National University of Computer and Emerging Sciences

Karachi Campus

Programming Fundamentals (CS1002)

Sessional-I Exam

Date: 9/20/2024

Total Time: 1hr

Total Marks: **30**

Total Questions: 03

Course Instructor(s)

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Roll No Section Student Signature

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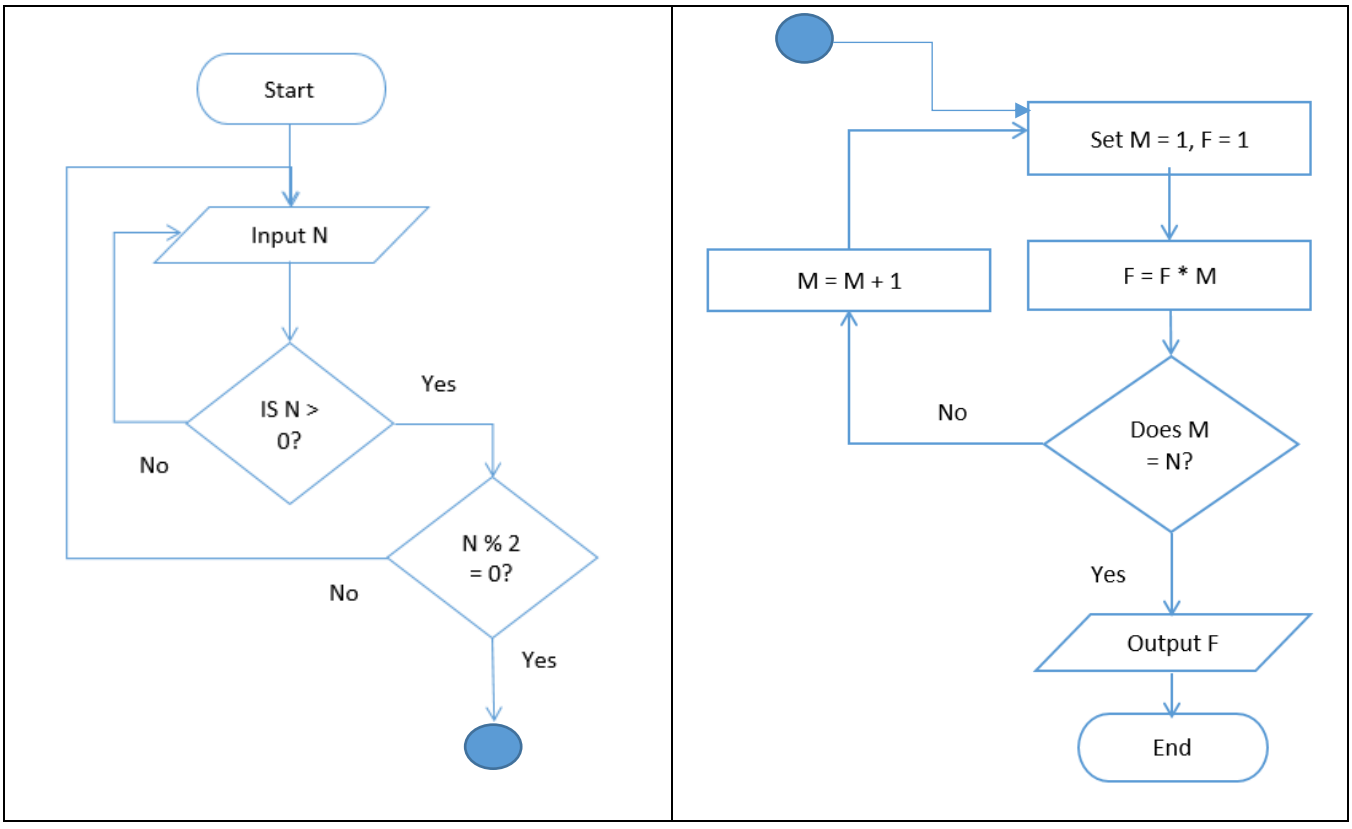
Attempt all questions.

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.

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

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.

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

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.

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

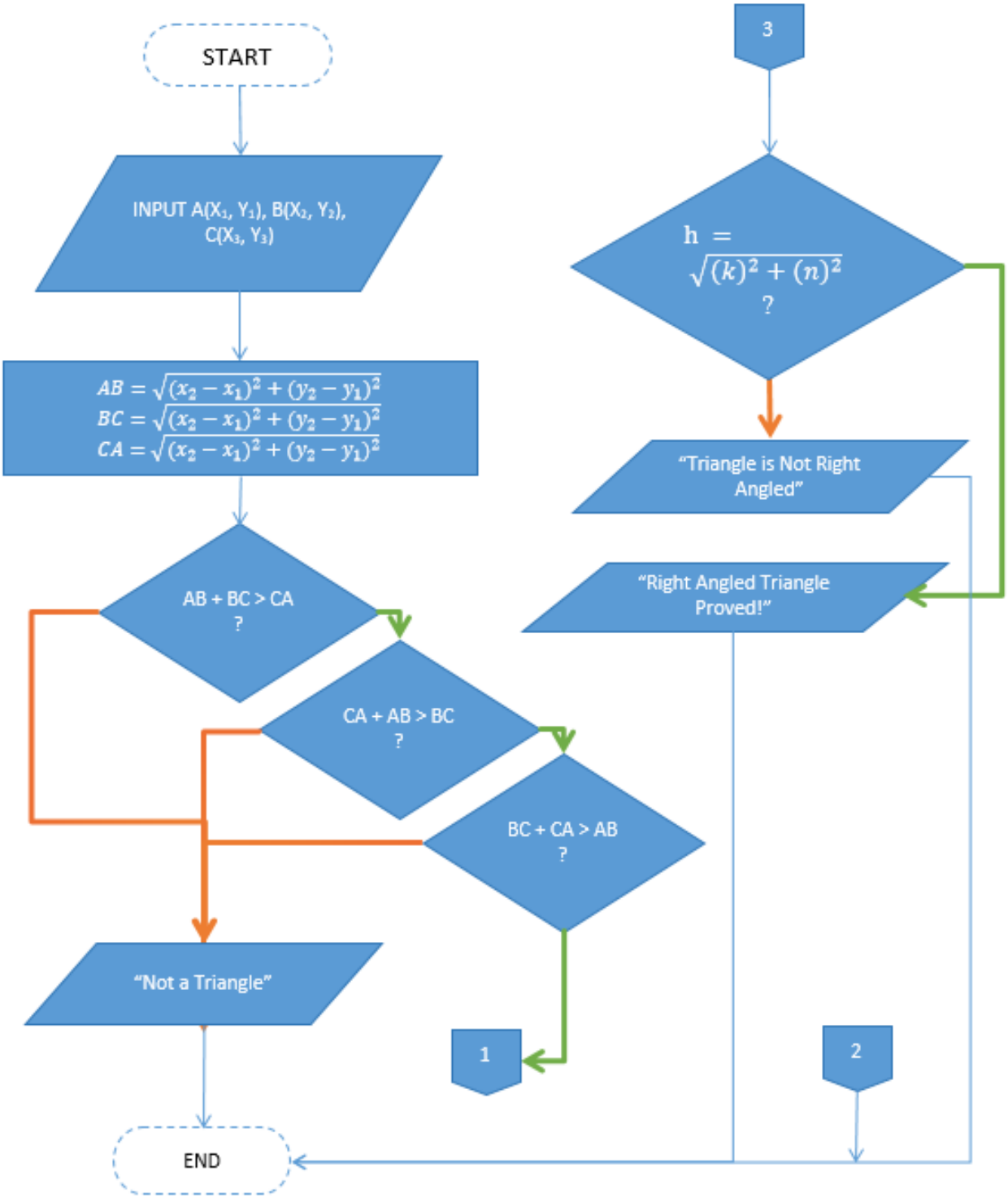
Note that it should also satisfy the triangle inequality theorem, which requires that the sum of the lengths of any two sides must be greater than the third side.

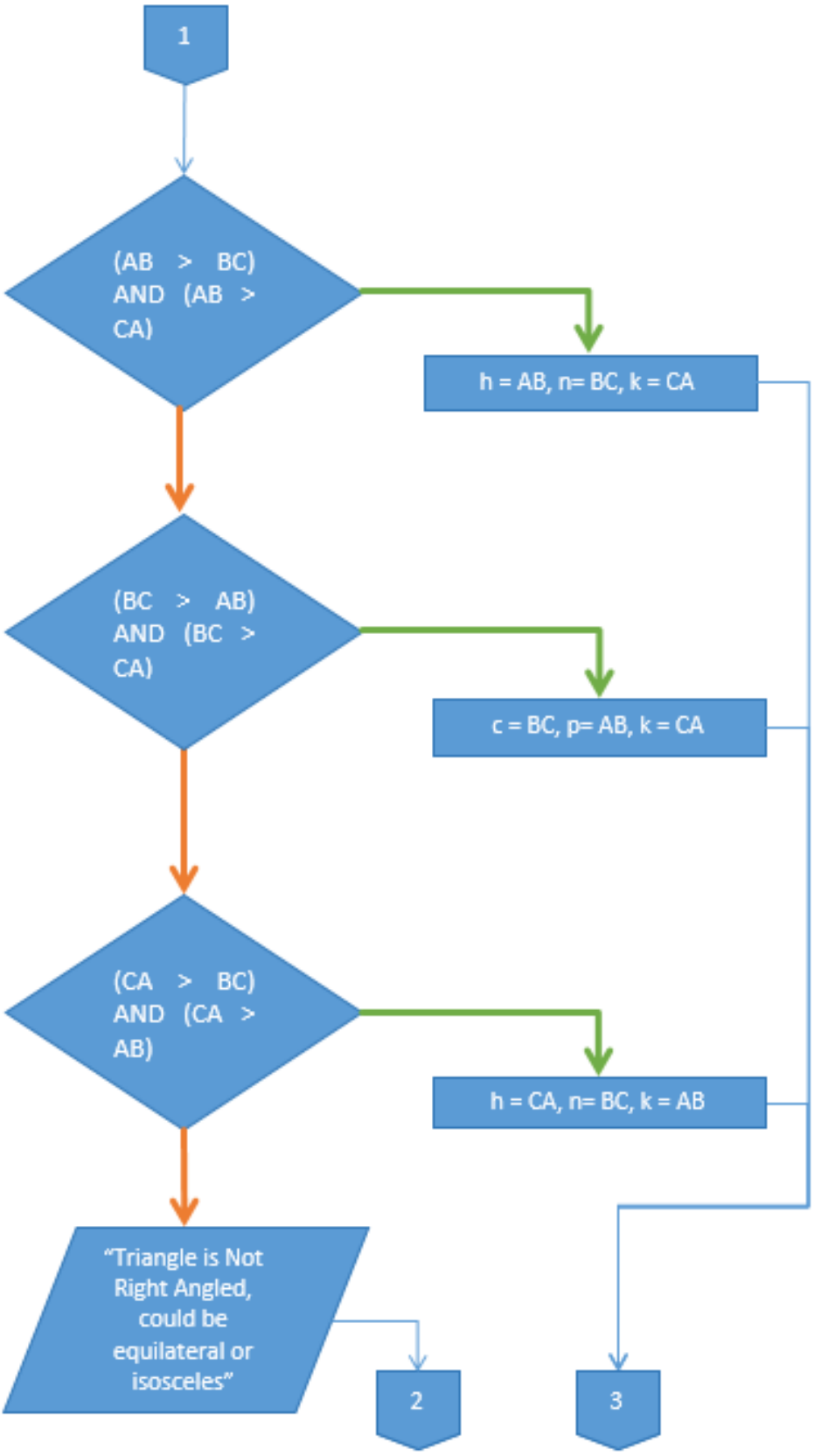
Marking Rubrics:

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




1
(AB > BC) AND (AB > CA)
h = AB, n= BC, k = CA
(BC > AB) AND (BC > CA)
c = BC, p= AB, k = CA
(CA > BC) AND (CA > AB)
h = CA, n= BC, k = AB
"Triangle is Not Right Angled, could be equilateral or isosceles"
2
3

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.

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

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);
```

```
        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 if(discount == 0 && tickets < 10)
{
        totalCost = costPerTicket * tickets;
        }
```

```
        else
        {
                printf("You are not allowed to buy in bulk\n\nYou can get only one ticket and cost of 1 ticket\n\n");
        totalCost = costPerTicket - costPerTicket * discount;
        }
        printf("Total amount to be paid: PKR %.2f\n", totalCost);

return 0;
}
```