

AUTOMATED PROGRESSION AND MEASURATION SYSTEM

BY

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I also express appreciation to my Head of Department of Mathematics/ computer **L.N. EZEAKO**, for his support.

CERTIFICATION

The study (APS) has been supervised and approved as having satisfied the condition for the award of (PGD) POST GRADUATE DIPLOMA IN COMPUTER SCIENCE of the Federal University of technology, Minna.

**NAME AND SIGNATURE OF
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DATE

**NAME AND SIGNATURE OF
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DATE

DEDICATION

This project is dedicated to the God Almighty, the owner of the world and every thing in it for his Devine Mercy and guidance today and tomorrow.

ABSTRACT

Computer being an electronic device which accept and processes data following a set of instructions known as PROGRAM to produce an accurate and efficient result called INFORMATION, this is thereby, termed the value of the machine lies solely on its ability to store large amount of data, the unfailing accuracy, conciseness and precision. Oh! Computers are marvelous and wonderful. Experts account for its supremacy over the human labour, which is widely believed. Therefore, what can the world do without computer today?

BACKGROUND

In human development, mathematics plays a major role in formal learning in all human activities, be it economical, political or academics, there is bound to be the need for calculations and most people even the professional in these areas of calculations usually scared either by the possibility of these being an error in their result from a calculation carried out or they are scared of the tedious procedures a particular problem or the large complex formula involved in solving a problem.

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CHAPTER ONE

1.0 INTRODUCTION

Calculations started from the origin of man or rather “early man”.

In what, they must have in one way or other counted apples, trees, and Animals in their environment in which they lived and ever since then, as man 's technological abilities increases, so does calculation becomes more complex and advanced. This project, automated progression and measuration system, is an aspect of mathematics that involves series called terms or set that follows a patter with a particular method of solution but the project is concerned with developing computer program to provide solution to progression problems.

1.1 STATEMENT OF PROBLEM

In human development, mathematics plays a major role in formal learning in all human activities, be it economical, political or academics, there is bound to be the need for calculations and most people even the professional in these areas of calculations usually scared either by the possibility of these being an in their result from a calculation carried out or they are scared of the tedious procedures a particular problem or the large complex formula involved in solving a problem.

These and some other reasons call for development of a means which could easily solve problems involving Calculations more reliable and error free and the computer, through the use of appropriate package, is a machine That can carry out calculations reliably and produce a result that is error free when given the figure

Ever, it has been the duty and the help of lectures to learn the techniques and skill required to handle mathematical problems. Through teaching computer aided learning has come to relief lectures to some extent by proving learning environment through computer for student in tertiary institutions

1.2 AIMS AND OBJECTIVES OF THE STUDY

This project is to serve as instruction – aided system, in solving progression problem

To create formula for solving measuring problem.

To encourage students to learn progression using computer.

CHAPTER TWO

2.0 INTRODUCTION

Calculation has been in existence since the time of early man. The history of computer in data processing has shown that in the time of early man calculations were made which shows that the technological development or upwardness lies solely on calculations. The generations of computer started by the early man through other stages to the latest stage now (the modern technological era) that enhances the easily flow of data and manipulation of data to generate output. Therefore "calculation has been the main stream of modern technological development. The history of computers in data processing gives the representation of the assertion. Above.

2.1 HISTORY OF COMPUTERS IN DATA PROCESSING

The historical development of computer in data processing ranges from the pre- modern (early man) abacus to the latest development in computer technology.

STAGE 1: THE PRE MODERN ERA ABACUS 450 BC

The early man was the first to recognize data processing system in the history of making by making use of the fingers of his hands to represent the numbers as is contains in hardware component and system handout produced by

BABA (unpublished). The next major step taken by the first civilizations was to represent numbers by means of stones in heap of ten as is stated in BABA Hardware component and system hand out unpublished. This in turn led to the development of Abacus or counterpane frame of seeds used by ancient Greeks or Romans and even today by many shops in China. Thus relatively simple device is a frame with beads arranged in parallel with wire at the middle represent figure. Arithmetic calculations are performed by manipulating the beads and the expert Abacus operator can calculate faster than a clerk using a desk calculator.

STAGE 2: NAPIER'S BONES (1617)

The invention of logarithms by John Napier, is a landmark in the history of computing. Logarithms enable us to multiply and divide large numbers quickly accurately and easily. As a by-product of logarithms, Napier devised a tool for multiplication and division that was nick named Napier Bones. The bones were actually rods manipulated to multiply or divide two numbers. This invention popular in Europe, was used to multiply, divide and extract square roots of numbers.

STAGE 3: PASCAL'S ADDING MACHINE (1642)

In 1642, Blaise Pascal, produced the first mechanical calculating machine with the number 0 – 9 and engraved it around the circumference of the beads. It

was operated by wheels on the front of calculator with the carry over digit transmitted to the next column by direct gearing of successive shaft. The machines could only be used to add or subtract numbers, it cannot perform multiplication and division. It was difficult to repair and many people were in doubt of its ability to some time.

STAGE 4: LECBINZE CALCULATOR (1671)

Gotfried von Leibniz in 1671 developed a machine which was an improvement of Pascal calculator. It utilized the same technique for addition and subtraction of the Pascal device in addition it can now perform multiplication and division of numbers.

However, as was the case with Pascal device, the machine was ahead of time the principles involve in Pascal and Leibniz calculator still found on some of the present day dial instrument e.g. electricity metre.

STAGE 5: JACQUARD WEAVING LOOM

In 1801 Joseph Marie Jacquard developed a method of controlling the operations of a weaving loom with the use of holes punched into card. This device was called Jacquard weaving loom. The holes punched into appropriate position in the card and could be mechanically programmed to weave specific pattern and to use specific colour. Jacquard device was the prototype of the

punched card machine which we are using today.

STAGE 6: CHARLES BABBAGE

In 1822, Babbage built his first different engine. It is a small machine involving several linked adding mechanism which will automatically generate successful value of simple algebraic function using the method of finite differences. The machine can computer very accurate mathematical table once a single set of until value had bears input into the mechanic from 1822 to 1848, babbage worked on a designing of a general -purpose digital calculating machine called an analytical engine. The machine is a program controlled mechanical digital computer, incorporating a complete arithmetic unit a stired and a punched card for input and output. babbage was frequently considered as the father of modern computer because his engine incorporated the essential feature of the current automatic computers.

STAGE 7: HOLLERITH TABULATING MACHINE

Towards the end of 19th century, DR. Herman Hollerith, modified the idea of Babbage different and analytical engines to produce. A machine to speed up the task of taking national census in U.S.A. the machine that Hollerith design incorporated manual operation which consist of punched card with holes punched on a card of 80 columns and 12 rows, that can be read using electronic

means this machine was capable to tabulating and sorting numbers and they used it for data processing for the population census in 1890 in U.S.A.

In 1910, 1 new machine was developed for census in U.S.A. which was a new tabulating system involving mechanical sensing card. This was the origin of punched card and was used in 1911 to develop an accounting machine and this was the fore – runner of machine use for accounting purpose nowadays.

STAGE 8: MARK I

In 1936, prof. Howard Aiken in collaboration with IBM (international Business machines) constructs the automatic sequence controller calculator. They were successful in 1941 by demonstrating the activities of Howard mark I and machine was capable of performing arithmetic operations effectively was developed. This machine was on electronic device which make use of counter wheel to store numbers in decimal form. Paper tape were also sued to input program and limited facilities for loping were available with electronics tapes inside and normally used about 200kv of power.

This machine could complete in 1 hour as many calculations as the mark I could do in a week. It could store only 20 numbers and the speed for addition, multiplication and division are 200, 300 and 6000 microseconds respectively. The major short – coming of ENIAC was its inability to store programs along with the data to so processed.

STAGE 10: EDVAC ELECTRONIC DISCRETE. VARIABLE
AUTOMATIC COMPUTER

In 1946, Mauchly and Eckert thought of another device that could incorporate Dr. von Neumann's idea of stored program the list of instructions which controls the operation of the computer, coded in the same way as the input data, initially stored in the computer along with the data, and then this program is executed automatically. These men aimed at constructing a device EDVAC, but their intention was not immediately achieved as they both separated to float their separate companies.

STAGE 11: EDSAC

This was the first computer to use the stored program. It was developed by M.V Wilkes of Cambridge University. The stored program concept allows modification to be done during the execution of program as intermediate result, data and on fact the program could be stored for future use instead of the usual repetition each time a program is run (executed).

Recently, we have other electronic commercial and scientific computer that was designed by the pioneers of EDSAC. Notably among these UNIVAC.

THE MEANING COMPUTER.

A computer is essentially an electronic device which process data supplied through any available input device e.g. keyboard into information which can be stored in its memory or communicated to the user via any available output device e.g. (screen).

The computers used in data processing composed one or more electronic machines using digital signal for recording and moving data and instructions. Thus an interface has to exist between the computer itself and the users to

- (a) Provide it with instruction and raw materials.
- (b) Understand the information produced by processing the raw materials.

TYPES OF PROGRESSING

2.2.1 ARITHMETIC PROGRESSION

If a sequence of terms is such that the difference between any term and the one immediately preceding it is constant, the terms are said to form an arithmetic progression. The difference is called the common difference.

Examples of arithmetic progressions are

- (i) 5, 8, 11, 14 ----- common difference are
- (ii) 3, 1, 5, 9 -----common difference +3.
- (iii) -2, -3/4, +1/2, +1³/4 -----common difference 1¹/4
- (iv) a, a+d, a+2d, a+3d ----- --common difference d

THE NTH TERM

Suppose the first term of an arithmetic progression (A.P) is 7 and the common difference. 3.

The second term is $7 + 1 (3) = 10$

The third term is $7 + 2 (3) = 13$

Similarly the nth term of an AP whose first term is a and whose common difference is d, is $a + (n - 1) d$.

2.2.2. GEOMETRIC PROGRESSION

If in a sequence of terms, each term is a constant multiple of the preceding, the terms are said to be in geometric progression (G.P). This multiple is called common ratio.

Examples of terms in G.P are:

(i) 3, 6, 12, 24 ----- common ratio is + 2

(ii) 8, 4, 2, 1, $\frac{1}{2}$ ----- common ratio is $\frac{1}{2}$

The nth term.

Suppose that 3 is the first term of a GP whose common ratio is 2.

The second term is $3 (2)$

The third is $3 (2^2)$

Similarly the n th term of a G.P whose first term is a and whose common ratio is r is $a*r^{n-1}$.

2.3 LIMITATIONS OF OLD SYSTEM

The manual operation of calculating progression problems involves the use of pen and paper and this method has a lot of limitations which.

1. *Includes slow in calculation:* The manual method of calculating could be very slow in that its speed depends on the rate at which the user can add, subtract, multiply and divide figures
2. *Tedious:* The manual method of calculating could be tedious if the data involved are very large and complex and if a particular step has to be repeated a number of times (looping).
3. *Prone to error:* In the course of using the manual method of calculation in solving problems, there is a greater chance of error in the calculation in that human beings cannot be perfect.
4. *Insecurity:* Data processed manually are not too secured in that they can easily be misplaced or accessed by unauthorized persons.

2.4 INPUT FORMAT OF THE OLD SYSTEM

In the manual method which is the old, variables are substituted with numbers integers or real numbers. The notations of these variables are shown below.

2.4.1 ARITHMETIC PROGRESSION

General format = $a + (n - 1) d$

a = first term of a given series

n = nth term of a gives series

d = common difference between the term of the series (A.P)

2.4.2 GEOMETRIC PROGRESSION

General format = $a * r^{n-1}$

a = first term of a given series

n = nth term of a given series

r = common ration between two terms of a series (G.P).

2.5 OUTPUT FORMAT OF OLD SYSTEM

The output of the old system can be either be in integer or real number form. The output is the expected result after processing the output data.

2.5.1 ARITHMETIC PROGRESSION.

T_n = Nth term of an A.P.

$T_n = a + (n - 1)d$

2.5.2 GEOMETRIC PROGRESSION

$T_n =$ Nth term of G.P

$$T_n = ar^{n-1}$$

2.6 PROCESSING IN THE OLD SYSTEM

Nth term of AP $T_n = a + (n - 1) * d$

Nth term of GP $T_n = a * r^{n-1}$

Sum of AP $S_n = (n/2 * 2 * a + (n - 1) * d)$

Sum of GP $S_n = a * (r^n - 1) / r - 1$ if $r > 1$

And $a * (1 - r^n) / 1 - r^n$ if $r < 1$

2.7 HOW THE OLD SYSTEM AFFECTS DECISION MAKING

The old system due to its limitations and its other attributes affects decision making in various ways which include.

1. *Show decision making:* Due to the slow speed with which the old system operates, it results into slow decision making and incases which involves business organization, slow decision making could have a bad effect on the set objectives of the organization.
2. *Wrong decision:* Because of the manual method of calculating in the old system there are greater chances of errors is the final result and when these results are used in decision making, it can lead to wrong decision

which could have effect on the user.

3. *Insecurity:* The old system does not provide adequate security for the processed data and cases where the processed data is lost and they are needed for future references they hinder decision making.

CHAPTER THREE

3.0 SYSTEM METHODOLOGY

Introduction of New system:- The new system (Automated progression system) is meant to handle Arithmetic progression and geometric progression is designed in view of the limitations invited in the use of manual methods.

CALCULATION IN LEARNING.

The system is designed such that its. Menu driven and provides the user with a set of options to close from the menu.

Operations: - The following mathematical operations are performed by the system. Series, arithmetic and geometric progression

3.1 INPUT FORMAT: -

The input format of the new system is such that integer, real constant are entered as numeric variable, lecterns and strings as alphanumeric and alphabetic variables. Choice, name and heading and label. The system prompts the user to enter the figure to be used in the proposed calculation as numeric variable. In cases that involves arrays of numbers, the system prompts the user to user the limit of the array and then subsequently the numbers. In other cases, the user is expected to input just the values to be used in the calculation.

Output format: - The format of the output is numeric, alphabetic and

alphanumeric for string variables. Values that output by the system are numeric constants (real or integer). After processing the system output the required results and the values used in its computation.

Documentation: - The project automated progression system is designed in A BASIC, is aimed at using the computer in calculating arithmetic and geometric progression as a teaching aid. The project beings with Logo APS (automotive progression system) and them to the main menu and the user is then requested to enter his/her choice from the provided options. On editing choice, the system then takes you to the specified environment wither automatic or geometric while in the specified environment, a sub menu is displayed for either the user to specify the problem to be solved and then the control is then transferred to the environment that handles such problem.

For instance if from the main menu which consists of arithmetic,
if the user wants to solve an arithmetic progression
then a for arithmetic progression, the system them moves
to arithmetic environment and display a sub – menu for the user to chose from
again a set of definition, formula, examples etc.

Upon entering of choice from the options displayed in the sub- menu of arithmetic progression the control is then transferred to the environment of the specified arithmetic progression. If the problem is such that has different types, the user again is requested to enter the kind of the problem to be solved from the

options provided in a sub – menu. The same procedure is used in solving geometric progression problem. The major point to meet is that the user make his/her choice from the provided menu and at each stage the user has to tell the system what course of action from within the provided options he/she wants the system to carry – out and as such the package could be said to be user friendly.

CHANGE OVER

The (APS) is prepared to be used in a parallel running with the manual method of learning and teaching while the APS will be used for check up and private use to enhance and promote fast and self learning. Both the (APS) and lectures are used together to get the best result for the student.

3.5 OUTPUT FORMAT OF THE OLD SYSTEM

The output of the old system like the input, can be either be in integer or real number form. The output is the expected result after processing the input data.

1. MATHEMATICAL PROBLEMS

a Arithmetic and Geometric progression

T_n = Nth term of an A.P

T_n = Nth term of a G. P

S_n = Sum of A.P

S_n = Sum of G.P

b. Quadratic Equation

X = Roots of an equation

c. Measurement

Area:

A = Area of any given shape

Volume:

V = volume of a shape

Perimeter:

P = perimeter of a given shape

d Median

med = mean of given values

e Mode

Mo = mode of given values

3.6 PROCESSING IN THE OLD SYSTEM

MATHEMATICAL PROBLEMS

Nth term of A.P $T_n = a + (n - 1)d$

Nth term of G.P $T_n = a * r^{n - 1}$

Sum of A.P $S_n = n/2 * (2*a + (n - 1)*d)$

Sum of G.P $S_n = a*(r^n - 1)/r - 1$ if $r \neq 1$

and $a*(1 - r^n)/1 - r^n$ if $r = 1$

Root of an equation $X = \frac{-b \pm \sqrt{b^2 - (4*a*c)}}{2*a}$

Area of SQUARE

$$A = S*S$$

Area of RECTANGLE

$$A = h*B$$

Area of TRIANGLE

$$A = \frac{1}{2}*B*H$$

Area of TRAPEZIUM

$$A = \frac{1}{2}*(A+B)*H$$

Area of PARALLELOGRAM

$$A = B*H$$

Area of CIRCLE

$$A = \pi*R*R$$

Area of SECTOR OF CIRCLE

$$A = \frac{\theta}{360} * \pi * R * R$$

Area of CUBE	$A = 6*S*S$
Area of CUBOID	$A = 2*(h*B+B*H+h*H)$
Area of CYLINDER	$A = 2*II*R*H+2*II*R*R$
Area of CONE	$A = II*r*l+II*R*R$
Area of SPHERE	$A = 4*II*R*R$
Perimeter of SQUARE	$P = 4*S$
Perimeter of RECTANGLE	$P = 2*(L+B)$
Perimeter of CIRCLE	$P = 2*II*R$
Perimeter of SECTOR OF CIRCLE	$P = 2*R + \frac{\theta}{360} * 2*II*R$
Volume of CUBE	$V = S*S*S$
Volume of CUBOID	$V = L*B*H$
Volume of PRISM	$V = A*H$
Volume of CYLINDER	$V = II*R*R*H$
Volume of CONE	$V = 1/3*II*R*R*H$
Volume of SPHERE	$V = 4/3*II*R*R*R$

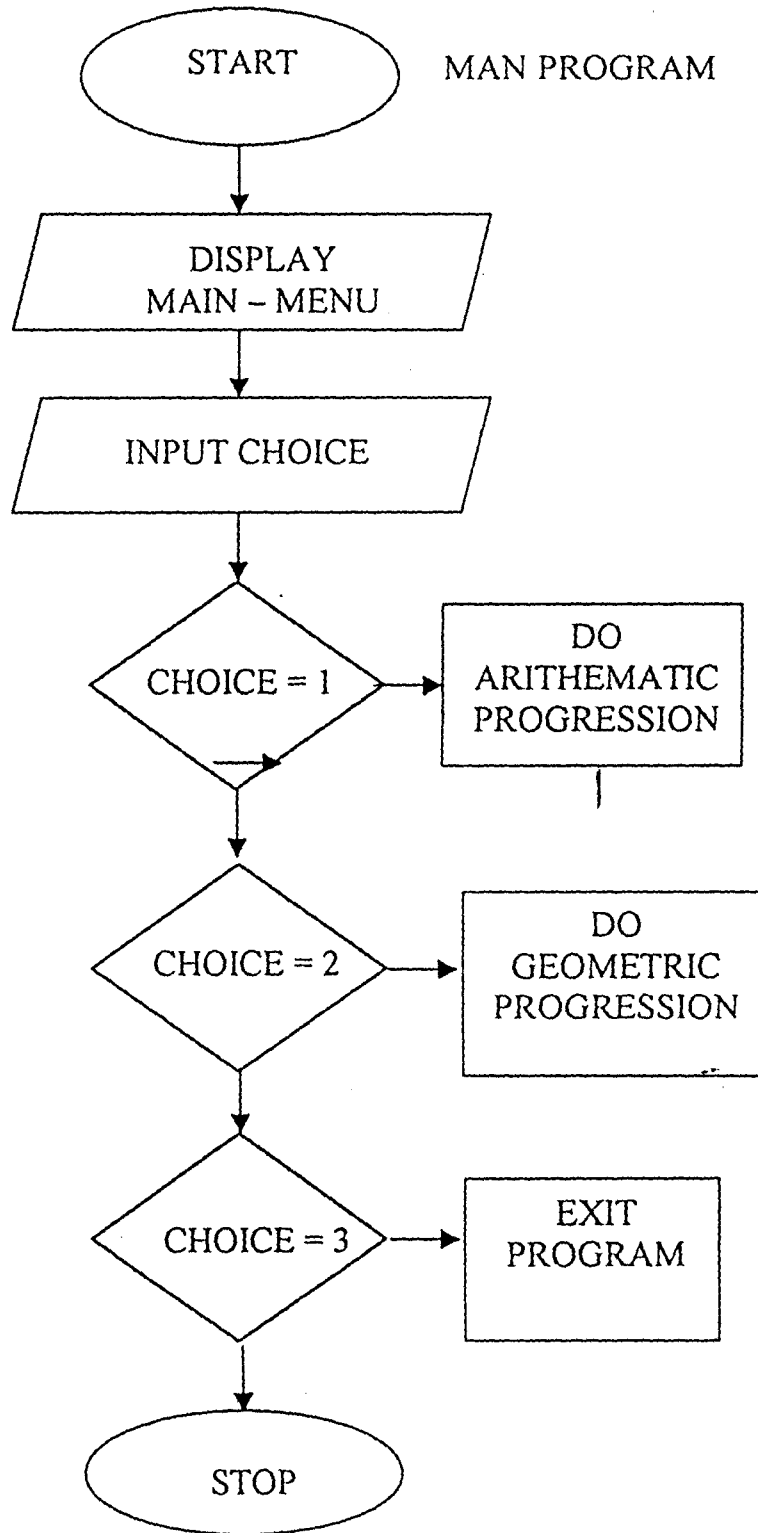
PERMUTATION/COMBINATION/FACTORIAL

Permutation	$P = n*(n-1)*(n-2)*...r/(n-r)*(n-r-1)*...$
Combination	$C = n*(n-1)*(n-2)*...1/(n-r)*(n-r-1)*...1*r*r-1*...1$
Factorial	$r = n*(n-1)*(n-2)*...1$

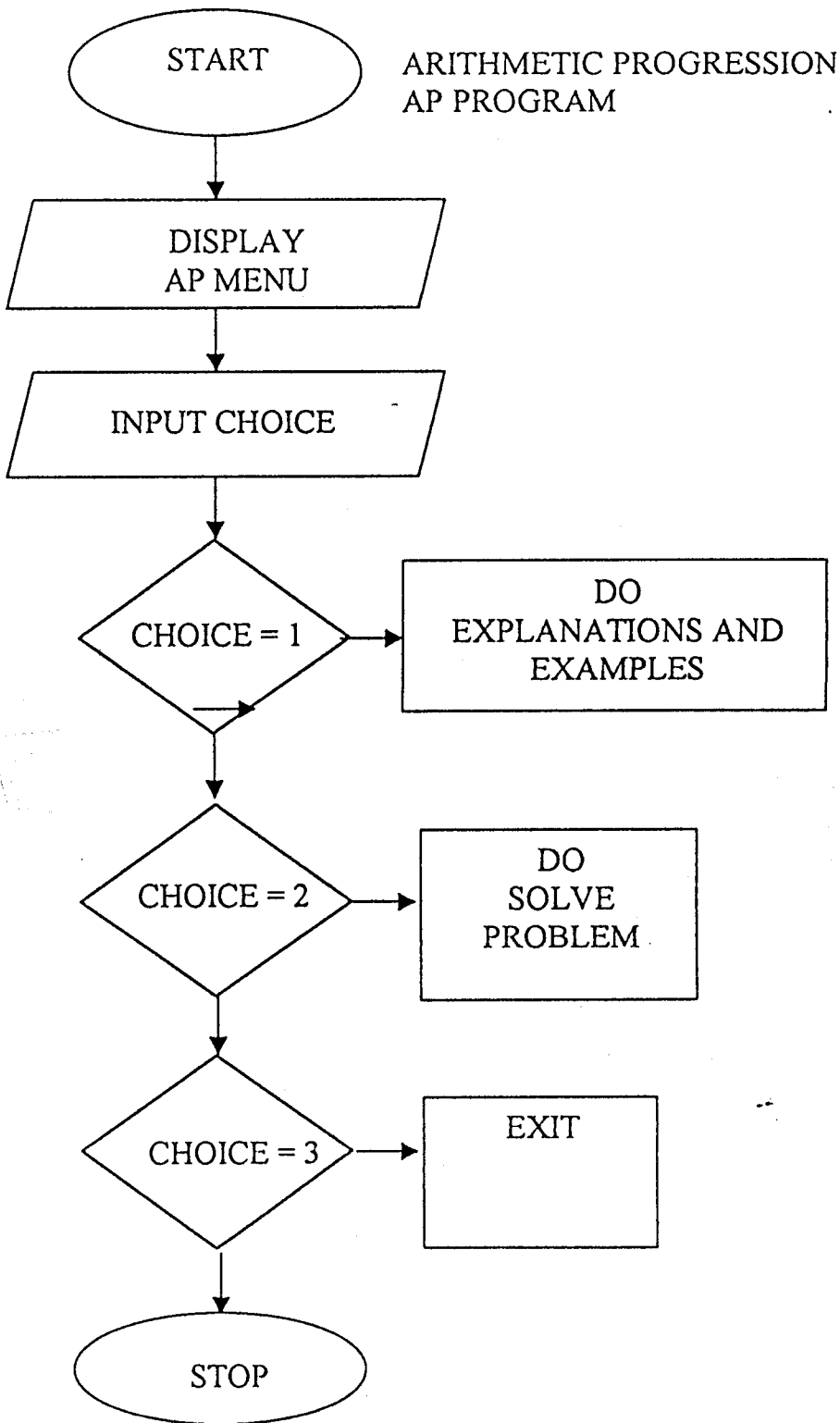
CHAPTER FOUR

SYSTEM DESIGN

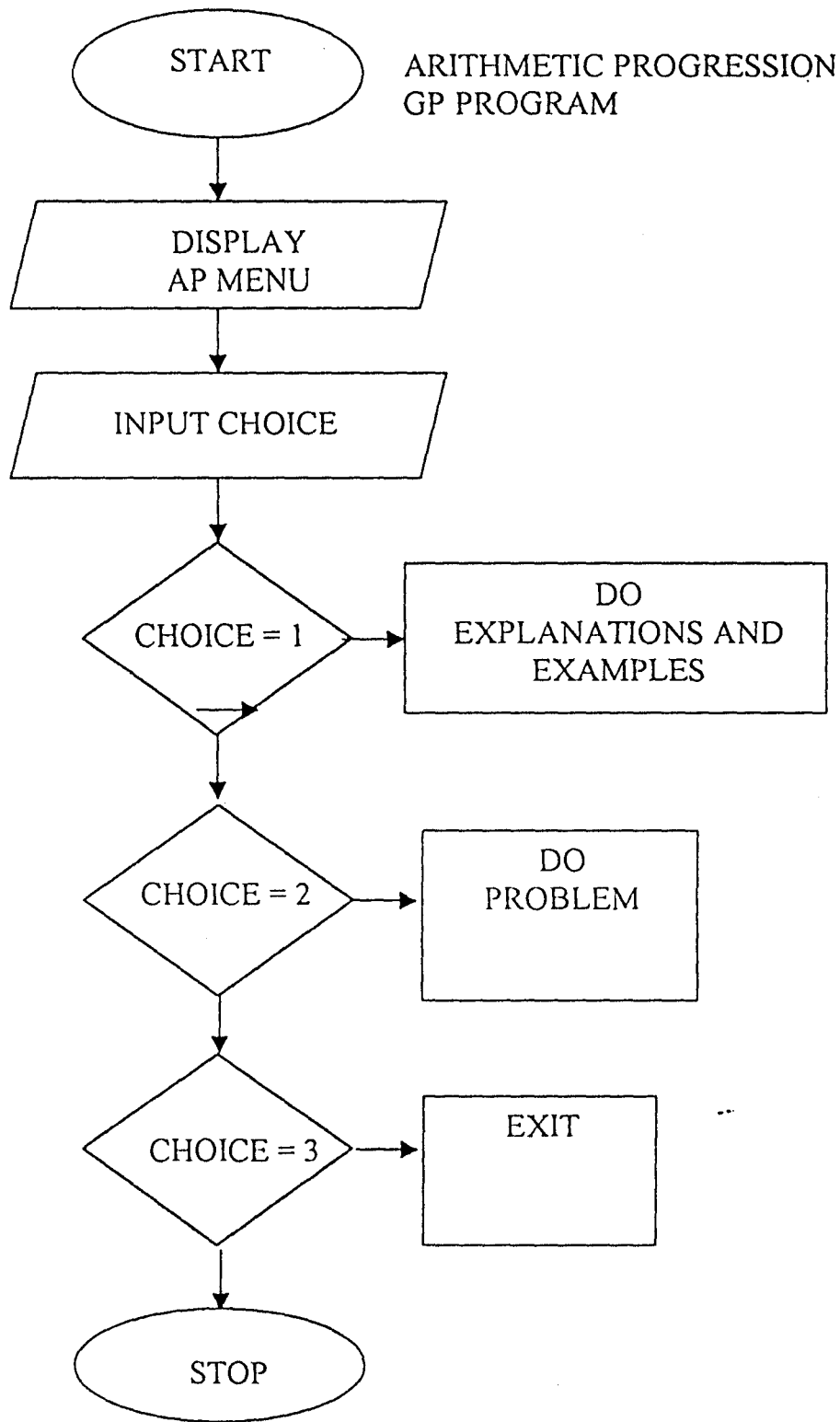
PROGRAM FLOWCHART



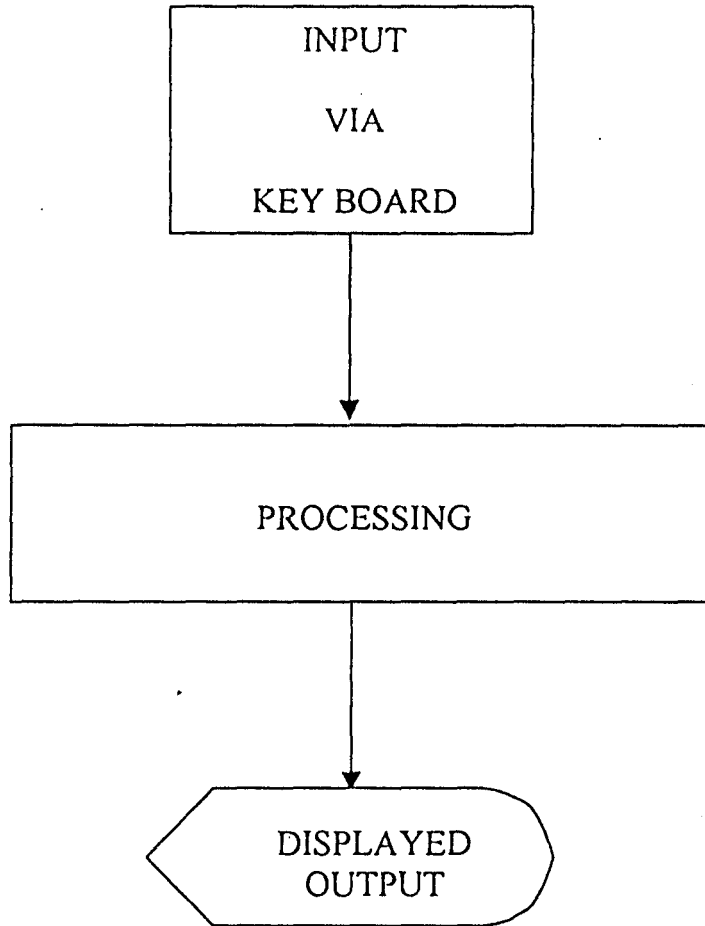
PROGRAM FLOWCHART



PROGRAM FLOWCHART



PROCESS FLOWCHART



4.3 ALGORITHM:-

This is the step by step procedures to solve progression.

4.3.1 MENU PROGRAM

- (1) Display main menu
- (2) Enter choice
- (3) If choice = 1 Do arithmetic progression

- (4) If choice = 2 Do Geometric progression
- (5) If choice = 3 exit program
- (6) Stop

4.3.2 AP PROGRAM

- (1) Display Ap menu
- (2) Enter choice
- (3) If choice = 1 Do explanation & examples
- (4) If choice = 3 Do solve problem
- (5) If choice = 3 exit program
- (6) Stop

4.3.3 GP PROGRAM

- (1) Display GP program
- (2) Enter choice
- (3) If choice = 1 Do explanation & examples
- (4) If choice = 2 Do solve problem
- (5) If choice = 3 exit program
- (6) Stop

CHAPTER FIVE

5.0 SUMMARY

It is a well fact that progression has been always seen as major topics of concern to student in that it involves a lot of formula and such students at the thought of having to do calculations are always scare. Therefore these factors an some other factors such as efficiency speed in learning and ability to score high mark and interest in mathematics as been the focus and earn of (APS).

5.1 CONCLUSION

The APS is meant to be used concurrently with the manual normal method of learning mathematic but manly used for checking and private learning for high ability and interest development in mathematics.

RECOMMENDATION

It is recommended that the user of the (APS) automated progression system strictly follow the procedure of operation of the (APS) for effective and accurate result to be achieved and the APS should be introduced in the school for parallel running of learning mathematics in tertiary institutions.

```
te (5,10), print "welcome to automated progression"
te (7,12), print "systems (APS)"
te (14,31), print "by"
te (12,25) print "mr nwozu E.A. Fed. Poly. Nas."

ate (7,31), print "menu"
ate (9,12), print "(1) arithmetic progression"
ate (11, 12), print "(2) geometric progression"
ate (13,12), print "(3) exit"
ate (15,14), print "chose 1, 2, or 3"
ate (15,27), input choice
choice = 1
ub ap
eif choice = 2
ub gp
eif choice =3
t
if.
routine (ap)

ate (5,29), colour 1: print "arithmetic progression"
ate (8,5), color 2: print "[1] definition of terms"
ate (10,5), color 2: print "[2] solve problem"
ate (12, 5), color 2: print "[3] exit"
ate (14,5), color 2: input "type the number your want" choice
choice = 1

ate (5,5), print "Ap is the from  $a+(n-1) * d$ "
t
ate (7,5), print "note that  $N2 - n1 = n3 = n2 = n4 - n3$ "
```

```

t
cate (10,5), print "definition, a is the first term in Ap"
it
cate (12,5), print "definition, n is the number of terms in Ap"
ait
cate (14,5), print "definition, d is hte diference between terms in AP"
it
cate (20,5), print "are you okay?"
put "yes or no" res$
res$ = yes
s
t choice = 2
choice = 2
s
0 locate (7,5), then print "let us solve probelm"
cate(10,5), input a, n, d
t  $T_n = a + (n - 1) * d$ 
cate (12,5), print "using the formula  $a + (n - 1) * d$ "
cate (13,5), print "the term is" Tn
cate (17,5), print "do you have more probelm?"
put "yes or No" res$
res$ = yes
toq 170
se
it
return
brounbine (GP)
s
cate (5,29), color 1: print "gometric progression"
cate (8,5), color 2: print "(1) definition of terms"
cate (10,5), color 2; Print "(2) solve probelm"
cate (13,5), color 2: print "(3) exit"

```

```
locate (14,5), color 2; input "type the number your want" choice
choice = 1
locate (5,5), print "GP is of the form arn-1"
locate (7,5), print "note that  $N_2/N_1 = N_3/N_2 = N_4/N_3$ "
locate (8,5), print "if not equal, then it is not GP"
locate (12,5), print "definitoin, n is the number of terms in GP"
locate (14,5), print "definition r is hte ratio between term in GP"
locate (20,5), print "are you okay?"
locate (22,5), input "yes or no" res$
res$ = yes
choice = 2
choice = 2
then locate (7,5), print "let us solve probelm"
locate (10,5), input a, r, n
Tn = a * r ^ N-1
locate (12,5), print "using hte formula  $a * r ^ N-1$ "
locate (13, 5), print "the term is" Tn
locate (17, 5), print "do you have more probelm?"
input "yes or no" res$
res$ = yes
to 200
else exit.
return
```

OUTPUT 1

Welcome to automated progression and Measurement system

(APMS)

BY

NWOZU E.A. FED. POLY. NAS.

OUTPUT 2

MENU

- [1] Arithmetic Progression**
- [2] Geometric Progression**
- [3] Measurement**
- [4] Exit**

Choose 1,2, 3 or 4

OUTPUT 3

Arithmetic Progression

[1] Definition of terms

[2] Solve Problem

[3] Exit

Type the number you want

AP is of the form $a + (n-1) * d$

Note that $N_2 - N_1 = n_3 - n_2 = n_4 - n_3$

Definition, a is the first term in AP

Definition, n is the number of term in AP

Definition, d is the difference between terms in AP

Are you okay?

Output 4

Let us solve problem

Using the formula $a + (n-1)d$

The term is 100

Do you have more problem?

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