ELEMENTARY COMPUTER PROGRAMMING WITH VISUAL BASIC

A computer program is a set of coded instructions given to the computer, and represents a logical solution to a problem. It directs a computer in performing various operations/tasks on the data supplied to it.

Programming is the process of designing a set of instructions (computer programs) which can be used to perform a particular task or solve a specific problem.

STAGES INVOLVED IN THE PROGRAM DEVELOPMENT CYCLE.

The process of program development can be broken down into the following stages:

1. Problem recognition (Identification of the problem).
2. Problem definition.
3. Program design.
4. Program coding.
5. Program testing & debugging.
6. Program Implementation and maintenance.
7. Program documentation.

A **pseudocode** is a method of documenting a program logic in which English-like statements are used to describe the processing steps. These are structured English-like phrases that indicate the program steps to be followed to solve a given problem.
The term "**Code**" usually refers to a computer program.
A **Flowchart** is a diagrammatic or pictorial representation of a program's algorithm. It is a chart that demonstrates the logical sequence of events that must be performed to solve a problem.

REASONS WHY A FLOWCHART WOULD BE USED INSTEAD OF A PSEUDOCODE TO SOLVE A PROBLEM

- A flowchart is easy to interpret and understand
- A flowchart provides a better/easier understanding of the problem processing logic.
- Flowcharts provide more detail yet readable structure of analyzing a problem.
- Are more capable of showing the overflow of instructions or data from one process to another.
- One can easily conceptualize the whole program at just a glance from a flowchart.
- A flowchart provides an easier way of error identification and rectification. They offer/give more efficient program maintenance as they give the programmer which part of the program logic to put emphasis on and can be edited to suite new changes.
- With flowcharts information needs or problems are analyzed in a more effective way that reduces costs and time wastage
- Makes results look attractive and organized

USING A FLOWCHART TO PLAN A PROCEDURE

SYMBOLS USED IN PROGRAM FLOWCHARTS

Below is a standard set of symbols used to draw program flowcharts as created by ***American National Standard Institute*** (***ANSI***).

1. **Terminal symbol.**

Ellipse (Oval in shape)

It is used to indicate the point at which a flowchart, a process or an algorithm begins & ends.

√ All Flowcharts must have a START & STOP symbol. The START/BEGIN symbol is the first symbol of a flowchart, & identifies the point at which the analysis of the flowchart should begin. The STOP/END symbol is the last symbol of a flowchart, & indicates the end of the flowchart.

√ The words **Begin** & **End** (or **Start** & **Stop**) should be inserted in the Terminal symbol.

2. **Input or Output symbol.**

(*Parallelogram*)

- It is used to identify/specify an input operation or output operation.

For example;

Input operation

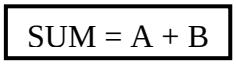
Output operation

Note. The words mostly associated with I/O operations are **READ** & **PRINT**. READ describes the entry of computer data, while PRINT relates to the printed output of information.

3. **Process symbol.**

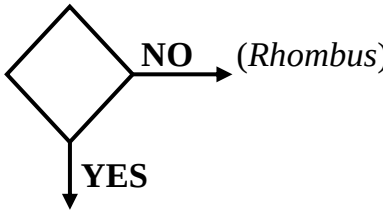
(*Rectangle*)

- **Process symbol** is used to indicate that a processing or data transformation is taking place. The information placed within the process symbol may be an algebraic formula or a sentence to describe processing.



Processing defined as a Formula Processing defined as a Sentence

4. **Decision symbol.**



(*Rhombus*)

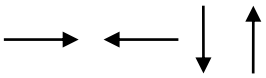
- It is used to indicate/ specify a condition or to show the decision to be made. There are **2** main components of a Decision symbol:

(i). A question asked within the Decision symbol, that indicates the comparison / logical operation.

(ii). The results of the comparison (which are given in terms of **YES** or **NO**).

The arrows labeled YES or NO lead to the required action corresponding to the answer to the question.

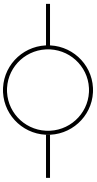
5. **Flow lines.**



Flow lines with arrowheads are used to indicate the direction of processing of the program logic, i.e., they show the order in which the instructions are to be executed. The normal flow of a flowchart is from *Top* to *Bottom*, and *Left* to *Right*.

Note. Flow lines should never cross each other.

6. **Connector symbol.**



Sometimes, a flowchart becomes too long to fit in a single page, such that the flow lines start crisscrossing at many places causing confusion & also making the flowchart difficult to understand.

The **Connector symbol** is used as a connecting point for arrows coming from different directions.

A Connector symbol is represented by a Circle, and a letter or digit is placed within the circle to indicate the link.

Note. Connectors do not represent any operation. They are used to connect two parts of a flowchart, indicating that the flow of data is not broken.

VARIABLES AND DECLARATION STATEMENT

Variables: computer memory locations used to temporarily store data while an application is running; each variable must be assigned a data type, which determines the memory location's data type. E.g. double, decimal, single, char, string, integer, Boolean, date, object etc

Declaring a Variable in Code: **Declaration statement**: used to declare, or create, a variable; Declaration statement includes: Scope keyword: Dim, Private, or Static e.g. Const

Keyword: A word that is reserved by the program because it has a special meaning/purpose.

VISUAL BASIC PROGRAMING PLATFORM

Visual Basic is always evolving, from the earlier versions of object based event driven Visual Basic which ended with the popular Visual Basic 6 to fully object oriented VB.Net versions. VB.Net started with Visual Basic.NET, then evolved through Visual Basic 2005, Visual Basic 2008 to the Visual Basic 2010, Visual Basic 2012, Visual Basic 2013, Visual Basic 2015 and the latest Visual Basic 2017.
For more information about VB Visit
https://www.vbtutor.net/vb2010/about_us_vb2010.html And for VB lesson visit
https://www.vbtutor.net/vb2010/vb2010_lesson1.html

VBTUTOR.NET , the popular online Visual Basic Tutorials, was founded by our tutor and Webmaster Dr.Liew in 1996. Since the inception of VBTUTOR.NET, it consistently ranks top on major search engines, including Google.

Dr.Liew holds a **Bachelor Degree in Mathematics** and a Master Degree in Management. In addition, he holds a **Doctoral Degree in Business Administration**(University of South Australia). In the 1970's, he started programming in many computer languages before the arrival of the personal computers. Among the computer languages, he has mastered FORTRAN and BASIC.

In 1980's, when Microsoft invented the MS-DOS and later Windows, he began to play with QBASIC. As a matter of fact, Microsoft shipped QBASIC free with MS_DOS and the earlier versions of Windows. Besides that, he also laid his hand on the QUICK BASIC compiler, a variant of QBASIC.

When Microsoft Introduced Visual Basic in the 1990s, he shifted his interest to the GUI-based Visual Basic programming and immediately fell in love with it. From then on he focuses on learning and mastering VB programming. Besides that, he also strives to educate Visual Basic hobbyists and students around the globe via our Website.

Visual basic is event driven

EXAMPLE 1:

a) Design an algorithm for a program that can output a phrase ‚I Love My School'
b) Using a Flowchart, design a program that can output a phrase "**I Love My School**"
c) Using a programming Language of your Choice write a program code that can output a phrase "I Love My School"

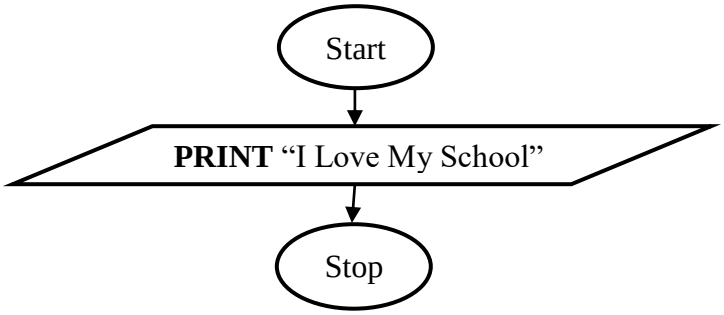
Solution (a) pseudocode

START
PRINT ‚I Love My School'
STOP

Solution (c) VB Code

```
Private Sub Button1_Click()
   MsgBox("I Love My School")
End Sub
```

Solution (c) Flow chart



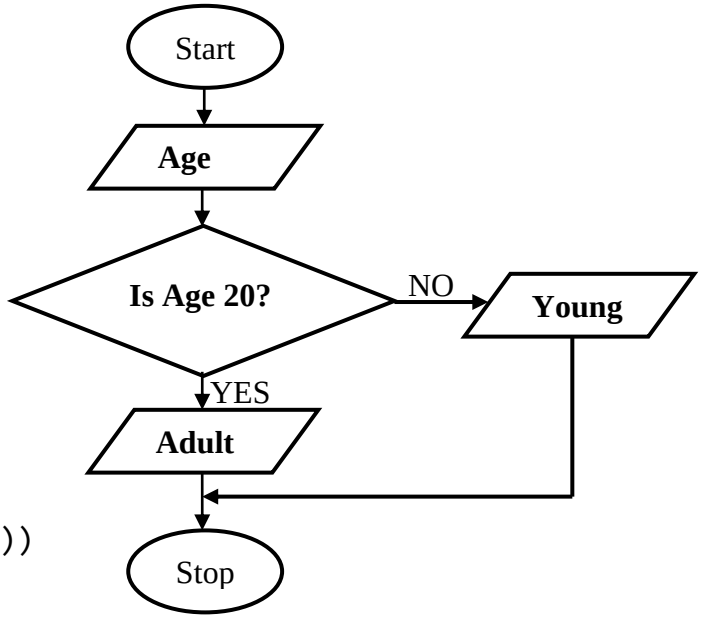
EXAMPLE 2:

Write a pseudocode for a program that can be used to classify people according to age. If a person is more than **20** years; output , "**Adult**" else output ,"**Young Person**".

Solution Pseudocode

START
PRINT "Enter the Age"
INPUT Age
IF Age > 20 THEN
PRINT "Adult"
ELSE
PRINT "Young person"
STOP

Code



VB Code

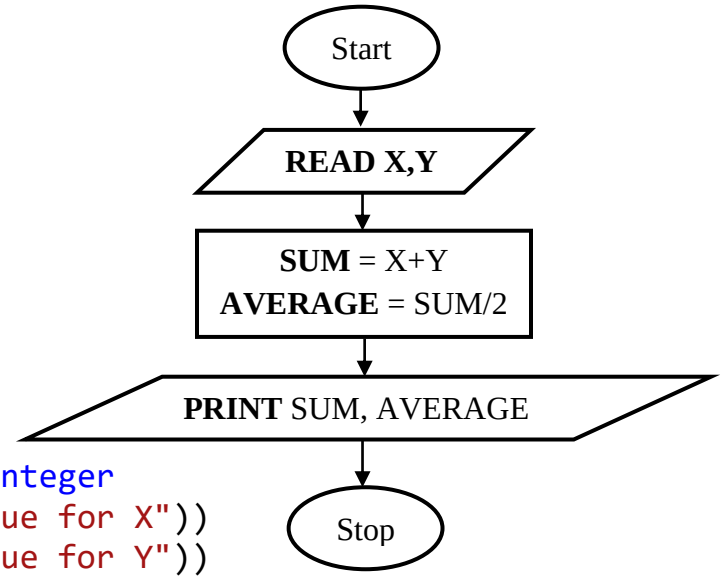
```
Private Sub Button1_Click()
  Dim Age As Integer
  Age = Val(InputBox("Enter the Age"))
  If Age > 20 Then
       MsgBox("Adult")
  Else
       MsgBox("Child")
  End If
End Sub
```

EXAMPLE 3:

Write a pseudocode that can be used to prompt the user to enter two numbers, Calculate the sum and average of the two numbers and then display the output on the screen.

Solution Pseudocode

```
START
   PRINT "Enter two numbers"
   INPUT X, Y
   Sum = X + Y
   Average = Sum/2
   PRINT Sum
   PRINT Average
STOP
```



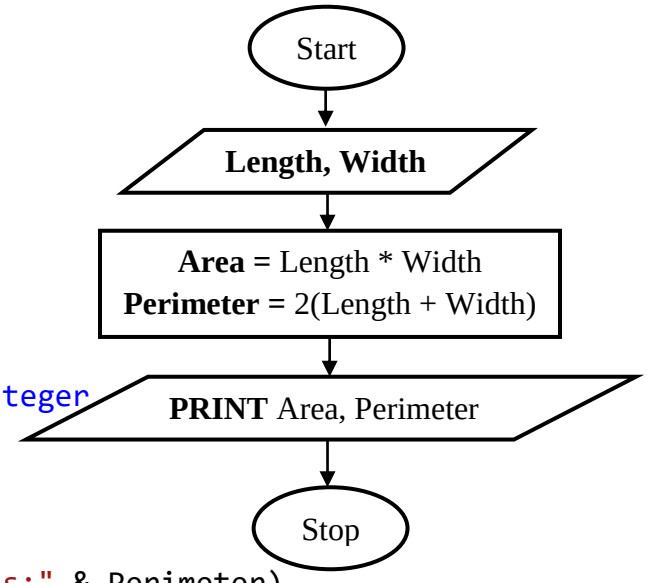

```
Private Sub Button1_Click()
    Dim X, Y, Sum, Average As Integer
    X = Val(InputBox("Enter value for X"))
    Y = Val(InputBox("Enter value for Y"))
    Sum = X + Y
    Average = Sum / 2
    MsgBox("Sum is:" & Sum & " Average is: " & Average)
End Sub
```

EXAMPLE 4:

Write a structured algorithm that would prompt the user to enter the Length and Width of a rectangle, calculate the Area and Perimeter, then display the result.

Solution Pseudocode

```
START
   PRINT ,Enter Length and Width'
   Area = Length * Width
   Perimeter = 2 (Length + Width)
   PRINT Area
   PRINT Perimeter
STOP
```



VB CODE

```
Private Sub Button1_Click()
Dim Length, Width, Area, Perimeter As Integer
Length = Val(InputBox("Enter Length"))
Width = Val(InputBox("Enter Width"))
Area = Length * Width
Perimeter = 2 * (Length + 2 * (Width))
MsgBox("Area is:" & Area & " Perimeter is:" & Perimeter)
End Sub
```

EXAMPLE 5:

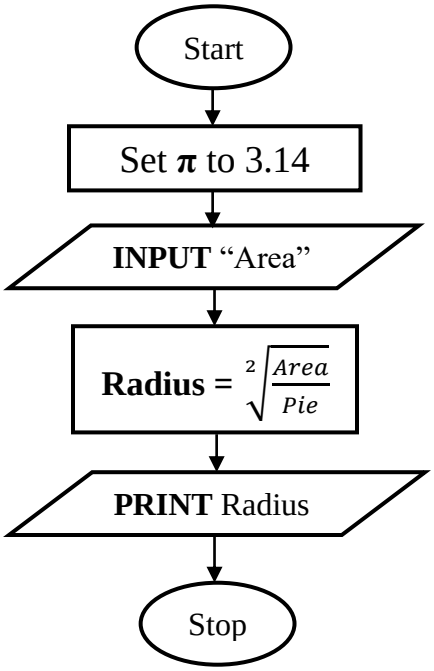
Kato was assigned a task by the computer teacher to develop a program that computes the radius of a circle whose area is to be entered by the user using either C or VB language. Assist Kato to write a working program according to the task assigned to him by the teacher

Solution Pseudocode

START

Set **π** to 3.14
Prompt the user for the Area
Store the Area
Set Radius to Sqrt(Area) / * Sqrt (**π**)
PRINT Radius

STOP



VB CODE

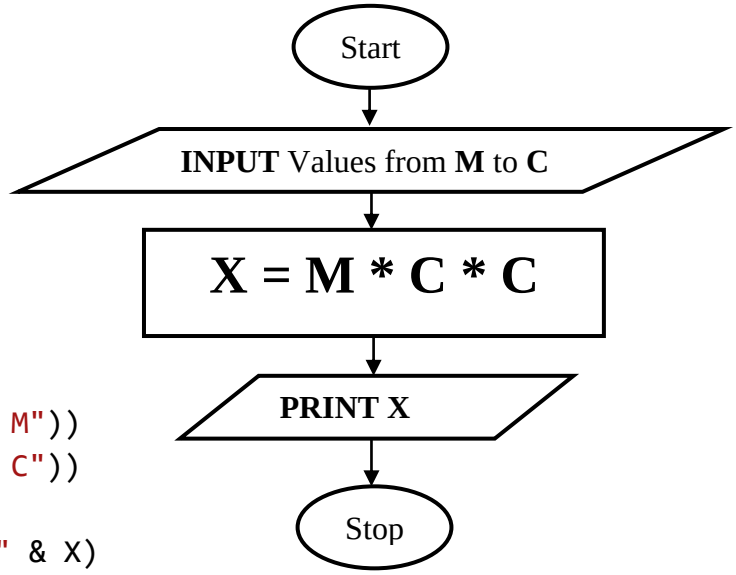
```
Private Sub Button1_Click()
Dim Area, Pie, Radius As Integer
Pie = 3.14
Area = Val(InputBox("Enter Area"))
Radius = Math.Sqrt(Area) /Math.Sqrt(Pie)
MsgBox("Radius is:" & Radius)
End Sub
```

EXAMPLE 5:

Write a pseudocode for a program that would be used to solve equation: $\mathbf{X = MC^2}$

Solution Algorithm

START
Enter values from M to C
X = M * C * C
Display X
STOP



VB CODE

```
Private Sub Button1_Click()
    Dim X, M, C As Integer
    M = Val(InputBox("Enter Value M"))
    C = Val(InputBox("Enter Value C"))
    X = M * C * C
    MsgBox("The Answer For X Is: " & X)
End Sub
```

EXAMPLE 6:

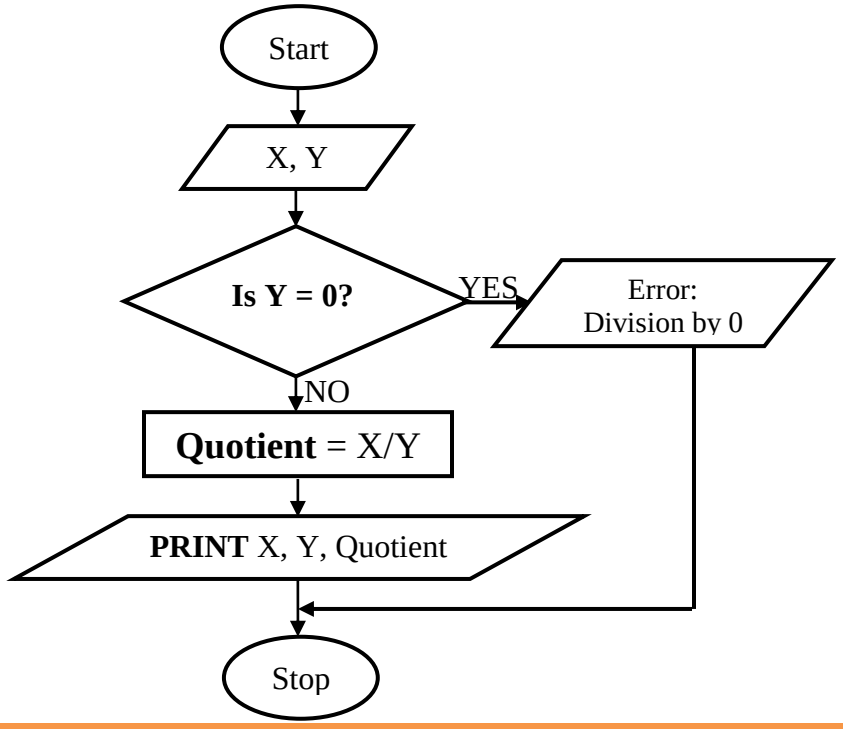
With aid of a pseudocode and a flowchart, design an algorithm that: Prompt the user to enter two numbers X and Y. Divide X by Y. However, if the value of Y is 0, the program should display an error message "Error: Division by zero". Use C or VB language to write its program.

Pseudocode

```
START
    PRINT "Enter two numbers X and Y"
    INPUT X, Y
    IF Y = 0 THEN
        PRINT "Error: Division by zero"
    ELSE
    Quotient = X/Y
    PRINT X, Y, Quotient
    ENDIF
STOP
```

VB CODE

```
Private Sub Button1_Click()
    Dim X, Y, Quotient As Double
    X = Val(InputBox("Enter Value X"))
    Y = Val(InputBox("Enter Value Y"))
    If Y = 0 Then
        MsgBox("Error: Division By Zero")
    Else
        Quotient = X / Y
        MsgBox("X Is: " & X & "Y is:" & Y & "Quotient is:" & Quotient)
    End If
End Sub
```



EXAMPLE 7:

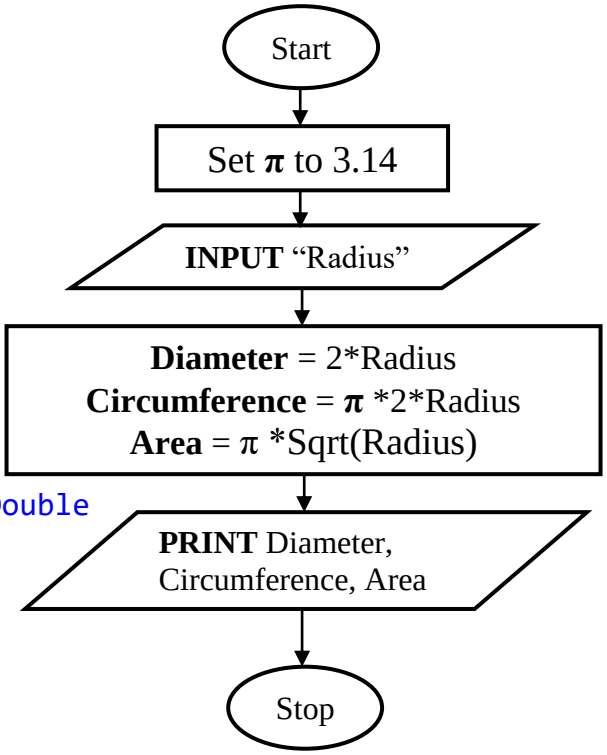
Write a pseudocode that can be used to calculate the Diameter, Circumference and Area of a circle and then display the output on the screen.

Pseudocode

START

Set π to 3.14
Prompt the user for the Radius (R)
Store the radius in a variable (R)
Set Diameter to 2 * Radius
Set Circumference to π * 2 * Radius
Set Area to π * Sqr (Radius)
PRINT Diameter
PRINT Circumference
PRINT Area

STOP



VB CODE

```
Private Sub Button1_Click()
Dim Area, Diameter, Circumference As Double
Dim Radius, Pie As Integer
Pie = 3.14
Radius = Val(InputBox("Enetr Radius"))
Diameter = 2 * Radius
Circumference = Pie * 2 * Radius
Area = Pie * Math.Sqrt(Radius)
MsgBox("Diameter is:" & Diameter)
MsgBox("Circumference is:" & Circumference)
MsgBox("Area is:" & Area)
End Sub
```

EXAMPLE 8:

The Harrisburg City Manager wants an application that determines voter eligibility and displays one of three messages. The messages and criteria for displaying each message are as follows:

Messages	Criteria
You are too young to vote	Person is young than 18 years old
You can vote	Person is at least 18 years old and is registered to vote
You Must Register before you can vote	Person is at least 18 years old but is not registered to vote.

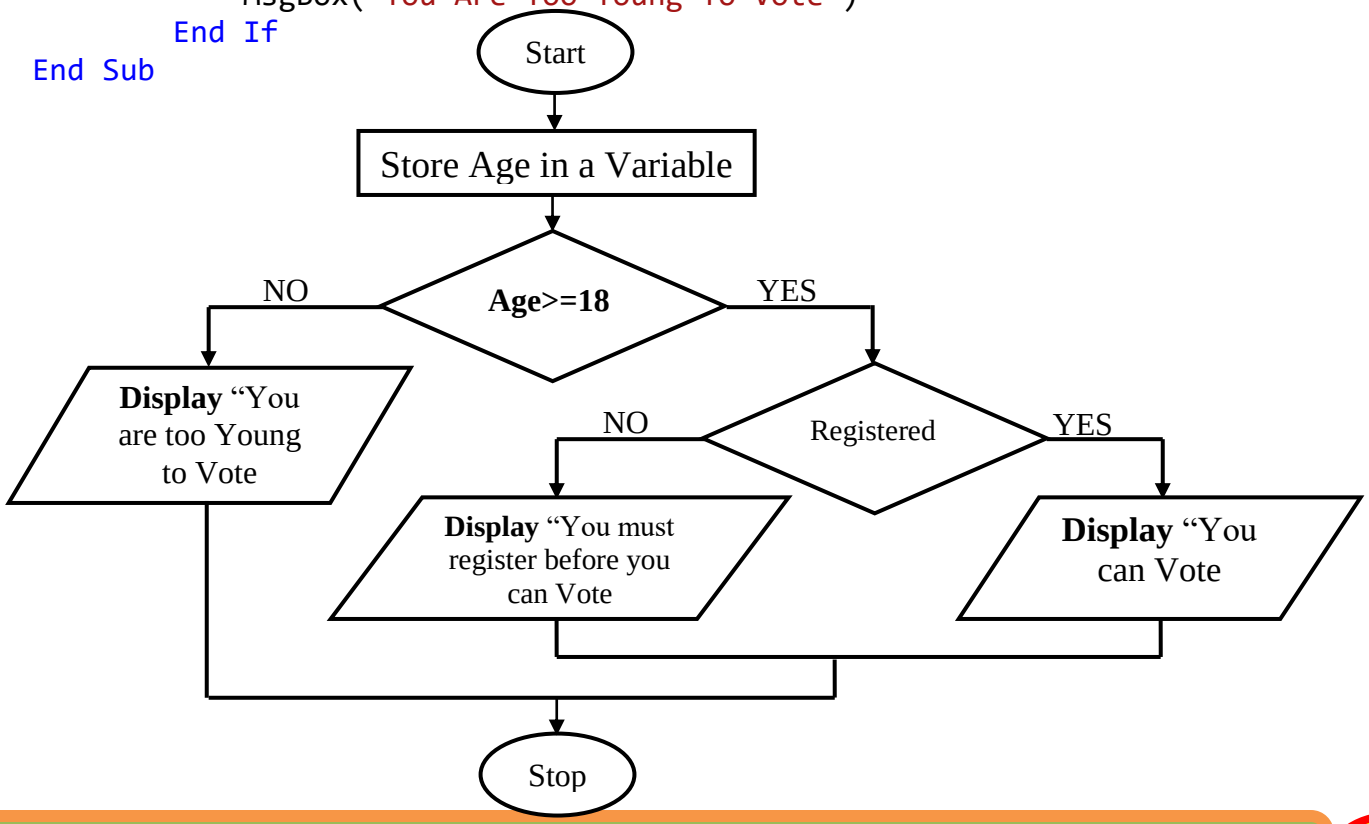
The manager has assigned you to develop a working application program for this company, in your preparations develop a pseudocode, a flow chart and finally choose from VB or C languages to write a Code that will be used for this application.

Pseudocode

```
START
    Print "Enter Age"
    Input Age
    If Age >=18 Then
        If Registered = True
            Print "You Can Vote"
        Else
            Print "You Must Registered Before You Can Vote"
    Else
    End If
        Print "You Are Too Young To Vote"
    End If
STOP
```

VB CODE (If Check1.value = 1 Then) for vb 6

```
Private Sub Button1_Click()
      Dim Age As Integer
         Age = Val(InputBox("Enter Age"))
         If Age >= 18 Then
             If CheckBox1.Checked = True Then
                 MsgBox("You Can Vote")
             Else
                 MsgBox("You Must Register Before Can Vote")
             End If
         Else
             MsgBox("You Are Too Young To Vote")
         End If
End Sub
```



EXAMPLE 9:

In an Olympics track event, medals are awarded only to the first three athletes as follows:

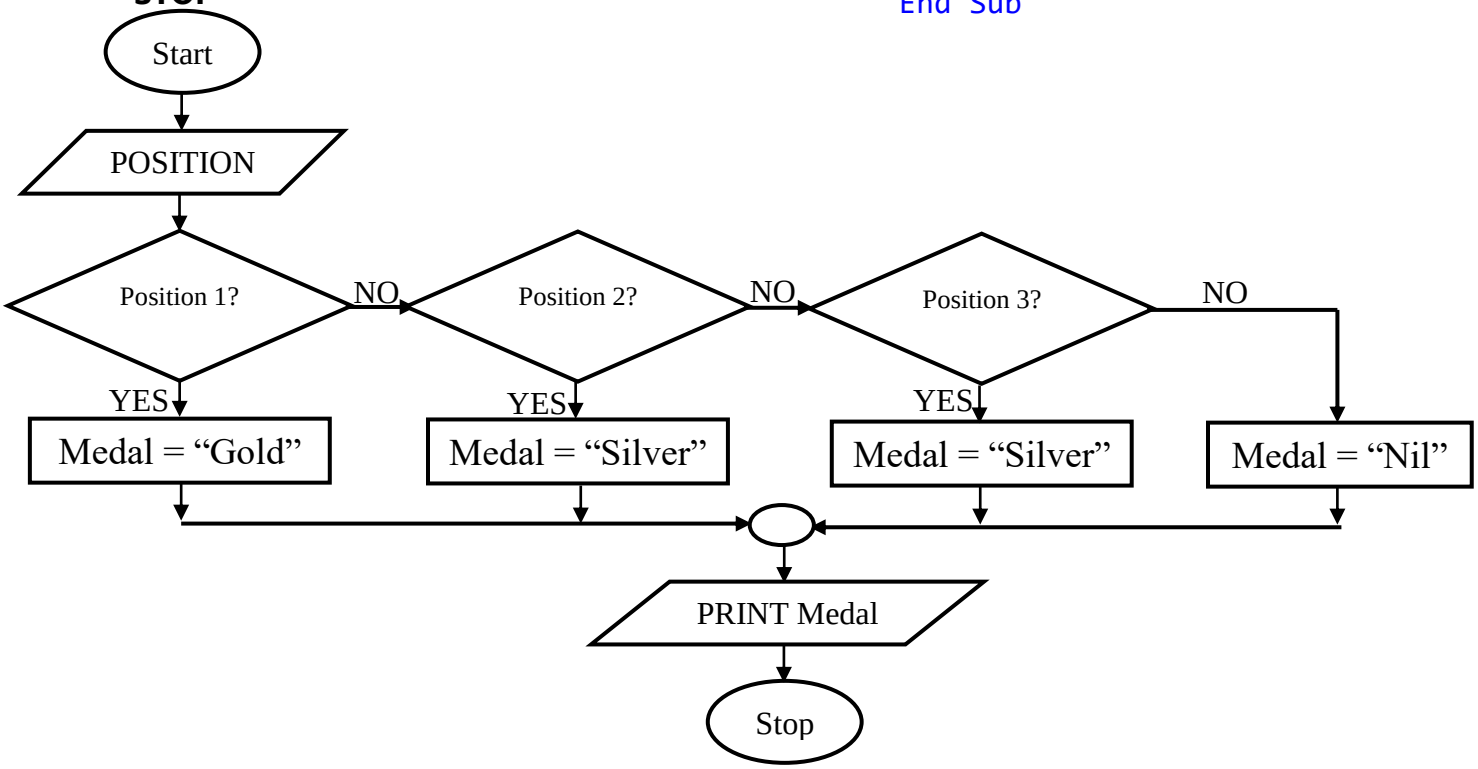
a). Position 1: Gold medal
b). Position 2: Silver medal
c). Position 3: Bronze medal

The pseudocode and flowchart below can be used to show the structure of the Nested IF selection.

Pseudocode

```
START
    ENTER "Position"
    IF Position = 1 THEN
        Medal = "Gold"
    ELSE
        IF Position = 2 THEN
            Medal = "Silver"
        ELSE
            IF Position = 3 THEN
                Medal = "Bronze"
            ELSE
                Medal = "Nil"
            ENDIF
        ENDIF
    ENDIF
STOP
```

```
Private Sub Button1_Click()
Dim Position As Integer
        Position = Val(InputBox
        ("Enter Position"))
        If Position = 1 Then
            MsgBox("Gold")
        Else
            If Position = 2 Then
                MsgBox("Silver")
            Else
                If Position = 3 Then
                    MsgBox("Bronze")
                Else
                    MsgBox("Nil")
                End If
            End If
        End If
    End Sub
```



EXAMPLE 10:

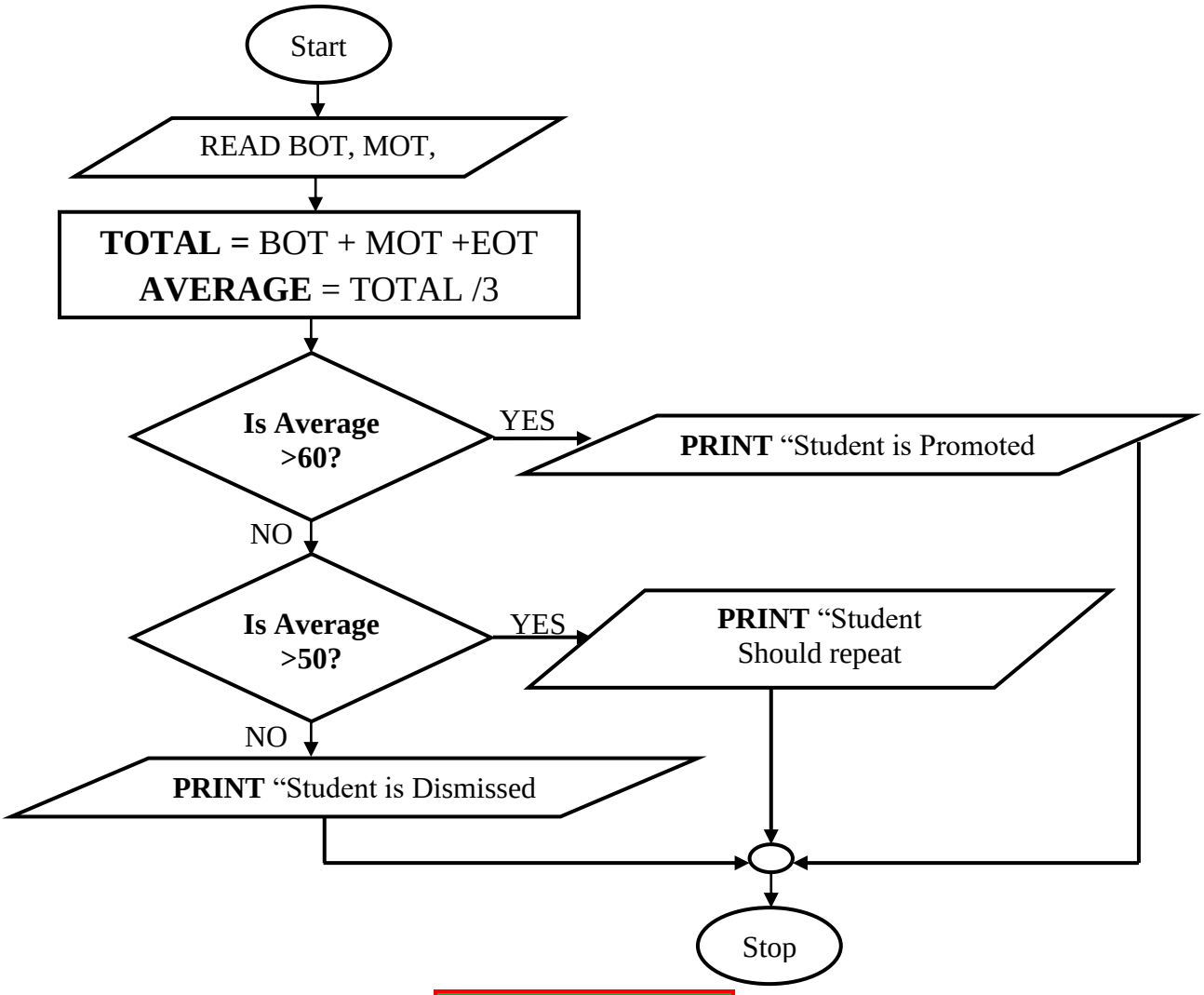
A school uses a simple computerized system to manage students' results. The school administers three examinations namely; beginning of term **(BOT)**, middle of term **(MOT)** and end of term **(EOT)**. The systems administrator has set the system to get the total of the three examinations and find the average which is used to promote the students to *the* next class. If the average mark is greater than 60, the student is promoted. If the average mark is from 50 to 60, the student repeats. If the average is below 50 the student is dismissed. **Write a suitable algorithm that will manage the students' results.**

Pseudocode

```
START
    PRINT "Enter BOT, MOT and EOT marks"
    READ BOT, MOT, EOT
    TOTAL = BOT + MOT + EOT
    AVERAGE = TOTAL/3
    IF AVERAGE > 60 THEN
        PRINT "Student is promoted"
    ELSE
        IF AVERAGE >= 50 THEN
            PRINT "Student should repeat"
        ELSE
            PRINT "Student Dismissed"
        END IF
    END IF
END
```

VB CODE

```
Private Sub Button1_Click()
      Dim BOT, MOT, EOT, TOTAL, AVERAGE As Double
         BOT = Val(InputBox("Enter BOT mark"))
         MOT = Val(InputBox("Enter MOT mark"))
         EOT = Val(InputBox("Enter EOT mark"))
         TOTAL = BOT + MOT + EOT
         AVERAGE = TOTAL / 3
         MsgBox("The Average is " & AVERAGE)
         If AVERAGE > 60 Then
             MsgBox("Student is promoted.")
         Else
             If AVERAGE >= 50 Then
                 MsgBox("Student should repeat.")
             Else
                 MsgBox("Student is dismissed.")
             End If
         End If
     End Sub
```



EXAMPLE 11:

Given a quadratic equation in the form: where a, b, and c are constant. Use a flowchart to design a program algorithm for calculating of the roots of quadratic equation.
Write the Pseudo code for the algorithm in (a) above, Using C or Visual Basic, write source code for a program that can solve the quadratic equations.

Pseudocode

START

PRINT ,Enter the coefficients a, b and c of the quadratic equation'

READ a, b, c

$$X1 = \frac{-b+\sqrt{b^2-4ac}}{2a}$$

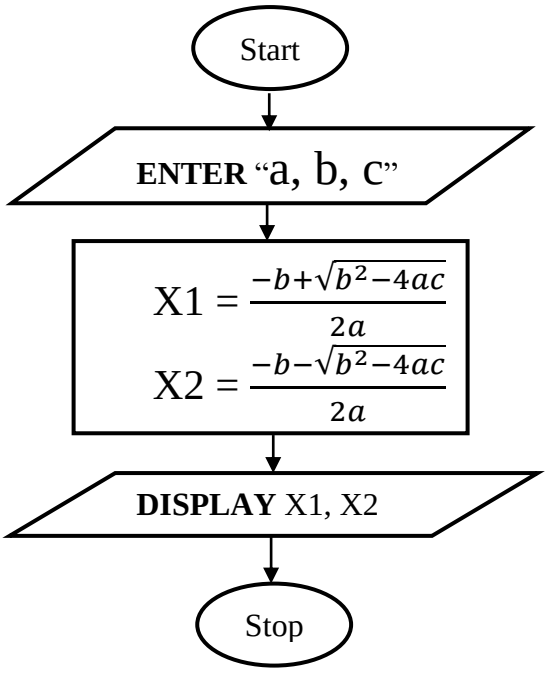
$$X2 = \frac{-b-\sqrt{b^2-4ac}}{2a}$$

DISPLAY X1, X2

STOP

VB CODE

```
Private Sub Button1_Click()
    Dim a, b, c As Integer
    Dim X1, X2 As Double
    a = Val(InputBox("Enter value for a"))
    b = Val(InputBox("Enter value for b"))
    c = Val(InputBox("Enter value for c"))
    X1 = (b + Math.Sqrt(b * b - (4 * a * c))) / (2 * a)
    X2 = (-b + Math.Sqrt(b * b - (4 * a * c))) / (2 * a)
    MsgBox ("The roots are:" & x1 & " And " & x2 & ".")
End Sub
```



EXAMPLE 12:

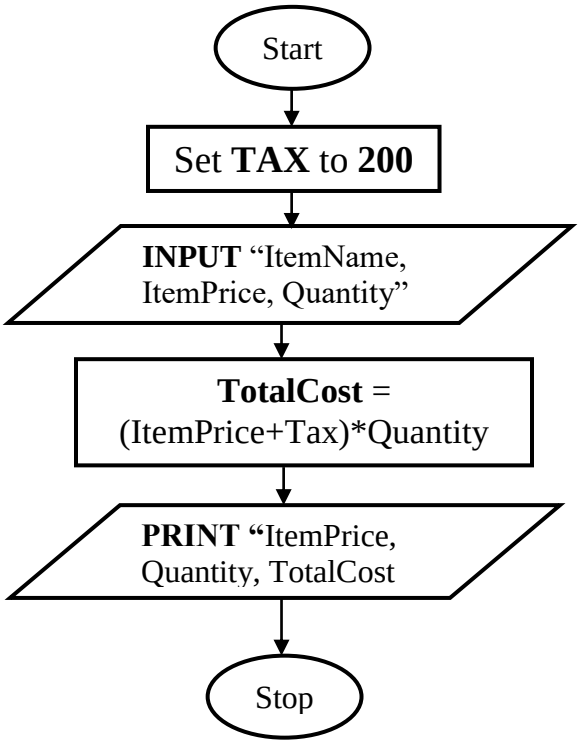
Mountain Biking wants an application that allows the store clerk to enter an item's price and the quantity purchased by a customer, but every item is charged a tax of **200**. The application should calculate the total amount the customer owes by multiplying the price by the quantity purchased plus the tax. It should then display the total amount owed.
Prepare a pseudocode, a flowchart and finally using VB or C language write the code for the above application.

Pseudocode

START

Set Tax to 200
Promt the User for 'ItemName, ItemPrice, Quantity'
Read ,ItemName, ItemPrice, Quantity'
TotalCost = (ItemPrice + Tax)*Quantity
PRINT ItemPrice, Quantity, TotalCost

STOP



VB CODE

```
Private Sub Button1_Click()
      Dim ItemPrice, Quantity, TotalCost As Integer
         Dim ItemName As Double
         Const Tax As Double = 200
         ItemName = Val(InputBox("Enter ItemName"))
         ItemPrice = Val(InputBox("Enter ItemPrice"))
         Quantity = Val(InputBox("Enter Quantity"))
         TotalCost = (ItemPrice + Tax) * Quantity
         MsgBox("ItemPrice is:" & ItemPrice & " Quantity Is :" &
Quantity & "TotalCost is:" & TotalCost)
    End Sub
```

EXAMPLE 13:

Write a computer program to return the first 20 even numbers.

```
Private Sub Button1_Click()
Dim Counter, EvenNumber As Integer
         For Counter = 1 To 20 Step 1
             EvenNumber = Counter * 2
             Print EvenNumber
    End Sub
```

EXAMPLE 14:

Mutuku took a loan of Ugx. 400,000 from a local bank at an interest rate of 10% payable in four years. Assuming you wish to develop a computer program that will keep track of monthly repayments:

(a) Identify the input, processing and output requirements for such a program.

(b) Design the algorithm for the program using a simple flowchart and pseudocode.

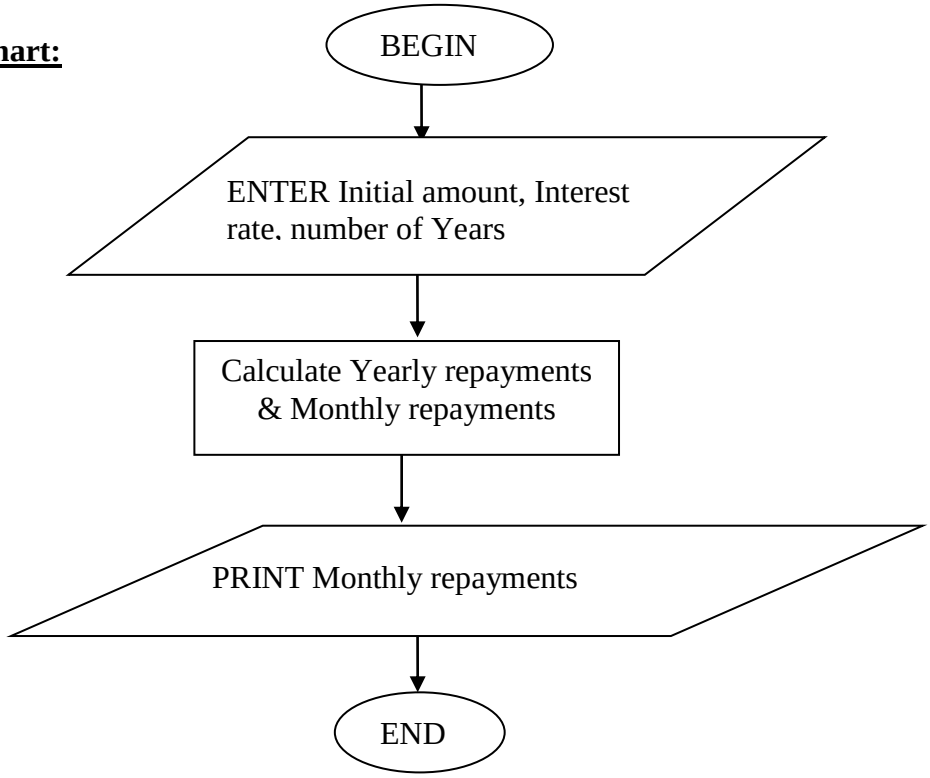
(a). Requirements:

Input	- Initial amount borrowed
	- Interest rate
	- Number of years
Processing	- equation to calculate Yearly repayments and Monthly **repayments**.
Output	- Monthly repayments calculated by the process

(b). Pseudocode:

START
  INPUT Initial amount borrowed
  INPUT Interest rate
  INPUT Number of years
  Calculate Yearly repayments
  Monthly repayments = (Yearly repayments / 12)
  OUTPUT Monthly repayments
STOP

Flowchart:



```
Dim X As Double
Dim Y As Double
Dim Result As Double

X = Text1.Text
Y = Text1.Text

Result = X + Y

Label1.Caption = Result
End Sub

Dim X As Double
Dim Y As Double
Dim Result As Double

X = Text1.Text
Y = Text1.Text
If Y = 0 Then
        Label1.Caption = “Cant Devide by Zero”
Else
Result = X / Y
Label1.Caption = Result
End If
End Sub

Dim X As Double
Dim Y As Double
Dim Result As Double

X = Text1.Text
Y = Text1.Text

Result = X -Y

Label1.Caption = Result
End Sub

Dim X As Double
Dim Y As Double
Dim Result As Double

X = Text1.Text
Y = Text1.Text
```

```
Result = X - Y

Label1.Caption = Result
End Sub
```

Program Documentation

```
Sum = X + Y ‘Addition of the two numbers (Documentation
```