Class Notes

Published Date: November, 2022

PPS: UNIT-1

Idea of Algorithm

FALL SEMESTER, YEAR (I/II sem, 1st yr)

FALL SESSION (2022-23)
(PPS)
MS. SHWETA TIWARI
Published Date: November, 2022

Shweta Tiwari

shwetatiwari08@recabn.ac.in
shwetatiwari08aug@gmail.com

TOPIC On : UNIT-1: Pseudocode. With Examples

By SHWETA TIWARI

Under On: Idea of Algorithm

PREPARED FOR
Engineering Students
All Engineering College

PREPARED BY
SHWETA TIWARI

TOPIC On : UNIT-1: What is Pseudocode? With Examples

Pseudocode is a compact and informal high-level description of a program using the conventions of a programming language, but intended more for humans. Pseudocode is not an actual programming language. So it cannot be compiled into an executable program. It uses short terms or simple English language syntaxes to write code for programs before it is actually converted into a specific programming language.
And there is no pseudocode standard syntax and so at times it becomes slightly confusing when writing Pseudocode and so let us understand pseudo code with an example.
And there is no pseudocode standard syntax and so at times it becomes slightly confusing when writing Pseudocode and so let us understand pseudo code with an example

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 pseudocode 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.

How to write a Pseudo-code?

1. Arrange the sequence of tasks and write the pseudocode accordingly.
2. Start with the statement of a pseudo code which establishes the main goal or the aim.
3. 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.
4. 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.
5. Use appropriate sentence casings, such as CamelCase for methods, upper case for constants and lower case for variables.
6. Elaborate everything which is going to happen in the actual code. Don't make the pseudo code abstract.
7. Use standard programming structures such as 'if-then', 'for', 'while', 'cases' the way we use it in programming.
8. Check whether all the sections of a pseudo code is complete, finite and clear to understand and comprehend.
9. 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.

Pseudocode, on the other hand, is a newer tool and has features that make it more reflective of the structured concepts. Unfortunately, the narrative presentation is not as easy to understand and follow.

RULES FOR PSEUDOCODE

1. Write only one stmt per line

Each stmt in your pseudocode should express just one action for the computer. If the task list is properly drawn, then in most cases each task will correspond to one line of pseudocode.

EX: TASK LIST:

```
Read name, hourly rate, hours worked,
deduction rate Perform calculations
    gross = hourlyRate *
    hoursWorked deduction =
    grossPay * deductionRate
    net pay = grossPay –
    deduction

Write name, gross, deduction, net pay
```

PSEUDOCODE:

```
READ name, hourlyRate, hoursWorked,
deductionRate grossPay = hourlyRate *
hoursWorked
deduction = grossPay *
deductionRate netPay =
grossPay – deduction

WRITE name, grossPay, deduction, netPay
```

2. Capitalize initial keyword

In the example above, **READ** and **WRITE** are in caps. There are just a few keywords we will use:

READ, WRITE, IF, ELSE, ENDIF, WHILE, ENDWHILE, REPEAT, UNTIL

3. Indent to show hierarchy

We will use a particular indentation pattern in each of the design structures:

SEQUENCE: keep statements that are “stacked” in sequence all starting in the same column.

SELECTION: indent the statements that fall inside the selection structure, but not the keywords that form the selection

LOOPING: indent the statements that fall inside the loop, but not the keywords that form the loop

EX: In the example above, employees whose *grossPay* is less than 100 do not have any deduction.

```
TASK LIST:

Read name, hourly rate, hours worked,
deduction rate Compute gross, deduction,
net pay

    Is gross >= 100?

        YES: calculate
        deduction
```

NO: no
deduction

Write name, gross, deduction, net pay

```
        PSEUDOCODE:
        READ name, hourlyRate,
        hoursWorked grossPay =
        hourlyRate * hoursWorked
        IF grossPay >= 100

            deduction = grossPay * deductionRate

        ELSE

        ENDIF

deduction = 0

        netPay = grossPay – deduction

        WRITE name, grossPay, deduction, netPay
```

4. <u>End multiline structures</u>

See how the IF/ELSE/ENDIF is constructed above. The ENDIF (or END whatever) always is in line with the IF (or whatever starts the structure).

5. <u>Keep stmts language independent</u>

Resist the urge to write in whatever language you are most comfortable with. In the long run, you will save time! There may be special features available in the language you plan to eventually write the program in; if you are SURE it will be written in that language, then you can use the features. If not, then avoid using the special features.

And there is no pseudocode standard syntax and so at times it becomes slightly confusing when writing Pseudocode and so let us understand pseudo code with an example.

- **INPUT** – indicates a user will be inputting something
- **OUTPUT** – indicates that an output will appear on the screen
- **WHILE** – a loop (iteration that has a condition at the beginning)
- **FOR** – a counting loop (iteration)
- **REPEAT – UNTIL** – a loop (iteration) that has a condition at the end
- **IF – THEN – ELSE** – a decision (selection) in which a choice is made
- any instructions that occur inside a selection or iteration are usually indented

Some Keywords That Should be Used

For looping and selection, The keywords that are to be used include

- Do While...EndDo;
- Do Until...Enddo;
- Case...EndCase;
- If...Endif;
- Call ... with (parameters);
- Call; Return ....; Return;
- When;

Always use scope terminators for loops and iteration.As verbs, use the words

- Generate,
- Compute,
- Process, etc.

Words such as

- set,
- reset,
- increment,
- compute,
- calculate,
- add,
- sum,
- multiply,

- ... print,
- display,
- input,
- output,
- edit,
- test , etc.

with careful indentation tends to foster desirable pseudocode.

Do not include data declarations in your pseudocode.

Pseudocode Examples (Algorithms Examples in Pseudocode)

Pseudocode Example 1: Add Two Numbers.**(Simple Pseudocode Example)**

```

BEGIN
NUMBER s1, s2, sum
OUTPUT("Input number1:")
INPUT s1
OUTPUT("Input number2:")
INPUT s2
sum=s1+s2
OUTPUT sum
END

```

Pseudocode Example 2: Calculate Area and Perimeter of Rectangle **(Simple Pseudocode Example)**

```

BEGIN
NUMBER b1,b2,area,perimeter
INPUT b1
```

```
UNPUT b2
area=b1*b2
perimeter=2*(b1+b2)
OUTPUT alan
OUTPUT perimeter
END
```

Pseudocode Example 3: Find Area and Perimeter of a Square (**Simple Pseudocode Example**)

```
BEGIN
NUMBER len, area,perimeter
INPUT len
area = len*len
perimeter = len*4
OUTPUT area
OUTPUT perimeter
END
```

Pseudocode Example 4: Find Area Of Circle using Radius **(Simple Pseudocode Example)**

```
BEGIN
NUMBER r, area
INPUT r
area=3.14*r*r
OUTPUT area
END
```

Pseudocode Example 5: Find Perimeter Of Circle using Radius **(Simple Pseudocode Example)**

```
BEGIN
NUMBER r, perimeter
INPUT r
perimeter=2*3.14*r
OUTPUT perimeter
END
```

Pseudocode Example 6: Calculate sales taxes **(Simple Pseudocode Example)**

```

BEGIN
NUMBER price, tax, taxRate, total

OUTPUT "Enter Product Price"
INPUT price
OUTPUT "Enter tax rate amoung 1 and 100"
OKU taxRate

tax= price* taxRate/100
total= price + tax

OUTPUT "Product tax="+tax
OUTPUT "Product total price ="+total

END

```

$$ax^2 + bx + c = 0$$

Pseudocode Example 7: Solve Quadratic Equation (**Pseudocode If Else Example)**

```
BEGIN
NUMBER a, b, c, d, x1, x2
INPUT a,b,c
d = b^2-4ac
IF (d >= 0) THEN
    x1 = (-b+√d)/2a yada x1 = (-b+d^(1/2)/2a
    x2 = (-b-√d)/2a yada x2 = (-b-d^(1/2)/2a
    OUTPUT "ROOT 1:"+x1
    OUTPUT "ROOT 2:"+x2
ELSE IF (d == 0) THEN
    x1=x2= -b/2a
    OUTPUT "ROOT 1:"+x1
    OUTPUT "ROOT 2:"+x2
ELSE
  OUTPUT "There is no real root"
ENDIF
END
```

Pseudocode Example 8: issue for driver licence (**Pseudocode If Else Example)**

```

BEGIN
NUMBER age

INPUT "Enter your age for driving licence"
OUTPUT age

IF age>=16  THEN
        OUTPUT "You can take driving licence"
ELSE
  OUTPUT "You can't take driving licence"
ENDIF
END
```

Pseudocode Example 9: Check a Number is Positive or Negative (**Pseudocode If Else Example)**

```

BEGIN

NUMBER num

OUTPUT "Enter a Number"
OKU num
IF num>0  THEN
        OUTPUT "Entered number is positive"
ELSE IF num <0 THEN
        OUTPUT "Entered number is negative"
ELSE
        OUTPUT "Entered number is zero"
ENDIF

END


```

Pseudocode Example 10: Find the biggest of three (3) Numbers (**Pseudocode If Else Example)**

```

BEGIN
NUMBER num1,num2,num3
INPUT num1
INPUT num2
INPUT num3
IF num1>num2 AND num1>num3  THEN
        OUTPUT num1+ "is higher"
ELSE IF num2 > num3 THEN
        OUTPUT num2 + "is higher"
ELSE
        OUTPUT num3+ "is higher"
ENDIF
END
```

Pseudocode Example 11: Print Numbers from 1 to 100. (**Pseudocode For Loop Example)**

```

BEGIN
NUMBER counter

FOR  counter = 1 TO  100 STEP 1 DO
        OUTPUT counter
ENDFOR

END

```

Pseudocode Example 12: Find Sum of Natural Numbers (1 to 100). (**Pseudocode For Loop Example)**

```

BEGIN
NUMBER counter, sum=0
FOR counter=1 TO 100 STEP 1 DO
        sum=sum+counter
ENDFOR
```

```
OUTPUT sum
END
```

Pseudocode Example 13: Read 50 numbers and find their sum and average.

(**Pseudocode For Loop Example)**

```
BEGIN
NUMBER counter, sum=0, num
FOR counter=1 TO 50 STEP counter DO
        OUTPUT "Enter a Number"
        INPUT num
        sum=sum+num
ENDFOR

OUTPUT sum
END
```

Pseudocode Example 14: Read 10 numbers and find sum of even numbers.

(**Pseudocode For Loop Example)**

```

BEGIN
NUMBER counter, sum=0, num
FOR counter=1 TO 10 STEP 1 DO
        OUTPUT "Enter a Number"
        INPUT num
        IF num % 2 == 0 THEN
        sum=sum+num
        ENDIF
ENDFOR
OUTPUT sum

END
```

Pseudocode Example 15: Find the sum of all elements of array. (**Pseudocode For Loop Example)**

```
BEGIN
NUMBER i=0, n=5, sum=0
ARRAY numbers={65,45,10,7,125}
FOR i=0 TO n-1 STEP 1 DO
  sum = sum + numbers[i]
ENDFOR

OUTPUT  "Sum of numbers in the array"+sum

END
```

Pseudocode Example 16: Calculate square of a number **(Simple Pseudocode Example)**

Alternative 1:

```

BEGIN
NUMBER num, result
OUTPUT "Enter a number for calculate the power of the number"
INPUT num

result=num*num
OUTPUT "Power of the Number:" + result

END


```

Alternative 2:

```

BEGIN
NUMBER num, result=0,counter

OUTPUT "Enter a number for calculate the power of the number"
INPUT num
FOR counter=0 TO num-1 STEP 1 DO
```

```
        result +=num
ENDFOR
OUTPUT "Power of the Number:" + result

END
```

Pseudocode Example 17: Calculate the Square Root of a Number (**Pseudocode For Loop Example)**

```

BEGIN

NUMBER root=1, counter=0,num
OUTPUT "Enter a number for calculate the root"
INPUT num
WHILE sayac < sayi+1 THEN
  i=i+1
  root=(num/root+root)/2
END WHILE
```

```
OUTPUT root
END
```

Pseudocode Example 18: Swap two variables with using a temporary variable **(Simple Pseudocode Example)**

```
BEGIN
NUMBER a,b,c
a=10, b=20
OUTPUT "Value of a :"+a
OUTPUT "Value of b :"+b
c=a
a=b
b=c
OUTPUT "Value of a :"+a
OUTPUT "Value of b :"+b
```

```
END
```

Pseudocode Example 19: Swap two variables without using a temporary variable

(Simple Pseudocode Example)

```
BEGIN
NUMBER a,b
a=10, b=20
OUTPUT "Value of a :"+a
OUTPUT "Value of b :"+b
a=a+b
b=a-b
a=a-b
OUTPUT "Value of a :"+a
OUTPUT "Value of b :"+b
END
```

Pseudocode Example 20: Print Numbers from 1 to n. (**Pseudocode For Loop Example)**

```
BEGIN
NUMBER counter,n
INPUT n
FOR  counter = 1 TO  n STEP 1 DO
        OUTPUT counter
ENDFOR

END
```

Pseudocode Example 21: Calculate the Sum and Average of n Number. (**Pseudocode For Loop Example)**

```
BEGIN
NUMBER counter,n,sum,avg
INPUT n
FOR  counter = 1 TO  n STEP 1 DO
        sum=sum+counter
ENDFOR
avg=sum/n
OUTPUT "Sum of numbers :"+sum
OUTPUT "Average of numbers :"+avg
END
```

Pseudocode Example 22: Design the algorithm and flowchart that finds and display the larger of the two numbers given different from each other.

```
BEGIN

Number n1,n2

Input n1

Input n2

  IF (n1>n2) THEN
      OUTPUT(n1+" is higher")
  ELSE IF(n2>n1)
      OUTPUT(n2+" is higher")
  ELSE
      OUTPUT("n1=n2")
  END IF
END

```

Pseudocode Example 23: Perform the application that calculates the area of the triangle whose height and base length entered by the keyboard.

```

BEGIN

Number b,h
,area
Input b

Input h

area=(b*h)/2
OUTPUT (Area of Triangle is "+area)
END

```

Pseudocode Example 24: The voltage (V) between the poles of a conductor is equal to the product of the current (I) passing through the conductor and the resistance (R) present on the conductor. It’s demonstrated by the V = I * R formula.

What is the algorithm of the program that calculates the voltage between the poles of the conductor by using the formula according to the current and resistance values entered by the user.

```

BEGIN
Number i,r,v
Input i
Input r
v=i*r
OUTPUT (v)
END
```

Pseudocode Example 25: What is the algorithm that the number entered by the user from the keyboard fully divided if it is divided into 3 and 5 .

```
BEGIN
Number num
Input num
    IF(num%3==0 AND num%5==0)
            OUTPUT(num+ " is divided into 3 and 5")
END
```

Pseudocode Examples 26: What is the algorithm that finds and shows on the screen that the water is in the form of solid, liquid or gaseous according to the temperature?

```
BEGIN
Number temp
Input temp
    IF(temp<=0)
            OUTPUT("solid state")
    ELSE IF(temp<100)
```

```
        OUTPUT("liquid state")
    ELSE
        OUTPUT("gaseous state")
END

```

Pseudocode Examples 27: While calculating the wage of a worker at a factory, these criterias are complied;

If the worker has worked less than 40 hours, the wage is calculated by multiplying the hours worked and the hourly wage, if the employee has worked for 40 hours or more, the hours worked calculated as 2 hours. What is the algorithm that prints the amount to be paid according to this information?

```

BEGIN
Number hour,fee,total
INPUT(hour)
INPUT(fee)
    IF(hour<40)
        total=hour*fee
    ELSE IF(hour>=40)
        total=hour*2*fee
    END IF
```

```
OUTPUT(total)
END

```

Pseudocode Examples 28: Program to Find GCD of Two Numbers

```

BEGIN
NUMBER n1 , n2 , gcd = 1, i
OUTPUT "Enter first Number:"
INPUT n1

OUTPUT "Enter second Number:"
INPUT n2
FOR  i = 1; i <= n1 && i <= n2; ++i THEN

        IF n1 % i == 0 && n2 % i == 0 THEN
                gcd = i
    END IF
END FOR

OUTPUT " G.C.D of "+n1+"and "+n1+" is "+ gcd
```

```
END
```

Pseudocode Examples 29: The LCM of two integers n1 and n2 is the smallest positive integer that is perfectly divisible by both n1 and n2 (without a remainder)

```

BEGIN
NUMBER n1 , n2 , lcm;

OUTPUT "Enter first Number:";
INPUT n1

OUTPUT "Enter second Number:";
INPUT n2
lcm = (n1 > n2) ? n1 : n2;

WHILE (true) THEN
```

```

IF (lcm % n1 == 0 && lcm % n2 == 0) THEN
    OUTPUT "The LCM of "+n1+"and "+n2+" is "+ lcm;
              BREAK WHILE;
END IF
++lcm;

END WHILE

END
```

Examples 30: Simple if else example

```

If student's grade is greater than or equal to 60
  Print "passed"
else
  Print "failed"

```

Examples 31: Alternative Pseudocode Example

```

Set total to zero
Set grade counter to one

While grade counter is less than or equal to ten
    Input the next grade
    Add the grade into the total

Set the class average to the total divided by ten
Print the class average.

```

Examples 32:

```

Initialize total to zero
Initialize counter to zero
Input the first grade

while the user has not as yet entered the sentinel
    add this grade into the running total
    add one to the grade counter
    input the next grade (possibly the sentinel)

if the counter is not equal to zero
    set the average to the total divided by the counter
    print the average
else
    print 'no grades were entered'

```

Examples 33: Student passed and failured in pseudocode

```

initialize passes to zero
initialize failures to zero
initialize student to one

while student counter is less than or equal to ten
    input the next exam result
    if the student passed
        add one to passes
    else
```

```
        add one to failures
    add one to student counter

print the number of passes
print the number of failures

if eight or more students passed
    print "raise tuition"

```

Examples 34: Pseudocode of Bubble sort technique

```

Set n to number of records to be sorted

repeat
    flag = false;

    for counter = 1 to n-1 do
        if key[counter] > key[counter+1] then
            swap the records;
            set flag = true;
    end if
  end do

  n = n-1;
until flag = false or n=1

```

OR the same can be expressed more concisely in words as below

```

repeat
  set a flag to False
  for each pair of keys
    if the keys are in the wrong order then
      swap the keys
      set the flag to True
    end if
  next pair
until flag is not set.

```