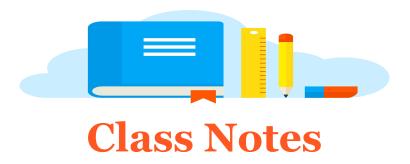
Covered Topics Under UNIT-1 of "PPS-PROGRAMMING FOR PROBLEM SOLVING (BCS101 / BCS201)"

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# PPS: UNIT-1 Idea of Algorithm

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

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TOPIC On : UNIT-1: Pseudocode. With Examples

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Under On: Idea of Algorithm

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# 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.

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### 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. <u>Capitalize initial keyword</u>

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  $\geq$  100?

YES: calculate deduction

NO: no

deduction

Write name, gross, deduction, net pay

PSEUDOCODE:

READ name, hourlyRate,

hoursWorked grossPay =

hourlyRate \* hoursWorked

IF grossPay  $\geq$  100

deduction = grossPay \* deductionRate

**ELSE** 

**ENDIF** 

deduction = o

netPay = grossPay - deduction

WRITE name, grossPay, deduction, netPay

#### 4. End multiline structures

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,

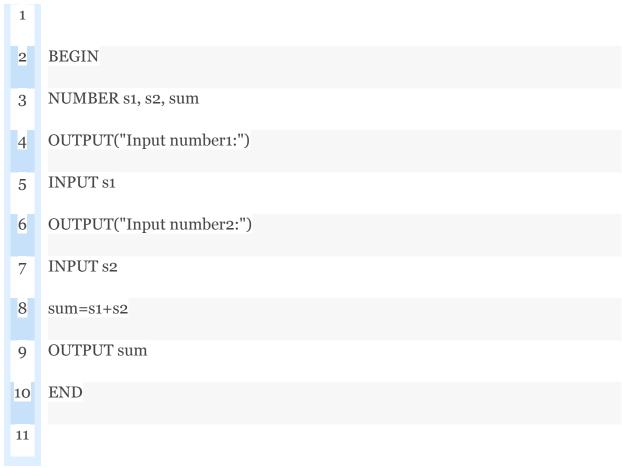
- ... print,
- display,
- input,
- output,
- edit,
- test, etc.

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)



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



5 U	NPUT b2
6 ar	rea=b1*b2
7 pe	erimeter=2*(b1+b2)
8 0	UTPUT alan
9 0	UTPUT perimeter
10 E	ND
11	

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



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



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

```
BEGIN

NUMBER r, perimeter

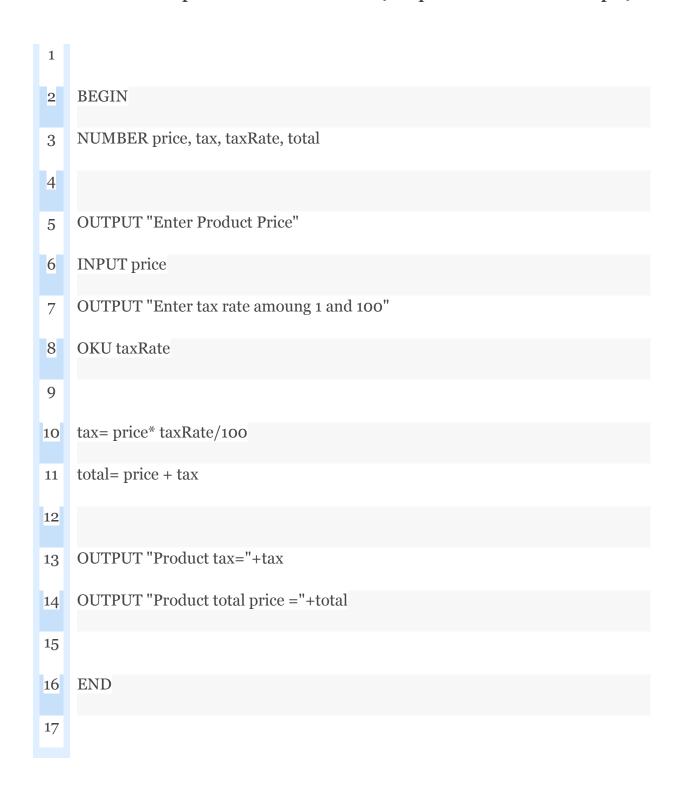
INPUT r

perimeter=2*3.14*r

OUTPUT perimeter

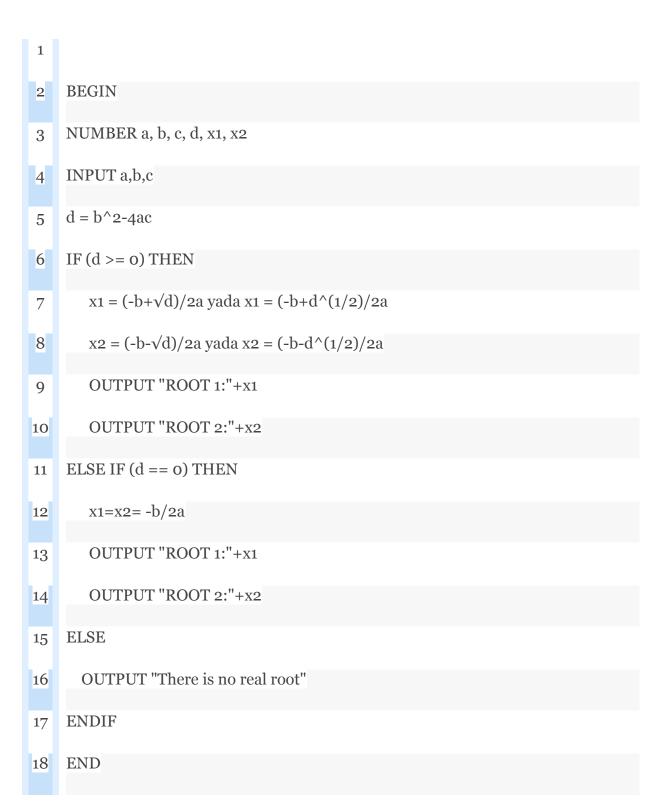
END
```

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



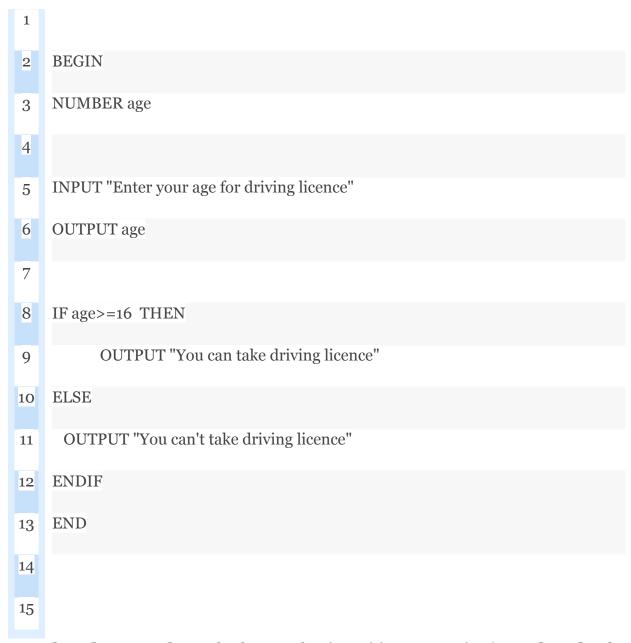
# $ax^2 + bx + c = 0$

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

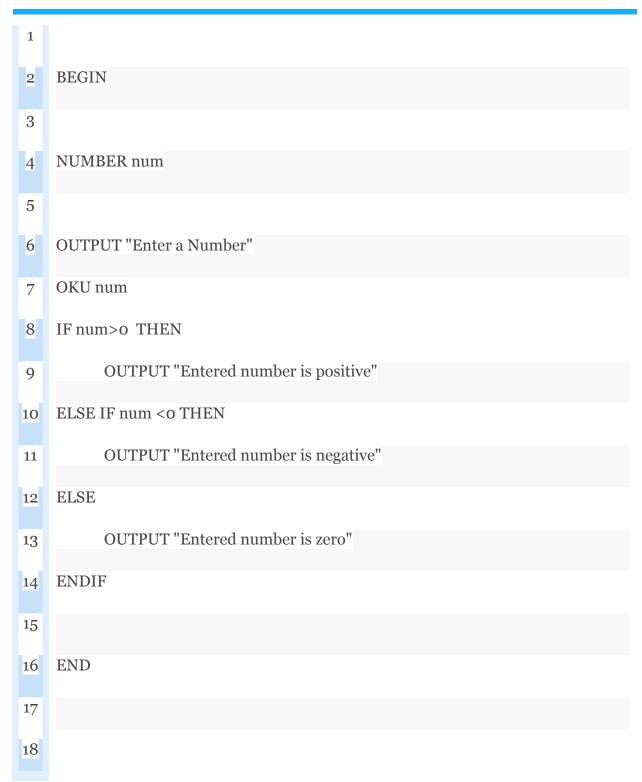


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Pseudocode Example 8: issue for driver licence (Pseudocode If Else Example)



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



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

1	
2	BEGIN
3	NUMBER num1,num2,num3
4	INPUT num1
5	INPUT num2
6	INPUT num3
7	IF num1>num2 AND num1>num3 THEN
8	OUTPUT num1+ "is higher"
9	ELSE IF num2 > num3 THEN
10	OUTPUT num2 + "is higher"
11	ELSE
12	OUTPUT num3+ "is higher"
13	ENDIF
14	END
15	
16	
17	
18	
19	

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

```
1
2
    BEGIN
    NUMBER counter
3
4
    FOR counter = 1 TO 100 STEP 1 DO
5
6
          OUTPUT counter
    ENDFOR
7
8
    END
9
10
```

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

```
1
2 BEGIN
3 NUMBER counter, sum=0
4 FOR counter=1 TO 100 STEP 1 DO
5 sum=sum+counter
6 ENDFOR
```

7	OUTPUT sum
8	END
9	
10 11	
11	
12	

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

(Pseudocode For Loop Example)

1	
2	BEGIN
3	NUMBER counter, sum=0, num
4	FOR counter=1 TO 50 STEP counter DO
5	OUTPUT "Enter a Number"
6	INPUT num
7	sum=sum+num
8	ENDFOR
9	
10	OUTPUT sum
11	END
12	

Pseudocode Example 14: Read 10 numbers and find sum of even numbers. (Pseudocode For Loop Example)

1	
2	BEGIN
3	NUMBER counter, sum=0, num
4	FOR counter=1 TO 10 STEP 1 DO
5	OUTPUT "Enter a Number"
6	INPUT num
7	IF num % 2 == 0 THEN
8	sum=sum+num
9	ENDIF
10	ENDFOR
11	OUTPUT sum
12	
13	END
14	
15	

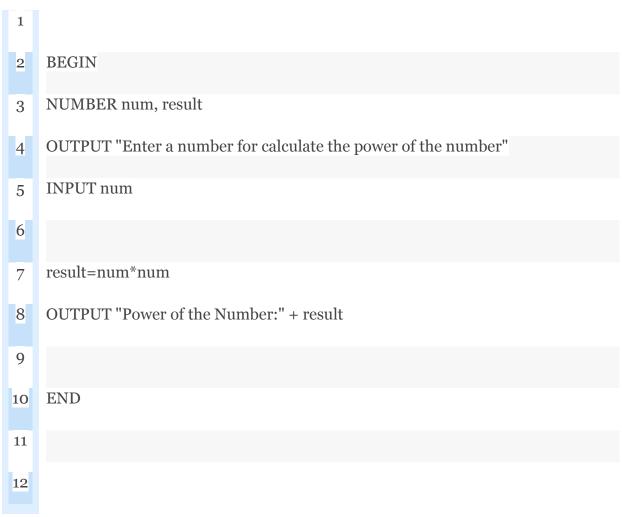
16 17

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

1	
2	BEGIN
3	NUMBER i=0, n=5, sum=0
4	ARRAY numbers={65,45,10,7,125}
5	FOR i=0 TO n-1 STEP 1 DO
6	sum = sum + numbers[i]
7	ENDFOR
8	
9	OUTPUT "Sum of numbers in the array"+sum
10	
11	END
12	

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

# **Alternative 1:**



# **Alternative 2:**

1	
2	BEGIN
3	NUMBER num, result=0,counter
4	
5	OUTPUT "Enter a number for calculate the power of the number"
6	INPUT num
7	FOR counter=0 TO num-1 STEP 1 DO

```
8 result +=num
9 ENDFOR
10 OUTPUT "Power of the Number:" + result
11 END
13 14 15
```

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

1	
2	BEGIN
3	
4	NUMBER root=1, counter=0,num
5	OUTPUT "Enter a number for calculate the root"
6	INPUT num
7	WHILE sayac < sayi+1 THEN
8	i=i+1
9	root=(num/root+root)/2
10	END WHILE

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

1	
2	BEGIN
3	NUMBER a,b,c
4	a=10, b=20
5	OUTPUT "Value of a :"+a
6	OUTPUT "Value of b :"+b
7	c=a
8	a=b
9	b=c
10	OUTPUT "Value of a :"+a
11	OUTPUT "Value of b :"+b

12	END			
13				
14 15				
15				
16				

**Pseudocode Example 19:** Swap two variables without using a temporary variable (**Simple Pseudocode Example**)

```
1
    BEGIN
2
    NUMBER a,b
3
    a=10, b=20
4
    OUTPUT "Value of a :"+a
5
6
   OUTPUT "Value of b :"+b
    a=a+b
7
   b=a-b
8
    a=a-b
9
10 OUTPUT "Value of a :"+a
    OUTPUT "Value of b :"+b
11
12
   END
13
```

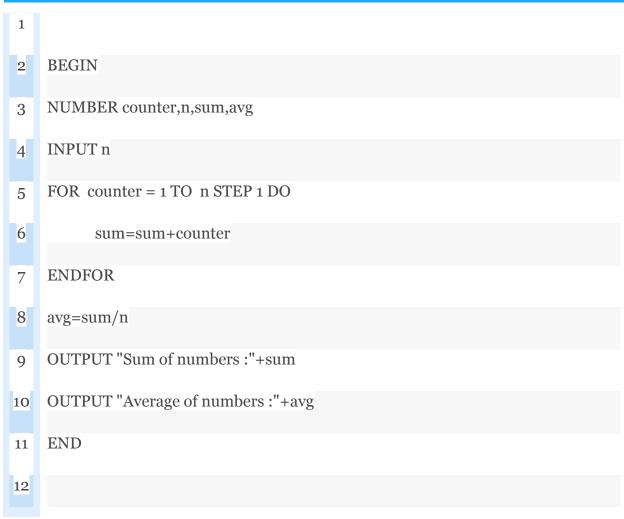
14 15 16

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

1 **BEGIN** 2 NUMBER counter,n 3 4 INPUT n FOR counter = 1 TO n STEP 1 DO 5 6 OUTPUT counter **ENDFOR** 7 8 **END** 9 10

Pseudocode Example 21: Calculate the Sum and Average of n Number.

(Pseudocode For Loop Example)



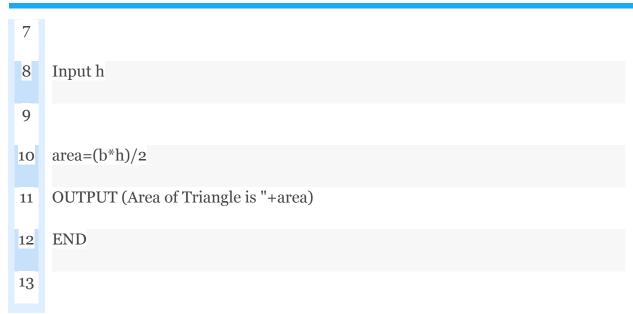
**Pseudocode Example 22:** Design the algorithm and flowchart that finds and display the larger of the two numbers given different from each other.



```
7
8
    Input n2
9
      IF (n1>n2) THEN
10
          OUTPUT(n1+" is higher")
11
      ELSE IF(n2>n1)
12
          OUTPUT(n2+" is higher")
13
      ELSE
14
          OUTPUT("n1=n2")
15
      END IF
16
    END
17
18
```

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





**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.



**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)

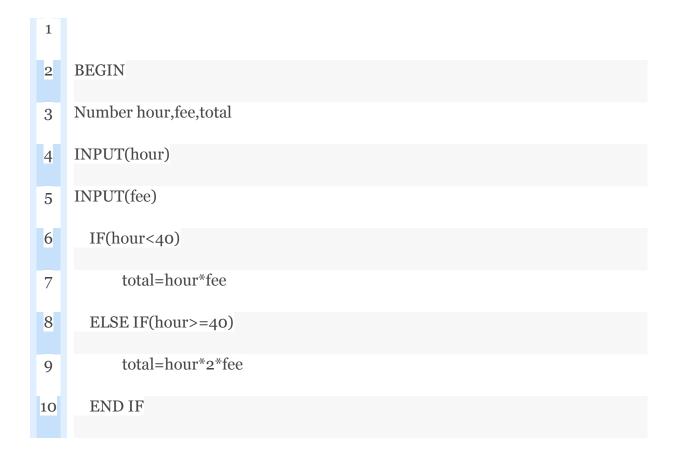
OUTPUT("solid state")

ELSE IF(temp<100)
```

```
8 OUTPUT("liquid state")
9 ELSE
10 OUTPUT("gaseous state")
11 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?



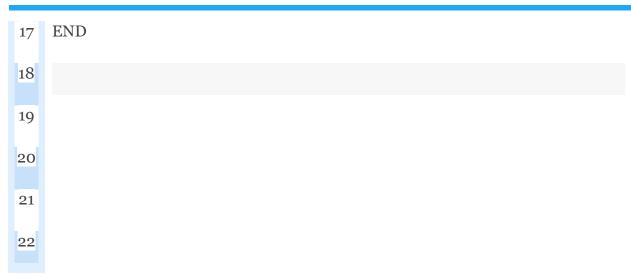
```
11 OUTPUT(total)

12 END

13
```

#### **Pseudocode Examples 28:** Program to Find GCD of Two Numbers





**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)

```
1
    BEGIN
2
    NUMBER n1, n2, lcm;
3
4
    OUTPUT "Enter first Number:";
5
6
    INPUT n1
7
    OUTPUT "Enter second Number:";
8
    INPUT n2
9
   lcm = (n1 > n2) ? n1 : n2;
10
11
   WHILE (true) THEN
12
```

```
13
    IF (lcm % n1 == 0 && lcm % n2 == 0) THEN
14
       OUTPUT "The LCM of "+n1+"and "+n2+" is "+ lcm;
15
             BREAK WHILE;
16
    END IF
17
18
    ++lcm;
19
    END WHILE
20
21
    END
22
23
24
25
```

# **Examples 30:** Simple if else example

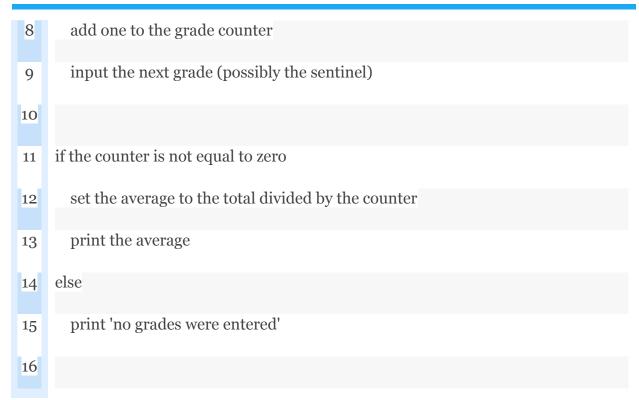
If student's grade is greater than or equal to 60
Print "passed"
else
Print "failed"

# Examples 31: Alternative Pseudocode Example

1	
2	Set total to zero
3	Set grade counter to one
4	
5	While grade counter is less than or equal to ten
6	Input the next grade
7	Add the grade into the total
8	
9	Set the class average to the total divided by ten
10	Print the class average.
11	

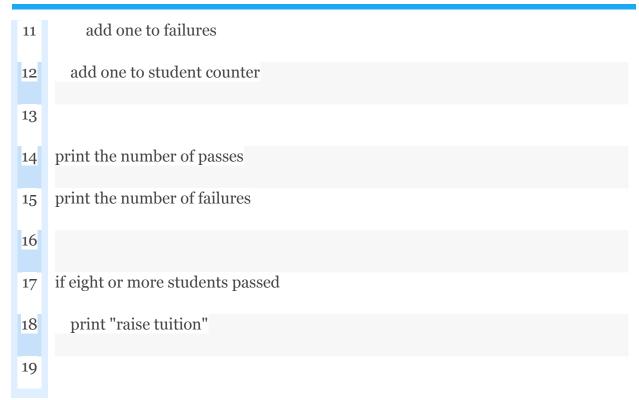
# Examples 32:

1	
2	Initialize total to zero
3	Initialize counter to zero
4	Input the first grade
5	
6	while the user has not as yet entered the sentinel
7	add this grade into the running total



Examples 33: Student passed and failured in pseudocode

1	
2	initialize passes to zero
3	initialize failures to zero
4	initialize student to one
5	
6	while student counter is less than or equal to ten
7	input the next exam result
8	if the student passed
9	add one to passes
10	else



Examples 34: Pseudocode of Bubble sort technique

1	
2	Set n to number of records to be sorted
3	
4	repeat
5	flag = false;
6	
7	for counter = 1 to n-1 do
8	if key[counter] > key[counter+1] then
9	swap the records;
10	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

