Flow Chart and Pseudo Code

Data Structure : FLOWCHARTS

The American National Standards Institute (ANSI) set standards for flowcharts and their symbols in the 1960s.

The International Organization for Standardization (ISO) adopted the ANSI symbols in 1970.

The current standard, ISO 5807, was revised in 1985.

Generally, flowcharts flow from top to bottom and left to right.

Data Structure : FLOWCHARTS

What is a Flowchart?

A flowchart is a graphical representations of steps of an Algorithm and programming logic

Flowchart Symbols

Terminator

The terminator symbol represents the starting or ending point of the system.

Process

A box indicates some particular operation.

Data Structure : FLOWCHARTS

Document

This represents a printout, such as a document or a report.

Decision

A diamond represents a decision or branching point. Lines coming out from the diamond indicates different possible situations, leading to different sub-processes.

Data

It represents information entering or leaving the system. An input might be an order from a customer. Output can be a product to be delivered.

Flow

Lines represent the flow of the sequence and direction of a process.

Data Structure : FLOWCHARTS

On-Page Reference

This symbol would contain a letter inside. It indicates that the flow continues on a matching symbol containing the same letter somewhere else on the same page.

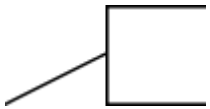
Off-Page Reference

This symbol would contain a letter inside. It indicates that the flow continues on a matching symbol containing the same letter somewhere else on a different page.

Delay or Bottleneck

Identifies a delay or a bottleneck.

Data Structure : FLOWCHARTS

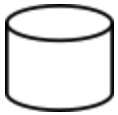


Annotation

Indicating additional information about a step in the program. Represented as an open rectangle with a dashed or solid line connecting it to the corresponding symbol in the flowchart

Predefined Process

Shows named process which is defined elsewhere. Represented as a rectangle with double-struck vertical edges



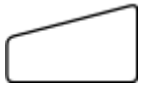
Data File or Database

Single documents

Multiple documents

Data Structure : FLOWCHARTS

Manual operation

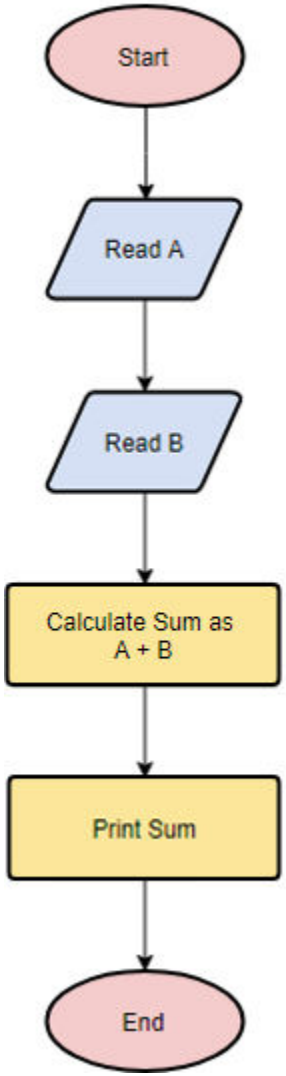


Manual input

Preparation or Initialization

Data Structure : FLOWCHARTS

Find the sum of 529 and 256



Start

A = 529

B = 256

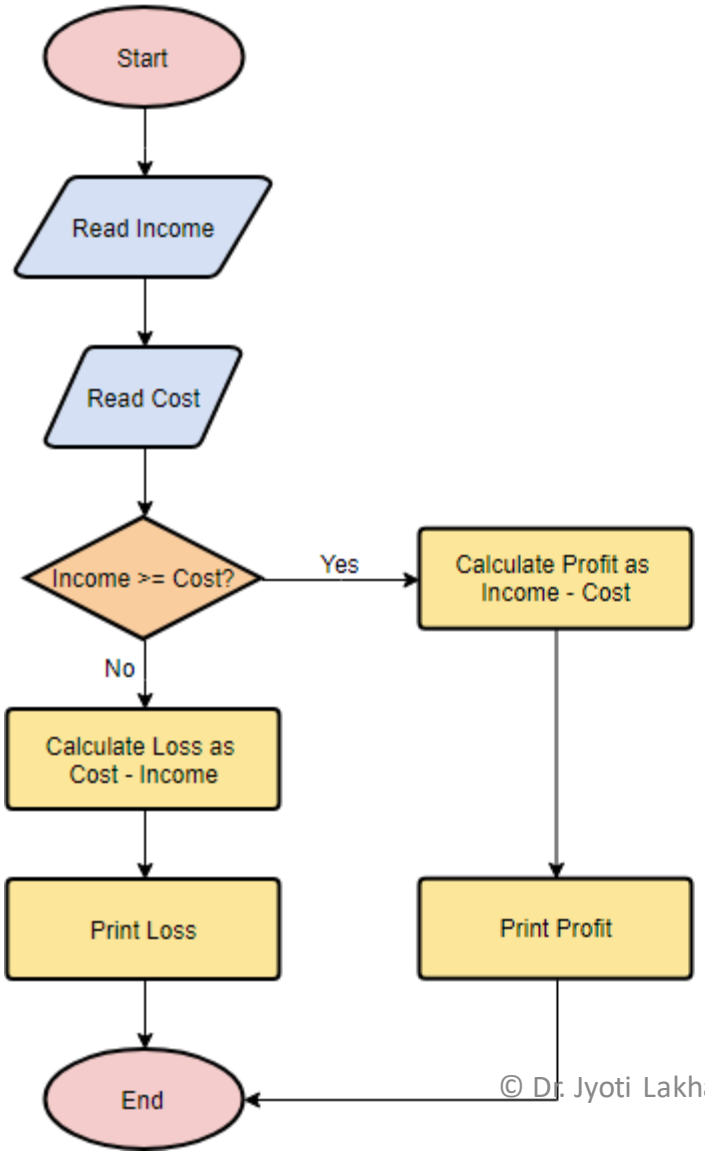
Sum = 529 + 256

Sum = 785

End

Data Structure : FLOWCHARTS

Calculate Profit and Loss



Find the profit/loss when income = 1,000, cost = 800

Start

Income = 1,000

Cost = 800

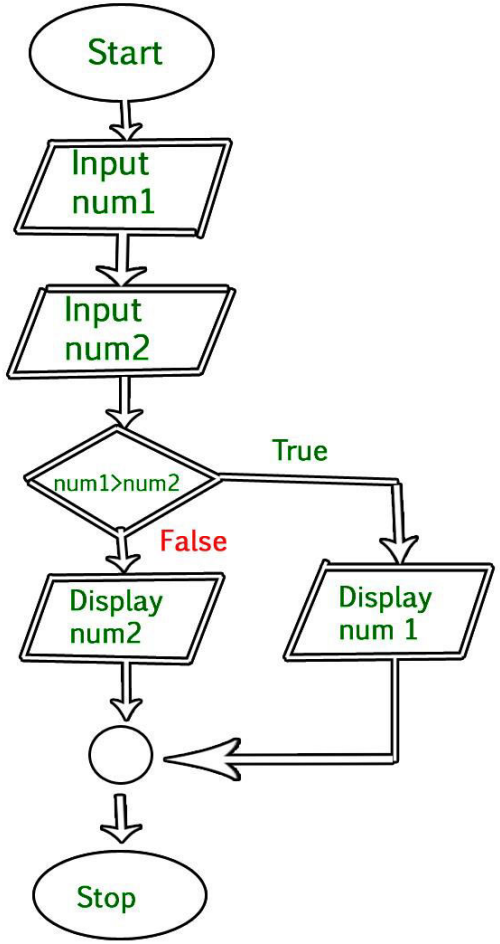
1,000 > 800? (Yes) Profit = 1,000 - 800

Profit = 200

End

Data Structure : FLOWCHARTS

Draw a flowchart to input two numbers from user and display the largest of two numbers



Data Structure : FLOWCHARTS

Download, Install and Practice

http://flowgorithm.org/download/index.htm

Data Structure : ALGORITHMS

An example of Algorithm

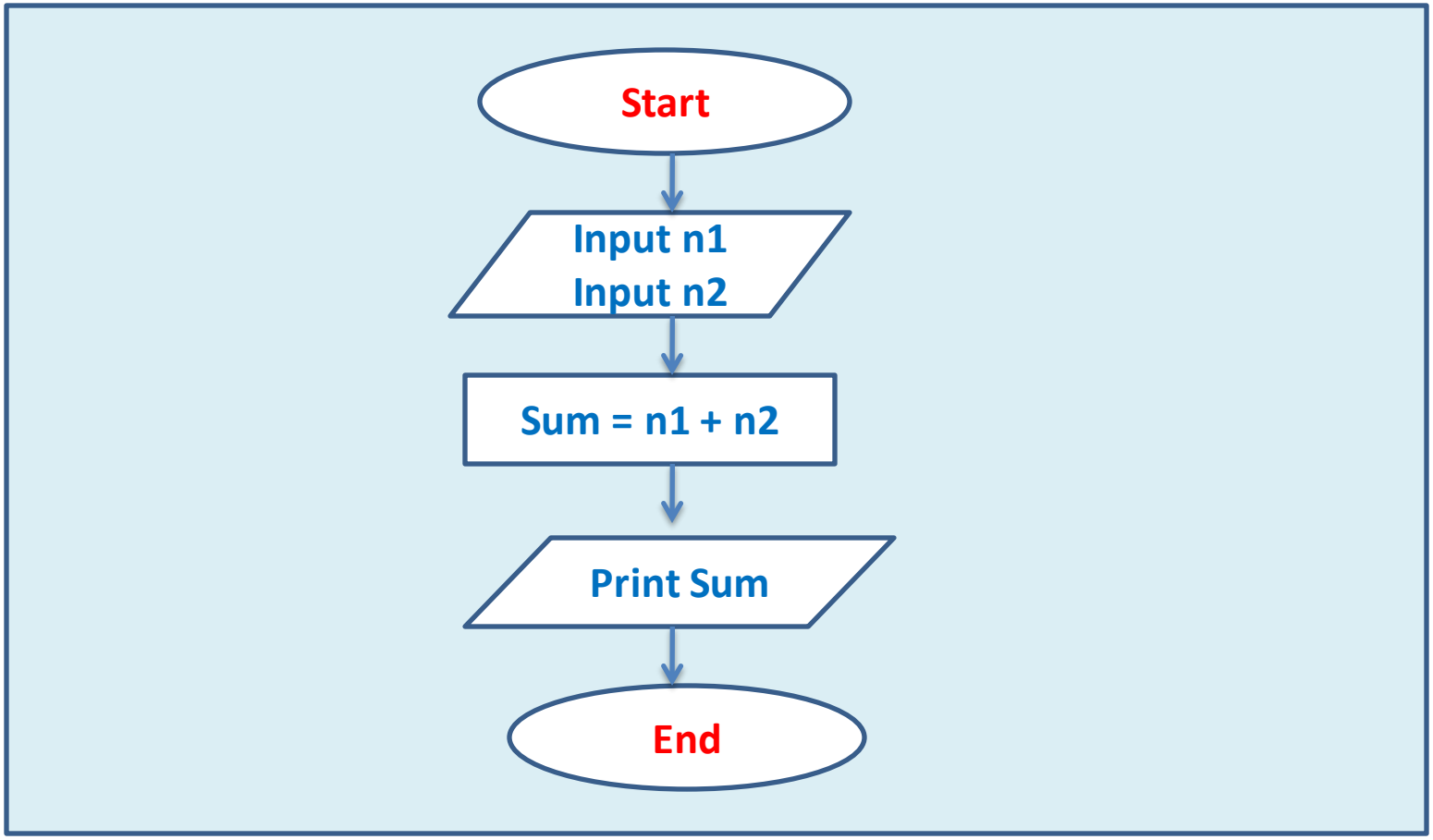
Algorithm to add two numeric values

1. Declare two variables n1 and n2
2. Read values in n1 and n2
3. Declare one more variable sum
4. Add n1 and n2 and assign result in sum
5. Print sum

General English

Data Structure : ALGORITHMS

Algorithm to add two numeric values



Flow Chart Implementation

Data Structure : ALGORITHMS

Algorithm to add two numeric values

Algorithm Name: Add_Numbers (n1, n2)
Input: Two integers n1 and n2
Output: sum of n1 and n2

```
Start
1. sum <- n1 + n2
2. Print sum
End
```

Pseudo Code Implementation

Data Structure : Pseudo Code

WHY? Algorithms will often be expressed in pseudo code

WHAT? A mixture of code and English

Pseudo code is a simple way of writing programming code in English

Pseudo code is simply an implementation of an algorithm in the form of annotations and informative text written in plain English.

Pseudo code is not actual programming language

It has no syntax like any of the programming language and thus can't be compiled or interpreted by the computer.

"While understanding pseudo code is usually not difficult, writing it can be a challenge"

Data Structure : Pseudo Code

Why use pseudo code at all?

If we write an algorithm in English,

the description may be at so high a level that it is difficult to analyze the algorithm and to transform it into code.

If instead we write the algorithm in code,

we have invested a lot of time in determining the details of an algorithm we may not choose to implement?

The GOAL of writing pseudo code, then, is

to provide a high-level description of an algorithm which *facilitates analysis* and *eventual coding*

but at the same time *suppresses many of the details* that vanish with asymptotic notation

Why use pseudo code at all?

It allows the designer to focus on the logic of the algorithm without being distracted by details of language syntax.

It describe the entire logic of the algorithm so that implementation becomes a rote mechanical task of translating line by line into source code.

Data Structure : Pseudo Code

Here are a few general guidelines for checking your pseudo code:

-Naomi Nishimura

1. Mimic good code and good English:

It is still important that variable names be mnemonic, comments be included where useful, and English phrases be comprehensible (full sentences are usually not necessary).

2. Ignore unnecessary details:

you shouldn't obsess about syntax at all

3. Arrange the sequence of tasks and write the pseudo code accordingly

4. Aim of the algorithm:

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.
```

5. Proper Indentation:

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"
```

Example:

```
if "1"
        print response "I am case 1"
if "2"
        print response "I am case 2".
```

5. Don't be labor the obvious:

In many cases, the type of a variable is clear from context; it is often unnecessary to make it explicit.

6. Take advantage of programming short-hands:

Using if-then-else or looping structures is more concise than writing out the equivalent in English;

Using parameters in specifying procedures is concise, clear, and accurate, and hence should not be omitted from pseudo code.

7. 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.

Data Structure : Pseudo Code

8. Use appropriate Naming Convention:

such as Camel Case for methods, upper case for constants and lower case for variables.

9. Elaborate everything which is going to happen in the actual code:

Don't make the pseudo code abstract

10. Use standard programming structures

such as 'if-then', 'for', 'while', 'cases' the way we use it in programming

11. Check whether all the sections of a pseudo code is complete, finite and clear to understand and comprehend

12. 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.

Advantages of Pseudo code

1. Improves the readability of any approach. It's one of the best approaches to start implementation of an algorithm

2. Acts as a bridge between the program and the algorithm or flowchart

3. 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

4. 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

Data Structure : Pseudo Code

No broad standard for pseudo code syntax exists, as a program in pseudocode is not an executable program, however certain limited standards exist

Pseudo code resembles skeleton programs which can be compiled without errors.

Flowcharts,
drakon-charts and
Unified Modelling Language (UML) charts can be thought of as a graphical alternative to pseudo code, but are more spacious on paper.

Languages such as HAGGIS bridge the gap between pseudo code and code written in programming languages.

- Wiki

Data Structure : Pseudo Code

Some Conventions to write Pseudo Code

Type of operation	Symbol	Example
Assignment	← or :=	$c \leftarrow 2\pi r$, $c := 2\pi r$
Comparison	=, ≠, <, >, ≤, ≥	
Arithmetic	+, −, ×, /, mod	
Floor/ceiling	⌊, ⌋, ⌈, ⌉	$a \leftarrow \lfloor b \rfloor + \lceil c \rceil$
Logical	and, or	
Sums, products	Σ Π	$h \leftarrow \Sigma_{a \in A} 1/a$

- Wiki

Data Structure : Pseudo Code

Action Words

Common Action Keywords:

Input:	**READ**
	OBTAIN
	GET
Output:	
	PRINT
	DISPLAY
	SHOW
Compute:	
	COMPUTE
	CALCULATE
	DETERMINE
Initialize:	
	SET
	INIT
Add one:	
	INCREMENT
	BUMP

Data Structure : Pseudo Code

IF-THEN-ELSE

The general form is:

```
IF condition THEN
        sequence 1
ELSE
        sequence 2
ENDIF
```

Example:

```
IF HoursWorked > NormalMax THEN
        Display overtime message
ELSE
        Display regular time message
ENDIF
```

WHILE

The general form is:

```
WHILE condition
        sequence
ENDWHILE
```

The loop is entered only if the condition is true.

```
WHILE Population < LimitCompute
        Population as Population + Births – Deaths
ENDWHILE
```

CASE

The general form is:

```
CASE expression OF
        condition 1 :
                sequence 1
        condition 2 :
                sequence 2
        ...
        condition n :
                sequence n
        OTHERS:
        default sequence
ENDCASE
```

```
CASE  grade  OF
        A     :
                points = 4
        B     :
                points = 3
        C     :
                points = 2
        D     :
                points = 1
        OTHERS  :
                points =  5
ENDCASE
```

FOR

The general form is:

```
FOR iteration bounds
        sequence
ENDFOR
```

Example:

```
FOR each month of the year (good)
FOR month = 1 to 12 (ok)
```

```
FOR each employee in the list (good)
FOR empno = 1 to listsize (ok)
```

REPEAT-UNTIL

The general form is:

```
REPEAT
        sequence
UNTIL condition
```

NESTED CONSTRUCTS

Example:

```
SET total to zero
REPEAT
    READ Temperature
    IF Temperature > Freezing THEN
            INCREMENT total
    END IF
UNTIL Temperature < zero
```

INVOKING SUBPROCEDURES

Use the **CALL** keyword.
For example:

```
CALL AvgAge with StudentAges
CALL Swap (CurrentItem, TargetItem)

CALL getBalance RETURNING aBalance
```

EXCEPTION HANDLING

```
BEGIN
   statements
EXCEPTION
   WHEN exception type
      statements to handle exception
   WHEN another exception type
      statements to handle exception
END
```