# DESIGN AND IMPLEMENTATION OF SAMPLE SIZE AND CENTRAL TENDENCY (MEAN, MEDIAN AND MODE) CALCULATOR

**BY**

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## DECLARATION

We hereby declare that the work in this project titled "**Design and Implementation of Sample Size and Central Tendency (Mean, Median and Mode) Calculator**" was performed by us under the supervision of Mallam Usman Wakili. The information derived from literatures has been duly acknowledged in the text and a list of references provided. The work embodied in this project is original and had not been submitted in part or in full for any other diploma or certificate of this or any other institution.

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(ST/CS/ND/21/094)                              Signature                    Date

## CERTIFICATION

This project work titled "**Design and Implementation of Sample Size and Central Tendency (Mean, Median and Mode) Calculator"** meets the regulations governing the award of National Diploma (ND) in Computer Science, Federal Polytechnic Mubi, Adamawa State

Mallam Usman Wakili                   _____

(Project Supervisor)                         Sign/Date

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(Head of Department)                      Sign/Date

Abdulrahman Saidu                     _____

(External Examiner)                        Sign/Date

# DEDICATION

I dedicate this project work to Almighty God for granting me the ability to accomplish this work successfully.

# ACKNOWLEDGEMENTS

I want to acknowledge Almighty God for his infinite mercy and protection throughout my academic activities. And for the understanding in achieving our academic success.

I also recognize my Supervisor Mallam Usman Wakili who took time, despite her busy schedule to directed and guided me throughout this research work.

I also acknowledge the Head of Department Computer Science Mr. Mustapha Kassim for his moral encouragement throughout my period of study. I also acknowledge all Staff of Computer Science Department for their support and encouragement and the knowledge they've impacted on me throughout our studies.

I also want to appreciate our parents for their love and care and for giving me the opportunity to be trained and achieve our dreams.

Finally, I appreciate the efforts of my Uncles and aunties, for their encouragement and support throughout the course of our study and also our friends and relatives, course mates and all well-wishers. I love you all, may the Almighty God bless you abundantly, Amen.

# TABLE OF CONTENTS

## LIST OF FIGURES

# ABSTRACT

*A calculator Generating Mean Median and Mode from Sample Population. This project is design to ease users from the challenging and difficult process of generating Mean, Median and Mode from Sample Population using the manual method i.e. Pen and Paper. The project was achieved using PHP 5.3.4 version program, HTML for the framework, CSS for styling and JavaScript for necessary validation and restriction of fields.*

# CHAPTER ONE
# INTRODUCTION

## 1.1 Background to the Study

In statistics the term "population" has a slightly different meaning from the one given to it in ordinary speech. It need not refer only to people or to animate creatures - the population of Britain, for instance or the dog population of London. Statisticians also speak of a population of objects, or events, or procedures, or observations, including such things as the quantity of lead in urine, visits to the doctor, or surgical operations. A population is thus an aggregate of creatures, things, cases and so on (Sathian, 2020).

Although a statistician should clearly define the population he or she is dealing with, they may not be able to enumerate it exactly. For instance, in ordinary usage the population of England denotes the number of people within England's boundaries, perhaps as enumerated at a census. But a physician might embark on a study to try to answer the question "What is the average systolic blood pressure of Englishmen aged 40-59?" But who are the "Englishmen" referred to here? Not all Englishmen live in England, and the social and genetic background of those that do may vary. A surgeon may study the effects of two alternative operations for gastric ulcer. But how old are the patients? What sex are they? How severe is their disease? Where do they live? And so on. The reader needs precise information on such matters to draw valid inferences from the sample that was studied to the population being considered. Statistics such as averages and standard deviations, when taken from populations are referred to as population parameters (Hancock, 2022).

A population commonly contains too many individuals to study conveniently, so an investigation is often restricted to one or more samples drawn from it. A well-chosen sample will contain most of the information about a particular population parameter but the relation between the sample and the population must be such as to allow true inferences to be made about a population from that sample. Consequently, the first important attribute of a sample is that every individual in the population from which it is drawn must have a known non-zero chance of being included in it; a natural suggestion is that these chances should be equal. We would like the choices to be made independently; in other words, the choice of one subject will not affect the chance of other subjects being chosen. To ensure this we make the choice by means of a process

in which chance alone operates, such as spinning a coin or, more usually, the use of a table of random numbers (Miaoulis, 2018).

Mean, mode and median are popular quantitative research methods used in business, as well as, engineering and computer sciences. In business studies these methods can be used in data comparisons such as comparing performances of two different businesses within the same period of time or comparing performance of the same business during different time periods. Mean can prove to be an effective tool when comparing different sets of data; however, this method might be disadvantaged by the impact of extreme values. A given set of data can contain more than one mode, or it can contain no mode at all. Extreme values have no impact on mode in data comparisons, however, the effectiveness of mode in data comparisons are compromised in the presence of more than one mode (Miaoulis, 2018).

## 1.2    Problem statement

The manual calculation of population size, mean, median and mode is mostly associated with the following setbacks which propel the application of computer to remove these drawbacks:

i.     Tedious process in the determination of sample size
ii.    Tedious process in deriving the mode of a population
iii.   Time consumption in calculating the mean of a given population
iv.    Difficult processes in calculating the median of a given population.

## 1.3    Aim and Objectives

The aim of this project work is to design and implement a calculator for c

i.     To design a system that will calculate the Sample Size of given population
ii.    To create a system that will determine the Mean of given figure
iii.   To calculate the Median of given series of numbers
iv.    To calculate the Mode of given numbers.

**1.4    Significance of the Study**

This research work will be of great significance not just for students, also to the users of the system. This importance includes:

i.    It will minimize the manual operation of obtaining sample size, mode mean and median

ii.    The benefits of the services provided by the computer would enhance efficiency of the process.

iii.    It will bring to awareness the importance of computerization.

iv.    It will enhance speed in the in the computation of sample size, mean median and mode.

**1.5    Scope of the Study**

Success of every research work depends on the areas covered (scope) during the research. This research work is limited to the calculation of Sample Size, Mean, Median and Mode

**1.6    Definition of Some Operational Terms**

**Population:** In statistics, a population is a set of similar items or events which is of interest for some question or experiment (Dunham, 2018).

**Sample Size:** The number (n) of observations taken from a population through which statistical inferences for the whole population are made (Hancock, 2022).

**Median**: is the middle value when the data is arranged in numerical order. It is another effective tool to compare different sets of data, however, the negative impact of extreme values is lesser on median compared to mean (Watson & Moritz, 2018).

**Mode:** is the value that appears the most (Watson & Moritz, 2018).

**Mean:** implies average and it is the sum of a set of data divided by the number of data (Watson & Moritz, 2018).

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1    Introduction

Statistics are used to summarize the data collected through survey or investigation. The basic role of statistics in research is to make conclusions about a population of interest when data is only available from a sample. Research data usually measure observations of an occurrence of an event as well as indicate exposure. Also, the role of statistician is to determine whether any association that is observed in the sample is actually a real one. In most cases, there will be some association even though very small. The statistician also has important role in determining if the association is different than what would occur by chance. The most common and basic statistical method used in applied research is frequency measure, which is simply a measure of counting and comparing their characteristics. These frequency measures are rates, ratios and proportions. The sampling techniques, on the other hand, are commonly used for research investigations to better estimate at low cost and less time with greater precision (Watson & Moritz, 2018).

According to Hancock (2022), the selection of sampling methods and determination of sample size are extremely important in applied statistics research problems to draw correct conclusions. If the sample size is too small, even a well conducted study may fail to detect important effects or associations, or may estimate those impacts or associations too imprecisely. Similarly, if the sample size is too large, the study would be more complex and may even lead to inaccuracy in results. Moreover, taking a too large sample size would also escalate the cost of study. Therefore, the sample size is an essential factor of any scientific research.

Sathian (2020) has pointed out that sample size determination is a difficult process to handle and requires the collaboration of a specialist who has good scientific knowledge in the art and practice of medical statistics. Techniques for estimating sample size and performing power analysis depend mainly on the design of the study and the main measure of the study.

The scholastic development of average most often begins in the primary grades with the concept of mode, followed by midrange and median. Studies indicate that when early primary grade. Students are first introduced to data sets they have difficulties

seeing the data as a whole and focus on the aspects of the individual data points (Hancock, 2022). According to Konold & Higgins (2021), ideal averages have four properties: (a) an actual value in the data set, (b) the most frequently occurring value in the data set, (c) located midway between two extreme values in the data set, and (d) relatively close to all other values in the data set. Two examples of ideal averages are the middle-clump, a cluster of values in the heart of a distribution, and the modal-clump, a central range of values that not only indicates central tendency, but also some sense of the data's distribution (Konold & Higgins, 2022; Russell, Schifter & Bastable, 2022).

## 2.2    The Concept of Sample Size

In 1786, Pierre Simon Laplace estimated the population of France by using a sample technique, along with ratio estimator. He also computed probabilistic estimates of the error.

Alexander Ivanovich Chuprov introduced sample surveys to Imperial Russia in the 1870s (Cochran and Robert, 2014). Sampling is related with the selection of a subset of individuals from within a population to estimate the characteristics of whole population. The two main advantages of sampling are the faster data collection and lower cost. (Kish 2016, Robert, 2014) Each observation measures one or more properties of observable subjects distinguished as independent individuals. In business research, medical research, agriculture research, sampling is widely used for gathering information about a population.

### 2.2.1    Criteria for good Sample Size

 (Glenn 1992, Cochran 1963, Gupta and Kapoor 1970) In addition to the purpose of the study and population size, three criteria usually will need to be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk, and the degree of variability in the attributes being measured (Miaoulis, 2018).

### 2.2.2    The Level of Precision

The level of precision, sometimes called sampling error, is the range in which the true value of the population is estimated to be. This range is often expressed in percentage points (e.g., ±5 percent) in the same way that results for political campaign polls are reported by the media. Thus, if a researcher finds that 60% of farmers in the sample have adopted a recommended practice with a precision rate of ±5%, then he or she can

conclude that between 55% and 65% of farmers in the population have adopted the practice (Cochran, 2021)

### 2.2.3 The Confidence Level

The risk level of confidence level is based on ideas of Central Limit Theorem. The key idea in the Central Limit Theorem is that when a population is repeatedly sampled, the average value of the attribute obtained by those samples is equal to the true population value. Further, the values obtained by these samples are normally distributed about the true value, with some samples having a higher value and some obtaining a lower value than the true population value. In a normal distribution, approximately 95% of the sample values are within two standard deviations of the true population value. This confidence interval is also known as risk of error in the statistical hypothesis testing. In other words, this means that if a 95% confidence level is selected, 95 out of 100 samples will have the true population value within the range of precision specified. There is always a probability that the sample obtain by the researcher or investigator does not represent the true population value. Such samples with extreme values are represented. This risk is reduced for 99% confidence levels and increased for 90% or lower levels of confidence (Gupta & Masuku, 2022).

### 2.2.4 Degree of Variability

The third criterion, the degree of variability in the attributes being investigated, refers to the distribution of attributes in the population. The variables with more homogeneous population, the smaller the sample size required. If the more heterogeneous population, the larger the sample size required to obtain a given level of precision (Smith, 2021). For example, a proportion of 50% indicates a greater level of variability than either 80% or 20%. This is because 80% and 20% indicate that a large majority do or do not, respectively, have the attribute of interest. Because a proportion of .5 indicates the maximum variability in a population, it is often used in determining a more conservative sample size, that is, the sample size may be larger than if the true variability of the population attribute were used (Dunham, 2021).

6

## 2.3    The Concept of Mean

The arithmetic mean is a tool that describes a data set and, as such, allows comparison between data sets.  The statistical nature of the arithmetic mean provides a means for drawing conclusions about the population or process from which the data originated (Cobb & Moore, 2017).  The arithmetic mean is one of many averages that can alone, or in conjunction with other averages, be utilized to interpret the data.  The statistical concept of the arithmetic mean utilizes a quantitative entity to represent, locate, qualify, describe, interpret, and/or signify a data set.  A conceptual understanding of other areas of descriptive and inferential statistics could be valuable in further building a complete understanding of the arithmetic mean.  For example, understanding the graphical representation of data could help students visualize the arithmetic mean; understanding appropriate experimental design and data collection could help students appreciate the effects of individual data points; and inferential qualities of statistics (e.g. confidence intervals) could help students realize the representative nature of the arithmetic mean. As with the mathematical conceptual knowledge of mean, the statistical conceptual knowledge of mean is rich in its relationships to other statistics, data representations, and conceptual ideas. The mean (average) of a data set is found by adding all numbers in the data set and then dividing by the number of values in the set. The median is the middle value when a data set is ordered from least to greatest (Batanero, 2017).

## 2.4    The Concept of Median

 Median of a distribution with a discrete random variable depends on whether the number of terms in the distribution is even or odd. If the number of terms is odd, then the median is the value of the term in the middle. This is the value such that the number of terms having values greater than or equal to it is the same as the number of terms having values less than or equal to it. If the number of terms is even, then the median is the average of the two terms in the middle, such that the number of terms having values greater than or equal to it is the same as the number of terms having values less than or equal to it (Miaoulis, 2018).

The median of a distribution with a continuous random variable is the value m such that the probability is at least 1/2 (50%) that a randomly chosen point on the function will be less than or equal to n, and the probability is at least 1/2 that a randomly chosen point on the function will be greater than or equal to m.

## 2.5 The Concept of Mode

According to Sudman (2016), the mode of a distribution with a discrete random variable is the value of the term that occurs the most often. It is not uncommon for a distribution with a discrete random variable to have more than one mode, especially if there are not many terms. This happens when two or more terms occur with equal frequency, and more often than any of the others. A distribution with two modes is called bimodal. A distribution with three modes is called trimodal. The mode of a distribution with a continuous random variable is the maximum value of the function. As with discrete distributions, there may be more than one mode.

## 2.6 The Concept of Calculator

Calculators allow students access to mathematical concepts and experiences from which they were previously limited with only paper and pencil. Because calculators make possible mathematical exploration, experimentation, and enhancement of learning mathematical concepts, the National Council of Teachers of Mathematics (NCTM) and various other organizations and individuals recommend that appropriate calculators be made available for use by students at every grade level from kindergarten through college (Almeqdadi, 2017). Despite the extensive research documenting the benefits of calculator use, there are still many skeptics who worry that calculator use will impair students' mathematical ability and result in increased mathematical illiteracy.

Elsie (2021), put it that calculators are valuable educational tools that allow students to reach a higher level of mathematical power and understanding. By reducing the time that, in the past, was spent on learning and performing tedious paper-and-pencil arithmetic and algebraic algorithms, calculator use today allows students and teachers to spend more time developing mathematical understanding, reasoning, number sense, and applications. Four-function, scientific, and graphing calculators, as well as calculators with computer symbolic algebra manipulation capability provide new pedagogical enhancement opportunities. They afford students learning tools that complement, but do not replace, mental and paper-and-pencil skills, and they expand students' ability to solve problems by providing multiple solution techniques.

According to Dunham (2021), Rote computations and tedious algebraic manipulations have historically turned many students away from mathematics. The subject of

mathematics has traditionally been thought of as memorizing formulas and substituting numbers in equations, drilling endlessly, and performing long, monotonous computations. The students who could perform these manipulations and computations quickly and accurately were considered to be mathematically inclined; those who were turned off by the mechanical operations were thought to be poor math students. Calculator technology allows students who would ordinarily be frustrated or bored by these tedious manipulations to have access to the real mathematics itself, thus gaining a higher level of mathematical understanding, rather than giving up. The fact is, calculators are better tools to do some of the computations and manipulations that were once done with paper and pencil. In the past, paper and pencil were the only tools available. Appropriate use of technology and associated pedagogy will get more students thinking and reasoning mathematically. Thus, more people will develop useful mathematical understanding and mathematical power.

Calculators now come in a number of sizes and styles, and they cover a tremendous range of capabilities, functions, and prices. Despite the myths of harmful consequences resulting from their use, calculators are a pedagogical tool of great value. Teachers of different grade levels and the general public harbor varying preconceived beliefs as far as the use of calculators in the classroom is concerned. Fears regarding the ill effects of calculator use, however, are unfounded. Research has proven that calculators are beneficial to students at every level of education. Calculators serve as an equalizer in mathematics education. Not only do they allow students who would ordinarily be turned off by traditional mathematics' tedious computations and algorithms to experience true mathematics, but they also help students to more quickly and readily develop number sense, gain mathematical insight and reasoning skills, value mathematics, and cultivate mathematical understanding, while they enjoy what they are learning (Campbell, 2021).

## CHAPTER THREE
## SYSTEM ANALYSIS AND DESIGN

### 3.1 Introduction

This chapter describes in detail the system design methodology. It focuses on the system structure and interactions. The proposed system is for determination of Sample size, Mean, Median and Mode. It equally consists of the system design which consists of the logic design. The logic design consists of various user interfaces and the chapter also explains the system design using UML diagrams. It proceeds by examining the Systems Requirement Specification (SRS) document which is majorly focused on only the functional requirements to be provided by the system.

### 3.2 Disadvantages of the Existing System

i.    It is tedious

ii.   It is time consuming

iii.  It requires a statistician to carry out the calculation

### 3.3 Advantages of the Proposed System

i.    It is easy to use

ii.   The request is generated immediately the figures are imputed to the system

iii.  It does not require a specialist to carry out the calculation.

### 3.4 The Proposed Method

Considering the aims and objectives of this project Waterfall Model of System Development Life Cycle was used for the development of the program. This method was used because it supports dividing of the program into sub units or phases and each phase has to be executed before going to the next one.

### 3.5 Method of Data Collection

There are two main sources of data collection in carrying out this study, information was basically obtained from two sources which are:

a)    Primary source

b)    Secondary source


**Primary Source**

Primary source refers to acts if collecting original data in which the researcher makes use of empirical approach such as personal interview, observation and questionnaires In my research I used interview method for primary source of information.

**Secondary Source**

The need for the secondary sources of data for this kind of project cannot be over emphasized. The secondary data were obtained by me from magazines, Journal, newspapers, library source and most of the information from the library research has been covered in my literature review in the previous chapter of this project.

## 3.6 System Design

### 3.6.1 Algorithm diagrams
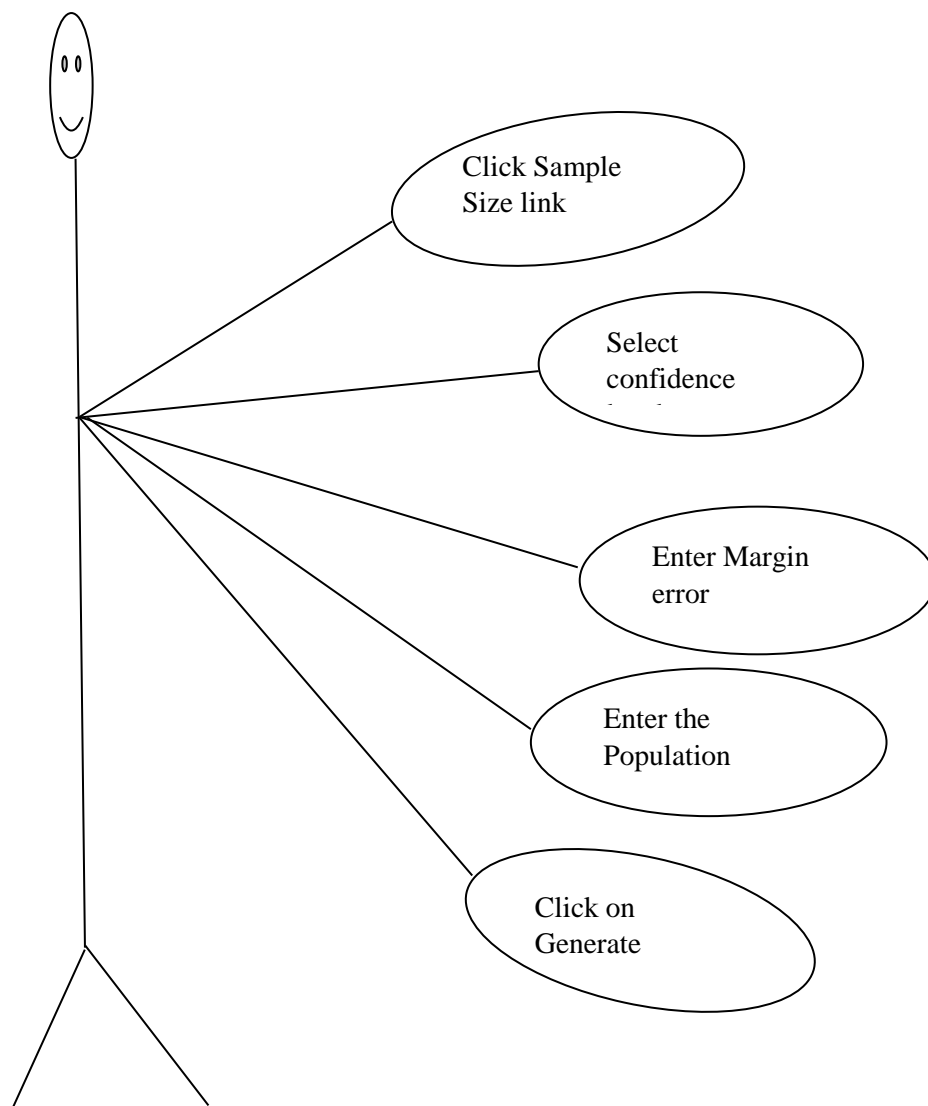


**Fig. 3.1: Use case diagram of Sample Size Calculator**
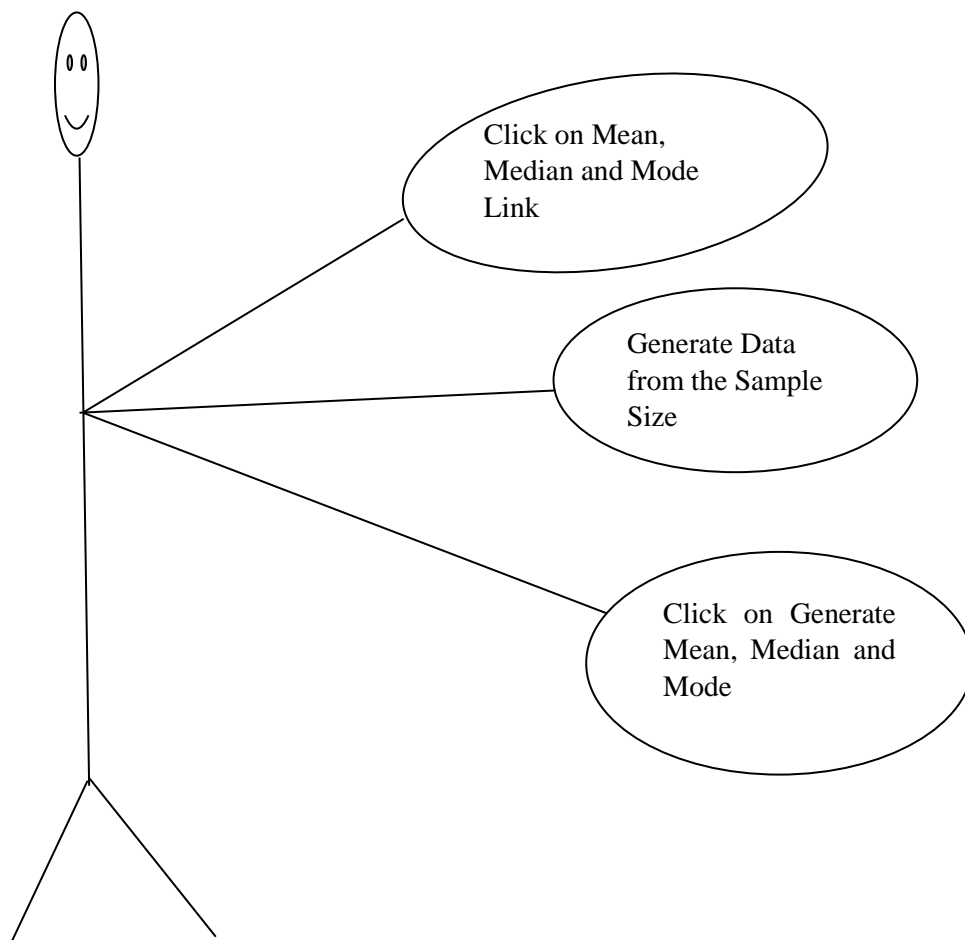
**Fig. 3.2: Use case diagram of Mean, Median and Mode Calculator**

### 3.6.2   Input/Output Design

**Sample Size Generator**

Confidence Level ⦿ 95%  ◯ 99%

Confidence Interval ▭

Population ▭

[ Generate Sample Size ]   [ Reset ]

Sample Size Generated

▭

**Figure 3.3: Input Design**

Generating data from the sample population using any appropriate statistical method e.g. Random sampling or stratified sampling.

▭

[ Generate ]        [ Reset ]

Mean      ▭

Median    ▭

Mode      ▭

**Fig. 3.4: Output Design**

Calculation of Mean, Median and Mode for the sample population which will be generalize for the whole population.

### 3.6.3 Procedure design

**Sample Size**

Sample Size: The number (n) of observations taken from a population through which statistical inferences for the whole population are made.

**Formula:**

This calculator uses the following formula for the sample size n:

$n = N*X / (X + N − 1)$,

where,

$X = Z_{\alpha/2}^2 *p*(1-p) / MOE^2$,

and $Z_{\alpha/2}$ is the critical value of the Normal distribution at α/2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size. Note that a Finite Population Correction has been applied to the sample size formula.

**Mean**

The mean of a set of values is the sum of the values divided by the number of values. It is also called the average.

**Formula:**

$$\text{Mean} = \frac{\sum_{i=1}^{n} xi}{n}$$

.

**Median**

The median is the middle number in a sorted, ascending or descending order.

If there is an odd amount of numbers, the median value is the number that is in the middle. If there is an even amount of numbers in the list, the middle pair must be determined, added together, and divided by two to find the median value.

**Formula**

Median = $\{(n + 1) \div 2\}^{th}$ value

**Mode**

The mode is the most frequently occurring observation or value.

### 3.7     System Requirement Specification

### 3.7.1     Software requirement

i. Windows 7 of Windows Operating System or higher version for faster processing

ii. Internet Browser

### 3.7.2     Hardware Requirement

i. Computer system

ii. At least 512 MB RAM

iii. At least 40GB hard disk

### 3.7.3     Personnel Requirement

The people required to operate this proposed system are Teachers, Students and all those who are involved in carrying out statistical works especially in the area of Sample Size, Mean, Median and Mode. Although the users must have knowledge of basic computer operations.

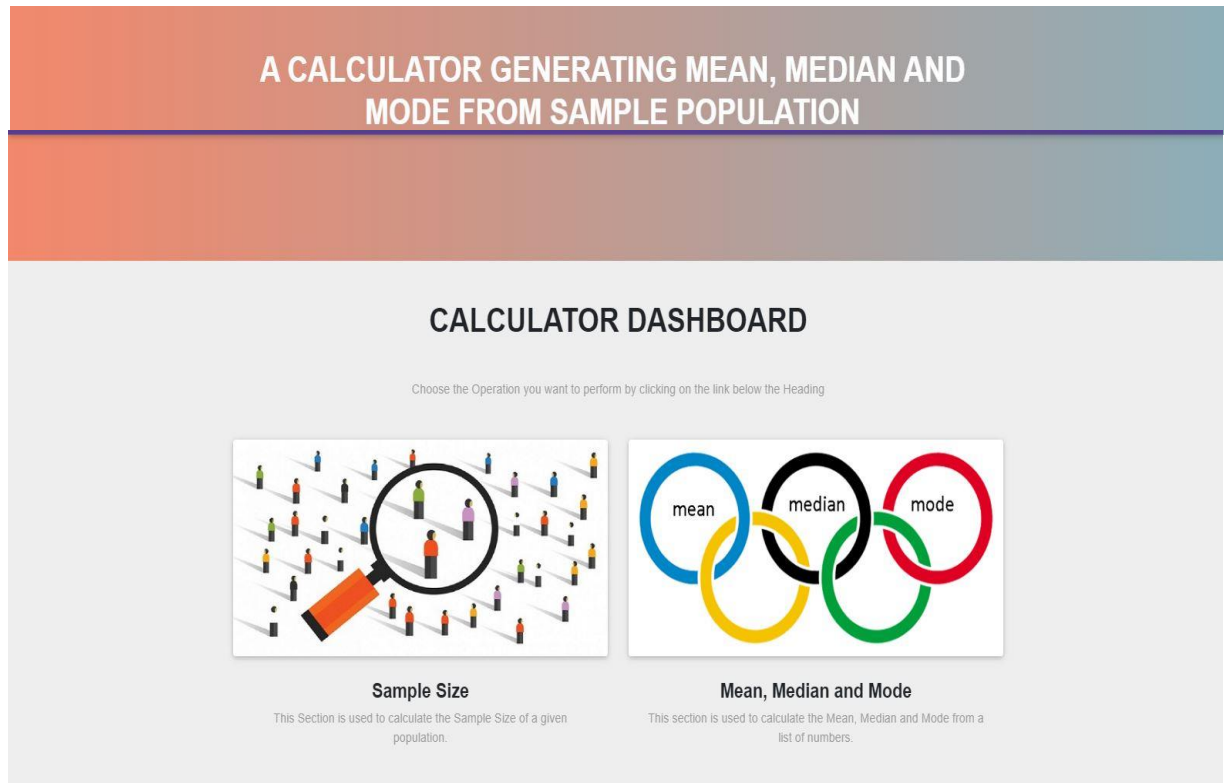# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1     Results



Figure 4.1 Home page

Figure 4.2: Input Page of Sample Calculator



Figure 4.3: Input page of Mean, Median and Mode Calculator

**Tested Output**



Figure 4.4: Sample Size Calculation



Figure 4.5: Mean, Median and Mode Calculation

**4.2     Discussion**

The aim of the project a calculator generating Mean, Median and Mode from sample population was achieved. Data was tested as shown in figure 4.4 and figure 4.5 above respectively.

**4.3     User Manual**

The interface was designed in such a way that users can calculate Mean, Median and Mode from Sample Population. The program is executable software as shown above, after it has been installed on a windows operating system.

This web base is designed using HTML, PHP, CSS and JavaScript programming languages and it can loaded by:

i.      Opening Xampp Server, on the web browser

ii.     Type http://localhost/lawrence/index.php and click enter

iii.    On the welcome screen select the needed link (Sample Calculator)

iv.     Fill the required field and click calculate

v.      Calculate for different sample sizes until the required range of data is obtained

vi.     Copy the Sample Sizes

vii.    Click on Mean, Median and Mode Link (Paste the copied data)

viii.   Click on Generate button

# CHAPTER FIVE
## SUMMARY, CONLUSION AND RECOMMENDATION

## 5.1    Summary

In the cost of carrying out this work a lot of lessons were learnt. Among which was that people were still depending on Pen and Paper calculation of Sample, Mean, Median and Mode. Again the major aim and objective of this project work, which was to develop a calculator that will calculate Mean, Median and Mode from Sample Population.

## 5.2    Conclusion

As computer scientists we  are always involve in statistical calculations such as Sample Size, Mean, Median, Mode, etc. It is on this background that this program is develop to ease the process, because it is an open program for staff, students and all those who are computer literates.

## 5.3    Recommendation

The researcher having involved so much in this research work, therefore came up with the following recommendations:

  i.    The user of this software should be able to read and write and must have little knowledge of computer.
 ii.    The user should have a little knowledge of basic statistical operations, this will guide them to have fair understanding of what is happening behind the scene.
iii.    This software should be used by both staff and students of statistic.
 iv.    This software be deployed in the School Library and made accessible to both staff and students especially to those who are carrying out statistical research.

## 5.4    Contribution to Knowledge

It has always been challenging and difficult especially for students to calculate Sample Size of a given population as well Mean, Median and Mode. It against this background that this software was developed to ease the process.

**5.5     Area for Further Work**

Since the method adopted here is web base, I suggest that the next researcher on this topic should concentrate in developing an application base method that can support Operating system like Windows, Android, etc

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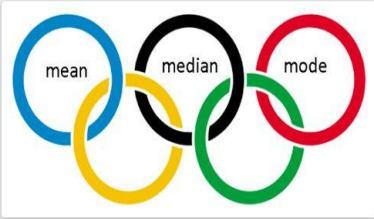
**APPENDIX A**

Home page



**CALCULATOR DASHBOARD**

Choose the Operation you want to perform by clicking on the link below the Heading

**Sample Size**

This Section is used to calculate the Sample Size of a given population.

**Mean, Median and Mode**

This section is used to calculate the Mean, Median and Mode from a list of numbers.

Input page



**SAMPLE SIZE CALCULATOR**

Confidence Level:  ● 95%  ○ 99%

Margin error: _____

Population: | _____

GENERATE    CLEAR

Fig. 4.3: Input page of Mean, Median and Mode Calculator

**Tested Output**

**Sample Size Calculation**

Figure 4.5: Mean, Median and Mode Calculation

## PROGRAM CODES

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
<meta http-equiv="x-ua-compatible" content="ie=edge">
<title>A Calculator Generating Mean, Mean and Mode from Sample Population</title>
<!-- MDB icon -->
<link rel="icon" href="images/logo.png" type="image/x-icon">
<!-- Font Awesome -->
<link rel="stylesheet" href="https://use.fontawesome.com/releases/v5.11.2/css/all.css">
<!-- Google Fonts Roboto -->
<link rel="stylesheet"
href="https://fonts.googleapis.com/css?family=Roboto:300,400,500,700&display=swap">
<!-- Bootstrap core CSS -->
<link rel="stylesheet" href="css/bootstrap.min.css">
<!-- Material Design Bootstrap -->
<link rel="stylesheet" href="css/mdb.min.css">
<!-- Your custom styles (optional) -->
<link rel="stylesheet" href="css/style.css">
<style>
/* Required for full background image */

html,
body,
header,
#intro-section {
height: 100%;
}

@media (max-width: 740px) {
html,
body,
header,
#intro-section {
height: 100vh;
}
}

.top-nav-collapse, .page-footer {
background-color: #563e91 !important;
}

.navbar:not(.top-nav-collapse) {
```

26

```css
background: transparent !important;
}

@media (max-width: 991px) {
.navbar:not(.top-nav-collapse) {
background: #563e91 !important;
}
}

.rgba-gradient {
background: rgba(17, 1, 41, 0.6);
/* fallback for old browsers */
background: -webkit-linear-gradient(to right, rgba(235, 56, 7, 0.6), rgba(40, 47, 75, 0.5));
/* Chrome 10-25, Safari 5.1-6 */
background: linear-gradient(to right, rgba(235, 56, 7, 0.6), #08516777);
/* W3C, IE 10+/ Edge, Firefox 16+, Chrome 26+, Opera 12+, Safari 7+ */
}


.img-gradient:after {
content: '';
position: absolute;
left: 0;
top: 0;
width: 100%;
height: 100%;
display: inline-block;
/* FF3.6+ */
background: -webkit-gradient(linear, left top, left bottom, color-stop(0%, rgba(220, 66, 37, 0.5)), color-stop(100%, rgba(0, 47, 75, 0.5)));
/* Chrome,Safari4+ */
background: -webkit-linear-gradient(top, rgba(0, 47, 75, 0.5) 0%, rgba(220, 66, 37, 0.5) 100%);
/* Chrome10+,Safari5.1+ */
background: -o-linear-gradient(top, rgba(0, 47, 75, 0.5) 0%, rgba(220, 66, 37, 0.5) 100%);
/* Opera 11.10+ */
/* IE10+ */
background: -webkit-gradient(linear, left top, left bottom, from(rgba(0, 47, 75, 0.5)), to(rgba(220, 66, 37, 0.5)));
background: linear-gradient(to bottom, rgba(0, 47, 75, 0.5) 0%, rgba(220, 66, 37, 0.5) 100%);
/* W3C */
filter: progid:DXImageTransform.Microsoft.gradient( startColorstr='#002f4b', endColorstr='#00000000', GradientType=0);
/* IE6-9 */
```

```
}

</style>
</head>
<body>


<!-- Start your project here-->
<!-- Main navigation -->
<header>
<!-- Navbar -->
<nav class="navbar navbar-expand-lg navbar-dark fixed-top scrolling-navbar">
<div class="container">
<a class="navbar-brand" href="#">FPM</a>
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarTogglerDemo02"
aria-controls="navbarTogglerDemo02" aria-expanded="false" aria-label="Toggle
navigation">
<span class="navbar-toggler-icon"></span>
</button>
<div class="collapse navbar-collapse" id="navbarTogglerDemo02">
<ul class="navbar-nav mr-auto smooth-scroll">
<li class="nav-item">
<a class="nav-link" href="#intro">Home
</a>
</li>
<li class="nav-item">
<a class="nav-link" href="#projects" data-offset="90">DASHBOARD</a>
</li>

</ul>

</div>
</div>
</nav>
<!-- Navbar -->
```