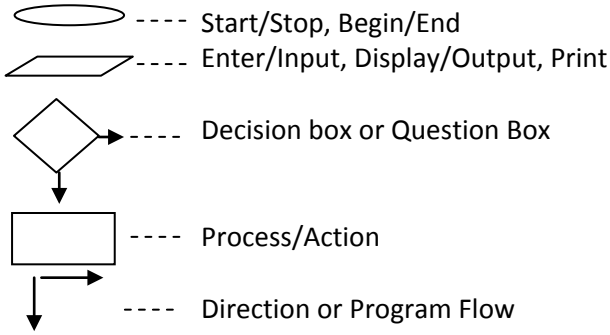
PAMODZI GIRLS SECONDARY SCHOOL
MATHEMATICS DEPARTMENT-2017

TOPIC: ALGORITHMS- FLOW CHARTS AND PSEUDO CODES

- Algorithms are steps that can be followed to produce a desired outcome. An algorithm can be implemented using Flow Charts and Pseudo Codes.
- A Flow chart is a chart showing these steps and a Pseudo Code is a representation of a Flow Chart in words and its usually of an open mouth shape.

SYMBOLS **MEANING**



OPERATIONS

Addition …….. +

Subtraction …….. –

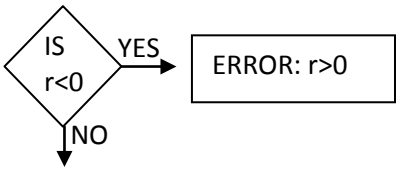
Multiplication …….. *

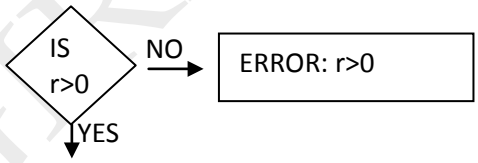
Division …….. /

NOTE: Distance measurable cannot be negative it has to be greater than zero e.g. radius, height, length, and breadth. Money can be zero or greater, other quantities can either be zero or greater than zero. There are also quantities with their limits or thresholds e.g. if the tax threshold of taxing a salary is K3000 in Zambia then a salary to be taxed must be greater than K3000 if not then it does not qualify to be taxed.

A look at a decision box or question box

e.g For Distance like Radius (r)



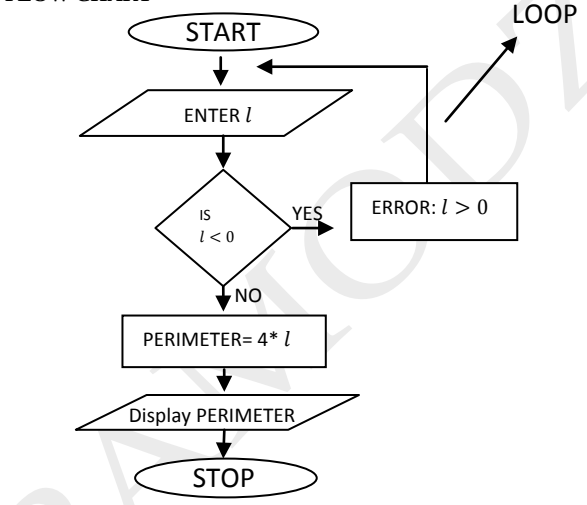


FLOW CHARTS AND PSEUDO CODES

Example 1:

Draw a flow chart and a Pseudo Code for perimeter of a square: Perimeter = $4l$

FLOW CHART



PSEUDO CODE

START

ENTER the length of the square

IF the length of the square is less than zero THEN ERROR re-enter positive length

ELSE

PERIMETER = 4*length

Display PERIMETER

STOP

NOTE: From the example above the formula for PERIMETER = $4l$, there is one variable (parameter) the length (l), 4 is not considered because it is a constant. Just like for $Area = \pi r^2$, r is the parameter but π is not a parameter it is a constant or a number which is $\frac{22}{7}$. In the Pseudo Code START and STOP are vertically on the same position just like ENTER and DISPLAY as indicated above because they have the same symbols respectively.

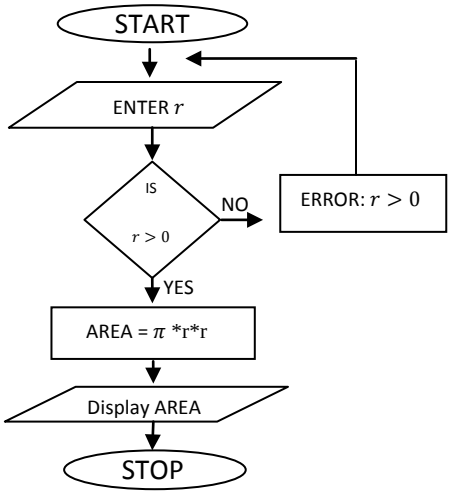
Example 2: For the area of a circle whose radius is r:

(a) Draw a flow chart

(b) Write a Pseudo code

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NB: For this one in some instances one may not be given the formula but it is important to know it because after decision box it must be shown ($Area = \pi r^2$ like $Area = \pi$ *r*r) as shown in the solution.

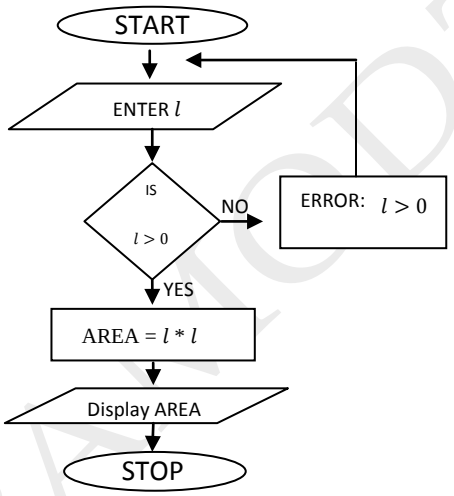
FLOW CHART	**PSEUDO CODE**
	START ENTER the radius of the circle IF the radius of the circle is less than zero THEN ERROR re-enter positive radius ELSE AREA = π * radius squared Display AREA STOP

CONSIDER: The decision box has NO giving an error and YES for proceeding depending on the question one has asked. On the Pseudo Code the formula can either be written as AREA = π *r*r or AREA = π * radius squared . There are no restrictions with the words to use in a Pseudo Code as long they are correct.

EXAMPLE 3: The Square has length l, for the Area of the square:

(a) Draw a flow chart
(b) Write a Pseudo code

Answer: First the formula for area of a square is: $A = l^2$

FLOW CHART	**PSEUDO CODE**
	START ENTER the length of the square IF the length of the square is less than zero THEN ERROR re-enter positive radius ELSE AREA = length squared Display AREA STOP

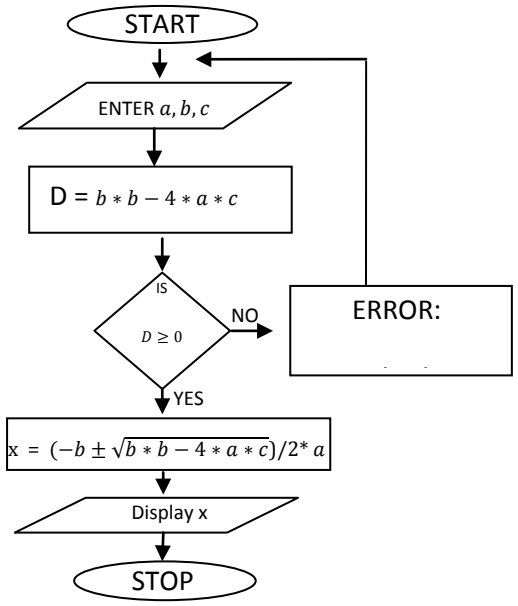
MORE THAN ONE PARAMETER

The above examples shows the Flow Charts and Pseudo Codes with one parameter, and so they had one "Enter"and "Decision" box but for most questions with two or more parameters they have two or more "Enter"and "Decision" boxes. However, some problems with many variables can have one "Enter"and "Decision" box depending on the stricture (Constraint) e.g. x = $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$, the Constraint is only on the Discriminant (D) = $b^2 - 4ac$ which can only give solution/s in real number if D = 0 or D>0 and so the focus is on D and not a, b and c. All solutions are dependent on the Discriminant when using a quadratic formula.

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A Flow Chart and Pseudo Code for x = $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ is as shown below

FLOW CHART



PSEUDO CODE

START

ENTER a,b,c

D = $b * b - 4 * a * c$

IF Discriminant is not greater than or equal to zero THEN ERROR, No solution in real numbers re enter correct values for a,b,c

ELSE

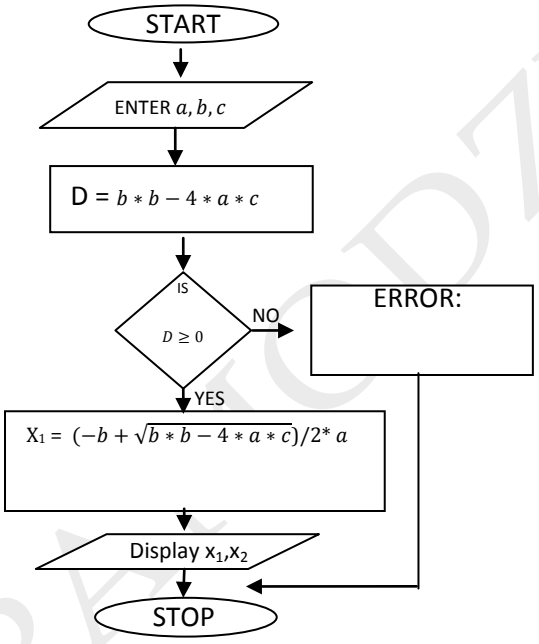
x = $(-b \pm \sqrt{b * b - 4 * a * c})/2 * a$

Display x

STOP

OR

FLOW CHART



PSEUDO CODE

START

ENTER a,b,c

D = $b * b - 4 * a * c$

IF Discriminant is not greater than or equal to zero THEN ERROR, No solution in real numbers you cannot proceed

ELSE

$x_1 = (-b + \sqrt{b * b - 4 * a * c})/2 * a$

$x_2 = (-b - \sqrt{b * b - 4 * a * c})/2 * a$

Display x_1,x_2

STOP

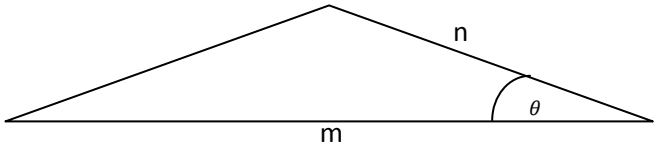
NOTE:

- For the two answers in a quadratic formula one can separate the formula for two answers $x_1$or x_2 or together as x = $(-b \pm \sqrt{b * b - 4 * a * c})/2 * a$
- The LOOP can go up to START if one re-enters correct values of a,b,c or STOP if one does not re-enter the correct values a, b and c and the LOOP goes down to STOP because even no solution can be an answer which can be marked.

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TWO PARAMETERS CONTINUED

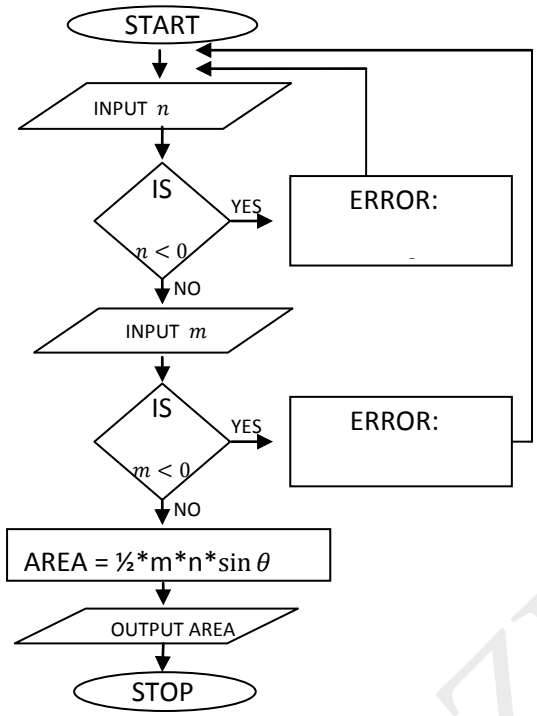
At times the Decision Box can be ignored depending on how the question is asked for example for a triangle below, one can complete a Flow Chart and a Pseudo Code for its area.



Solution

Formula: Area $= \frac{1}{2}mn\sin\theta$

FLOW CHART



PSEUDO CODE

START

INPUT n

If n is less than Zero Display ERROR message and re-enter n>0
ELSE

INPUT m

If n is less than Zero Display ERROR message and re-enter m>0

ELSE

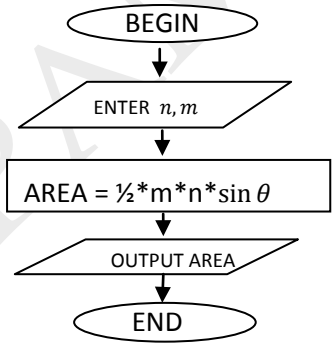
AREA = ½*m*n*sin θ

OUTPUT AREA

STOP

OR the other way is if the decision box is ignored and parameters are entered in one box as below:

FLOW CHART



PSEUDO CODE

BEGIN

ENTER n,m

AREA = ½*m*n*sin θ

OUTPUT AREA

END

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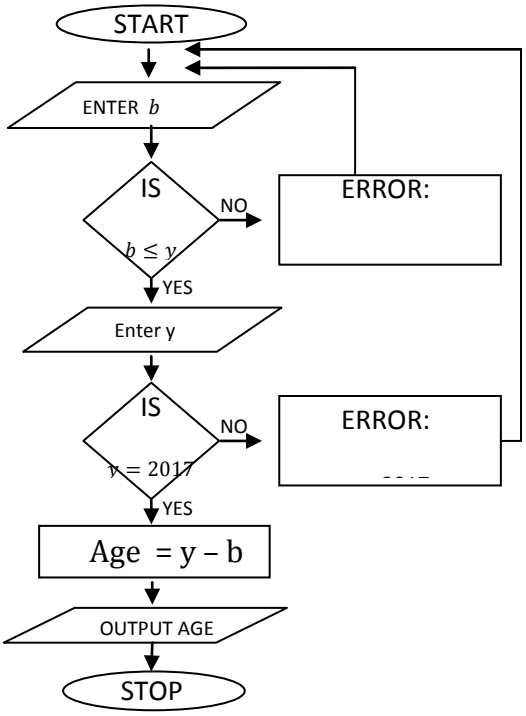
PROBLEM SOLVING:

In 2017 Chanda asked Mapalo to draw a Flow chart and a Pseudo Code about calculating the age, how can Mapalo go about it.

SOLUTION: Formula Age = Current Year – Date of Birth

Let Age be **A**, Current Year be y and Date of birth be **b**: The formula is A = y – b

FLOW CHART



PSEUDO CODE

START

ENTER b

If b is not less than or equal to y ERROR message and re-enter $b \leq y$
ELSE

ENTER y

If y is not equal 2017 Display ERROR message and re-enter y = current year

ELSE

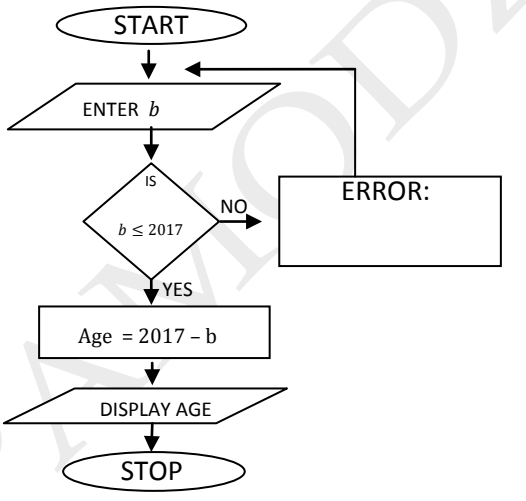
Age = y – b

OUTPUT AGE

STOP

But if you take the formula to include 2017 then you can Let Age be **A**, Current Year is 2017 and Date of birth be **b**: The formula becomes A = 2017 – b
Therefore, we have one parameter giving the following solutions:

FLOW CHART



PSEUDO CODE

START

ENTER b

If b is not less than or equal to 2017 ERROR message and re-enter $b \leq 2107$
ELSE

AGE = 2017 – b

DISPLAY AGE

STOP

EXERCISE

1. Draw a flow chart and a corresponding Pseudo Code for the following:
   a) Volume of Cone
   b) Volume of a cylinder
   c) Area of a right angled triangle
   d) A phone call
2. If the tax threshold of taxing a salary is K3000 in Zambia then a salary to be taxed must be greater than K3000 if not then it does not qualify to be taxed. Draw a flow chart and a corresponding Pseudo Code for this.

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MATHEMATICS DEPARTMENT-2017

ALGORITHMS

FLOW CHARTS AND PSEUDO CODES

Prepared and Compiled by Bweupe I. (HOD Mathematics)

Don' t fear it' s not about codes but about charts and words