Lecture 3

Algorithms & Flowcharts

INFORMATION TECHNOLOGY UNIVERSITY

سورة طه پارہ: 16

قَالَ رَبِّ اشْرَحْ لِيْ صَدْرِيْ ۙ ﴿٢٥﴾

[قَالَ: اس نے کہا] [رَبِّ: اے رب !] [اشْرَحْ: کھول دے] [لِيْ: میرے لیے] [صَدْرِيْ : میرا سینہ]

وَيَسِّرْ لِيْٓ اَمْرِيْ ۙ ﴿٢٦﴾

[وَيَسِّرْ: اور آسان کر دے] [لِيْ: میرے لیے] [اَمْرِيْ : میرا کام]

وَاحْلُلْ عُقْدَةً مِّنْ لِّسَانِيْ ۙ ﴿٢٧﴾

[وَاحْلُلْ: اور کھول دے] [عُقْدَةً: گرہ] [مِّنْ: سے] [لِّسَانِيْ: میری زبان]

يَفْقَهُوْا قَوْلِيْ ۖ ﴿٢٨﴾

[يَفْقَهُوْا: وہ سمجھ سکیں] [قَوْلِيْ : میری بات]

QUESTIONS / FEEDBACK / CONCERNS

UBS

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Word Problems

- Read the problem.
- Identify and list the facts.
- Figure out exactly what the problem is asking for.
- Eliminate excessive information.
- Pay attention to units of measurement.
- Draw a diagram.
- Find or develop a formula.
- Consult a reference.
- Do the math and check your answer.

ALGORITHM

Step 1: Obtain a description of the problem.

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Step 2: Analyze the problem

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Step 3: Develop a high-level algorithm.

Step 1: Obtain a description of the problem.

Step 2: Analyze the problem

Step 3: Develop a high-level algorithm.

Step 4: Refine the algorithm by adding more detail.

Step 1: Obtain a description of the problem.

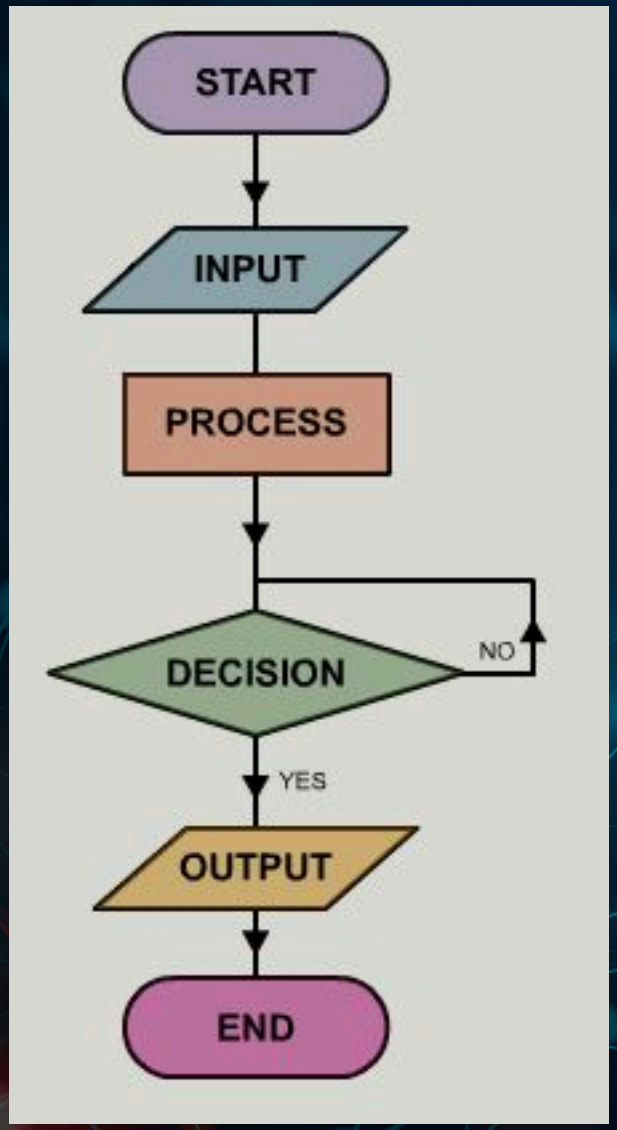
Step 2: Analyze the problem

Step 3: Develop a high-level algorithm.

Step 4: Refine the algorithm by adding more detail.

Step 5: Review the algorithm.

FLOWCHARTS



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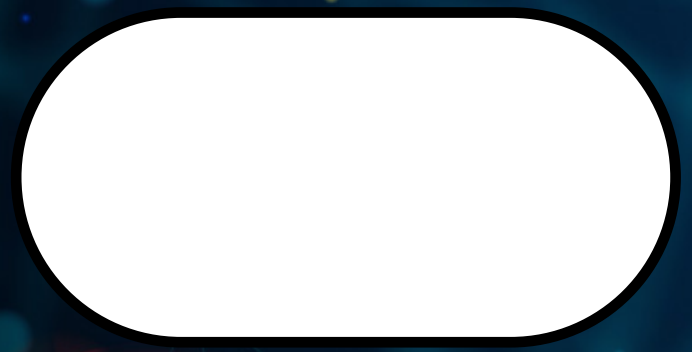
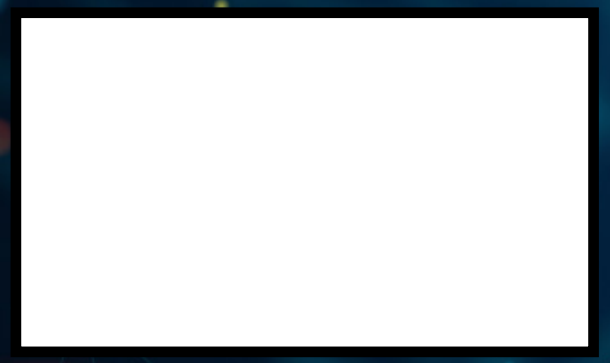


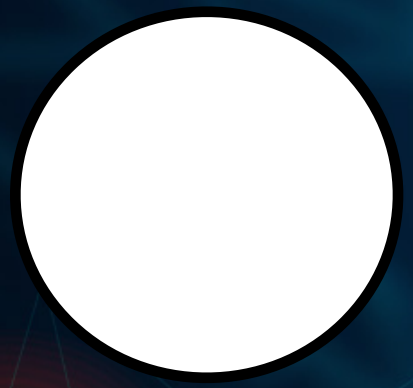
TERMINALS (START / STOP)

INPUT / OUTPUT



PROCESS

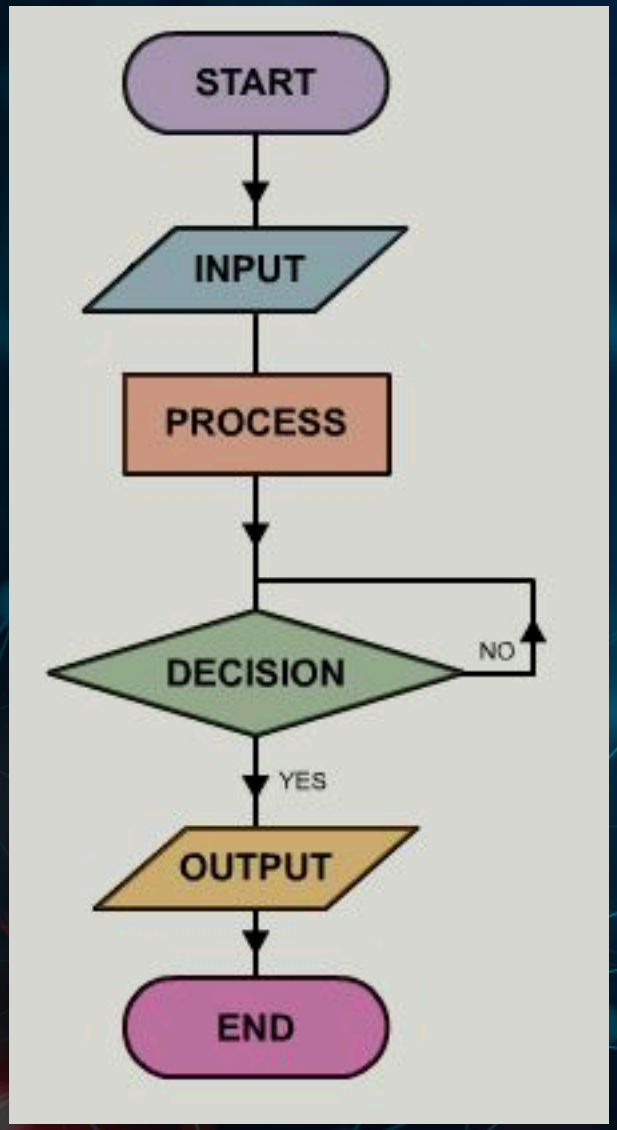
DECISION



CONNECTORS

FLOW

FLOWCHARTS



Source : https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.pinterest.com%2Fpin%2F835277680693784 63%2F&psig=AOvVaw0M_LVOyWh1tNSLcNkLX0_J&ust=1632790336500000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCOiPx5L4nfMCFQAAAAAdAAAAABAf

Advantages of Flowcharts

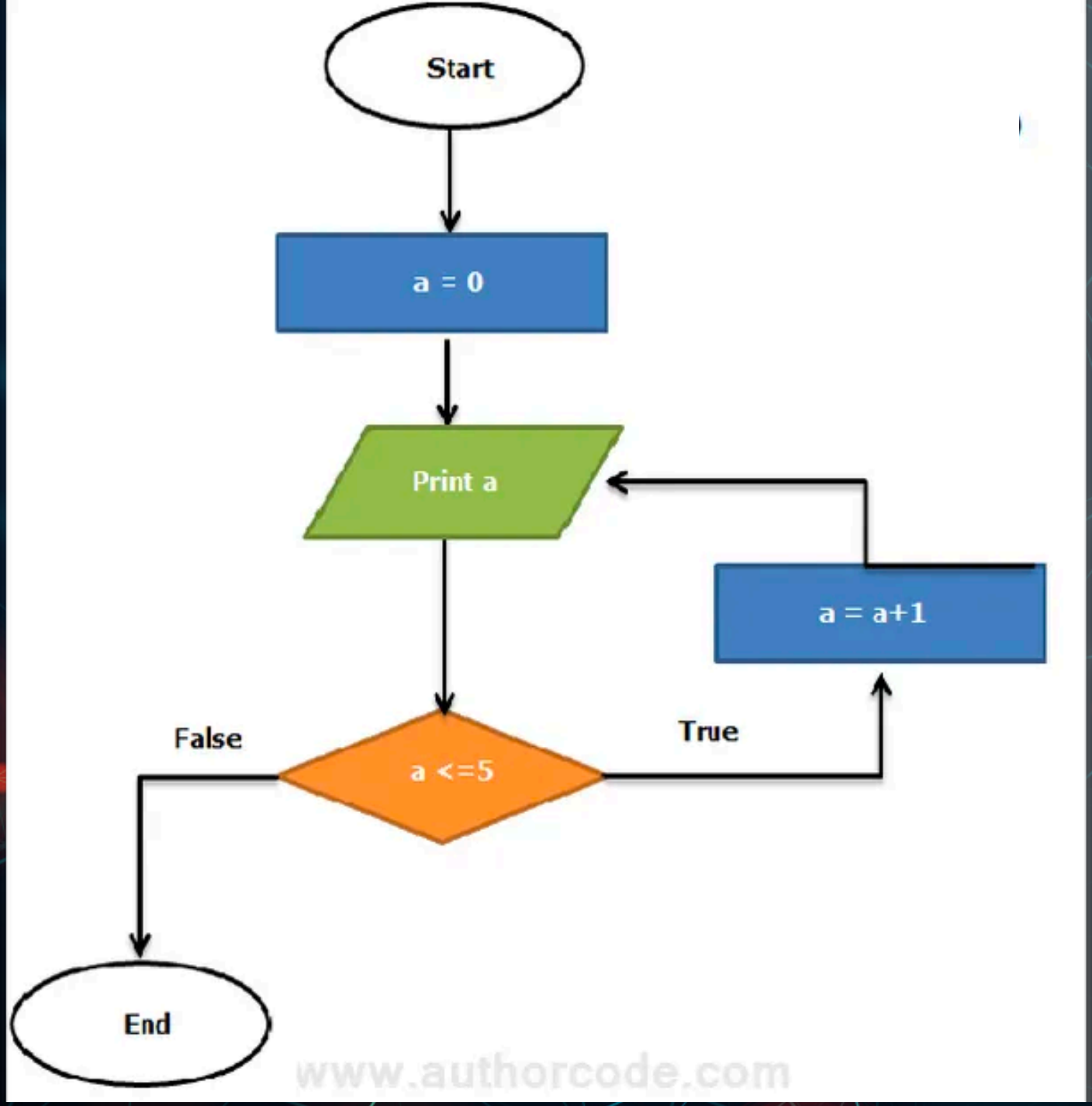
- Effective Communication
- Effective Analysis
- Easy Debugging and Efficient Testing
- Efficient Coding
- Proper Documentation
- Efficient Program Maintenance

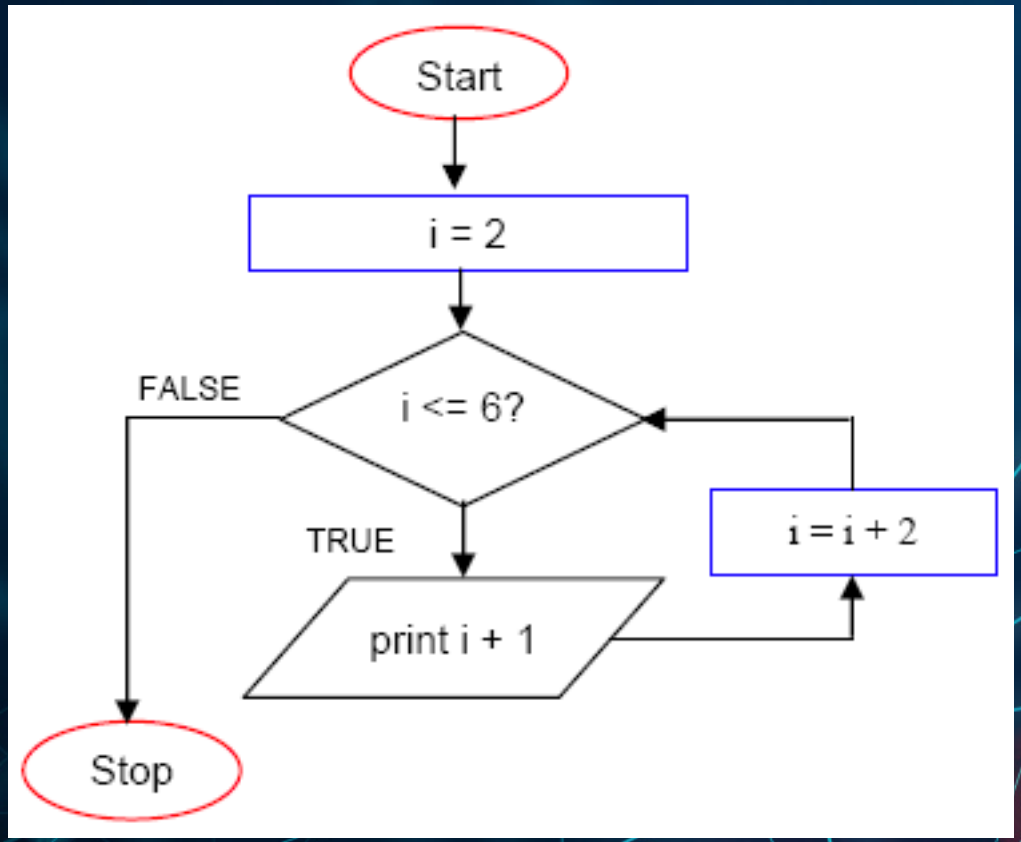
Source: https://www.codesansar.com/computer-basics/flowcharts.htm

Disadvantages of Flowcharts

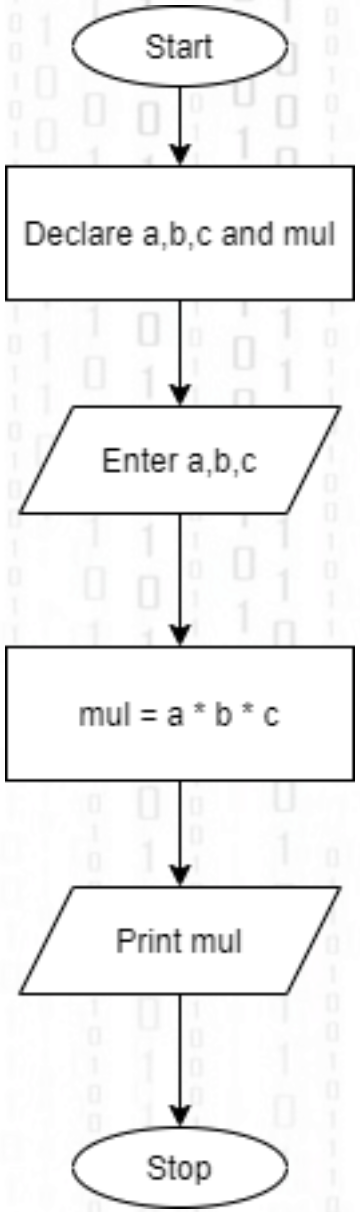
- Problem in case of Complex Logic
- Difficulty in Modifications

Source: https://www.codesansar.com/computer-basics/flowcharts.htm

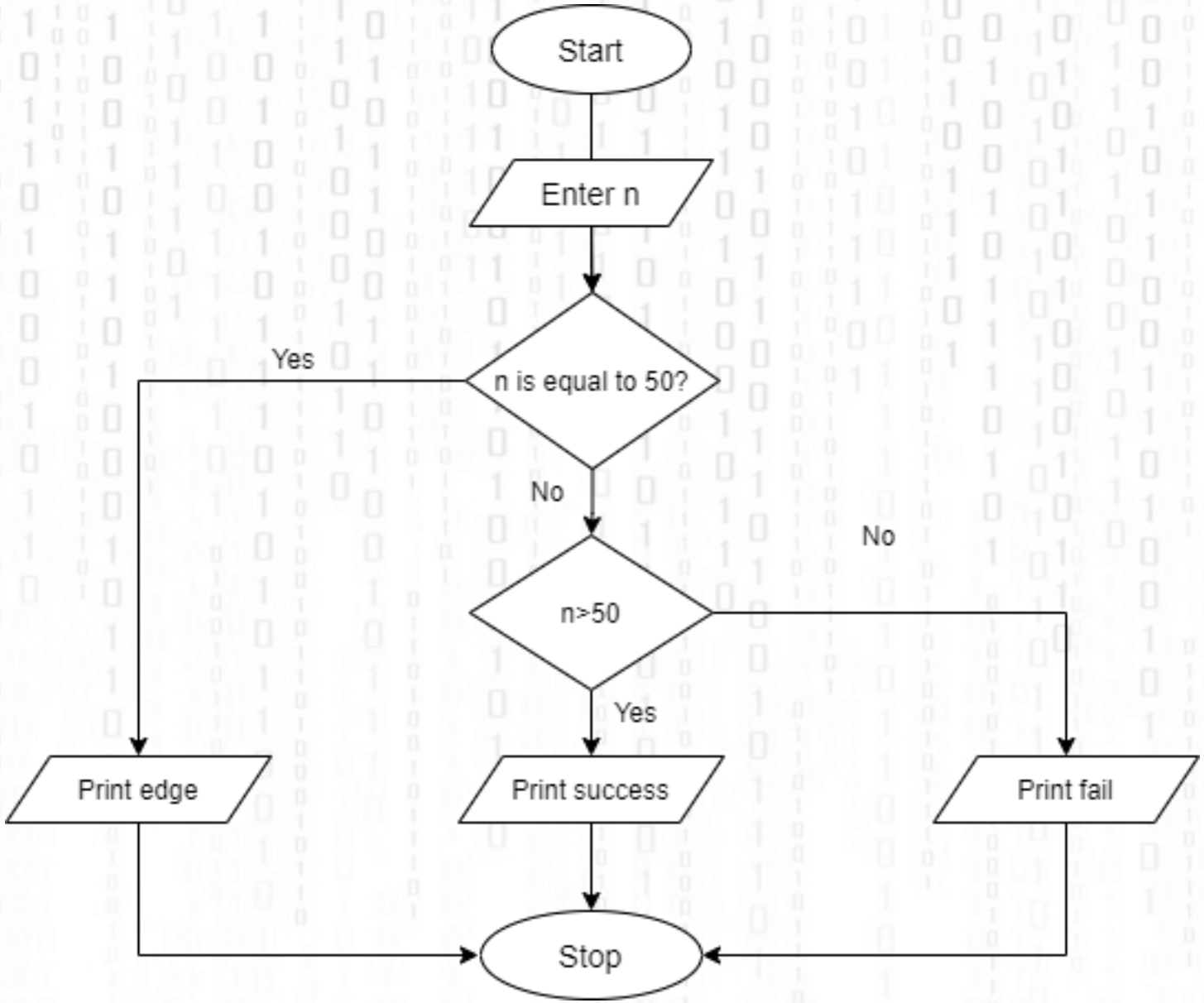




Multiplication of three numbers.



A number is given as input. If the number is greater than 50, print ‘success’. If the number is less than 50, print ‘fail’. If the number is equal to 50, print ‘edge’



Algorithm

It’s an organized logical sequence of the actions or the approach towards a particular problem. A programmer implements an algorithm to solve a problem. Algorithms are expressed using natural verbal but somewhat technical annotations.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

Pseudo code

It’s simply an implementation of an algorithm in the form of annotations and informative text written in plain English. It has no syntax like any of the programming language and thus can’t be compiled or interpreted by the computer.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

How to write a Pseudo-code?

- Arrange the sequence of tasks and write the pseudocode accordingly.

- Start with the statement of a pseudo code which establishes the main goal or the aim.
  Example :
  This program will allow the user to check the number whether it's even or odd.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

How to write a Pseudo-code?

- The way the if-else, for, while loops are indented in a program, indent the statements likewise, as it helps to comprehend the decision control and execution mechanism. They also improve the readability to a great extent.

Example:

```
if "1"
    print response
        "I am case 1"

if "2"
    print response
        "I am case 2"
```

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

How to write a Pseudo-code?

- Use appropriate naming conventions. The human tendency follows the approach to follow what we see. If a programmer goes through a pseudo code, his approach will be the same as per it, so the naming must be simple and distinct.

- Use appropriate sentence casings, such as CamelCase for methods, upper case for constants and lower case for variables.

- Elaborate everything which is going to happen in the actual code. Don’t make the pseudo code abstract.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

How to write a Pseudo-code?

- Use standard programming structures such as ‘if-then’, ‘for’, ‘while’, ‘cases’ the way we use it in programming.
- Check whether all the sections of a pseudo code is complete, finite and clear to understand and comprehend.
- Don’t write the pseudo code in a complete programmatic manner. It is necessary to be simple to understand even for a layman or client, hence don’t incorporate too many technical terms.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

Do's :

- Use control structures
- Use proper naming convention
- Indentation and white spaces are the key
- Keep it simple.
- Keep it concise.

Don'ts :

- Don't make the pseudo code abstract.
- Don't be too generalized.
-

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

Advantages of Pseudocode

- Improves the readability of any approach. It's one of the best approaches to start implementation of an algorithm.
- Acts as a bridge between the program and the algorithm or flowchart. Also works as a rough documentation, so the program of one developer can be understood easily when a pseudo code is written out. In industries, the approach of documentation is essential. And that's where a pseudo-code proves vital.
- The main goal of a pseudo code is to explain what exactly each line of a program should do, hence making the code construction phase easier for the programmer.

https://www.geeksforgeeks.org/how-to-write-a-pseudo-code/

Pseudo-code

- Variables:
- Assignment:

```
set = 5;
```

- Input/output:

Output – Write / display / print
Input – Read / get / input

- Selection:

```
if ( conditional statement)
        statement list
else
        statement list
```

Pseudo-code

- Repetition:

In a repetition problem

- Count is initialised
- Tested
- incremented

while (condition statement)

statement list

Pseudo-code Example

- Write pseudo code that reads two numbers and multiplies them together and print out their product.

PSEUDO-CODE	CODE
Read num1 , num2 Set multi to num1*num2 Write multi	int num1, num2, multi; cin>>num1>>num2; multi = num1 * num2; cout<<multi<<endl;

https://computersciencewiki.org/images/e/ea/Pseudo_Code_Practice_Problems.pdf

Pseudo-code Example

- Write pseudo code that tells a user that the number they entered is not a 5 or a 6.

PSEUDO-CODE	CODE

Read isfive
If(isfive = 5)
Write "your number is 5"
Else if (isfive = 6)
Write "your number is 6"
Else
Write "your number is not 5 or 6"
	int isfive;
	cin>> isfive;
	if(isfive == 5) {
	cout<<"your number is 5";
	} else if(isfive == 6) {
	cout<<"your number is 6";
	} else {
	cout<<"your number is not 5 or 6";
	}

Pseudo-code Example

- Write pseudo code that tells a user that the number they entered is not a 5 or a 6.

PSEUDO-CODE	CODE

Read isfive
If(isfive = 5 or isfive = 6)
Write "your number is a 5 or 6"
Else
Write "your number is not 5 or 6”
	int isfive;
	cin>> isfive;
	if(isfive == 5 ll isfive == 6) {
	cout<<"your number is 5 or 6";
	} else {
	cout<<"your number is not 5 or 6";
	}

Pseudo-code Example

- Write pseudo code that tells a user that the number they entered is not a 5 or a 6.

PSEUDO-CODE	CODE

Read isfive
If(isfive is not 5 and isfive is not 6)
Write "your number is not 5 or 6"
	int isfive;
	cin>> isfive;
	if(isfive != 5 && isfive != 6) {
	cout<<"your number is not 5 or 6";
	}

https://computersciencewiki.org/images/e/ea/Pseudo_Code_Practice_Problems.pdf

Pseudo-code Example

- Write pseudo code that performs the following: Ask a user to enter a number. If the number is between 0 and 10, write the word blue. If the number is between 10 and 20, write the word red. if the number is between 20 and 30, write the word green. If it is any other number, write that it is not a correct color option.

https://computersciencewiki.org/images/e/ea/Pseudo_Code_Practice_Problems.pdf

Pseudo-code Example

PSEUDO-CODE	CODE

Write "Please enter a number"
Read colornum
If (colornum >0 and colornum <= 10)
  Write blue
else If (colornum >10 and colornum <= 20)
  Write red
else If (colornum >20 and colornum <= 30)
  Write green
else
  Write "not a correct color option"
	int colornum;
	cout<<"Please enter a number"
	cin>> colornum;
	if(colornum > 0 && colornum <= 10) {
	  cout<<"blue";
	} else if(colornum > 10 && colornum <= 20) {
	  cout<<"red";
	} else if(colornum > 20 && colornum <= 30) {
	  cout<<“green";
	} else {
	  cout<<"not a correct color option"
	}

https://computersciencewiki.org/images/e/ea/Pseudo_Code_Practice_Problems.pdf

QUIZ