

## Programming Fundamentals (CS1002)

## Sessional-I Exam

Date: 9/20/2024

Total Time: 1hr

### Course Instructor(s)

Total Marks: 30

Dr. Farrukh Shahid, Basit Ali, Farooq Zaidi, Fahad Hussain, Nauraiz Subhan, Kariz Kamal, Kashif, Sumaiya, Bakhtawar, Rafia, Zain Noreen, Iqra Fahad.

Total Questions: 03

Roll No \_\_\_\_\_

Section \_\_\_\_\_

Student Signature \_\_\_\_\_

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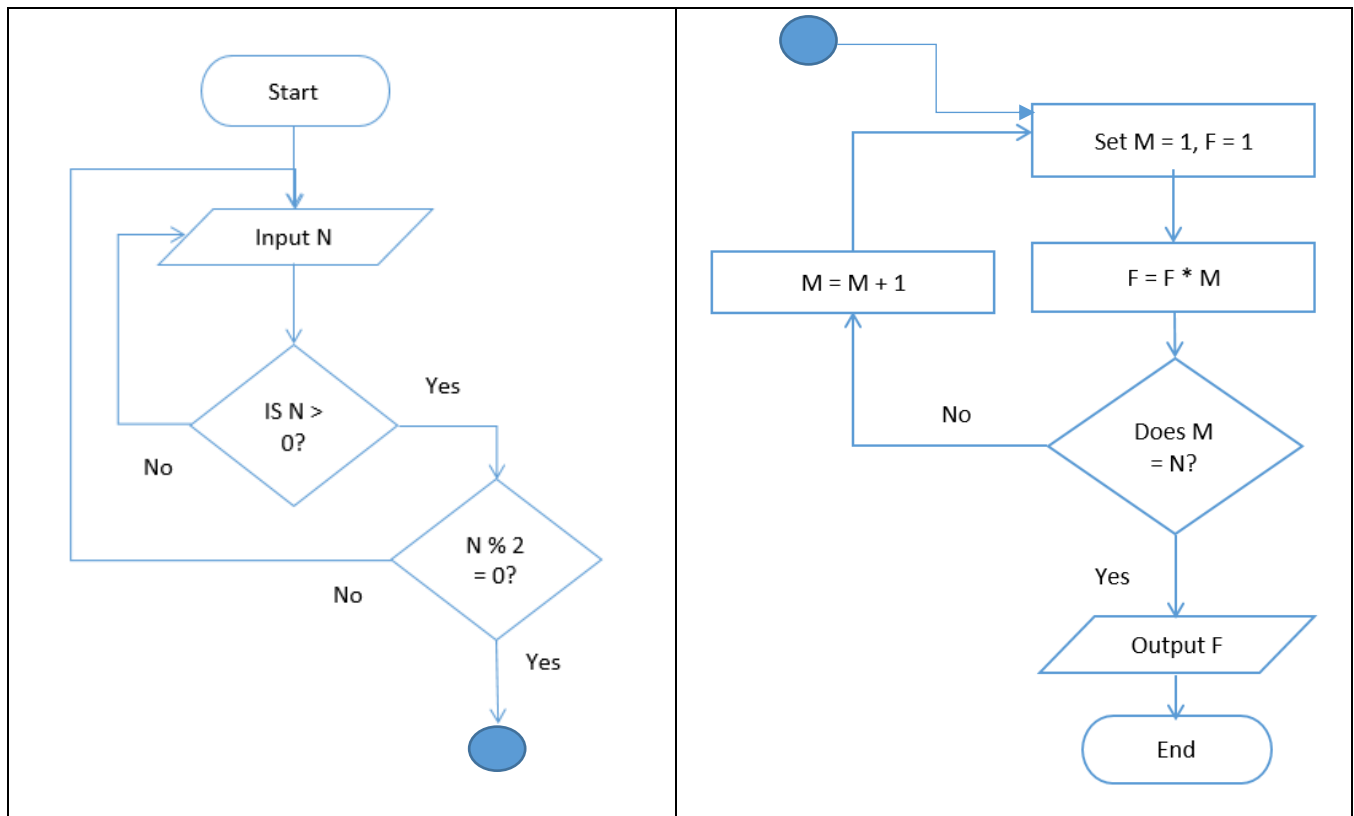
Attempt all questions.

**CLO 2: Examine code writing, compiling, debugging and program execution.**

**Q1:** Do as directed.

[Marks 8, 4 each]

A) What would be the output "F" if the input "N" is 6?



### Marking Rubrics:

Binary Marking, 0 or 4

**Solution:** If we assign the value 6 to N in this flowchart, it will run indefinite/infinite times, and the output F will never appear. Moreover, the flowchart will never end.

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B) Write the output of below C-Language Code.

```
#include <stdio.h>
int main() {
    int p = 8, q = 12, r = 5, s = 10;

    if (p + r > s && q - s < p) {
        p = q / r + s;
        if (p > r || s < q) {
            s = s - r;
            if (s == p) {
                q = p * s;
            } else {
                q = q + p;
            }
        }
    } else {
        s = p + q - r;
        p = s * r;
    }
    printf("%d %d %d %d", p, q, r, s);
    return 0;}
```

**Marking Rubrics:**

Total 4 marks, 1 mark each for 1 output IN ORDER.

**Solution: 12 24 5 5**

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**CLO3: Justify problem solving techniques and analytical thinking by identifying the concepts and properties of algorithm.**

**Q2:**

**[Marks 10]**

Draw a flowchart to check if a triangle, defined by its coordinates on a Cartesian plane, is a right-angled triangle based on the given rules. For the vertices  $(x_1, y_1)$ ,  $(x_2, y_2)$ , and  $(x_3, y_3)$ , compute the side lengths using the distance formula given below.

$$\text{Euclidean Distance } (x, y) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Ensure that the triangle satisfies the Pythagorean Theorem, where the square of the longest side (hypotenuse) should be equal to the sum of the squares of the other two sides.

$$c = \sqrt{a^2 + b^2}, \text{ where } c \text{ is hypotenuse}$$

Note that it should also satisfy the triangle inequality theorem, which requires that the sum of the lengths of any two sides must be greater than the third side.

### Marking Rubrics:

Inputs:	1 mark
Calculation for points (AB, BC, CA):	1 marks
Condition for Triangle Inequalities:	2 marks
Condition for Finding MAX Side:	2 marks
Condition for hypotenuse:	2 marks
Complete flow from start to end:	2 marks

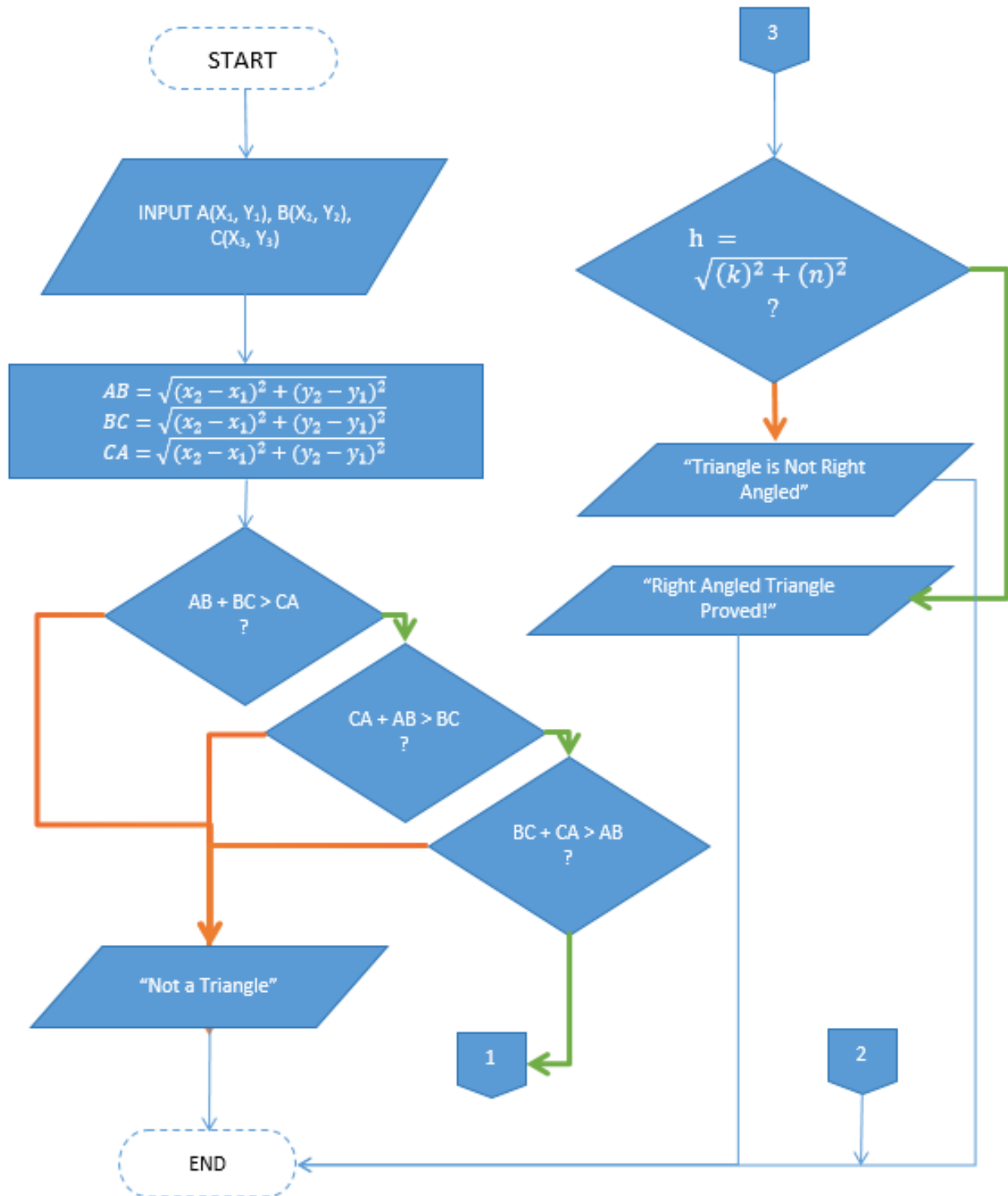
### Deductions:

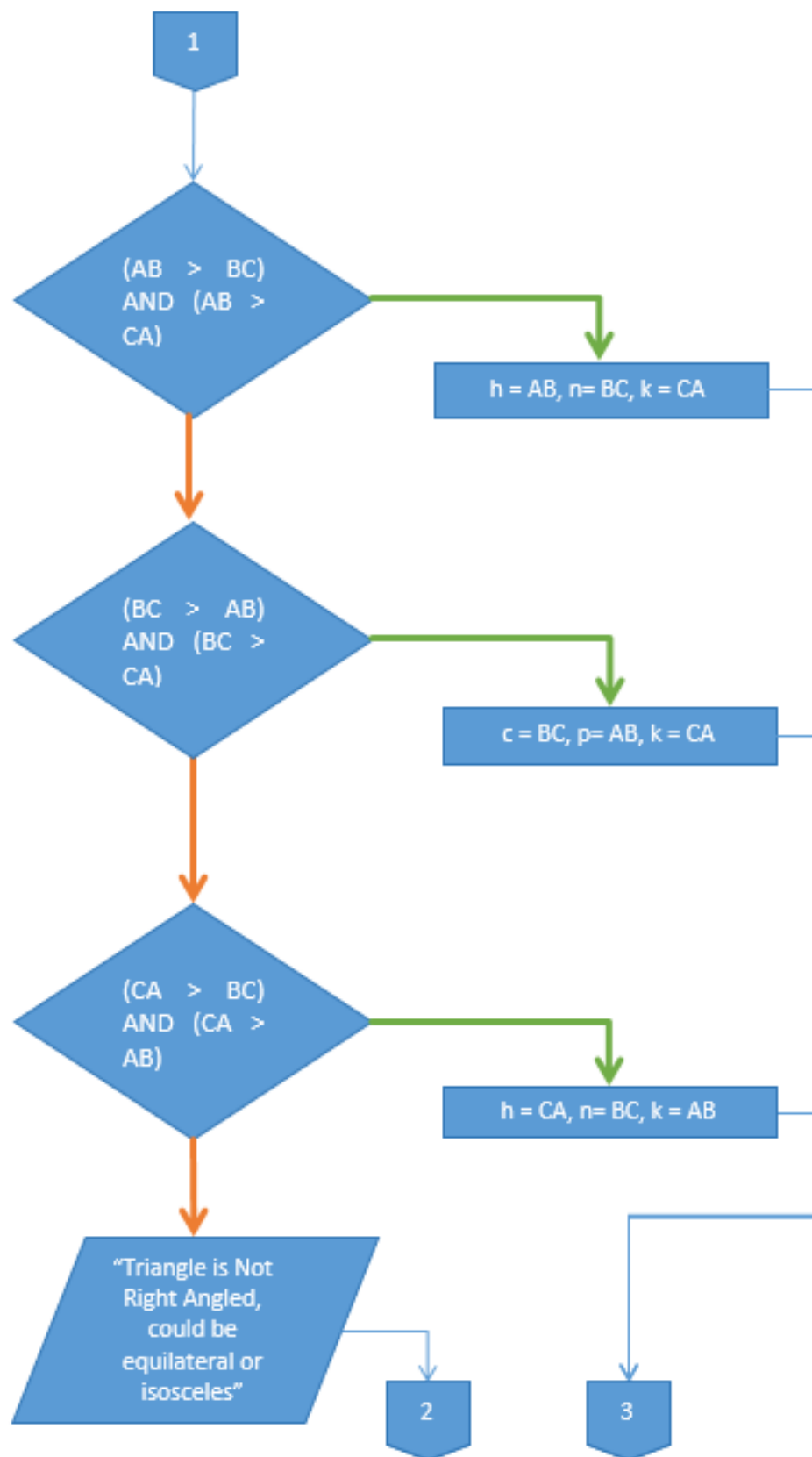
For Incorrect Labellings/Flow/Arrow Direction:	-1 mark
Incorrect use of connector:	-1 mark

**Solution:**

**Green Arrow = TRUE**

**Orange Arrow = FALSE**





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**CLO 4: Design basic problems of the real world through small/medium size programs.**

**Q3:** Write a complete C program for the requirements given below.

**[Marks 12]**

DECS is organizing a party for the FAST students. The program needs to calculate the total amount to be paid by student based on various conditions.

### **COST DETAILS:**

- **21K Batch:** PKR 1800 per person.
- **22K Batch:** PKR 1700 per person.
- **23K Batch:** PKR 1600 per person.
- **24K Batch:** PKR 1500 per person.

### **DISCOUNT CRITERIA:**

- If the roll number ends with "10", the student gets a 10% discount.
- If the roll number ends with "20", the student gets a 20% discount.
- **Bulk purchase:** If a student buys more than 10 tickets, one ticket is free. If the student avails the lucky number discount then bulk purchases are not allowed.

### **PROGRAM REQUIREMENTS:**

1. Take the student ID as input comprising of 6-digit integer number in the form of XXYYYY, where XX is a batch year and YYYY is actual roll number.
2. Validate the roll number for students (ensure it is a 6-digit number). Also, ensure that XX is a valid batch number.
3. Apply the relevant discounts.
4. Calculate and display the total and the discounted amount.

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## **Marking Rubrics**

12 marks

Validation of 6 digit number & batch number — 2 marks

Digit Extraction initial 2 for batch and last 2 for discount — 4 marks

If Else batch wise — 2 marks

Bulk Discount — 2 marks

Proper code with proper billing — 2 marks

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## **Solution**

```
#include <stdio.h>
int main()
{
    int id, tickets;
    int batch, rollNumber, costPerTicket = 0;
    float totalCost, discount = 0.0;

    printf("Enter your 6-digit student ID (XXYYYY): ");
    scanf("%d", &id);

    printf("Enter the number of tickets: ");
    scanf("%d", &tickets);
```

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```
batch = id / 10000;
rollNumber = id % 10000;

if (id < 100000 || id > 999999 || batch < 21 || batch > 24)
{
    printf("Invalid student ID.\n");
    return 1;
}

if (batch == 21)
{
    costPerTicket = 1800;
}
else if (batch == 22)
{
    costPerTicket = 1700;
}
else if (batch == 23)
{
    costPerTicket = 1600;
}
else if (batch == 24)
{
    costPerTicket = 1500;
}

int rollEnding = id % 100;

if (rollEnding == 10)
{
    discount = 0.10; // 10% discount
}
else if (rollEnding == 20)
{
    discount = 0.20; // 20% discount
}

if (discount > 0 && tickets==1)
{
    totalCost = costPerTicket - costPerTicket * discount;
}
else if (discount == 0 && tickets > 10)
{
    totalCost = costPerTicket * tickets - costPerTicket;
}
else
{
    printf("You are not allowed to buy in bulk\n\nYou can get only one ticket\n\n");
    totalCost = costPerTicket - costPerTicket * discount;
}
```

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```
}  
printf("Total amount to be paid: PKR %.2f\n", totalCost);  
  
return 0;  
}
```