

Lecture 4

Pseudocode & Number System

قَالَ رَبِّ اشْرَحْ لِي صَدْرِي ۝
﴿٢٥﴾

[فَالَّذِي نَسِيَ كَهُولَ دَعَى رَبَّهُ أَشْرَحَ لَهُ مَنْ يَرَى لِي صَدْرِي مِيرَا سِينَهُ]

وَيَسِّرْ لِي آمْرِي ۝
﴿٢٦﴾

[وَيَسِّرْ لَهُ آمْرِي مِيرَا كَامَ لِي مِيرَا سِينَهُ]

وَاحْلُلْ عُقْدَةً مِنْ لِسَانِي ۝
﴿٢٧﴾

[وَاحْلُلْ لَهُ كَهُولَ دَعَى عُقْدَةً گَرَهَ مِنْ لِسَانِي مِيرَا زِبانَ سِينَهُ]

يَفْقَهُوا قَوْلِي ۝
﴿٢٨﴾

[يَفْقَهُوا وَهُوَ سِجْهَ سَكِينَ [قَوْلِي مِيرَا بَاتَ سِينَهُ]]

³ QUESTIONS / FEEDBACK / CONCERNS



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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.

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Step 2: Analyze the problem

Step 3: Develop a high-level algorithm.

Step 4: Refine the algorithm by adding more detail.

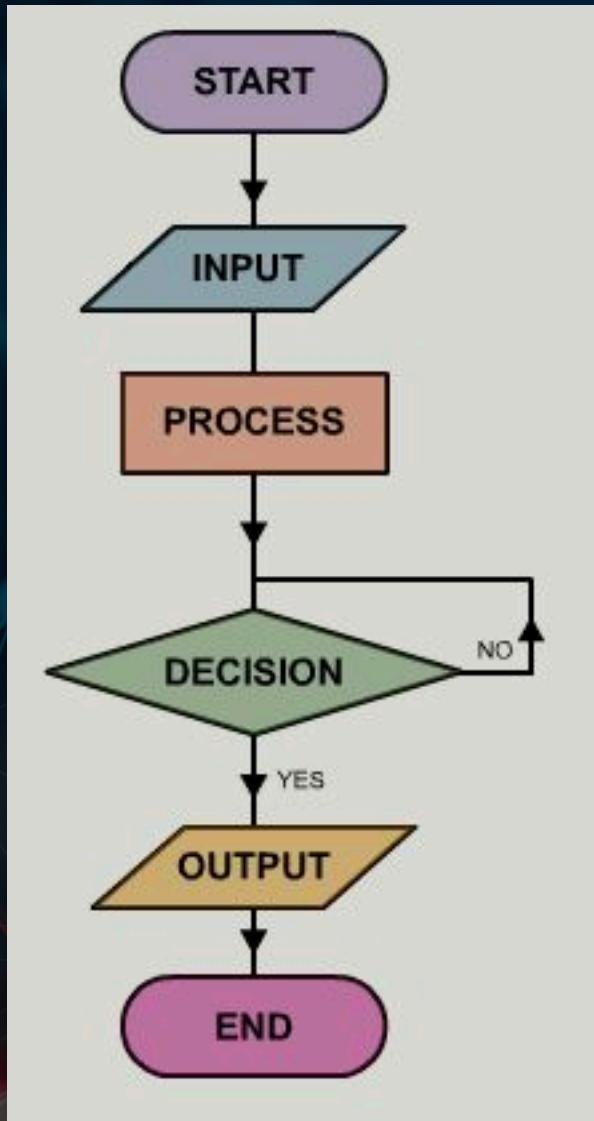
Step 1: Obtain a description of the problem.

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



TERMINALS (START / STOP)

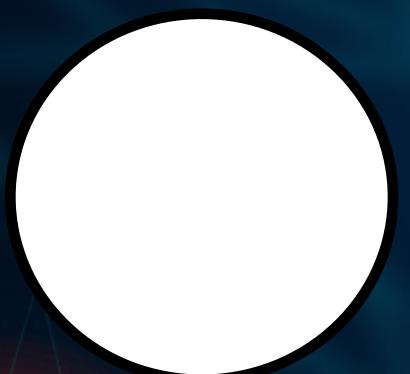
INPUT / OUTPUT



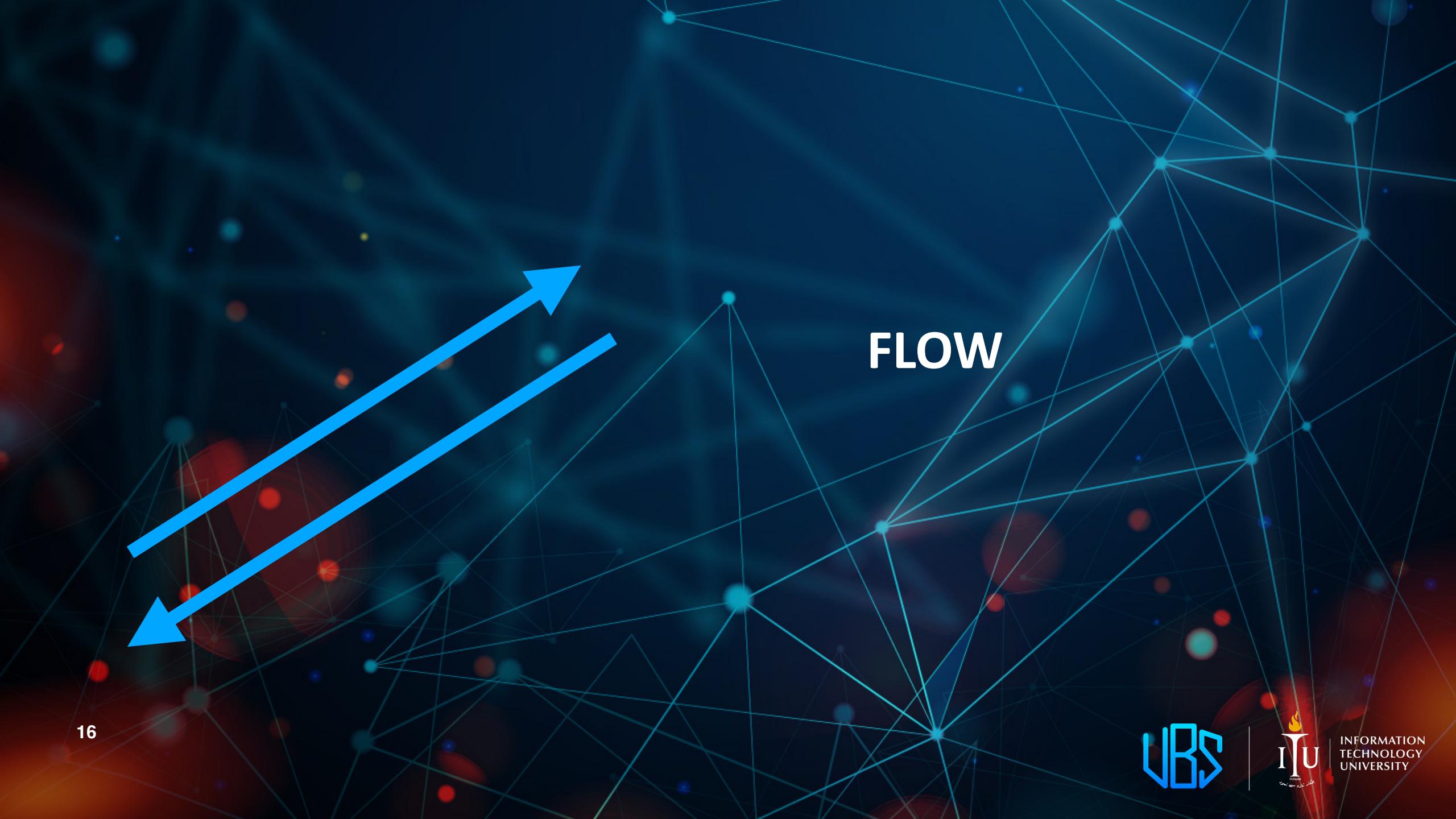
PROCESS



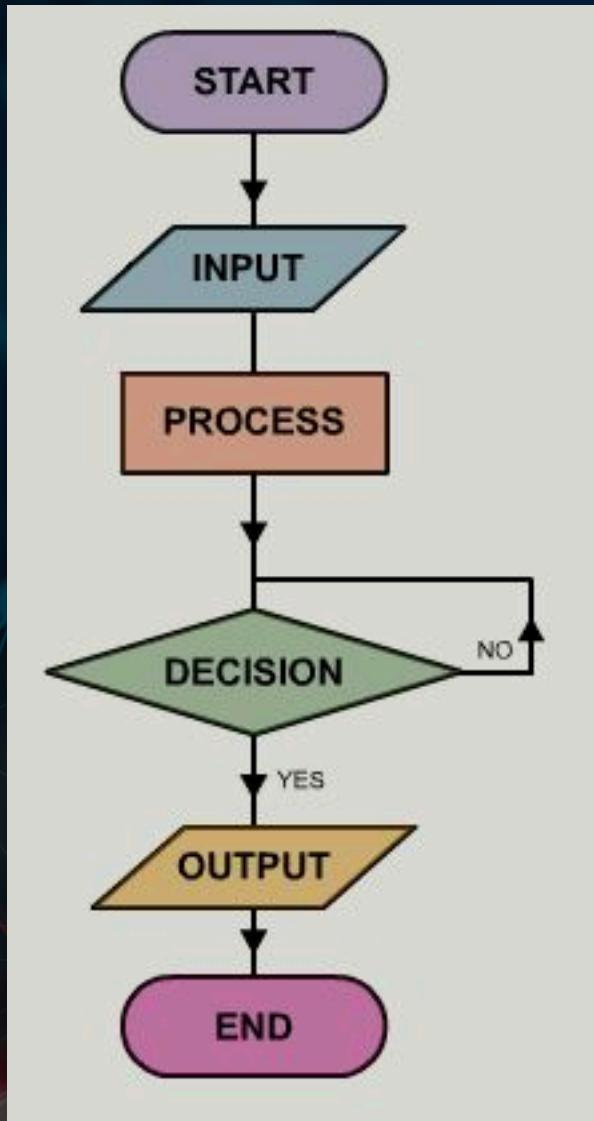
DECISION



CONNECTORS



FLOW



FLOWCHARTS

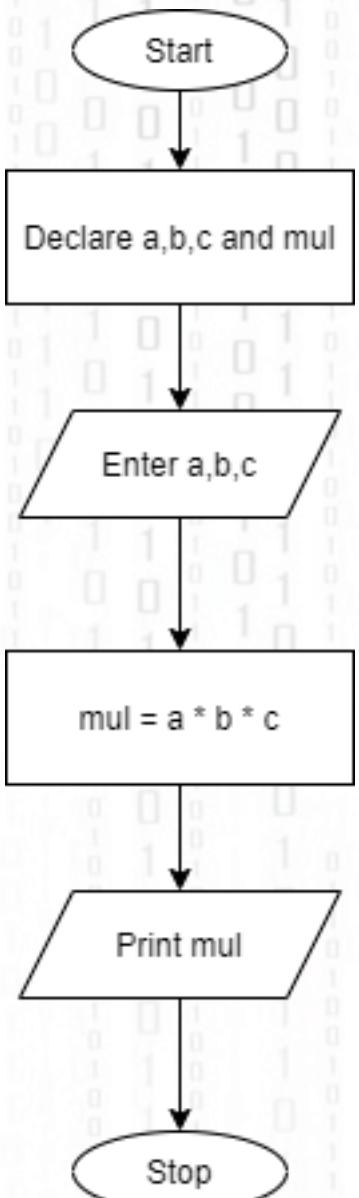
Advantages of Flowcharts

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

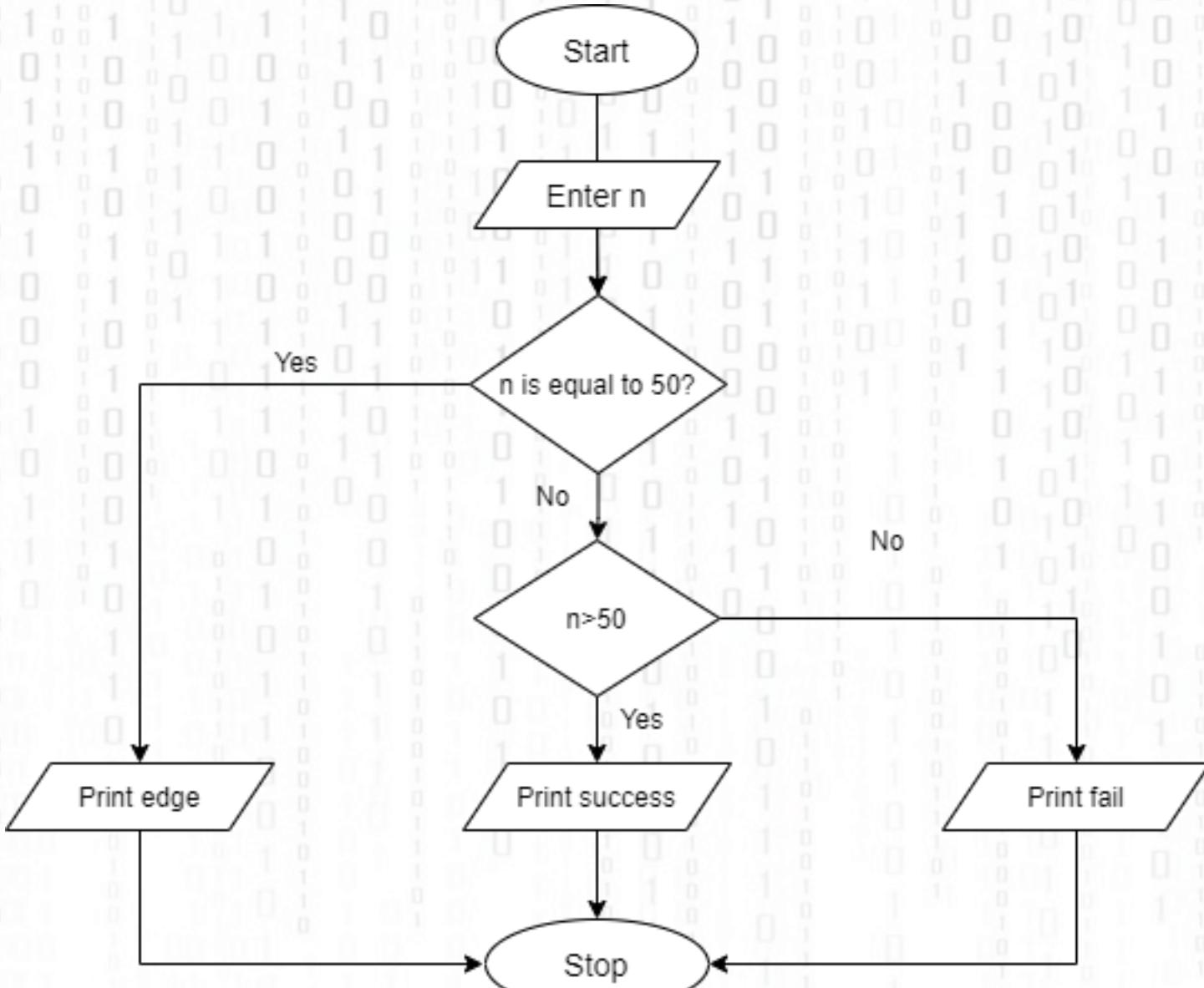
Disadvantages of Flowcharts

- Problem in case of Complex Logic
- Difficulty in Modifications

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.

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.

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.

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"
```

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.

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.

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.
-

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.

Pseudo-code

- Variables:
- Assignment:
- Input/output:
- Selection:

set = 5;

Output – Write / display / print

Input – Read / get / input

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

Read num1 , num2
Set multi to num1*num2
Write multi

CODE

```
int num1, num2, multi;  
cin>>num1>>num2;  
multi = num1 * num2;  
cout<<multi<<endl;
```

Pseudo-code Example

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

PSEUDO-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"
```

CODE

```
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

```
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"
```

CODE

```
int isfive;
cin>> isfive;
if(isfive == 5 || 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

```
Read isfive  
If(isfive is not 5 and isfive is not 6)  
    Write "your number is not 5 or 6"
```

CODE

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

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.

Pseudo-code Example

PSEUDO-CODE

Write "Please enter a number"

Read colordnum

If (colordnum >0 and colordnum <= 10)

 Write blue

else If (colordnum >10 and colordnum <= 20)

 Write red

else If (colordnum >20 and colordnum <= 30)

 Write green

else

 Write "not a correct color option"

CODE

```
int colordnum;  
cout<<"Please enter a number"  
cin>> colordnum;  
if(colordnum > 0 && colordnum <= 10) {  
    cout<<"blue";  
} else if(colordnum > 10 && colordnum <= 20) {  
    cout<<"red";  
} else if(colordnum > 20 && colordnum <= 30) {  
    cout<<"green";  
} else {  
    cout<<"not a correct color option"  
}
```

110

40



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NUMBER SYSTEMS



110_{10}

10

Decimal



1×10^2

110

0×10^0

1×10^1

2347

- As you saw, there are 2 groups of a thousand. Not coincidentally, $1000 = 10 \cdot 10 \cdot 10$, which can also be written as 10^3 .
- There are 3 groups of a hundred. Again, not coincidentally, $100 = 10 \cdot 10$ or 10^2 .
- There are 4 groups of ten, and, $10 = 10^1$.
- Finally, there are 7 groups of one, and $1 = 10^0$. (That may seem strange, but any number to the power of 0 equals 1, by definition.)

$$892 = 8*10^2 + 9*10^1 + 2*10^0$$

$$1147 = 1*10^3 + 1*10^2 + 4*10^1 + 7*10^0$$

$$53 = 5*10^1 + 3*10^0$$

Numbers System	Base
Binary	2
Octal	8
Decimal	10
Hexadecimal	16

8

Octal

8

Octal

only eight digits: 0, 1, 2, 3, 4, 5, 6, and 7

110_8







$$110_8 = 72_{10}$$

778

John offers to give you 47_8 cookies, and Jane offers to give you 43_{10} cookies. Whose offer do you take?

77 10

77₁₀

? x 8²

? x 8⁰

? x 8¹

$(77-64)_{10}$ 13_{10} 1×8^2 $? \times 8^0$ $? \times 8^1$

$(77-64-8)_{10}$

5_{10}

1×8^2

$? \times 8^0$

1×8^1

$(77-64-8-5)_{10}$ 0_{10}



2

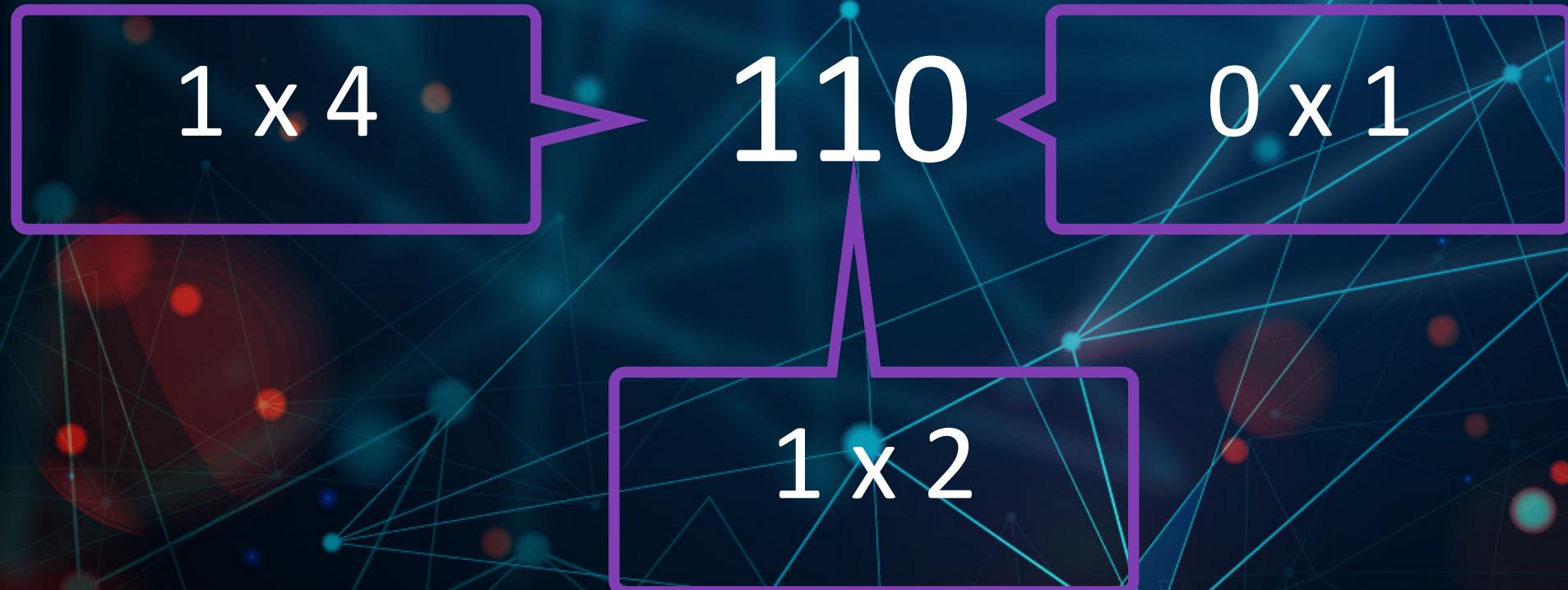
Binary

2

Binary

only two digits: 0, and 1

110_2







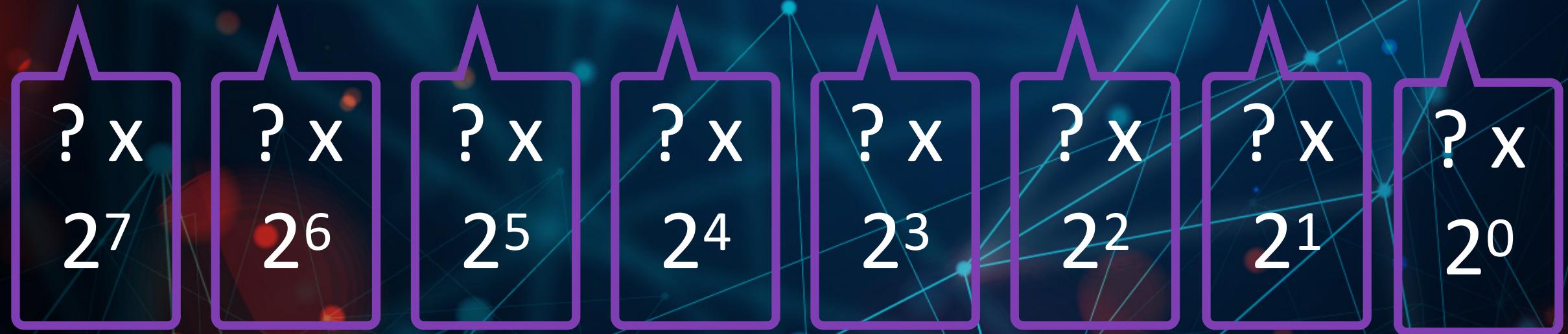
$$110_2 = 6_{10}$$

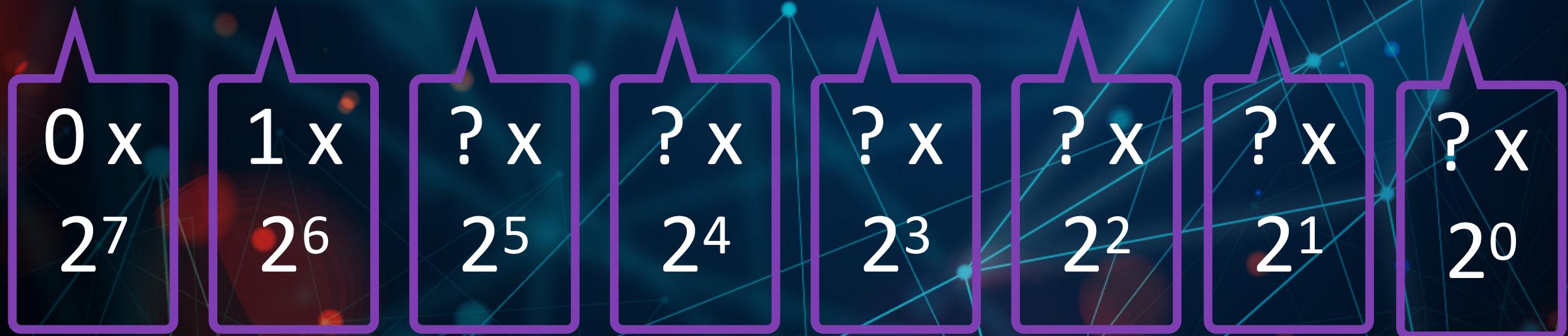
1111₂

77 10

71

77 10



$(77-64)_{10}$ 13_{10} 

$(77-64-8)_{10}$

5_{10}



$(77-64-8-4)_{10}$

1_{10}



$(77-64-8-4-1)_{10}$

0_{10}



$01001101_2 = 77_{10}$

16

Hexadecimal

16

Hexadecimal

only sixteen digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

110₁₆

80



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$$110_{16} = 272_{10}$$

RECAP

GitHub

Tools (Cygwin, IDE, GitHub)

Flowcharts

Algorithms

Approach towards a word problem

Pseudocode

Flowcharts Advantages & Disadvantages

Numbers Systems (Decimal, Binary, Octal & Hexadecimal)



QUIZ