



ADMISSION TEST GUIDE

MASTER OF SCIENCE IN COMPUTING AND DATA ANALYTICS

**FACULTY OF SCIENCE
SAINT MARY'S UNIVERSITY**

VERSION DATE: 2024 ADMISSION

Resources:

This guide provides sample examination questions with answers as well as related YouTube videos. Students should read these questions and attempt to solve them on their own. They should then compare their answers with the ones that are provided. We also recommend that the students type these answers in an IDE of their choice, compile, run and test the programs.

Admission test:

The admission test will be divided into two parts.

The first part will be the take-home programming test worth 10%.

- Students will be required to solve three questions.
- Students can write programs in any language. However, we strongly recommend Java, C++, C, or C#.
- Students should then submit their program, and screenshots of three successful runs to prove that their programs work, in a single pdf document using a word processor of their choice.
- The answers from this take-home test will be compared with the second part of the test for programming style. This comparison will make sure that the students have indeed solved the take-home test on their own.
- Students will also be asked questions about the take-home test in their interview.

The second part of the test is a technical interview worth 90%.

- The second part of the test will be an open book test. Students can use any resources, including this guide, and their solutions for the take-home assignment.
- Students will be asked questions about their programs from the take-home test, and follow up questions.
- Students can write programs in any language. However, we strongly recommend Java, C++, C, or C#.

Practice Question 1: Write a program that prints a table of how much volume of water a cylinder (with a radius (r) of 3 meters) is holding, as the height of water rises from 10 to N meters in increments of 2, where the value of N is input by the user. $volume = \pi \times r^2$ The following is a sample session (Do not worry about rounding off the values):

This program prints volume of water in a cylinder with radius of 3 meters for heights rising from 10 to N meters, in increments of 2. Please input the value of N:

30

```
-----  
height volume  
-----
```

```
10 282.74  
12 339.29  
14 395.84  
16 452.39  
18 508.94  
20 565.49  
22 622.04  
24 678.58  
26 735.13  
28 791.68  
30 848.23
```

Video with solution: <http://youtu.be/IfWUM9VGndY>

Solution:

```
import java.util.Scanner;  
public class Q4  
{  
    public static void main(String [] a)  
    {  
        Scanner k = new Scanner(System.in);  
        System.out.print("This program prints volume of water " +  
            "in a cylinder with radius\nof 3 meters for heights ranging from " +  
            "10 to N meters, in increments of 2.\nPlease input the value of N: ");  
        int N = k .nextInt();  
        System.out.println("-----");  
        System.out.println("height\t\t\tvolume");  
        System.out.println("-----");  
        for(int i = 10; i <= N; i +=2)  
        {  
            double volume = i*Math.PI*Math.pow(3,2);  
            System.out.printf("%d\t\t\t%.2f\n",i,volume);  
        }  
    }  
}
```

Practice Question 2:

Write a program that:

- reads a number N
- uses one array of Strings of length N to store student names, an array of doubles of length N to store the marks in the midterm (marks range from 0-100 and weighted 35% of total), and an array of double's to store the marks in final examination (marks range from 0-100 and weighted 65% of total)
- reads a list of student names, midterm and final examination marks, stores them in the corresponding arrays
- calculates the total marks for each student
- keeps track of sum of marks for the midterm and final examination
- prints all student names, midterm, final examination, and total marks, as well as the grade in a table
- At the end, prints average for midterm, final examination, and total marks, as well as average grade
- (Do not worry about having exactly two decimal points and other fancy number formatting)

Sample output:

```
-----  
Name Midterm Final Total  
-----  
John 40.00 50.00 46.50  
Jill 50.00 55.00 53.25  
Chris 67.00 79.00 74.80  
Mitchell 49.00 78.00 67.85  
Erica 88.00 80.00 82.80  
-----  
Average 58.80 68.40 65.04  
-----
```

(Solution on the next page)

```
import java.util.Scanner;
public class QF5
{
    public static void main(String [] a)
    {
        Scanner k = new Scanner(System.in);

        System.out.print("How many students? ");
        int n = k.nextInt();

        String [] names = new String[n];
        double [] marks1 = new double[n];
        double [] marks2 = new double[n];

        readArray(k,names,marks1,marks2);
        writeArray(names,marks1,marks2);
        writeAverage(marks1,marks2);
    }

    public static void writeAverage(double [] marks1, double [] marks2)
    {
        double sum1 = 0, sum2 = 0;
        for(int i = 0; i < marks1.length; i++)
        {
            sum1 = sum1 + marks1[i];
            sum2 = sum2 + marks2[i];
        }
        System.out.println("\tAvg\t\t"+(sum1/marks1.length)
            + "\t"+(sum2/marks2.length)
            + "\t"+((sum1*0.35+sum2*0.65)/marks1.length));
    }

    public static void readArray(Scanner k, String [] names,
        double [] marks1, double [] marks2)
    {
        for(int i = 0; i < names.length; i++)
        {
            System.out.print("Name of student " + i + ":");
            names[i] = k.next();
            System.out.print("Midterm marks for " + names[i] + ":");
            marks1[i] = k.nextDouble();
            System.out.print("Final marks for " + names[i] + ":");
            marks2[i] = k.nextDouble();

        }
    }

    public static void writeArray(String [] names,
        double [] marks1, double [] marks2)
    {
        System.out.println("-----");
        System.out.println("No.\tName\t\tMid\tFin\tTot");
        System.out.println("-----");

        for(int i = 0; i < names.length; i++)
        {
            double tot = marks1[i]*0.35+marks2[i]*0.65;
            System.out.println(i+"\t"+names[i] + "\t\t" + marks1[i]
                + "\t"+marks2[i]+"\t"+tot);
        }
        System.out.println("-----");
    }
}
```

There is no video that develops the solution for Question 2. But the following set of three videos and corresponding files will help you get there.

Video part I: <http://youtu.be/wHnjXqRe7Ic>

Program developed in the video:

```
import java.util.Scanner;
public class StudentNameArray
{
    public static void main(String [] a)
    {
        Scanner k = new Scanner(System.in);

        System.out.print("How many students? ");
        int n = k.nextInt();
        String [] names = new String[n];

        for(int i = 0; i < names.length; i++)
        {
            System.out.print("Name of student " + i + " :");
            names[i] = k.next();
        }

        for(int i = 0; i < names.length; i++)
        {
            System.out.println("The name of student " + i + " is " + names[i]);
        }
    }
}
```

Video, part II: http://youtu.be/D_j3kT8BSMU

Program developed in the video:

```
import java.util.Scanner;
public class StudentNameArrayFun
{
    public static void main(String [] a)
    {
        Scanner k = new Scanner(System.in);

        System.out.print("How many students? ");
        int n = k.nextInt();
        String [] names = new String[n];

        readArray(k,names);
        writeArray(names);
    }

    public static void readArray(Scanner k, String [] names)
    {
        for(int i = 0; i < names.length; i++)
        {
            System.out.print("Name of student " + i + ":");
            names[i] = k.next();
        }
    }

    public static void writeArray(String [] names)
    {
        for(int i = 0; i < names.length; i++)
        {
            System.out.println("The name of student " + i + " is " + names[i]);
        }
    }
}
```

Video, part III: <http://youtu.be/n8-opxX8YHg>

Program developed in the video:

```
import java.util.Scanner;
public class StudentMarksSummary
{
    public static void main(String [] a)
    {
        Scanner k = new Scanner(System.in);

        System.out.print("How many students? ");
        int n = k.nextInt();

        String [] names = new String[n];
        double [] marks = new double[n];

        readArray(k,names,marks);
        writeArray(names,marks);
        writeAverage(marks);
        writeMaximum(marks);
    }

    public static void writeAverage(double [] marks)
    {
        double sum = 0;
        for(int i = 0; i < marks.length; i++)
        {
            sum = sum + marks[i];
        }
        System.out.println("\tAvg\t\t"+(sum/marks.length));
    }

    public static void writeMaximum(double [] marks)
    {
        double max = marks[0];
        for(int i = 1; i < marks.length; i++)
        {
            if(max < marks[i])
            {
                max = marks[i];
            }
        }
        System.out.println("\tMax\t\t"+max);
    }
}
```

```
public static void readArray(Scanner k, String [] names, double [] marks)
{
    for(int i = 0; i < names.length; i++)
    {
        System.out.print("Name of student " + i + ":");
        names[i] = k.next();
        System.out.print("Marks for " + names[i] + ":");
        marks[i] = k.nextDouble();
    }
}

public static void writeArray(String [] names, double [] marks)
{
    System.out.println("-----");
    System.out.println("No.\tName\t\tMarks");
    System.out.println("-----");

    for(int i = 0; i < names.length; i++)
    {
        System.out.println(i+"\t"+names[i] + "\t\t" + marks[i]);
    }
    System.out.println("-----");
}
}
```

Practice Question 3:

Write a program that prints a table of conversion from Celsius (C) to Fahrenheit (F) for American visitors to Saskatchewan for temperatures ranging from -40 to +40 in increments of “inc”, where inc will be input by the user. $F = \frac{9}{5} \times C + 32$. A sample session is given below. Do not worry about number of decimal places.

```
Welcome to Saskatchewan! Temperatures here range
from -40 to 40 Celsius. I will print a table for
you. Please input the increments:
```

```
7
```

```
-----
Celsius Fahrenheit
-----
-40.00      -40.00
-33.00      -27.40
-26.00      -14.80
-19.00       -2.20
-12.00       10.40
-5.00        23.00
 2.00        35.60
 9.00        48.20
16.00        60.80
23.00        73.40
30.00        86.00
37.00        98.60
```

Practice Question 4:

Write a program that:

- uses one array of Strings of length N to store student names, an array of integers of length N to store the number of black and white (BW) papers printed (charged at \$0.05 per page), and an array of integers to store the number of color papers printed (charged at \$0.10 per page),
- reads a list of student names, numbers of BW and color pages printed, stores them in the corresponding arrays
- calculates the printing charge for each student which should also include 15% HST
- keeps track of sum of BW and color pages printed
- prints all student names, the numbers of BW and color pages printed, as well as the printing charge
- at the end, prints:
 - total numbers of BW and color pages printed, as well as the printing charge
 - average numbers of BW and color pages printed, as well as the printing charge
- (Do not worry about having exactly two decimal points and other fancy number formatting)

Example session:-----
INPUT SECTION:

How many students? 5
Name of student 0: Pawan
BW copies for Pawan: 34
Color copies for Pawan: 12
Name of student 1: Nora
BW copies for Nora: 65
Color copies for Nora: 45
Name of student 2: William
BW copies for William: 100
Color copies for William: 21
Name of student 3: Billy
BW copies for Billy: 32
Color copies for Billy: 34
Name of student 4: Ulrik
BW copies for Ulrik: 32
Color copies for Ulrik: 22

OUTPUT SECTION:

No. Name BW copies Color copies Charge

0 Pawan 34 12 \$3.34
1 Nora 65 45 \$8.91
2 William 100 21 \$8.17
3 Billy 32 34 \$5.75
4 Ulrik 32 22 \$4.37

Total 263 134 \$30.53
Average 53 27 \$6.11