WIX1002 Fundamentals of Programming

Tutorial 1 Problem Solving in Programming

Draw the Input Process Output (IPO) model and build the pseudocode, flow chart for each of the problems:

Part I

1. **Request two numbers from the user and print the multiplication of the numbers.**

IPO Model:

Input: Two numbers from the user

Process: Multiplication of the two numbers

Output: Result of multiplication

Pseudocode:

Start

DECLARE num1, num2, result AS REAL

DISPLAY "Enter the first number:”

INPUT num1 DISPLAY "Enter the second number: "

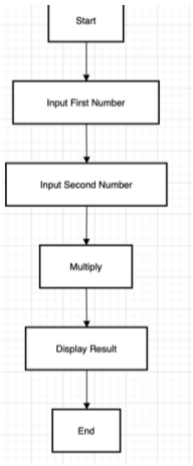
INPUT num2 result = num1 * num2 DISPLAY "Multiplication of the given two numbers = "

Calculate the result

Display the result

End

FLOWCHART:



2. Determine whether a random number is greater than 50.

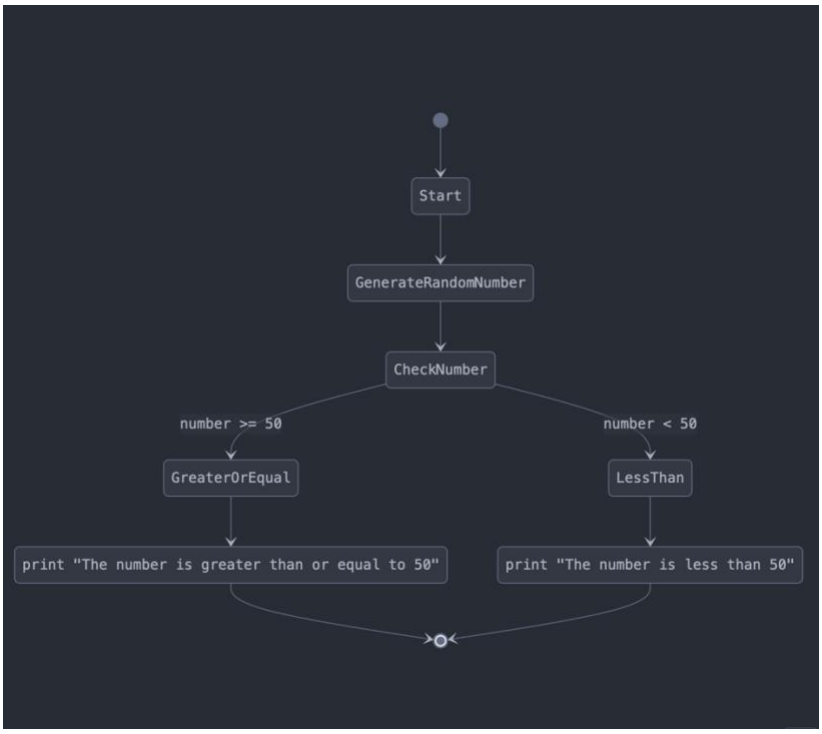
IPO Model:

Input	Generate a random number between 1 and 100.
Process	Compare the random number with 50.
Output	Print whether the number is greater than, equal to, or less than 50.

Pseudocode:

```
BEGIN
CREATE a Random object
GENERATE a random number between 1 and 100
IF number is greater than or equal to 50 THEN
PRINT "The number X is greater than or equal to 50"
ELSE
PRINT "The number X is less than 50"
ENDIF
END
```

FLOWCHART:



3. Print the pass/fail grade based on the mark entered by user. The passing mark is at least 40.

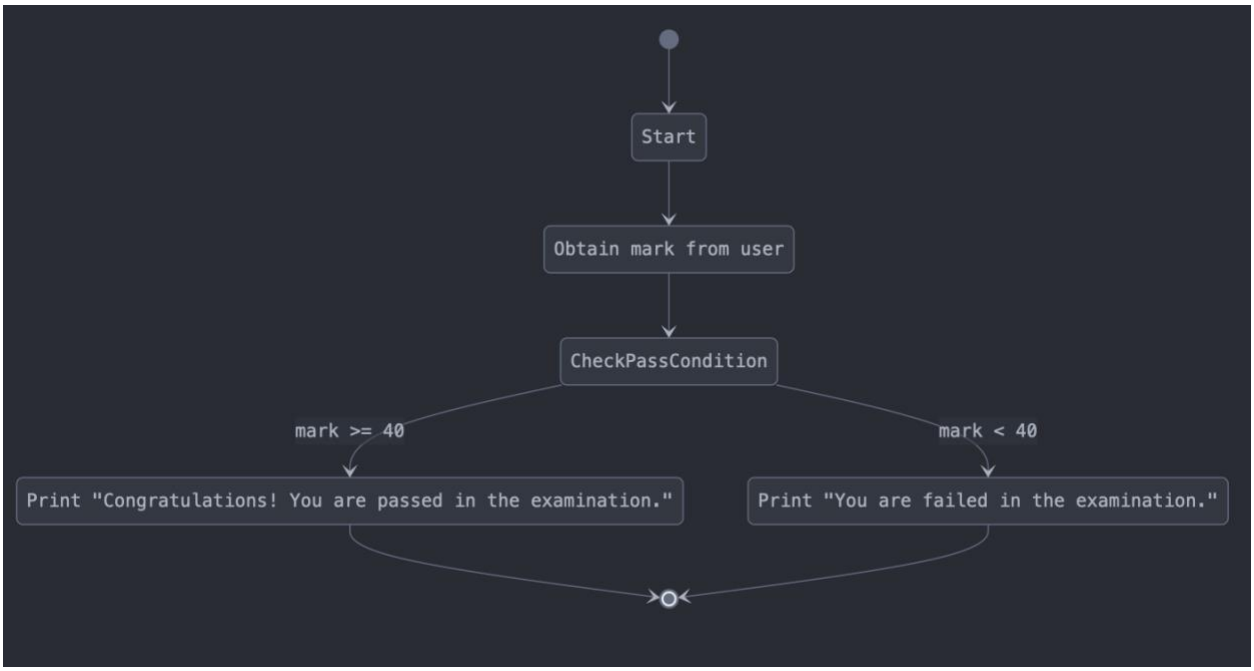
IPO Model:

Input	User enters the obtained mark.
Process	Compare the mark with the passing mark (40). If the mark is 40 or higher, the student passes; otherwise, they fail.
Output	Display either "Congratulations! You passed" or "You failed in the examination."

Pseudocode:

```
BEGIN
DISPLAY "Enter your obtained mark: "
READ mark
IF mark >= 40 THEN
DISPLAY "Congratulations! You are passed in the examination"
ELSE
DISPLAY "You are failed in the examination."
ENDIF
END
```

FLOWCHART:



4. Print the results of the two players' dice game.

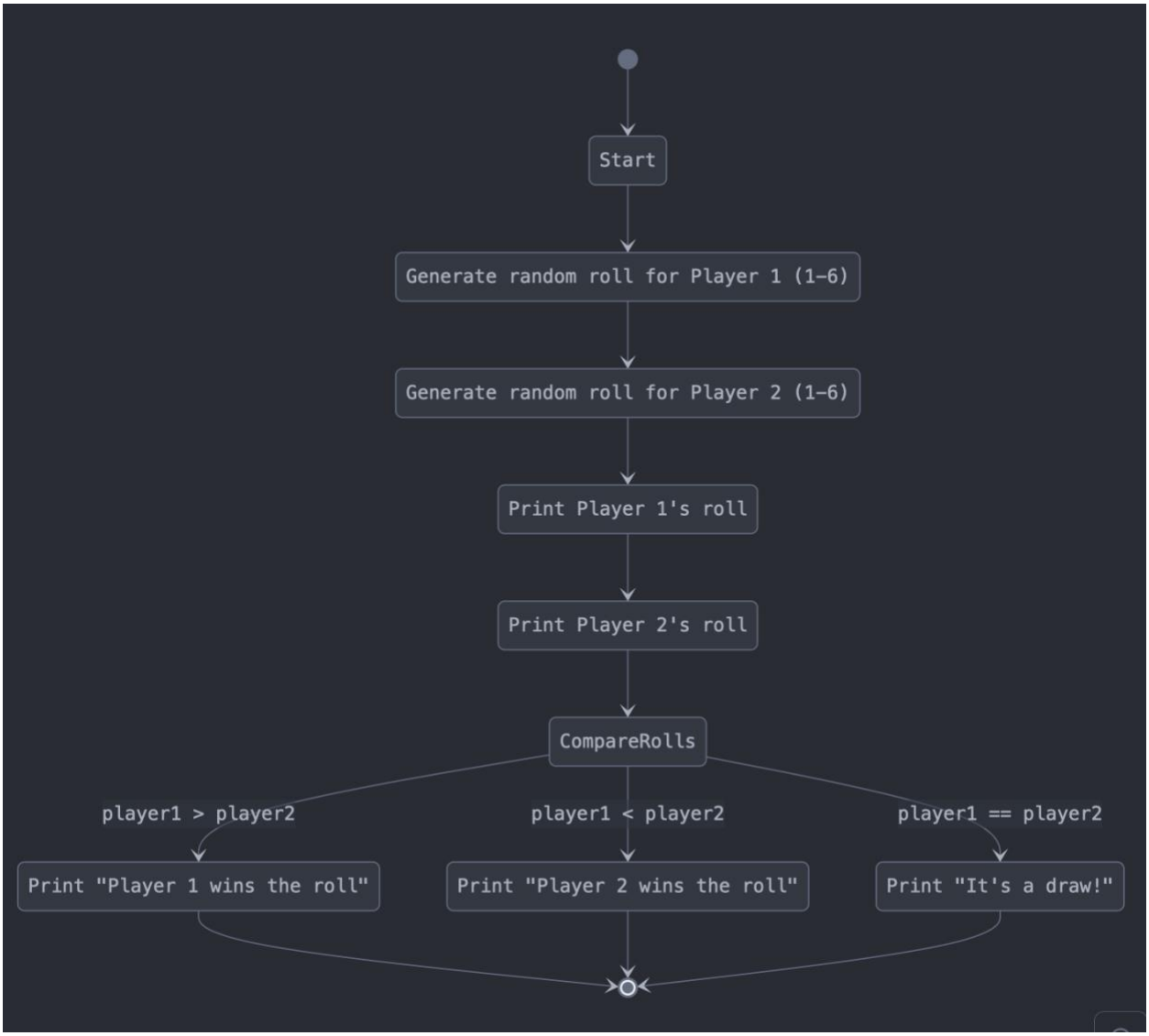
IPO Model:

Input	User enters the obtained mark.
Process	Compare the mark with the passing mark (40). If the mark is 40 or higher, the student passes; otherwise, they fail.
Output	Display either "Congratulations! You passed" or "You failed in the examination."

Pseudocode:

```
BEGIN
   DISPLAY "Enter your obtained mark: "
   READ mark
   IF mark >= 40 THEN
      DISPLAY "Congratulations! You are passed in the examination"
   ELSE
      DISPLAY "You are failed in the examination."
   ENDIF
END
```

FLOWCHART:



5. Print the perimeter of a rectangle.

IPO Model:

Input User enters the length and width of the rectangle.
Process Calculate the perimeter using the formula: P=2×(length+width)
Output Display the perimeter of the rectangle.

Pseudocode:

```
BEGIN
    DISPLAY "Enter the length of the rectangle: "
```

READ length

DISPLAY "Enter the width of the rectangle: "

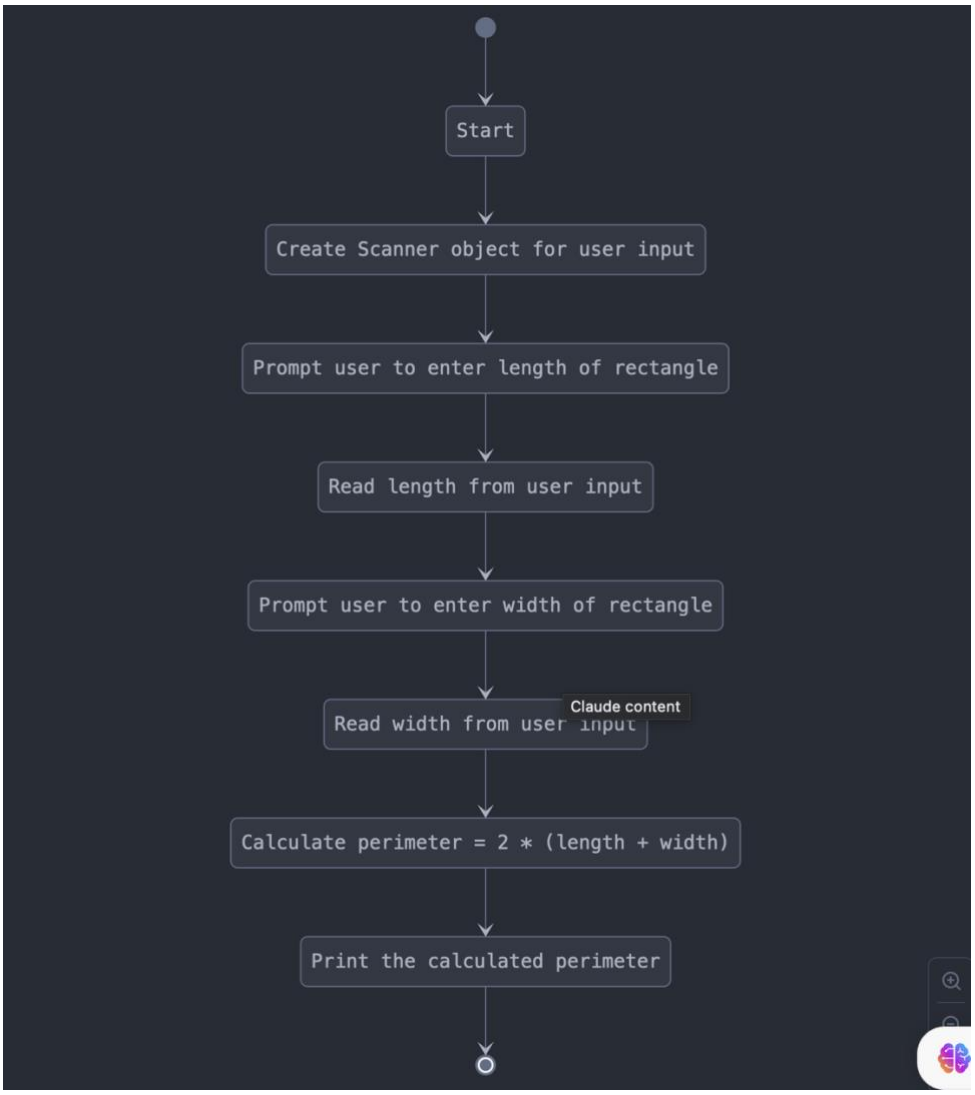
READ width

COMPUTE perimeter = 2 * (length + width)

DISPLAY "The perimeter of the rectangle is: ", perimeter

END

FLOWCHART:



6. Print the minimum number from 10 random numbers generated by computer.

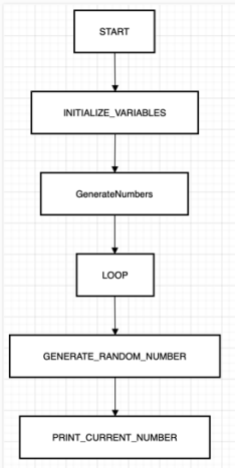
IPO Model:

Input Generate 10 random numbers between 0 and 999.
Process Loop through the numbers, keep track of the smallest and largest values.
Output Display the 10 generated numbers, the minimum number, and the maximum number.

Pseudocode:

```
BEGIN
   CREATE a Random number generator
   DISPLAY "Generated numbers: "
   SET min to a large number (1000)
   SET max to a small number (0)

   FOR i = 1 to 10 DO
      GENERATE a random number between 0 and 999
      DISPLAY the generated number

      IF random number < min THEN
         UPDATE min = random number
      ENDIF

      IF random number > max THEN
         UPDATE max = random number
      ENDIF
   ENDFOR

   DISPLAY "Minimum number: ", min
   DISPLAY "Maximum number: ", max
END
```

FLOWCHART:



7. Print the number of odd and even number from 10 random numbers generated by computer. The random number must be from 10 – 100.

IPO Model:

Input Generate 10 random numbers between 10 and 100.

Process Loop through the numbers, check if each number is odd or even, and keep count.

Output Display the 10 generated numbers, the count of even numbers, and the count of odd numbers.

Pseudocode:

```
BEGIN
   CREATE a Random number generator
   INITIALIZE oddCount = 0, evenCount = 0
   DISPLAY "Generated Numbers: "
   FOR i = 1 to 10 DO
      GENERATE a random number between 10 and 100
      DISPLAY the generated number
       IF random number MOD 2 == 0 THEN
         INCREMENT evenCount
```

```
        ELSE
            INCREMENT oddCount
        ENDIF
    ENDFOR
    DISPLAY "Total Number of even numbers: ", evenCount
    DISPLAY "Total Number of odd numbers: ", oddCount
END
```

FLOWCHART:

Part II

8. Count the number of alphabet U and M from a sentence entered by user.

IPO Model:

Input User enters a sentence.

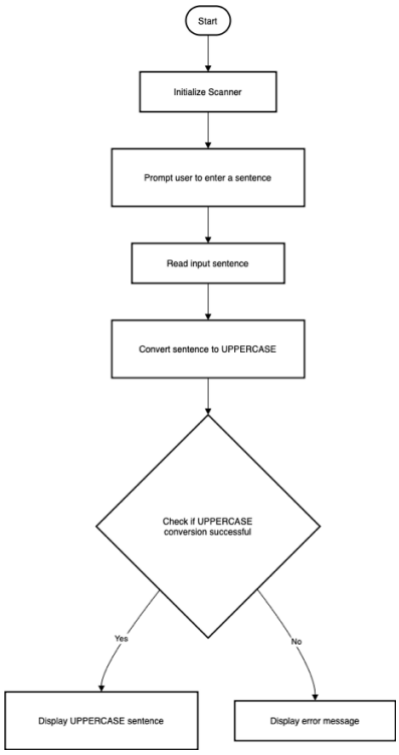
Process Convert the sentence to uppercase. Loop through each character and count occurrences of 'U' and 'M'.

Output Display the number of times 'U' and 'M' appear in the sentence.

Pseudocode:

```
BEGIN
DISPLAY "Please enter a sentence: "
READ sentence
CONVERT sentence to uppercase
INITIALIZE countU = 0, countM = 0
FOR each character in sentence DO
IF character == 'U' THEN
INCREMENT countU
ELSE IF character == 'M' THEN
INCREMENT countM
ENDIF
ENDFOR
DISPLAY "Number of 'U' in the sentence: ", countU
DISPLAY "Number of 'M' in the sentence: ", countM
END
```

FLOWCHART:



9. Display the frequency of a keyword from a web page.

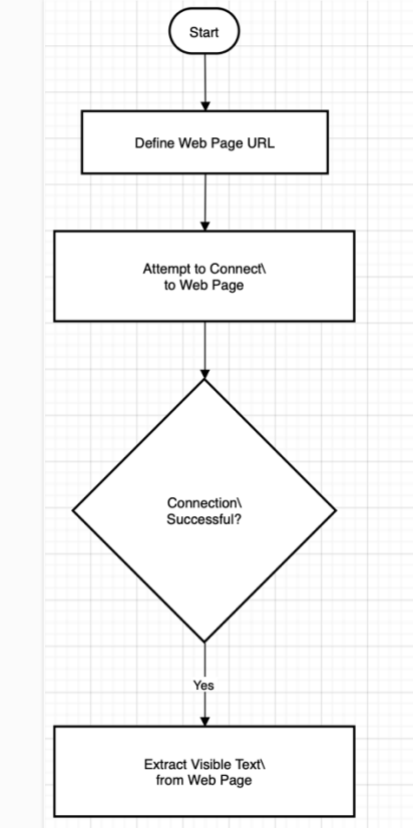
IPO Model:

Input Fetch the webpage content using Jsoup. Define a keyword to search.
Process Extract visible text, convert it to lowercase, and count occurrences of the keyword.
Output Display how many times the keyword appears on the webpage.

Pseudocode:

```
BEGIN
  TRY
    SET url = "https://www.um.edu.my"
    FETCH webpage content using Jsoup
    EXTRACT visible text from the webpage and convert to lowercase

    SET keyword = "um"
    INITIALIZE count = 0
    INITIALIZE index = 0

    WHILE keyword is found in text starting from index
      INCREMENT count
      MOVE index forward by keyword length
    ENDWHILE

    DISPLAY "The keyword appears", count, "times."

  CATCH IOException
    DISPLAY "Error fetching or parsing the web page"
END
```

FLOWCHART:



10. Display the number of female student from a random list of 100 students.

IPO Model:

Input Generate random genders (0 = male, 1 = female) for 100 students.

Process Loop through 100 students, assign a random gender, count the number of males and females.

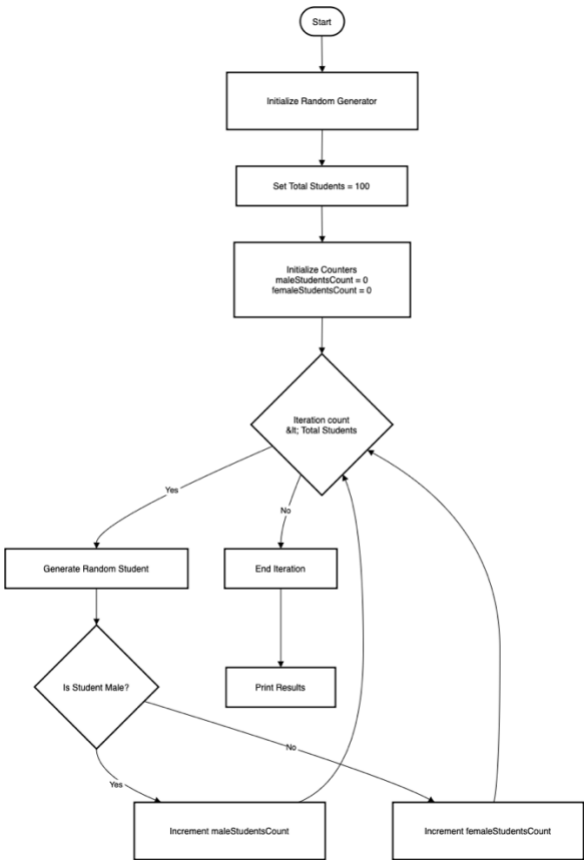
Output Display the number of female and male students.

Pseudocode:

```
BEGIN
   INITIALIZE totalStudents = 100
   INITIALIZE femaleStudentsCount = 0
   INITIALIZE maleStudentsCount = 0

   FOR i = 1 to totalStudents DO
      GENERATE a random number (0 or 1)
      IF random number == 1 THEN
         INCREMENT femaleStudentsCount
      ELSE
```

```
        INCREMENT maleStudentsCount
      ENDIF
   ENDFOR

   DISPLAY "Number of female students: ", femaleStudentsCount
   DISPLAY "Number of male students: ", maleStudentsCount
END
```

FLOWCHART:



11. Display a list of 5 random numbers in descending order. (Sort)

IPO Model:

Input Generate 5 random numbers (0 to 1000).

Process Store the numbers in an array, sort them in descending order.

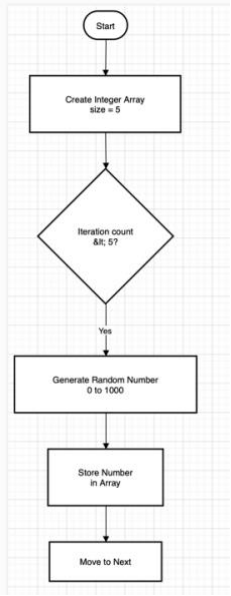
Output Display the original numbers and the sorted numbers in descending order.

Pseudocode:

```
BEGIN
```

```
    DECLARE an array of size 5
    FOR i = 0 to 4 DO
        GENERATE a random number between 0 and 1000
        STORE the number in the array
    ENDFOR
    DISPLAY "Original random numbers are: "
    FOR each number in array DO
        PRINT number
    ENDFOR
    SORT the array in descending order
    DISPLAY "Random numbers in descending order: "
    FOR each number in sorted array DO
        PRINT number
    ENDFOR
END
```

FLOWCHART:



12. Guess a random number generated by computer.

IPO Model:

Input User enters a guess for a randomly generated number (1–100).

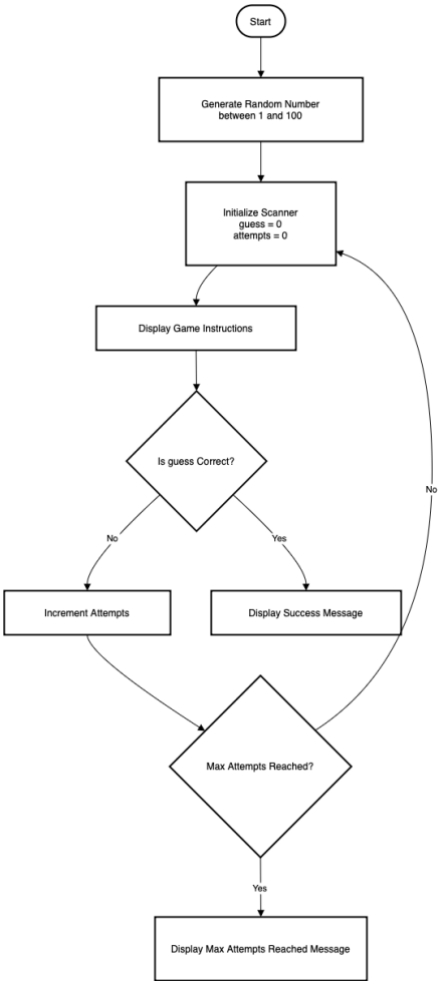
Process Compare the guess with the random number, provide hints, and count the attempts.

Output Inform the user if the guess is too low, too high, or correct. Display the number of attempts when the correct guess is made.

Pseudocode:

```
BEGIN
  GENERATE a random number between 1 and 100
  INITIALIZE attempts = 0
  INITIALIZE guess = 0

  DISPLAY "I have generated a random number between 1 and 100."
  DISPLAY "Try to guess the number!"

  WHILE guess is not equal to random number DO
    PROMPT user to enter a guess
    READ user input
    INCREMENT attempts

    IF guess is less than random number THEN
      DISPLAY "Too low! Try again."
    ELSE IF guess is greater than random number THEN
      DISPLAY "Too high! Try again."
    ELSE
      DISPLAY "Congratulations! You guessed the number."
      DISPLAY "It took you", attempts, "attempts."
    ENDIF
  ENDWHILE
END
```

FLOWCHART:


Start
Generate Random Number between 1 and 100
Initialize Scanner guess = 0 attempts = 0
Display Game Instructions
Is guess Correct?
No
Yes
Increment Attempts
Display Success Message
No
Max Attempts Reached?
Yes
Display Max Attempts Reached Message