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:

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

IPO Model:

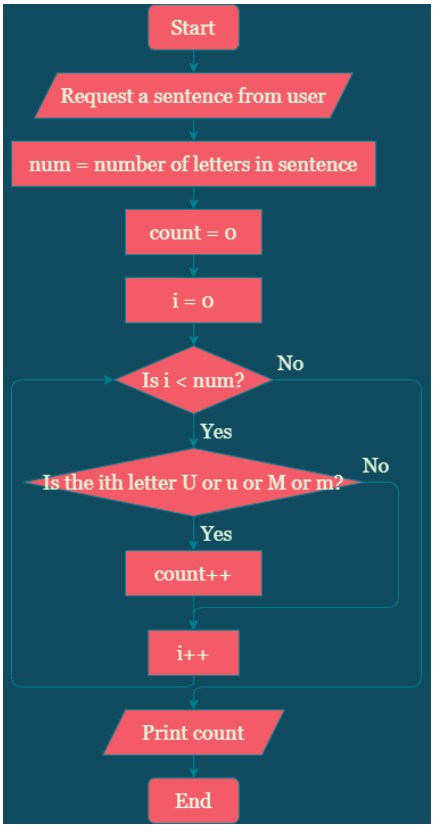
Input	Process	Output

• A sentence	• Set count = 0
	• For each letter in the sentence
	  ○ If the letter is U, u, M or m
	  ▪ Increment count by 1
		• Number of alphabet U and M, count

Pseudocode:

1. Request a sentence from user.
2. Set count = 0.
3. For each letter in the sentence,
   If the letter is U, u, M or m,
   Increment count by 1.
4. Print the number of alphabet U and M, count.

Flowchart:




```java
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Please enter a sentence: ");
    String sentence = scanner.nextLine();

    int count = 0;

    for (char i : sentence.toCharArray())
        if (i == 'U' || i == 'u' || i == 'M' || i == 'm')
            count++;

    System.out.println("Number of alphabet U and M: " + count);
}
```

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

IPO Model:

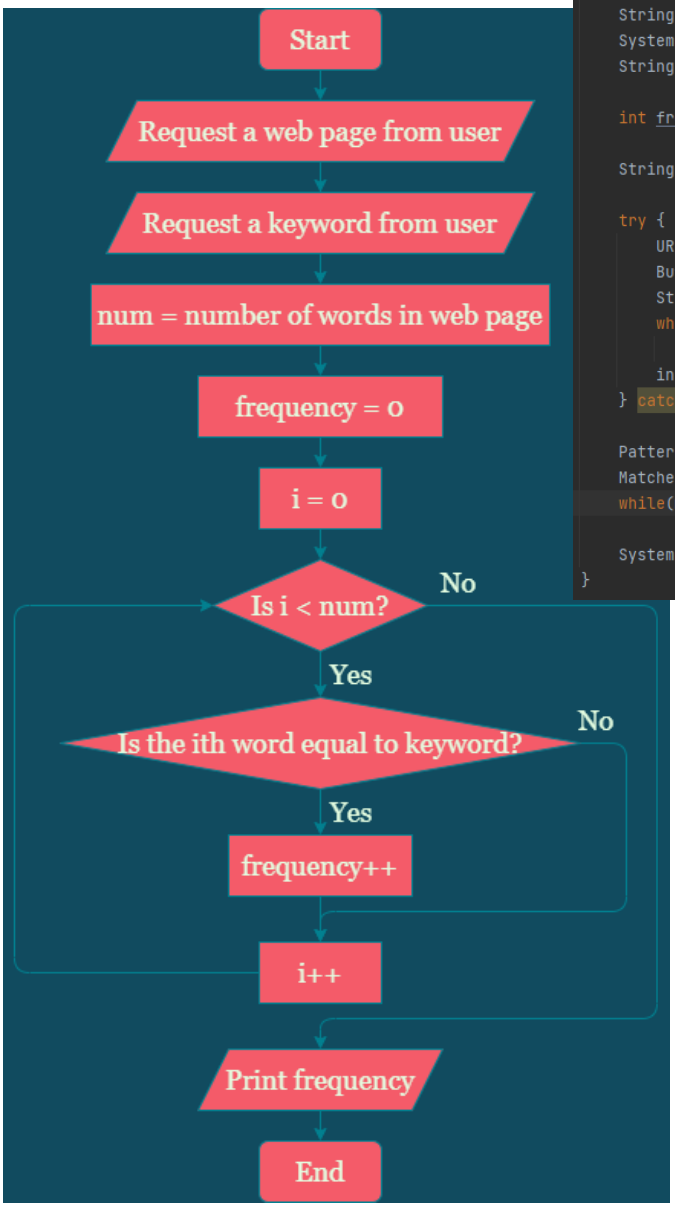
Input	Process	Output

• A web page
• A keyword
	• Set frequency = 0
	• For each word in the web page
	  ○ If the word is equal to the keyword
	  ▪ Increment frequency by 1
		• Frequency of the keyword, frequency

Pseudocode:

1. Request a web page and a keyword from user.
2. Set frequency = 0.
3. For each word in the web page,
   If the word is equal to the keyword,
   Increment frequency by 1.
4. Print the frequency of the keyword, frequency.

Flowchart:




```java
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Please enter a webpage URL: ");
    String url = scanner.nextLine();
    System.out.print("Please enter a keyword: ");
    String keyword = scanner.nextLine();

    int frequency = 0;

    String content = "";

    try {
        URL oracle = new URL(url);
        BufferedReader in = new BufferedReader(new InputStreamReader(oracle.openStream()));
        String inputLine;
        while ((inputLine = in.readLine()) != null)
            content += inputLine + "\n";
        in.close();
    } catch (Exception e) {}

    Pattern pattern = Pattern.compile(keyword, Pattern.CASE_INSENSITIVE);
    Matcher matcher = pattern.matcher(content);
    while(matcher.find()) frequency++;

    System.out.println("Frequency of the keyword: " + frequency);
}
```

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

IPO Model:

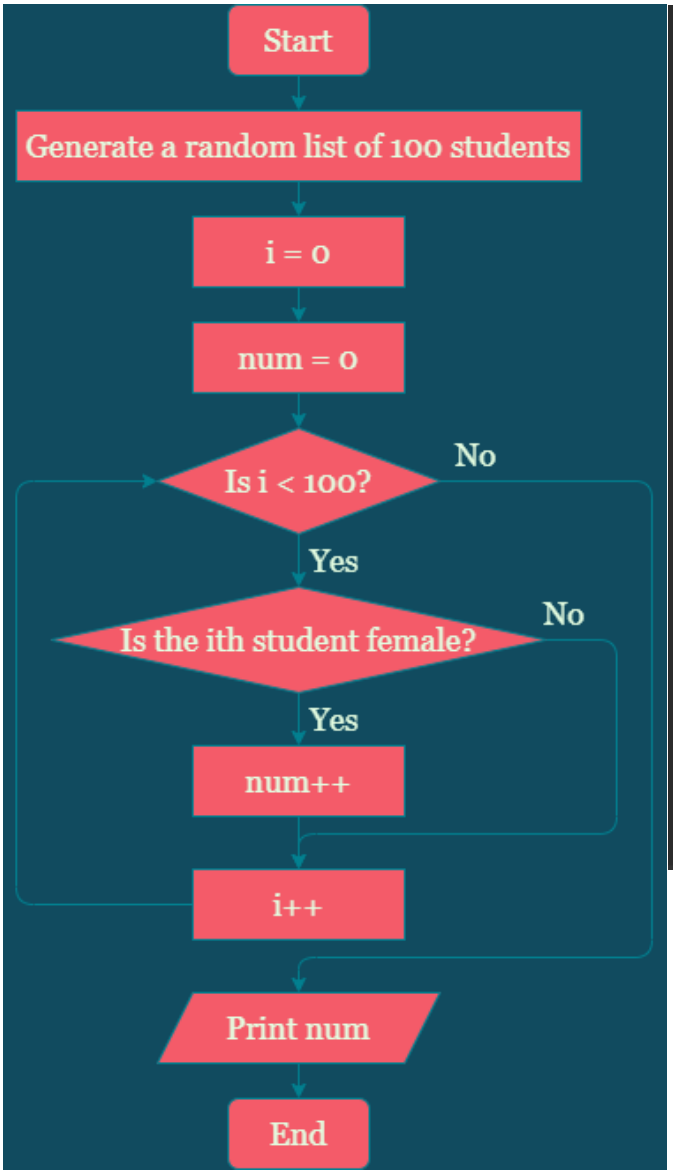
Input	Process	Output

• A list of 100 students	• Generate a random list of 100 students
	• Set num = 0
	• For each student in the list
	  ○ If the student is female
	  ▪ Increment num by 1
		• Number of female students, num

Pseudocode:

1. Generate a random list of 100 students.
2. Set num = 0.
3. For each student in the list,
   If the student is female,
   Increment num by 1.
4. Print num.

Flowchart:




```java
public static class Student {
    public char gender;

    public Student(char gender) { this.gender = gender; }
}

public static void main(String[] args) {

    Student[] list = new Student[100];
    for (int i = 0; i < 100; i++) {
        Random random = new Random();
        if(random.nextInt( bound: 2) == 0)
            list[i] = new Student( gender: 'M');
        else
            list[i] = new Student( gender: 'F');
    }

    int num = 0;

    for(Student student : list)
        if(student.gender == 'F')
            num++;

    System.out.println("Number of female students: " + num);
}
```

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

IPO Model:

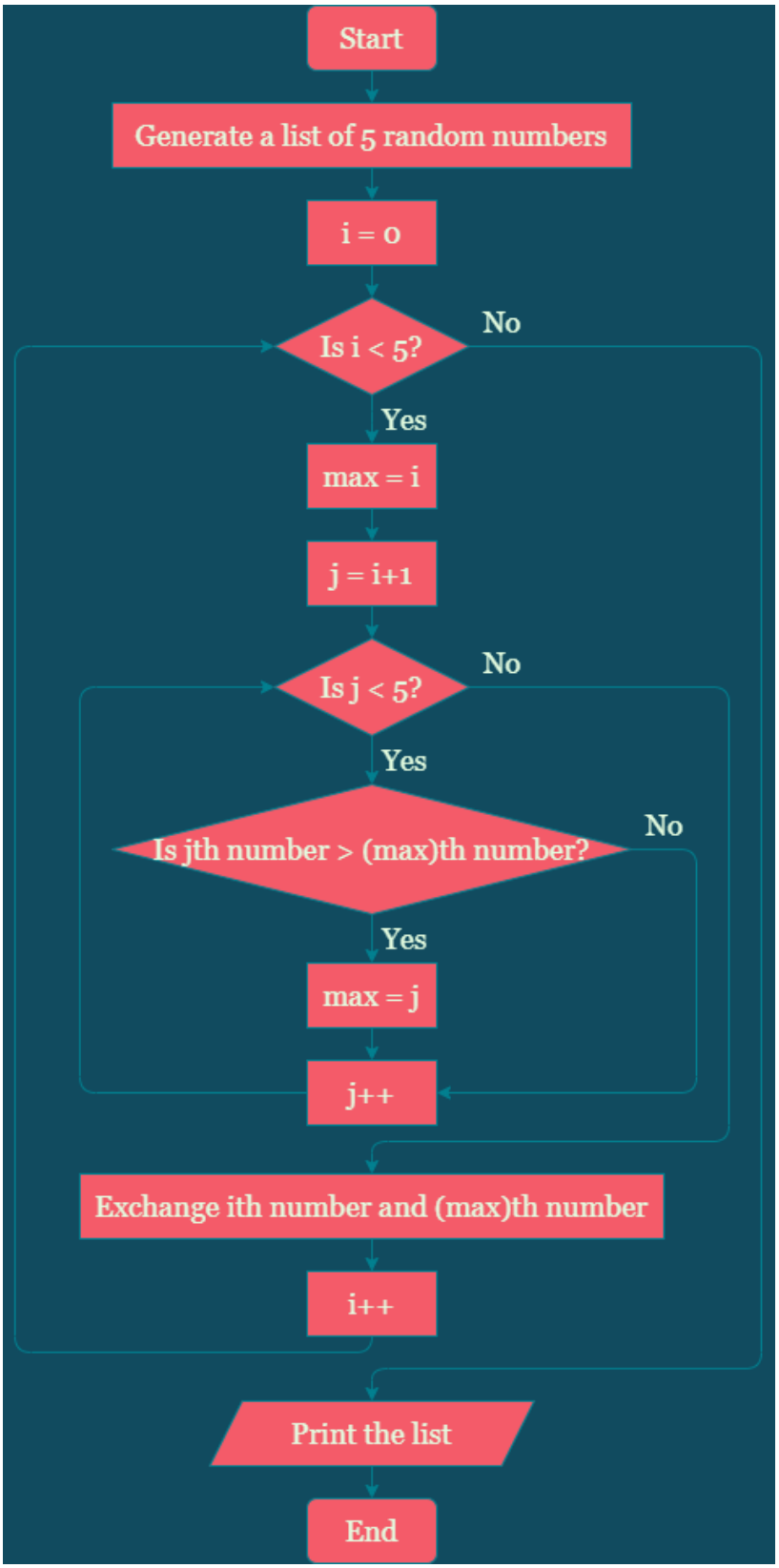
Input	Process	Output

• A list of 5 random numbers	• Generate a list of 5 random numbers
	• Set i = 0
	• While i < 5
	  ○ Set max = i
	  ○ Set j = i+1
	  ○ While j < 5
	  ▪ If jth number > (max)th number
	  • Set max = j
	  ▪ Increment j by 1
	  ○ Exchange ith number and (max)th number
	  ○ Increment i by 1
		• The list in descending order

Pseudocode:

1. Generate a list of 5 random numbers.
2. Set i = 0.
3. While i < 5,
    a. Set max = i.
    b. Set j = i+1.
    c. While j < 5,
        i. If maxth number < jth number,
            Set max = j.
        ii. Increment j by 1.
    d. Exchange ith number and (max)th number.
    e. Increment i by 1.

Flowchart:




```java
public static void main(String[] args) {
    Random random = new Random();

    int[] num = new int[5];
    for (int i = 0; i < 5; i++)
        num[i] = random.nextInt( bound: 20);

    for (int i = 0; i < 5; i++) {
        int max = i;
        for (int j = i+1; j < 5; j++)
            if (num[j] > num[max])
                max = j;
        int temp = num[i];
        num[i] = num[max];
        num[max] = temp;
    }

    for (int i = 0; i < 5; i++)
        System.out.print(num[i] + " ");
}
```

12. Guess a random number generated by computer.

IPO Model:

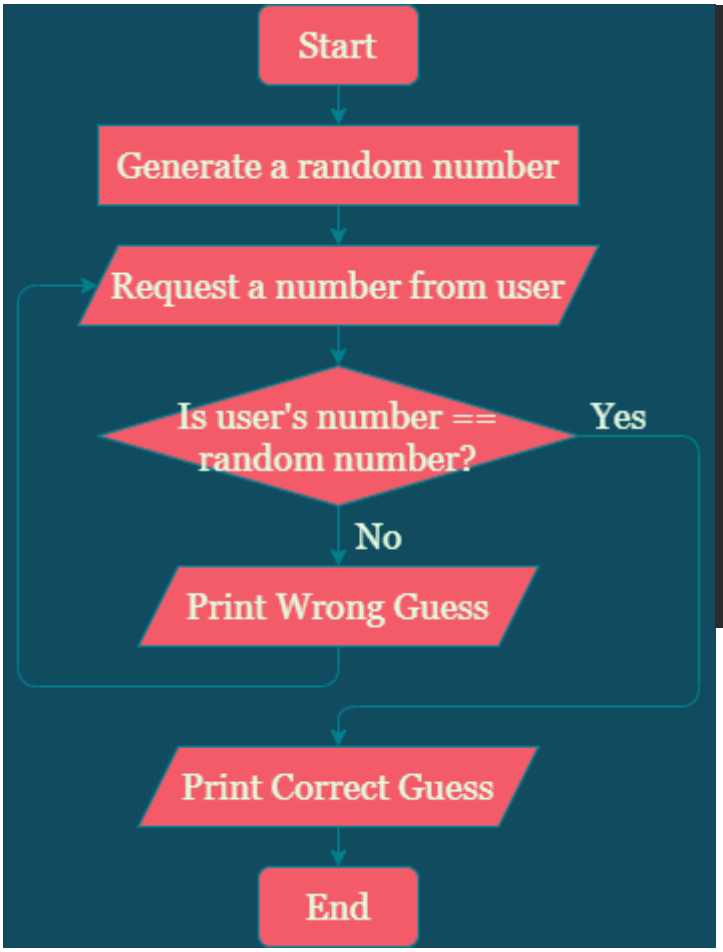
Input	Process	Output

• A random number
• User's number
	• Generate a random number
	• Request a number from user
	• While user's number != random number
	  ○ Print Wrong Guess
	  ○ Request a number from user
	• Print Correct Guess
		• Correct/Wrong Guess

Pseudocode:

1. Generate a random number.
2. Request a number from user.
3. While user's number != random number,
    a. Print Wrong Guess.
    b. Request a number from user.
4. Print Correct Guess.

Flowchart:




```java
public static void main(String[] args) {
    Random random = new Random();
    int randNum = random.nextInt( bound: 10) + 1;

    Scanner scanner = new Scanner(System.in);
    System.out.print("Guess the number: ");
    int num = scanner.nextInt();

    while(num != randNum) {
        System.out.println("Wrong Guess");
        System.out.print("Guess the number: ");
        num = scanner.nextInt();
    }
    System.out.println("Correct Guess");
}
```