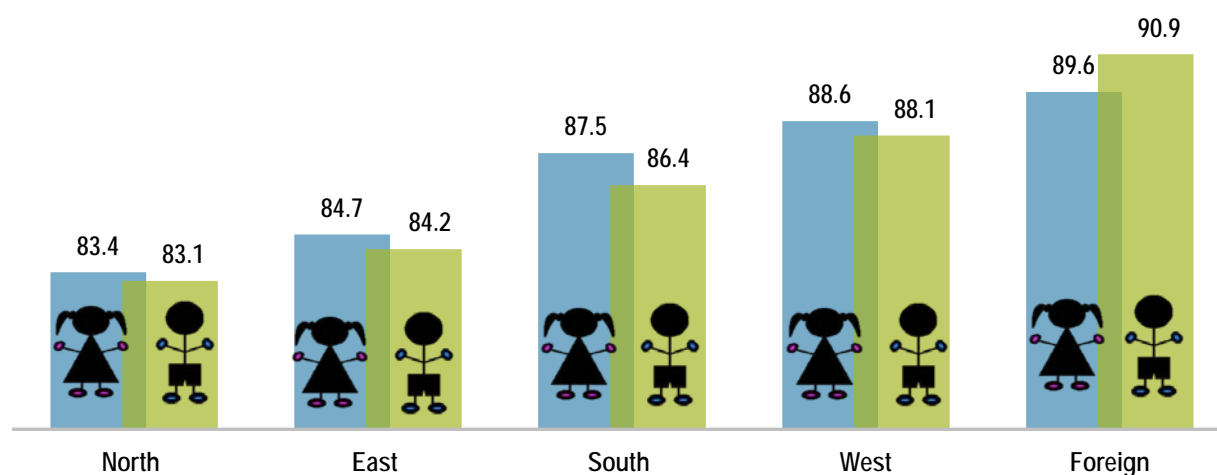**Girls performed significantly better than boys.**

REGION-WISE COMPARISON

East

Mean Marks: 84.4

Number of Candidates: 37,929

Highest Marks: 100
Lowest Marks: 21

North

Mean Marks: 83.2

Number of Candidates: 43,215

Highest Marks: 100
Lowest Marks: 01

REGION

Mean Marks: 86.9

Number of Candidates: 23,897

Highest Marks: 100
Lowest Marks: 33

South

Mean Marks: 88.3

Number of Candidates: 9,842

Highest Marks: 100
Lowest Marks: 40

West

Mean Marks: 90.2

Number of Candidates: 250

Highest Marks: 100
Lowest Marks: 43
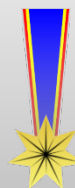
Foreign

Mean Marks obtained by Boys and Girls-Region wise

North	East	South	West	Foreign
83.4 83.1	84.7 84.2	87.5 86.4	88.6 88.1	89.6 90.9

Comparison on the basis of Gender within Region

Region	Gender	N	Mean	SE	t-value
North (N)	Girls	18,298	83.4	0.10	2.28*
	Boys	24,917	83.1	0.09	
East (E)	Girls	15,853	84.7	0.11	3.05*
	Boys	22,076	84.2	0.10	
South (S)	Girls	11,599	87.5	0.10	7.59*
	Boys	12,298	86.4	0.11	
West (W)	Girls	3,718	88.6	0.20	1.89
	Boys	6,124	88.1	0.16	
Foreign (F)	Girls	127	89.6	1.14	-0.79
	Boys	123	90.9	1.20	

*Significant at 0.05 level

The performance of girls was significantly better than that of boys in northern, eastern and southern region.

REGION (N, E, S)
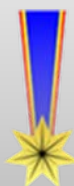
MARK RANGES : COMPARISON GENDER-WISE

Comparison on the basis of gender in top and bottom mark ranges

Marks Range	Gender	N	Mean	SE	t-value
Top Range (81-100)	Girls	33,133	93.1	0.03	-5.90*
	Boys	43,224	93.4	0.03	
Bottom Range (0-20)	Girls	0	0	0	-
	Boys	3	3.0	1.53	

*Significant at 0.05 level

Marks Range (81-100)

Performance of boys was significantly better than the performance of girls.

Marks Range (81-100)

Boys ■ Girls ■ All Candidates

Range	Boys	Girls	All Candidates
81 - 100	93.4	93.1	93.2
61 - 80	71.1	71.5	71.3
41 - 60	54.9	55.7	55.2
21 - 40	38.1	33.5	37.1
0 - 20	3.0		3.0
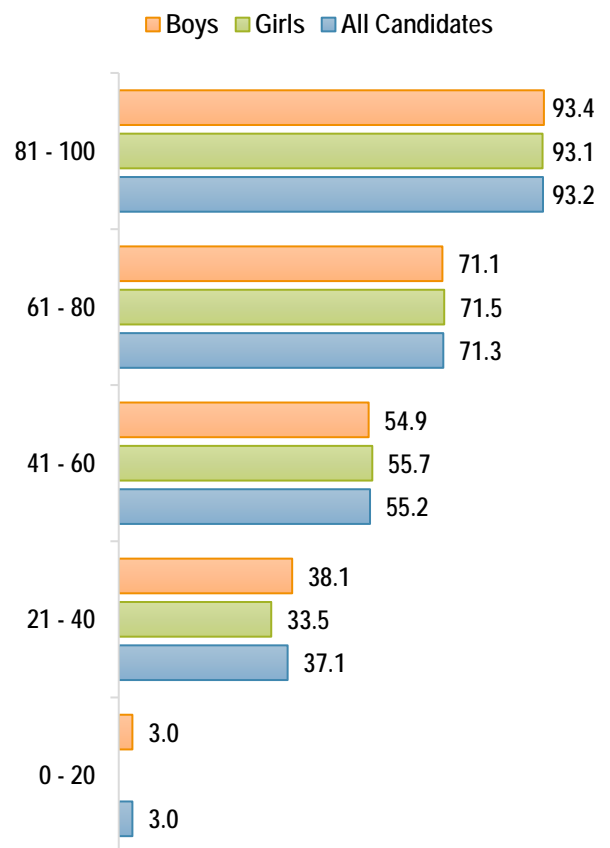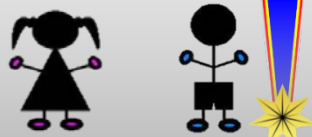
GRADES AWARDED : COMPARISON GENDER-WISE

Comparison on the basis of gender in Grade 1 and Grade 9					
Grades	**Gender**	**N**	**Mean**	**SE**	**t-value**
Grade 1	Girls	23,852	96.2	0.02	-4.61*
	Boys	31,745	96.3	0.02	
Grade 9	Girls	0	0	0	-
	Boys	3	3.0	1.53	

*Significant at 0.05 level

Grade 1

Performance of boys was significantly better than the performance of girls.

Grade 1

Boys ■ Girls ■ All Candidates

	Boys	Girls	All Candidates
1	96.3	96.2	96.2
2	84.8	84.8	84.8
3	75.6	75.6	75.6
4	66.8	66.9	66.8
5	57.2	57.5	57.3
6	48.4	48.8	48.5
7	40.8	40.6	40.8
8	21.0	26.8	25.6
9	3.0		3.0
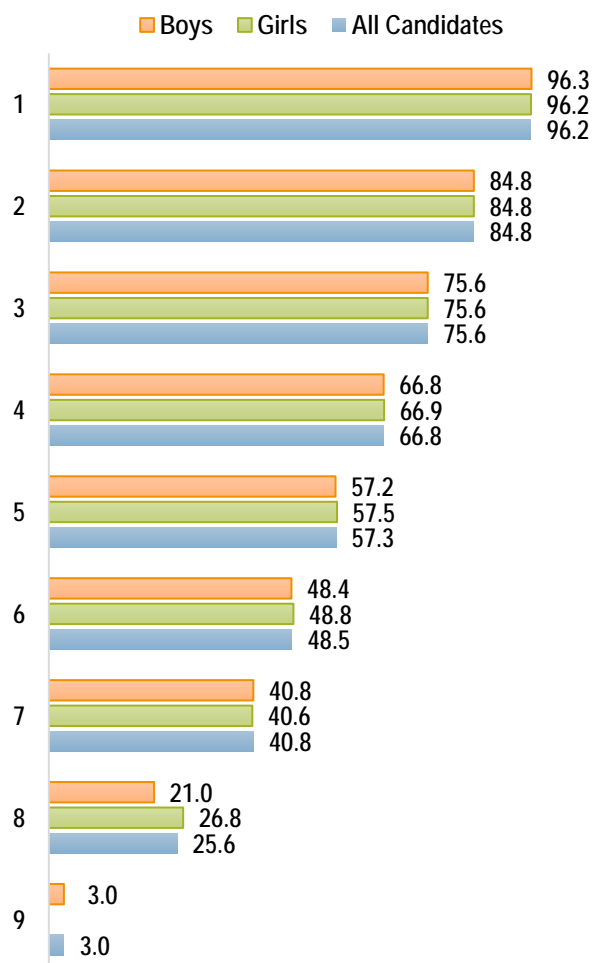
SECTION A (40 Marks)
Attempt all questions

Question 1

(a)   Name any two basic principles of Object-oriented Programming.   [2]

(b)   Write a difference between **unary** and **binary** operator.   [2]

(c)   Name the keyword which: [2]

    (i)   indicates that a method has no return type.

    (ii)   makes the variable as a class variable.

(d)   Write the memory capacity (storage size) of **short** and **float** data type in bytes.   [2]

(e)   Identify and name the following tokens: [2]

    (i)   public

    (ii)   'a'

    (iii)   ==

    (iv)   { }

Comments of Examiners

(a) Most of the candidates wrote the features of Java instead of principles of Object-oriented Programming.

(b) Although many candidates attempted this part well, there were some candidates who were confused between the terms operator and operand and wrote operator in place of operand.

(c) (i) Some candidates were unable to write the return type in a method header/prototype.

   (ii) Many candidates did not name the keyword which makes the variable as a class variable. A few candidates wrote keyword as the answer which was incorrect.

(d) Many candidates did not write the storage capacities of data types in bytes correctly. Some candidates wrote the answers in bits and the unit was written in bytes or *vice versa*. Some candidates wrote the incorrect memory size.

(e) (i) Most of the candidates were unable to differentiate tokens confidently. Many candidates, instead of keyword wrote access specifier /access visibility.

   (ii) Many candidates wrote character or char instead of character literal /constant.

   (iii) Most of the candidates got confused between assignment operator and equality / relational operator and wrote the answer as equal to /assignment operator.

   (iv) Many candidates wrote the literal meaning of { } as braces / parenthesis / curly braces.

MARKING SCHEME		
Question 1		
(a)	Encapsulation, Data Abstraction, Polymorphism, Inheritance.	*(Any two)*

(b)		Unary operator	Binary operator
		It works /Performs on single operand or variables. **OR** Holds only one operand	It works/performs on two variables or operands. **OR** Holds more than one operand

(c)	(i)	void
	(ii)	static

(d)	short – 2 bytes
	float – 4 bytes

(e)	(i)	Keyword
	(ii)	character literal /constants
	(iii)	operator
	(iv)	separator/punctuator

Question 2

(a)   Differentiate between **if else if** and **switch-case** statements.   [2]

(b)   Give the output of the following code: [2]

        String P = "20", Q ="19";

        int a = Integer.parseInt(P);

        int b = Integer.valueOf(Q);

          System.out.println(a+""+b);

(c)   What are the various types of errors in Java?   [2]

(d)   State the data type and value of **res** after the following is executed: [2]

        char ch = '9';

        res= Character.isDigit(ch);

(e)   What is the difference between the **linear** search and the **binary** search technique?   [2]

Comments of Examiners

(a) Many candidates got confused between bidirectional and multiple branching statements. Some candidates gave appropriate examples but could not explain in detail.

(b) Some candidates

    (i) added and showed the result as 39

    (ii) wrote 20 & 19 in two different lines.

    (iii) used '- ' in between 20 and 19

    (iv)wrote 19 20

    (v) wrote 20 19 within double quotes.

(c) Some candidates, instead of writing the name of different errors i.e syntax, logical and runtime error mentioned the examples of syntax errors only.

(d) Many candidates were not clear about the difference between the data type and wrapper classes. Some candidates wrote the data type and result in Uppercase [Boolean / True]. A few candidates wrote data type as primitive with the value as 9.

(e) Most of the candidates wrote the correct answer. However, some candidates wrote two full programs instead of the difference between the linear search and the binary search technique. Some candidates wrote the difference between bubble sort and selection sort.

Suggestions for teachers

- Follow the steps while introducing any new construct such as: need of construct in the program, its basic syntax, working, example.

- Train students to compare between *if else if* and *switch-case* statements with examples.

- Explain wrapper classes and its function parse and value of with various examples to know the working.

- Clarify to the students the concept of various types of concatenation in the print statement with the help of examples and hands on sessions in the laboratory.

- Show the working of program and output on the computer and explain how errors occurs, how they are displayed and how to eliminate them and, the difference between various types of errors.

- Instruct the students not to use uppercase letters when datatype is asked.

- Explain Library class Character and its various functions with the help of examples and show their working on the computer for the students to understand output.

- Clarify to the students the difference between the two methods of searching with working or examples.

Question 2

(a)

if else if	switch case
Range of values are checked	Only one value is compared
Supports both primitive and composite data types	Supports only integer (byte, short, int, long), char and String
Relational/Logical expressions can be checked	Only equality can be checked

(Any two valid differences)

(b) 2019

(c) Syntax error

Logical error

Runtime error

(d) (i)   boolean

(ii)   true

(e)

Linear search	**Binary search**
1. Array need not be sorted	Array must be sorted in ascending/descending order
2. check each item	Does not check each item
3. Checks the search value with values in the array from 0th index	Checks the search value with middle value of the array
4. It checks in a sequential order	It checks by diving the array into two halves

Question 3

(a)   Write a Java expression for the following: [2]

$| x^2+2xy |$

(b)   Write the return data type of the following functions: [2]

(i)   startsWith( )

(ii)   random( )

(c) If the value of **basic**=1500, what will be the value of **tax** after the following statement [2]
is executed?

tax = basic>1200 ? 200 :100;

(d) Give the output of following code and mention how many times the loop will execute? [2]

int i;

for(i=5 ; i>=1 ;i--)

{

　　if(i%2 ==1)

　continue;

　System.out.print(i+ " ");

}

(e) State a difference between call by value and call by reference. [2]

(f) Give the output of the following: [2]

Math.sqrt(Math.max(9,16))

(g) Write the output for the following: [2]

String s1 = "phoenix"; String s2 ="island" ;

System.out.println (s1.substring(0).concat (s2.substring(2)));

System.out.println(s2.toUpperCase());

(h) Evaluate the following expression if the value of x=2, y=3 and z=1. [2]

　　　　v=x+ --z+ y++ +y

(i) String x[] = {"Artificial intelligence", "IOT", "Machine learning", "Big data"}; [2]
Give the output of the following statements:

(i)　　System.out.println(x[3]);
(ii)　　System.out.println(x.length);

(j) What is meant by a package? Give an example. [2]

Comments of Examiner

(a) Many candidates were unsure about the concept of absolute representation mathematically. Some candidates used the mathematical operators as x instead of multiplication symbol (*) in the expression.

(b) In sub parts (i) and (ii) of this question, majority of the candidates wrote Data types in capital letters.

(c) Some candidates simply converted the ternary operator statement to if...else.

(d) Most of the candidates gave the output as 4, 2, 1 instead of 4, 2. Several candidates did not have a clear idea of the number of times loop was repeated and wrote the output as 2 instead of 5. Some candidates were not clear about the difference between print () and println( ) and wrote the output as 4 2.

(e) Most of the candidates could answer this question well. However, some candidates were confused between actual and formal parameters. A few candidates repeated the same words of the question.

(f) Majority of the candidates wrote the correct answer. However, some candidates were unable to solve the second part correctly. A few candidates were unclear about Math.sqrt and Math.pow functions.

(g) Most of the candidates answered this question correctly. However, some candidates were not clear about the working of substring (). A few candidates got confused with both print statements and so jumbled up the outputs.

(h) Many candidates answered this question correctly. But some candidates were unsure about post and pre - increment or decrement and change of self -value and so miscalculated the value of v. v=2+ - -1+3+4 = 10; v=2+0+3+3 =8; v=2+0+4+4=10

(i) (i) Majority of the candidates made an error in the counting of array index. Several candidates were unclear about array subscripts. Some candidates stated the array index counting from 1 instead of from 0. A few candidates wrote the answer in capital letter.

  (ii) Majority of the candidates got confused with length and length () method. Many candidates found the length of the last element i.e. Big Data instead of finding the length of the array.

(j) Most candidates wrote the correct examples but were unable to write the correct definition. Several candidates did

not include important keywords like related classes etc. in the definition. Some candidates wrote collection of classes/ collection of functions/objects, etc.

- Explain, with examples, how to find the length of the array and array element.

- Advise students to include keywords while writing the definition of a term.

MARKING SCHEME

Question 3

(a)	Math.abs(x*x +2*x*y) Math.abs(Math.pow(x,2)+ 2*x*y)
(b)	(i) boolean (ii) double
(c)	tax = 200
(d)	4 2 five times loop will execute
(e)	<table><tr><td>Call by value</td><td>Call by reference</td></tr><tr><td>It works with primitive data type</td><td>It works with reference data type</td></tr><tr><td>The original value of variable remains unchanged</td><td>The original value of variable changes</td></tr><tr><td>Operation is performed on duplicate value of variables</td><td>Operation is performed on original values of variables.</td></tr><tr><td>It is also called as pure function.</td><td>It is also called as Impure function.</td></tr></table>
(f)	4.0
(g)	phoenixland ISLAND
(h)	v = 9
(i)	(i) Big data (ii) 4
(j)	**Package** in Java is a mechanism to encapsulate a group of classes, sub packages and interfaces Example: java.lang java.util java.io

SECTION B (60 Marks)
*Attempt **any four** questions from this Section*

Question 4

Design a class name **ShowRoom** with the following description: [15]

Instance variables / Data members:

String name   -   To store the name of the customer

long mobno   -   To store the mobile number of the customer

double cost   -   To store the cost of the items purchased

double dis   -   To store the discount amount

double amount-   To store the amount to be paid after discount

Member methods:

ShowRoom()   - default constructor to initialize data members

void input ()   - To input customer name, mobile number, cost

void calculate () -To calculate **discount** on the **cost** of purchased items, based on following

criteria

Cost	Discount (in percentage)
Less than or equal to ₹ 10000	5%
More than ₹10000 and less than or equal to ₹ 20000	10%
More than ₹ 20000 and less than or equal to ₹ 35000	15%
More than ₹ 35000	20%

Void display () - To display customer name, mobile number , amount to be paid
after discount.

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

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Comments of Examiners

In this Question stepwise following glitches were noticed:

- Majority of the candidates, instead of declaring the instance variables as global variables, declared and initialized in the constructor.

- Most candidates were not clear about the concept of default constructor.

- Some candidates initialised with some values instead of with default values.

- Several candidates were able to write the if statements correctly but were unable to calculate the amount as cost - dis.

- A number of candidates used different function names other than those specified in the question.

- Several candidates, instead of accepting data by using methods of Scanner class, used a function with arguments.

- A large number of candidates did not use the variable names as per the question. In some answer scripts, syntax of object creation and function calling statements were incorrect.

- A few candidates accepted the data in the main function and passed as arguments to the input () function.

- A few candidates, instead of directly calculating discount, calculated it as a slab.

- A few candidates were unable to write the main function.

MARKING SCHEME

Question 4

```java
import java.util.*;
class ShowRoom
{
 String name;
 long mobno;
 double cost;
 double dis;
 double amount;
 ShowRoom( )
 {
   name = " ";
   cost=0;
   mobno=0;
   dis = 0.0;
   amount=0.0;
  }
 void input()
 {
    Scanner  sc  = new  Scanner(System.in);
    System.out.println("enter name, mobile no and cost");
    name=sc.next();
    mobno=sc.nextLong();
    cost=sc.nextDouble();
 }
 void calculate()
 {
   if(cost <=10000)
   {
      dis=0.05*cost;
    }
   else if(cost >10000 && cost <=20000)
   {
     dis=0.1*cost;
   }
   else if(cost >20000 && cost <=35000)
   {
     dis=0.15*cost;
   }
   else
   {
    dis=0.2*cost;
   }
amount = cost - dis;
  }
 void display()
 {
```

Steps
Class name
Declaration of Variables
Default constructor
void input ()
3 Inputs
4 conditions and calculations
amount = cost – dis
void   display () with Output statements
Object creation & function call
Mnemonic code / Variable description

```
      System.out.println("Name  is     :"+name);
      System.out.println("Mobile no is :"+mobno);
      System.out.println("Amount      :"+ amount);
   }
  public static void main (String arg[])
   {
      ShowRoom ob =new ShowRoom();
      ob.input();
      ob.calculate();
      ob.display();
   }
}
```

Question 5

Using the **switch-case** statement, write a menu driven program to do the following: [15]

(a)   To **generate** and print Letters from A to Z and their Unicode

Letters   Unicode

A   65

B   66

.   .

.   .

.   .

Z   90

(b) Display the following pattern using **iteration** (looping) statement:

1

1 2

1 2 3

1 2 3   4

1 2 3   4   5

Comments of Examiners

(a) Many candidates answered this question correctly. Some common errors observed were:
   (i)   unable to develop menu driven programs using switch case.
   (ii)   wrote two separate programs instead of one menu driven program.
   (iii) no knowledge of type conversion.
   (iv)   did not accept choice in the menu.
   (v)   Initial and final values of looping statements were incorrect in some answer scripts.
   (vi)   Used twenty-six different print statements to display the Unicode characters.
   (vii) Missed out *break* statement.
   (viii) In the switch statement, wrote *s* in capital terminated with a semicolon i.e. Switch (ch);.

(b) Many students

   (i)   Wrote pattern without nested for loop.
   (ii)   Used five printing statements for displaying the pattern.
   (iii) Used print statement in place of println () statement.

Suggestions for teachers

- Explain clearly the switch case construct with syntax.

- Teach the difference between loop and nested loop with examples.

- Explain the importance of break statement.

- Explain how to obtain the ASCII code of character.

- Demonstrate type conversion on the computer.

- Drill objective type exercises based on the type conversion.

- Teach the concept of pattern printing with nested loop through a lot of programs.

- Explain the purpose of outer and inner loop in the nested loop as outer loop is for number of lines and inner loop is for each line considering that many elements are to be printed.

- Emphasise on < and > sign and its effect on the output.

MARKING SCHEME
Question 5

```java
import java.util.*;
 class menu
{
 public static void main (String args[])
 {
    Scanner obj = new Scanner (System.in);
    int choice,x;
    System.out.println(" enter 1 for unicode of letters, 2 Pattern");
    choice = obj.nextInt();
    switch(choice)
    {
```

```java
    case 1: System.out.println(" Letters "+ "          " + " Unicode");
    for (char c='A'; c<='Z'; c++)
    {
         x=c;
        System.out.println( c +"          "+ x);
      }
/*      OR
   char x;
   for (int i=65;i<=90;i++)
   { x=(char)i;
            System.out.println(x +"          "+ i);
     }*/
     break;
     case 2:
     for (int i=1; i<=5;i++)
      {
            for (int j=1; j<=i; j++ )
      {
            System.out.print(j+" ");
      }
            System.out.println();
 }
            } // End of switch
         }// End of main
         }// End of class
```

Steps
Menu with Input choice
switch(choice) with {
case1 :
loop
Assignment
Output Statement
break
case 2:
outer loop
inner loop
printing
new line
Mnemonic code / variable description

Question 6

Write a program to input **15** integer elements in an array and sort them in **ascending** order using the **bubble** sort technique.

Comments of Examiners

Most of the candidates were able to write this program correctly. However, some of the common mistakes observed were:

(i) Array was not created properly.

(ii) Array input was written without using a loop.

(iii) String input been taken.

(iv) In sorting part, outer loop was written as - for (int i=1;i<=15;i++) inner loop - for(int j=0 ; j<=15 ; j++).

(v) Swapping was not done correctly a[j] =a[j+1]; a[j+1]=temp; temp was not assigned any value.

(vi) Syntax of the method to input value into array being incorrect a[ ] =sc.next() or nextint();.

Suggestions for teachers

- Teach correct syntax of the array creation and where to mention the size of the array with various datatypes.

- Explain the difference between array initialization and creation.

- Demonstrate on the computer that for array input / output / any operation, index starts from 0 and ends <a.length.

- Clarify that each array element is accessed using its index /subscript.

- Interpret the technique of sorting with examples.

- Spell out the purpose of outer loop and inner loop in an array.

- Show swapping on the computer.

MARKING SCHEME
Question 6

```java
import java.util.*;
class Bubble
{   public static void main(String[]args)
    {
        Scanner abc = new Scanner (System.in);
          int a[] = new int[15];
         System.out.println("Enter elements");
        for (int i=0;i<15;i++)  // OR i< a.length
        {
           a[i]=abc.nextInt();
        }//end of for

         int temp;
        for (int i=0;i<a.length-1;i++) // OR  i <14
        {
           for (int j=0;j<(a.length-1)-i;j++) // OR  j<14-i
           {
```

	Steps
if(a[j]>a[j+1])	Array Declaration
{	Input
temp=a[j]; a[j]=a[j+1];	Sorting: Outer loop (< a. length-1 or < 14)
a[j+1] =temp;	Inner loop (< (a.length-1) –i or <14-i)
}//if	check
}//inner }//outer	swap
}//main	int temp
}//end class	Mnemonic codes / Variable description

```
        if(a[j]>a[j+1])
        {
          temp=a[j];
          a[j]=a[j+1];
          a[j+1] =temp;
        }//if
     }//inner
   }//outer

  }//main
}//end class
```

Question 7

Design a class to overload a function **series ()** as follows: [15]

(a)   void series (int x, int n) – To display the sum of the series given below:

$x^1 + x^2 + x^3 + $ ……………… x^n terms

(b)   void series (int p) – To display the following series:

0, 7, 26, 63 ……………. p terms

(c)   void series ( ) – To display the sum of the series given below:

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{4} \text{……………} \frac{1}{10}$$

Comments of Examiners

(a) The concept of overloading was not clear to some candidates: The common errors made by candidates in this part were:

   (i)   Different functions with different names were used.
   (ii)   Attempted as three sub parts (a), (b) and (c).
   (iii)   Single function was used to define all the three logics.
   (iv)   Different function name, i.e., other than series () was used.
   (v)   Instead of print statement, return statement was used.
   (vi)   In the first function the variable sum was not declared.
   (vii)   Sum of the series was not found, only each term of the series was printed.

(b) Most candidates did not find the computation of $(i * i * i) - 1$. Several candidates did the initialization of loop variable with 0. Several candidates did not use the type casting in the calculation. Function Parameters as well as input was found in the function in some answer scripts. A few candidates added the term instead of displaying it.

(c) Several candidates did not declare the variable sum as double. Many candidates did not declare it at all. Some candidates in the for loop, instead of i=2, wrote i=1. Some candidates wrote Output statement inside for loop. A few candidates did not calculate the sum of the series.

MARKING SCHEME

Question 7

```
class Overload
{
 public static void  series (int x , int n)
 {
        double sum=0.0;
        for (int i=1;i<=n;i++)
        {
        sum=sum+ Math.pow(x,i);
        }
        System.out.println(sum);
  }

        public static void series (int p)
        {
        for (int i=1; i<=p; i++)
        System.out.println((i*i*i)-1);
        }
        public static void series ()
        {
     double sum=0.0;
        for (int i=2; i<=10;i++)
        {
        sum=sum+(double)1/i;
        }
        System.out.print("Sum= "+sum);
    }//end of function


}
```

Steps
Function prototype with 2 parameters
Declaration and initialization of double sum
for loop
Using math function and adding terms
Displaying sum
Second function with one parameter
Declaration and initialization of double sum
for loop
Finding term and displaying
Third function with no parameter
for loop
Finding sum
Displaying
Mnemonic codes / variable description

Question 8

[15]

Write a program to input a **sentence** and convert it into uppercase and count and display the total number of words starting with a letter **'A'**.

Example:

Sample Input: ADVANCEMENT AND APPLICATION OF INFORMATION TECHNOLOGY ARE EVER CHANGING.

Sample Output: Total number of words starting with letter 'A' = 4.

Comments of Examiners

Majority of the candidates answered this question correctly. However, in this question variety of logic was used to write the program. The common errors observed in this program were:

(i)   Not added a space before or after the string.

(ii)   Extracting the part of the string was not done correctly.

(iii)   Instead of checking for A, a character was accepted and checked for that character.

(iv)   Instead of nextLine(), next() was written.

(v)   In the for loop, index started from 1 instead of 0. For (int i=1; i<=s.length();i++).

(vi)   Counter variable was not initialised to 0.

(vii)   The counter variable was initialised inside for loop.

(viii) Output statement was written inside for loop to display count.

(ix)   Next character after space was taken as ch+1.

(x)   String functions were called/invoked without String Variable/object.

Question 8

```
import java.util.*;

 class loop

 {

 public static void main (String args[])

 {

 Scanner sc=new Scanner (System.in);

 String str; char ch, ch1; int c=0;

 System.out.println("Enter a sentence");

 str= sc.nextLine();

str=str.toUpperCase();

 int len= str.length();

 for (int i=0; i<len-1;i++)

 {

      ch= str.charAt(i);

      ch1=str.charAt(i+1);

      if (i==0 && ch=='A')

       c++;

      else if (ch==' ' && ch1=='A')

            c++;

 }

 System.out.println("Number of words started with letter 'A' ="+c);

 }

 }
```

Steps
Variable declaration and initialization
Input & convert to uppercase
Finding length
loop
Extraction of a characters   (ch & ch1)
Checking for first character & increment counter
Checking for rest of the characters & increment counter
Output
Variable description / Mnemonic codes

Question 9

A *tech number* has even number of digits. If the number is split in two equal halves, then the square of sum of these halves is equal to the number itself. Write a program to generate and print all *four digits tech numbers.*   [15]

Example:

Consider the number 3025

Square of sum of the halves of 3025 $\quad = (30+25)^2$

$= (55)^2$

$= 3025$ is a tech number.

Comments of Examiners

Most of the candidates attempted this question correctly. However, the common mistakes in this program were:

(i) Instead of the code for generating all the four digits tech number, a number from the user was accepted.

(ii) Only the logic for the example given in the question paper, i.e., 3025 was accepted.

(iii) A four-digit number into two equal halves was not split.

(iv) Instead of n%100 and n/100 respectively, n%10 and n/10 were used.

(v) Both the halves as per the question were not summed up.

(vi) Instead of calculating square of the sum, 2 to the sum was multiplied.

(vii) Instead of printing the required tech number, the message *It is a tech number was printed*.

MARKING SCHEME

Question 9

```
class Q9
{
public static void main (String args[])
{
int x,i,j,k, n;
for (x=1000; x<=9999; x++)
{
i= x%100;
j= x/100;
n= i+j;
k=n* n;
if(x== k)
System.out.println(x);
}
}
```

Steps
Declaration of variables
loop
Finding the first half and second half of the number
Adding the two halves
Finding the square
Checking the original number with the square
Displaying the output
Mnemonic codes / Variable description

GENERAL COMMENTS

Topics found difficult/ confusing by candidates

- Use of Math.max() and Math.abs().
- Extraction of character using substring () .
- Variable declaration with initial value.
- Object creation.
- Type casting
- Extraction of word.
- Loops for sorting elements in an array.
- Constructor concept.
- Program for printing the series (0, 7, 26, 63...).
- Dividing the four-digit number into two halves.
- Principles and features.
- Bits and Bytes.
- Keyword for class variable.
- Name of different tokens.
- Conversion of data type.
- Return type of different functions.
- Continue statement.
- Declaration of instance variables and their initialisation.
- Creation of object and method call.
- Generation of UNICODE characters.
- Sorting technique (inner loop condition).

Suggestions for candidates

- Follow the concepts given in the scope of the syllabus.
- Clarify the concepts and practise them both, on the paper and on the computer.
- Solve a lot of problems based on all the concepts.
- Learn the syntax and working of every construct properly, with suitable examples.
- Comprehend the key terms/definitions and then learn.
- Practise Library class and its various functions.Check its output on the computer to understand their working.
- Develop the habit to do dry run of a program, which you write. This will help in better understanding of concepts and aid in solving questions.
- Apply simple logic in programs to get desired output.
- Complete the assignments and cross check on the computer for their proper working. Get the assignments checked by your teacher.
- Solve previous years' ICSE question papers to understand the types of questions asked and how to attempt an ICSE question paper.
- Check output-based questions on the computer.
- Design your own questions for string functions, math functions, loops - for, while, do while, etc.
- Check for the logic for different variety of numbers-based questions and develop a logic for the same.
- Do not resort to rote learning this subject but understand and practise the concepts learnt regularly.
- Follow a proper study schedule when preparing for the examination.