DEVELOPM ENT AND STANDARDIZATION OF MATHEMATICS ACHIEVEMENT TEST FOR MIDDLE BASIC EDUCATION PUPILS IN DELTA AND EDO STATES

BY

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CERTIFICATION

We the undersigned, hereby certify that this Ph.D. Thesis in Measurement and Evaluation is written by Abhuegbeude, Augusta Bose Idowu of the Department of Guidance and Counselling, Faculty of Education, Delta State University, Abraka

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DECLARATION

I hereby declare that this is my original work written in the Department of Guidance and Counselling, Delta State University, Abraka.

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DEDICATION

This work is dedicated to God Almighty whose infinite mercy, guidance, protection and assurance led me through this study.

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TABLE OF CONTENTS

ABSTRACT

The purpose of the study was to develop and standardise Mathematics Achievement Test for Middle Basic Education Pupils in Delta and Edo States. TheStandardized Mathematics Achievement Test (SMAT) instrument was meant primarily to address theproblem of aninadequate number of achievement testfor teachers use in the formative evaluation of the pupils. The study is to provide counsellors with aninstrument that can be used for guidance and counselling for basic four, five and sixpupils. In developing the instrument, a table of

thespecification was drawn up to cover the entire component appropriately. The content areas covered are Number and Numeration, basic operation, measurement, algebraic process, quantitative reasoning, geometry and mensuration and everyday statistics drawn from Mathematics curriculum for middle basic education. The cognitive areas are knowledge, comprehension, application, analysis, synthesis and evaluation. Literature relevant to the study were reviewed especially procedures for test development and standardisation, classical test theory, item response theory, validity and reliability. Moreover, empirical studies on gender, location, and school type as it affects pupils' achievement in Mathematics were also critically examined. Instrumentation research design was used. There are 3,016 public and private schools with apopulation size of 339,944 basic four, five and six pupils from public, and government approved private basic schools in Delta and Edo States. A sample size of 5,000 that constitute the population was used. The sample was made up of pupils in middle basic education that includes male and female, rural and urban and public and private schools from the 60 schools randomly selected that served as astratifiedmulti-stage sample. Two instruments, the Mathematics Achievement Test (MAT) and theStandardised Mathematics Achievement Test were used to obtain data for the study. The content validity and the face validity of the instrument were established by the use of atable of specification and expert judgment while reliability was established by the use of Kuder-Richardson formula 20 and a reliability coefficient of 0.60, 0.55 and 0.65 was obtained. The data gathered from MAT was used for item analysis. SMAT was used to answer research questions 1-8. The findings obtained indicate that; the SMAT has content and face validity andreliability of 0.60, 0.55 and 0.65. All the items inSMAT have difficulty and discriminative index of 0.30 – 0.60. The norm profile for gender, school type, location and states were established. The gender,school type,location and states mean scores were relatively close as the pupils perform averagely this indicate that the developed test was adequate for middle basic education. The researcher recommended that Mathematics teachers and school administrators of basic schools in Delta and Edo States should seek for SMAT and use it for effective evaluation of their pupils' ability in Mathematics. The SMAT should be officially recognised as a standard testin Delta and Edo States as it has all essential psychometric characteristics of a good test. Testing instruments should possess the required standard regarding psychometric properties for the tool to be used in the school system.Finally,pupils in the middle basic education should take the study of Mathematics more severeto obtain ahigher score in Mathematics.

CHAPTER ONE
INTRODUCTION

Background to the Study

Education constitutes the primary instruments for sustainable human development, as well as the fulcrum around which every other activity revolves. It is because of this that development experts posit that no society can rise beyond its educational level. Nations, which have recorded tremendous feats in the world heavily rely on the instrumentality of education. Nigeria has recognised that her educational system has deteriorated due to some reasons, and has not made as much progress as she would have likely achieved in attaining her Education for All (EFA) goals. To address this undesirable situation, she embarked on a reform of the entire system to provide not only access but to improve the quality and

efficiency of education in the country (Adomeh, Arhedo & Omoike, 2007). In 1999, Nigeria changed from universal primary education to universal basic school system, which schools in Nigeria are currently operating.

At the inception of the democratic government in 1999, there was a general decay in all aspects and levels of the educational system. The state of infrastructure in the schools in Nigeria was appalling. Teachers are poorly trained and poorly motivated. The funding of education was relegated to the background in the scheme of things. In this context, the former civilian government of President Olusegun Obasanjo felt that if educational goals were not realised, then progress in other sectors such as health, agriculture, and general economic development would remain unrealizable. The federal government then launched the Universal Basic Education (UBE) programme on 30 September 1999 in Sokoto. The UBE vision statement was that at the end of nine years of continuing education, every child should acquire appropriate levels of skills in literacy, numeracy, communication, manipulation and life skills. In this manner, a child would be employable, useful to himself and the society by possessing relevant ethics, moral and civil values at the end (UBE Act, 2004). From this vision, the child should have a continuous, uninterrupted stretch of education for nine years from Primary School to Junior Secondary School Class 3 and be provided with non-formal skills and training.

According to the conference on education in Jomtien, basic education is made free and available to all and sundry, thus emphasisingfree access, equality, efficiency, literacy, numeracy and life-long skills for all. Odili, Ebisine and Ajuar (2011) described life-long education as that which is designed to help learners develop appropriate skills, competencies and attitudes. They explained further that this is to enable him/her to live successfully in the society as well as prepare him/her to assume roles as an adult in future. Life-long education involves continuing process of updating knowledge and renewing skills that can help to equip the individual to cope with the changing nature of this modern life with its unpredictable pattern of life and work. A commitment to life-long education can be developed from early years in school, thus laying a foundation for the development of self-reliance in learning and a sense of responsibility for personal fulfilment.

The Universal Basic Education programme is almost the same as the old Universal Primary Education scheme. It is free and universal. Free in the sense that, there will be no financial cost from the pupils. Poverty will not be an obstacle to any child and adolescent receiving a basic education. Universal means that access is open to every child irrespective of gender, social, physical or economic conditions. The need to write test items in simple English language so that pupils from a diverse background, male/female, public/private

school, urban/rural location, high/low social economic status will be measured on the same scale. The consideration given to this issue may not have been enough in the Universal Primary Education (UPE). The UPE failed to emphasise life -long learning and vocational education and its inability to apply knowledge to the environment of the pupil. National Economic and Empowerment Development Strategies (NEEDS) was developed in response to the development challenges of Nigeria. It recognised education as central to the achievement of its goals. It recommended the complete revision of the school curriculum "to reflect the dynamism of the society and emerge global issues" (National Planning Commission, 2005, p.36). The UPE Mathematics curriculum was reviewed. First, this revision became necessary because the UBE Bill 2004 mandated a nine-year compulsory education. Compulsory education means that parents, guardians, communities are under obligation to ensure that children take full advantages of the opportunities given by UBE. Secondly, (NEEDS) and Millennium Development Goals (MDGs) also necessitated the need to revise this curriculum. In this review, some topics were dropped while new ones were added. There were shifts in topics from one class to the other (upwards/downwards) where necessary. Quantitative reasoning is a new item introduced in this review curriculum.

The UBE curriculum placed equal emphasis on cognitive, affective, psychomotor domains and quantitative reasoning. Quantitative reasoning helpboosts pupil's achievement in cognitive, affective and psychomotor capacities. These the UPE curriculum fails to do as they lay more emphasis on the cognitive, negating the affective and psychomotor domains. The UBE emphasise the implementation of continuous assessment that could be used as a device for monitoring and evaluating the educational progress of UBE programme. This process provides information on pupils under UBE programme in a continuous manner on a daily, weekly, monthly, termly and sessional basis. For the program to succeed, there is the need to collect information about pupils in a comprehensive manner comprising their cognitive, affective and psychomotor learning outcomes. This goal can only be achieved using a suitable instrument (test), which has essential psychometric properties of a real test. A test involves collecting pupils data and using these data to give value judgment of the pupils. The teacher should be able to construct test items that have the essential psychometric properties of a proper test and be able to convert raw scores to Z- score and T- score to give a valued judgment of the pupils' performance. Another problem with the UPE curriculum was the way Mathematics content was addressed; emphasis was placed on traditional methods of instruction in which pupils engaged in memorising of facts through rote learning. In this way, pupils were unable to

engage in meaningful Mathematics learning and students' motivation to learn low. The need to teach Mathematics with pupils-centred strategies was a major concern of Nigerian Educational Research and Development Council as it revised the curriculum. Content in UPE curriculum was organised based on how teachers teach; topics were not aligned with quantitative reasoning tasks, and very few examples of realistic Mathematics were given. These shortcomings in the area of content were overcome in UBE Middle Basic Education Mathematics as curriculum content is evenly distributed to encourage the use of facilitative teaching and learning strategies. Every topic in the new curriculum is associated with quantitative reasoning task to facilitate the development of problem- solving, and psychomotor skills and daily use of mathematical knowledge is emphasised (Adeneye & Awofala, 2012). In the basic four, five and six, examination questions are not set in quantitative reasoning. This situation prompted the researcher to undertake this study of developing a test item including quantitative reasoning task for formative evaluation of the pupils. There are now six themes in this revised curriculum: Number and Numeration, Basic Operations, Measurement, Algebraic process, Geometry and Mensuration and everyday Statistics.

The Mathematics curriculum for Universal Basic Education in Nigeria is focused on giving children the opportunity to:

1. Acquire mathematical literacy necessary to function in an information age.
2. Cultivate the understanding and application of Mathematics skills and concepts necessary to thrive in the ever-changing technological world.
3. Develop the essential element of problem-solving, communication reasoning and connection within their study of Mathematics.
4. Understand the major ideas of Mathematics bearing in mind that the world has changed and is still changing since the first National Mathematics curriculum was developed in 1977. It is, therefore, necessary to incorporate such changes in the areas of information and communications technologies (ICT), population and family life education, environmental degradation, drug abuse, HIV/AIDS. These gave rise to the need to make the curriculum more responsive to the survival and developmental needs of the Nigerian child (Federal Ministry of Education, 2007 p. viii-xi)

Mathematics is very central in the teaching of science and many other school subjects. Mathematics is a unifying subject and pupils' interest in science cannot be alienated from Mathematics. Mathematics as a science tool is used to interpret scientific phenomena. Nasir (2001) asserted that Mathematics is an indispensable tool used by engineers, scientists and many other professionals in their search for clear understanding of the

physical world. He stressed further that Mathematics is mostly considered a tool in that it contains the skills for problem-solving, organising, simplifying, interpreting data and performing calculations that are necessary in fields such as business and industry. Today Mathematics is so important to the extent that a pass is required to gain admission into JSS1 while a credit pass is required to get admission into SSS l and study various courses in higher institutions of learning. Also, lack of basic understanding of Mathematics and Science may hinder one from explaining some of the daily events occurring in the environment. Mathematics is the foundation of any science subject and technological development of any nation (Abdulhamed, 2002). Mathematics is the queen of the science, and no country can hope to achieve greatness if there is no proper foundation in Mathematics (Odigwu, 2002). Mathematics is the wheel on which other subjects move. Mathematics teachers, as well as most educators, opined that good performance at advanced levels could be attained, only if a solid foundation is laid at the middle basic school level. Mathematics test that is based on the UPE has many shortfalls compared to UBE in the area of topics and performance objectives. There is then need to develop a test in Mathematics that mirrors the themes and performance targets of the UBE. There is also the need to provide a standardisation platform such as Z and T-score to guide teachers in comparing standards. The most test currently in use in schools and public examinations lack these attributes.

Testing has become one of the most critical parameters by which a society judges the product of her educational system. Testing has been an integral part of the school system to the extent that even the habitual absentees normally turn up to school and present themselves for testing on examination days. The reason for testing is to identify the latent ability of examinee. Testing has been completely accepted in most modern societies as the most objective method of decision making in schools, industries, and government agencies.“The test is a set of questions or statement that have been structured and graduated to elicit and measure responses about an attribute” (Odili & Ajuar, 1995, p.3). Tests are used in gathering valuable data in which educational decisions are based (Orluwene & Ukwuije, 2009). These decisions are valid and centred on the learner so that such decision should be carefully based on authentic and accurate data. Authentic and correct data collected from testing helps the teacher to ascertain the extent to which the instructional objectives has been achieved, provides feedback on the efficiency of his teaching methods and materials. On the parts of the learner, it increases their motivations to learn, development of good study habit, and to help to determine one’s area of strengths

and weakness. Teacher-made achievement test and standardised achievement test are frequently used in achieving these ends.

Achievement tests are the tests designed to evaluate how much learning that has taken place due to exposure to a given instruction of learning. Ipaye (1983) defined achievement test as an evaluation of past or present learning by measuring progress, which students have made as a result of instruction or training. A teacher-made achievement test is that test which is designed by classroom teachers (Mehrens & Lehmann(as cited by Opong, 2006). They had observed that teacher-made achievement test lack uniformity in administration and scoring. Therefore, there is a need for well constructed, standardised and administered test to help reduce the deficiencies of the teacher-made test in Mathematics. Moreover, the teacher-made tests that is always in use for evaluation in our middle basic education lack test norms and test manuals. According to Gronlund (1976), because they do not have norms and test manuals, informal achievement tests scores are "limited in comparison and interpretation" (p. 267). A standardised achievement test is that test, which is designed by a test expert and has been subjected to certain statistical analysis to ascertain the psychometric properties of the test. In a standardised test, the tests are norm and responses subjected to item analysis. Test norms enable us to understand how pupils perform in a given test.

The norm is a device that can help us compare a student or group of pupils with the reference group or standardised sample hence the score for an individual is compared to the distribution of the scores (Spector, 1992). A standardised test is usually tested, and the responses are subjected to item analysis (Nworgu, 2003). Nworgu (2003) went further to say that such test could only be prepared by subject teachers who work with specialists in test development. According to him, this will make it possible to determine the psychometric qualities of the items such as item difficulty, discriminative and distracter capacities as well as the validity and reliability of the test. If such test is available for Mathematics pupil's evaluation, they will be more prepared to face their primary six placement examinations in Mathematics with confidence. It should be noted that the teaching of Mathematics is not complete until every aspect of the concepts taught has been adequately evaluated. Considering the relevance of Mathematics as a core subject in the curriculum of the middle basic education, and the foundation of any science subject and technological development of any nation, a comprehensive instrument for such effective evaluation of Mathematics pupils is therefore needed.

Test manual is a kind of document that always contains information on the development, purpose and psychometric properties of a test and information that can guide

the administration, scoring and evaluating the standard test is included. The need for such a developed and standardised test with norms and test manual to be available for pupils effective evaluation should be made very necessary in our middle basic education schools in Nigeria.

Test development is a crucial stage in any valid and reliable examination. According to Lunderman (1970), the production of a high-quality choice item is a relatively difficult task which requires experience, concentration, a thorough knowledge of the subject matter, and a good deal of patience. Standardised tests are usually the product of experienced teachers, curriculum specialists and test experts. Standardised test covers a wider area of skills and knowledge than the teacher made test. A standardised test is usually based on the course content, and objectives common to many schools across a country, state or a designated geographical area and the preparation, therefore, requires more skills. Hence, the highly skilled nature of the personnel required for its construction and the time available is usually long. As observed by Opong (2006), most classroom teachers cannot or will not be able to undergo the rigours involved in constructing and validating achievement test. He went on to state that this is because classroom teachers are not skilled in the act of construction and standardisation of tests. The procedures adopted in their test development are haphazard, narrow in scope and covers few topics taught within a specified period (Nworgu, 2003). He went on to say that such tests are designed to suit the convenience of the locality where they are produced, and staff member of the school usually administer such test. In most cases, such classroom test lacks validity and reliability that are essential characteristics of a good test. The primary concern of this research is the development and standardisation of Mathematics Achievement Test (MAT). It is necessary because many locally made tests suffer from weakness or absence of planning carried out before work is begun on writing the test items and teachers need to familiarise themselves with what goes into the development of standardised test so as to ease the process of administration and scoring.

The development of a standardised achievement test is based on the need for certain educational information. The need may be to determine the testees' general level of achievement, to diagnose the testees' particular learning difficulties, compare students' performance based on age or location and sex. Once the need hasbeen identified and clarified, the general nature of test specified, test development begins.

The procedures for developing standardised achievement test may differ depending on type and nature of the test. Gronlund (1976) opined that the following steps are typical for the construction of standardised achievement test:

i. Planning the test

ii. Preparing the test

iii. Experimental tryout and revision

iv. Administering the standardise edition.

As a result of the background information, the researcher decided to develop a standard Mathematics instrument for middle basic education (Basic four, five and six) pupils in Delta and Edo States to address the issue of shortage of developed and standardised Mathematics achievement test for effective formative evaluation of pupils in middle basic education.

Statement of the Problem

Testing is a fundamental part of teaching and learning process. It serves the purpose of selecting students into the educational programme, classification of students, certification of students, prediction of future performance and potentials, verification and evaluation of the academic programme. Other purposes are the provision of significant data and information for diagnostics and counselling.

Evaluation is an integral part of any educational policy, UBE programme inclusive. One of the challenges of the UBE programme is an inadequatestandardised testing instrument for the assessment of pupils in middle basic education which were not provided for at the formative stage of the policy, especially in Mathematics. A review of pupils' performance in 2014/15 academic session of primary six placement examination in Delta state by Delta state ministry of education Asaba revealed that pupils perform poorly in Mathematics. It may be due to lack of standardised Mathematics achievement test instrument which the teachers can use in finding out Mathematics ability possessed by the pupils. If this testis developed, it will help to make available a test instrument that can be utilised by teachers in the daily assessment of their pupils.

UBE curriculum is associated with quantitative reasoning task to facilitate the development of problem-solving and psychomotor skills which is taught in the classroom. A survey of public and private middle basic schools carried out in Delta and Edo states by the researcher revealed that almost all the basic schools in Edo, and few in Delta states do not set questions in quantitative reasoning during the examination. This problem needs to be addressed because the pupil needs to be evaluated in every area they are taught. The development of the MAT will help to provide a test instrument that covers quantitative reasoning task to assess the achievement of pupils in Mathematics.

Teachers that are involved in the daily assessment of the UBE programme need to know the procedure on how to develop the test. The continuous assessment workshop on

cognitive, affective and psychomotor domain organised by Ministry of Education, Delta state in 2006 for teachers revealed that most of the teachers that attended the workshop did not know the procedures for test construction. It has created a problem in the education sector. Making available the instrument for them to use is not enough for the assessment of their pupils. The thoroughness and details involved in development and standardisation of test should be made known. The researcher interaction with the headmaster/headmistress of basic schools revealed the list of teachers' qualification in Delta and Edo states basic school that most of them are National Certificate of Education (N.C.E) and few First Degree holders either B.Sc Mathematics or B.Ed Mathematics with little or no educational background on test development. As such, many teachers in Delta and Edo states basic schools are not well exposed to the development and standardisation of the test because they did one or two courses in measurement and evaluation. Hence many Mathematics teachers are not qualified psychometricians who are a good tester and test developers. The teacher is central to the task of teaching and learning. His understanding of development and standardisation of the test is crucial in his/her ability to give an interpretation and valid judgment of the pupils' performance. In assessing their pupils' abilities and achievement, most Mathematics teachers develop test without following principles of test development and standardisation hence when the pupils are subjected to the standardisedtest; they perform poorly. The need for Mathematics teachers to adhere to rudiment of test construction cannot be overlooked, as this situation creates a problem in the educational system and affects the performance of pupils when subjected to external examination.

Item analysis is a process of examining each item for difficulty index, discriminative index and distracter. It has been observed that the difficulty index, discriminative index and efficient distracter of test items used in the schools are not established. The essential psychometric properties of a good Mathematics test instrument may not be considered by the Mathematics teacher during test construction. Hence their test instrument may lack validity and reliability. A test that lack adequate validity and reliability cannot be used to generalise the performance of pupils. The majority of the basic school teachers lack the ability to convert raw scores to Z-scores and T-scores as stipulated in the handbook on continuous assessment. The handbook on continuous assessment stated that raw scores of pupils should not be used for judging and generalising pupils' performance, but the raw scores should be converted to standard scores. It has created a problem for the basic school teachers in the course of assessing the pupils. The development of SMAT will help to provide a test instrument with difficulty index, discriminative index, validity, reliability and standard norm established.

Furthermore, a standardised test developed by test experts, such as psychometricians and other professional evaluators are not always available for use by teachers and pupils in middle basic education. In Nigeria, most pupils are not opportune to have access to standardised MAT. The problem of the study is to develop Standardised Mathematics Achievement Test for Pupils in Middle Basic Education in Delta and Edo States that could be used to carry out the formative evaluation. This problem prompted the researcher to embark on this study.

Research Questions

1. What is the content validity of the developed Standardised Mathematics Achievement Test for Middle basic education pupils?

2. What is the difficulty index of each item of the developed Standardised Mathematics Achievement Test for Middle basic education pupils?

3. What is the discriminative index of each item of the developed Standardised Mathematics Achievement Test for Middle basic education pupils?

4. What is the reliability of the developed Standardised Mathematics Achievement Test for Middle basic education pupils?

5. What is the gender norm for the Standardised Mathematics Achievement Test for Middle basic education pupils?

6. What is the location norm for the Standardised Mathematics Achievement Test for Middle basic education pupils?

7. What is the school type norm for the Standardised Mathematics Achievement Test for Middle basic education pupils?

8. What are the states norms for the Standardized Mathematics Achievement Test for Middle basic education pupils?

Purpose of the Study

The purpose of the study is to develop and standardise MAT for middle basic education pupils in Delta and Edo states.

Specifically, the study seeks to do the following:

- Construct Mathematics achievement test with 220 multiple choice items for pupils in middle basic education.

- Determine the validity of the instrument of the SMAT for middle basic education.

- Establish the reliability of the instrument of the SMAT for middle basic education.
- Establish the difficulty index of each item in the SMAT.
- Establish the discriminative index of each item in the SMAT.
- Prepare test norm for gender, school type, location and states of the SMAT for middle basic education pupils.
- Compare the standards for Delta and Edo States of the SMAT for middle basic education pupils.
- Develop test manual of the SMAT for middle basic education pupils.

Significance of the Study

The study may be of great importance to pupils, counsellors, teachers, school administrators, curriculum developers and researchers.

The instrument may help in the assessment of pupils' achievement thereby determining the areas of strength and weakness, providing remedies in the field of weakness, and preparing the pupils for upper basic education. It will make available the norm profile of the middle basic school pupils' performance in Mathematics based on gender, location, school type and the states. The school counsellors will use the research data as psychological tools for counselling, diagnostic evaluation and gaining insight into the pupils' potentials.

The teacher may be able to use the instrument to determine the effectiveness of his/her teaching methodology and teaching aids. It will serve as a guide to teachers who are not test experts in developing and standardising their tests as it will provide for them procedure for test development, how to standardise test, establish validity, reliability and how to prepare test norm.

The school administrators in evaluating the performance of their teachers can use the research data. One of the yardsticks for assessing teachers' performance is from the performance of their pupils. Therefore the information obtained from pupils performance in the SMAT can be used to determine teachers performance. It will provide employers of labour knowledge to know which teachers to promote and those that require being retrained

The data and information obtained from the developed test can be used for further research work that can result in correcting or modification and developing a new

curriculum. It will help curriculum planners and developers to identify areas of weakness or strength in the curriculum that needs correction, amendment and reinforcement.

Theoretically, the study attempts to fill the existing gap in research in the field of Measurement and Evaluation with particular reference to the development and standardisation of Mathematics instrument seen as SMAT for Middle Basic Education.

Scope and Delimitation of the Study

The scope of the study is specifically on the development and standardisation of MAT for pupils in middle basic education. The test covers the cognitive domain which is: knowledge, comprehension, application, analysis, synthesis and evaluation. The content is Number and Numeration, Basic Operations, Measurement, Algebraic process, Quantitative Reasoning, Geometry and Mensuration and Everyday Statistics drawn from Mathematics curriculum for middle basic education. The multiple choice items format was employed. The test parameters include validity, reliability, item discrimination index and item difficulty index. Preparation of standardised scores using Z-score and T-score, test manual and test norm based on gender, location, type of school and states were established.

Limitations of the Study

The following limitations were observed:

i. The statistics from item analysis from the sample group selected for trial testing were different when the test was administered to another sample group as the pupils performance varied.

ii. The sample was limited to pupils in public and private middle basic schools in Delta and Edo states. Not all the schools and pupilswere used because the sample will be too large for the researcher to cover.

iii. The geographical location of the schools poses as a limitation on the ability of the researcher to visit all the schools as when due.

Operational Definition of Terms

Middle basic education under the UBE curriculum comprises pupils in basic four, five and six.

Curriculum refers to a collection of subjects, of which Mathematics is one.

Z-score and T-score are respectively standard scores that are used in comparing pupils performance across groups such as gender, location, school type and states.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

Theoretical and empirical literature related to the study was reviewed under the following subheadings:

Conceptual Framework of the Study

Measurement Theory

Universal Basic Education Curriculum

Concept of Test

Concept of Achievement Test

Types of Achievement Test

Characteristics of Standardised Test

Principles of Test Development and Standardisation

Concept of Reliability

Concept of Validity

Administrating the Standard Edition

Test Manual

Empirical Findings

Appraisal of Review Literature

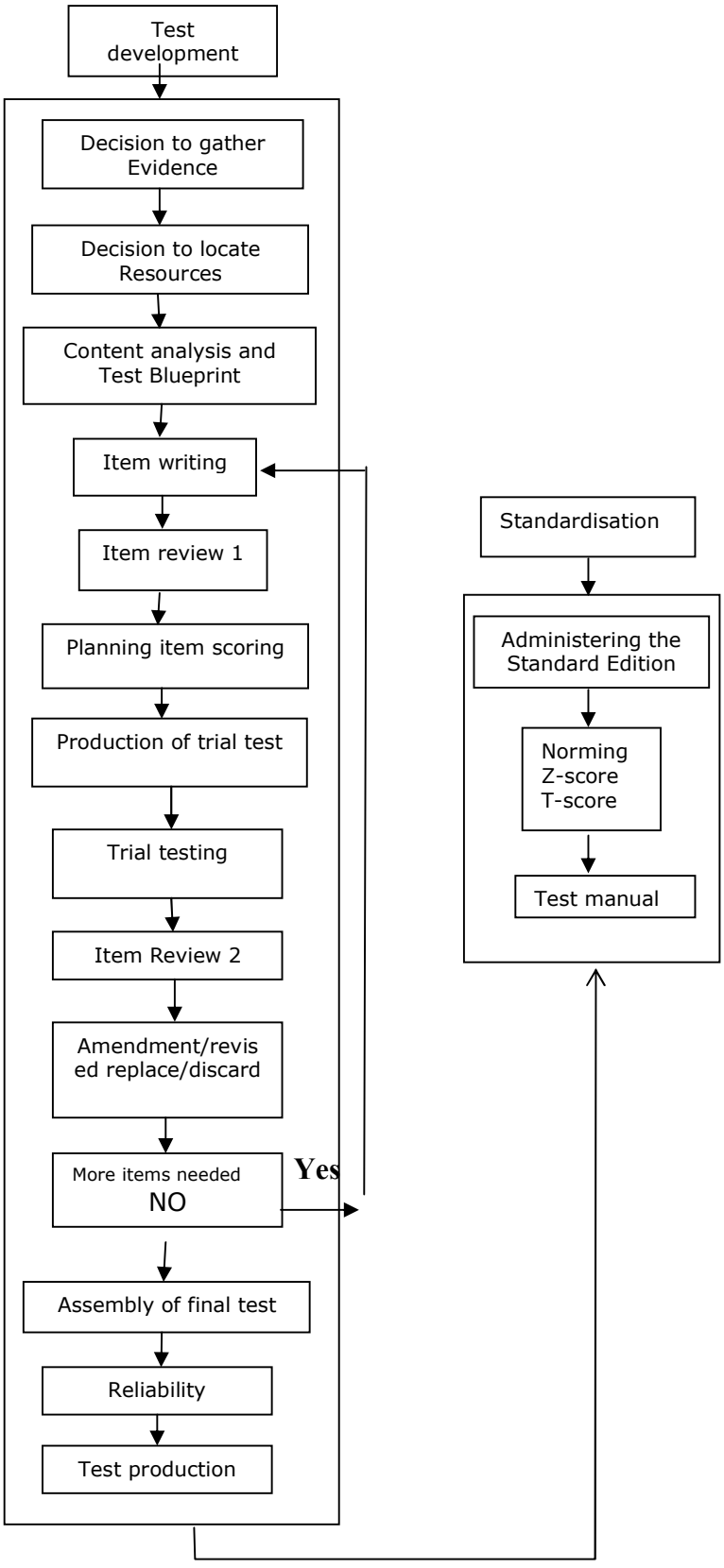
Conceptual Framework

The researcher used the conceptual framework in figure 1 in the construction and standardization of the MAT. The conceptual framework was used in determining the development procedures of the test items and the standard norm of the score of pupils to Z-score and T-score.

Having examined, the stages of test construction by UNESCO, it is important to point out that the UNESCO stages fail to include the norming process of the test that would provide the test developer opportunity to generalized the performance of testee. This shows that UNESCO stages end at development process and do not include standardization process. Hence the researcher identified this and modified it to include standardization process.

Conceptual Framework of the Study

Figure 1



Source: Adapted from UNESCO (2005)

Consequently, the procedure followed by the researcher in the development of the Mathematics objective test items was based on the adapted work of UNESCO (2005) which was modified by the researcher as shown in figure 1.

The development process involves decision to gather evidence, to local resources, content analysis and test blueprint. The preparation of test blueprint table ensures proportional and adequate coverage of the course content (basic four, five and six curriculum) that reflect the behavioural objectives. The items were generated in accordance with the test blueprint table. Item writing, Item review 1, planning item scoring, production of trial test, trial testing, item review 2, amendment, more items needed, assembly of final test, reliability and test production. Detail in page 25.

Finally, the test was administered to large sample for standardisation purpose. Standardization process was carried out by converting the raw scores to standard scores (Z-score and T-score). The items were later prepared into a test manual. These procedures were followed to produce the Standardised Mathematics Achievement Test for basic four, five and six pupils in Delta and Edo states.

Measurement Theory

Measurement in education is an indirect process. This is so because behavioural characteristics are not tangible as we have them in the physical sciences. We use what we observed during the indirect measurement process to predict or estimate what we were looking for. Measurement of behavioural characteristic is not error free. Hence, in educational measurement, we need a theory of measurement to provide some guide during our attempt to measure and based on its result, estimate a given trait level. For example, an ability level possessed by a learner (Nenty, 2004).

There are two theoretical models that often sustain the rationale behind test development in education. These are:

Classical Test Theory (CTT)

Item Response Theory (IRT)

Classical Test Theory

The theory postulates that an observed score (x) for an individual is made up of two components: the true score (T) representing the quantity of the variable or attribute under measurement and error score (E) representing a numerical value that is due to the influence of error during the measurement process.

Represented in a mathematical equation:

$xi = Ti + Ei$ ……(1)

The observed score (x) is obtained by adding all the examinees scores on all the items of a test. The error scores (E) is random. It is due to factors not controlled in the measurement procedure. It includes such factors as state of health, announcement by invigilators, noise from fellow testees etc in the midst of many questions and within the duration of a test these errors cancel out.

Assumptions of Classical Test Theory

The assumption of classical test theory is based on the same table of specification. Two or more tests can be developed such that each test will have the same standard deviation and the same reliability and the variance in each test, which is not explainable by true score, is due to random error. According to Lord (1980) given a pair of parallel tests and the relationship in equation 1, the following are deducible:

i. The expected error score is zero
ii. The correlation between error scores on two parallel test is zero
iii. The correlation between error and true score on the same measurement is zero and since error, scores are uncorrelated.
iv. The variance of the observed score is equal to the sum of true score and error score variance.

CTT also states that measures are always unreliable because they contain error, and estimates of reliability reflect that relative amounts of error that measure contains (Grimm & Yarnold, 2004). The main source of error in a measurement is due to random error according to CTT. To reduce the error component is to improve reliability. Two ways are suggested: Standardization and Aggregation (Grimm & Yarnold). Standardization according to them simply means attempts to control the measurement conditions carefully so that extraneous sources of error are not allowed to influence the scores such as test instructions and duration. For example, if the same amount of time is not given to the different respondents on the given test some will be rushed over. The result scores will not reflect the true standing of the testees. Aggregation is another better way of improving test validity because a test with many questions that cover the content of the subject area and many objectives items have a better chance of reviewing ability of the testees than a test with one or few items. Many objective items were constructed to cover the Mathematics content that was used for this research work.

According to Nenty (1998), the proportion of the true score variance to the observed score variance gives an index of the consistency within which test measures whatever it is measuring or test reliability. Test scores sustain vital decision. Valid test

scores must support vital decisions or scores, which true score components have made the greatest contribution.

Item Selection under CTT

In order to ensure that test is reliable in selecting items for test under the CTT, the following factors must guide item selection:

i. Items selected should correlate as high as possible with each other. One should avoid items with low correlations.
ii. Items selected should be those answered by about half of the examinees
iii. One should avoid items with low correlation.

To Maximize Validity

Items that correlate as high as possible with criterion but as low as possible with each other should be selected.

Criticisms of the Classical Test Theory

The major limitations of CTT are as follows:

CTT has been criticized on the ground that it lacks objectivity. Wright (1977) sees this as a serious problem because if psychological measurement is scientific in its enterprise, score from the test must be objective and not biased. Experience has shown that an individual score from time to time varies if tests are repeatedly taken. There is also variation in the mean and standard deviation.

CTT examinee characteristic (observed scores) cannot be separated from test characteristics, that CTT is test oriented rather than item oriented.

Item Response Theory

Item response theory is considered the most significant development in psychometrics (Warm, 1978). The exponents of item response theory (IRT) are Ferguson (1942), Lord (1952), and Rasch (1960) amongst others. IRT postulates that latent trait is responsible for an individual's performance in a given test. An individual possesses a given amount of latent trait in a given subject. Odili (2004) stated that in Latent Trait Theory, an individual's behaviour level could be accounted for to a high level, by defining certain human characteristics called traits, quantitatively estimating the individual is standing on each of these traits, and then using the numerical values obtained to predict or explain performance in relevant situations. In IRT, Latent trait is given the name of the Greek letter ⊖Its value ranges from –3 to +3. It has no natural Zero point or unit. The zero point is taken as the mean and standard deviation respectively. According to Warm (1978), when an individual walk into a testing room, he brings with him his theta (p 14).

In testing an individual, observed score xi is made up of three components Viz

$Xi = \ominus i + \lambda i + \varepsilon i \ldots (2)$

Where $\ominus$ = (theta) true ability component for the individual.

λ = (landa) is the extraneous error variable components of the score

ε = (epsilon) is the random error component of the score.

The recognition of landa is a major deviation from the classical test theory. Landa is the component of the score, which is sustained by systematic error of measurement. It cannot be eliminated by sampling. Sources of extraneous errors variables are those factors that rest on the testees. They include language of the test items, test wiseness, culture and communication skills etc. When they are not checked in test development process, an individual performance in the test will be a function standing on the extraneous ability and not the latent trait position in the subject matter.

Assumptions of IRT

There are four basic assumptions of IRT:

1. The know–Correct Assumption: This assumption stipulates that a testee will give a correct answer to a test item, which he knows. However, it is important to note that, not in every case that a testee knows the correct answer that he would answer correctly. In instances of clerical errors, a testee would know answer to item number 4 in the series but shade it in number 7 and could continue in that order. This violates this assumption.
2. The Local Independence Assumption: This means that the probability of a testee getting an item correct is unaffected by the answer given to other items in the test. (Warm, 1978). The local independence assumption states that question should be set in such a way that one question should not give a clue to the answer of another question.
3. The Unidimensionality Assumption: Is the most far reaching assumption of IRT. it states that test items should be developed to measure a single trait. Unidimensionality of test item is one of the assumptions that must be satisfied when doing measurement under IRT procedures (Odili n.d) the lack of unidimensionality in test items is a source of measurement error. If we take Mathematics test for example, unidimensionality of test items means that all the items in the Mathematics test should measure only Mathematics trait. Unidimensionality ensures that only Mathematics ability sustain performance in the Mathematics test. If Mathematics test item measures English language ability, then performance in the test will

depend on student's ability in Mathematics and English language. Such scenario will affect negatively the validity and reliability of the Mathematics test.

To ensure that test items are unidimensional, the test constructor should ensure the following:

Test a unit area of the subject matter at a time.

Reduce influence of languages. In an environment where English language is the medium of communication questions should not be designed in complex English language.

Adopt empirical approach to ensure that items are unidemensional. Empirical approaches such as factor analysis increases unidimensionality of items in a test as it pull together items that measure common traits.

4. The Normal Ogive Assumption: This assumption describes the relationship between testees latent trait ($\ominus$) and probability of getting an item correctly. It states that the ability of getting an item correctly is a function of the testees. Latent trait and a plot of the graph of theta ($\ominus$) and probability of getting the item correct will yield the shape of the normal Ogive.

The normal Ogive can be analysed at three important points: the lower asymptote, the upper asymptote and the inflection point. The lower asymptote represents the probability of getting the item correct for an individual whose theta is –3. The less the lower asymptote the lower the probability of getting the item correct by guessing. The upper asymptote represents the probability of getting the item correct by an individual within the highest theta. It is never one. The inflection point is the rising point of the Ogive, which represents the difficulty index of the item. The more it moves to the left hand side the more difficulty is the item.

Criticisms of IRT

The major limitation of IRT is:

In IRT only one latent trait cannot be measure in a test because other multiple factors such as cognitive ability, anxiety and motivation level exist.

Although there exist some weaknesses, the two theories postulates and basic assumptions helped the researcher to enhance the quality of test items on Mathematics used for this research work.

Having discussed classical test theory and item response theory, the researcher used item response theory in effecting unidimensionality of the test and the local independent assumption and classical test theory in item analysis. The test constructor adopted various ways of enhancing the validity and reliability of the test under construction. Some of the

ways are: removal of extraneous errors as much as possible, increasing the data through the increase of the respondents, elimination of random error component by proper sampling of the subjects, keeping the language of test as low as possible to avoid ambiguous statements that can lead to misinterpretations and confusions. Clear test instructions to ensure that testees are not misdirected, making sure of a good testing environment so that the testees will be able to have adequate comfort for maximum performance.

Having examined the two theories, both theories emphasized the selection of quality items in test development. CTT and IRT aid the researcher to achieve the validity and the reliability of the Mathematics achievement test, the researchers followed the various ways recommended to control the extraneous sources of error including standardization and aggregation (Grimm & Yarnold, 2004). The postulate of the IRT such as unidimensionality and local independence were taken care of; using the CTT statistical analysis was computed to ensure that items with the desired Difficulty index and Discriminative index were selected for the final test.

Universal Basic Education Curriculum

The UBE curriculum acknowledges that pupils live in an area that form the society and that their personal development is deeply affected by their relationship in the home and other people in the society. The curriculum take full account of these aspects of the pupil's life in seeking to balance individual and social development, and in developing an appreciation of how the different dimensions of life complement each other and in helping the pupil to work co-operatively with others. The curriculum reflects the educational, cultural, social and economic aspirations and concerns of Nigeria society. It also takes cognizance of the changing nature of knowledge and society and caters for the needs of individual pupil in adjusting to such change to enable the pupil to live a full life. To develop interest in Mathematics, pupils need to acquire basic knowledge and skills in Mathematics to meet social needs. The provisions of MDGs and NEEDS profoundly influenced the objectives content, materials and methods of the nine-year basic education curriculum. UBE aim at development of life-long education was one of the provisions of MDGs. NEEDS was developed in response to the developmental challenges of Nigeria. NEEDS recognized that it is only through education these goals can be achieved. In order to achieve this, UBE draw a curriculum from the environment of the pupil as trade, farm measuring etc are emphasized in the curriculum and it also emphasize reasoning which is capable of letting the pupil generate objective of self-assessment. Thus, test items from the

curriculum should emphasize literacy, numeracy, social value, problem solving and manipulative skills

Literacy is the ability to read and use written information as well as to write appropriately in a range of contexts .Literacy involves the integration of speaking, listening, and critical thinking with reading and writing. Literacy skills enable pupils to interact with one another to achieve particular purpose. Numeracy is the ability to reason and to apply simple numerical basic concept. Numeracy skills consist of comprehending fundamental Mathematics like addition, subtraction, multiplication, division etc. Examples $2 + 2 = 4$, $3 - 1 = 2$, $2 \times 5 = 10$. Numeracy involves using mathematical ideals efficiently to make sense of the world. Numeracy is a life skill. Being numerate goes beyond simple doing sum 'doing sum' means having the confidence and competence to use numbers and think mathematically in everyday life. Numeracy when used in the contexts as literacy means having a grasp of numbers and data arithmetic and reasoning necessary for everyday life. It means confidently handling money, understanding interest, using time tables, working out journey times and interpreting graphs and charts (National Numeracy for Everyone for Life, 2012).

Social value seeks to develop pupils spiritually and morally and to foster in each pupil an ethical sense that will enable him/ her to acquire values on which to base choices and form attitudes. Promotes their emotional and physical development in a rapidly changing society, effective interpersonal and intra personal skills and skills in communication are essential for personal, social and educational fulfilment. Learning Mathematics encompasses skills and functions, which are part of everyday life. For example, seven children went for mangoes and agreed to share. They picked 245 mangoes. How will they find out how many they will each get? By solving this type of problem, pupils are learning to discriminate what knowledge is required for certain situations and developing their common sense.

Lambdin (as cited in Kelly, 2006) describes problem solving as somewhat cyclical and interdependent with understanding. "Understanding enhances problem solving… learning through problem solving develop understanding" (Lester as cited in Kelly, 2006 184-194). Lambdin also implies that problem solving is cyclic in nature. When a pupil focuses on a problem, thinks he/she understands it, and devises a solution plan, a series of steps are initiated and revisited as the pupils thinking continues to evolve. Yet when implementing the plan of action, he/she discovers a misconnection in his/her understanding of the problem, which requires revisiting the problem. Thus, it seems that problem solving is an interactive process and, if this is the case, all Universal Basic Education school

teachers might be well advice to include problem solving in their construction of Mathematics test. Example Blessing helps her elderly neighbour for 1/3 of an hour every night and for ½ an hour at the weekend. How much time does she spend helping her in 1 week?

Hatfield, Edwards, Bitter &Morrow (as cited in Kelly, 2006) defined 'Manipulative' as any tangible object, tool or mechanism that may be used to clearly demonstrate a depth of understanding (p185). Mathematics manipulative skill provides young children an opportunity to practice Mathematics skills while playing with attractive hands on items. The ability to think critically, to apply learning and to develop flexibility and creativity are also important factors in the success of the pupils' life. Mathematical reasoning is concerned with development of inductive and deductive reasoning skill that comprises a significant part of Mathematical thinking. In Mathematics syllabus, the activities suggested are examples where the pupils can engage in logical argument, draw conclusions and asses the solution of others. Pupils should acquire self-confidence in their ability to do Mathematics and determine the reasonableness of their answers. The UBE curriculum places particular emphasis on promoting these skills and abilities so that pupils may cope successfully with changes.

According to Adeneye and Awofola (2012), the difference between the old primary school Mathematics curriculum and the new basic education primary school Mathematics curriculum are:

No distinctions between pupils and teacher activities in the old curriculum, while in the new curriculum, activities are broken down into pupils' activity and teacher activity. Secondly, no sample evaluation item to guide the teacher in the old curriculum but in the new curriculum evaluation guide consists of sample evaluation item to guide the teacher. Thirdly, content is organized based on how teachers teach; topics are not aligned with quantitative reasoning task. Very few examples of realistic Mathematics were given. Whereas in the new curriculum content is organized based on how pupil learn and every topic in the curriculum is associated with quantitative reasoning task to facilitate the development of problem solving and psychomotor skills and daily use of Mathematical knowledge is emphasized. Fourthly, in the old curriculum, there is little mention about developing positive attitude in pupils but in the new one, there is more emphasis on how to develop positive attitude toward Mathematics and on pupils' motivation. Fifthly, Teacher method, techniques and strategies are not pupil centred in the old curriculum while in the new curriculum teaching-learning activities prepared parallel to learning outcome require pupils centre method, techniques and strategies.

Sixthly, the existing primary school Mathematics curricula truncate the 9-years continuous school in the old curriculum. The new basic education Mathematics curriculum gives room for the 9-yearscontinuous schooling. Seventhly, few sample activities require the use of manipulative skills in the old curriculum whereas; in the new curriculum virtually all of the samples' activities require how to use manipulative skills for pupils' construction of knowledge. Lastly, Curricula content is over loaded which does not encourage the use of these teaching and strategies that promote skills development. Academic nature of the old Mathematics curricula made it to lose touch of basic learning for lifelong survival and no adequate representation of emerging issues. While in the new curriculum, curriculum content is evenly distributed to encourage the use of facilitative teaching and learning strategies. The curriculum is interspersed with skills for lifelong survival and emerging issues such as HIV/AIDS are well represented.

Concept of Test

Test is the most commonly used instrument for assessing achievement particularly in the cognitive domain. Test can be defined as an attempt to measure a person's knowledge, intelligence and other characteristics in a systematic way. Odili and Ajuar (1995) define test as a set of questions or statement, which have been structured and graduated to elicit and measure responses about an attribute. Badmus and Omoifo (2003) said test is any kind of device or procedure for measuring ability, achievement, interest or attitude or any other traits. Egbule (2002) defined test as any kind of device or procedure for measuring aptitude, interest, ability, achievement and any other trait or personal attribute. Tests are very vital tools in education measurement and evaluation which effective teaching depends on. Hence there cannot be teaching and learning without measurement and evaluation (Nworgu, 1992).

Concept of Achievement Test

Odili and Ajuar (1995) opine that achievement tests therefore aimed at assessing the extent to which set educational objectives have been attained. Egbule, (2000) said achievement tests are designed to evaluate how much learning that has taken place under a given period. Mehrens and Lehmann (as cited in Odili and Ajuar), define it as any test that has a representative sampling of the course content and that is designed to measure the extent of present knowledge. Nworgu (as cited in Odili and Ajuar) refers to it as a systematic and purposeful quantification of learning outcomes that involve the determination of the degree of attainment of individuals in task course or programmes to which they were sufficiently exposed. Ahman and Glock (1971) define it as a test, which compare achievement of students in one school with those of students in other schools;

while Ughamadu, Onwegbu and Osunde (2000) define achievement test as a test designed to measure students' present level of knowledge or skills of performance. In addition, Oji (2003) sees achievement test as a test designed to measure the quality and effectiveness of executed curriculum unit and thus to contribute to the evaluation of educational progress and attainment. From the above definitions, achievement test is the degree of student's success in past and present learning activity as result of instruction.

Type of Achievement Tests

Achievement test is either teacher-made test or a standardized test. Odili and Ajuar (1995) say achievement tests are of two major types:

Teacher-made achievement test

Standardised achievement test.

They went further to say that teacher-made achievement test are tests developed by classroom teachers for purpose of assessing their students' achievement in specific subject. Egbule (2002) defines teacher made achievement tests as those tests of achievement constructed by the teacher as the name implies, designed to measure learning or the outcome of instruction over a short period of time. While standardized achievement test refers to the test of achievement that have been treated with the view of removing all sources of biases, that is, all forms of errors in measurement. According to Odili and Ajuar, these are test designed to obtain samples of behaviour under uniform procedures constructed by test experts and administered, scored and interpreted under specified uniform conditions. Stanley and Hopkins (1972) reported that standardized achievement test are tests which have been processed for reliability and validity. A standardized test whether achievement or psychological, is an instrument that has been carefully and expertly developed, usually with tryout, analysis and revision. Ebel (1979) says it has explicit instruction for standard administration and has tables of norms for score interpretations derived from administration of the test to a defined sample of students. Uwajie-Ero (1997) assented that standardized test can also be referred to as one that has norms with fixed frame of reference for the scores and have been published for general use by experts. It is also a measurement of behaviour in which one is able to make comparisons between the performance of one set of students (or individuals) and others.

Characteristics of a Standardized Achievement Test

A standardized test has certain distinctive feature according to Gronlund (1976). These include:

- ✓ fixed set of test items designed to measure a clearly defined sample of behaviour, specific direction for administering and showing the test norms based on

representative groups of individuals like those for whom the test was design.

- ✓ The test norms enable us to compare an individual's test score to the scores of known groups who have taken the test.
- ✓ Equivalent forms provided for many standardized test. These make it possible to repeat the test without fear that individual will remember the answers from the first testing. Because equivalent forms of test are built on the same specification (but independently), they measure the same sample of behaviour with different sets of test items.
- ✓ Comparable forms provided for some standardized test. These forms measure the same aspects of behaviour but at different grade levels.

A test manual and other accessory materials provided are guides for administering and scoring the test, for evaluating its technical qualities and for interpreting and using the results.

Principles of Test Development and Standardization

There are various reasons why tests are developed and administered to students. The primary concern of this research is the development and standardization of MAT. Egbule (2002) defines test development as a systematic process of assembling of a test by drawing and compiling the task for the testee(s). Okobia (1990) says in developing and standardizing a test, certain procedures are followed. Psychometricians have come to agree that test development is a procedural and a systematic process. Nworgu (2003) suggested the following steps when constructing a test:

> Content analysis, Review of instructional objectives, Development of test blueprint or table of specifications, Item writing, Face validity, Item review, Trial testing, Item analysis, Item selection, Test assembly, Final testing, Test manual, Final production.

Osadebe (2001) pointed out that any researcher who jumps into the issue of test construction without proper planning, will end up with a lopsided test. UNESCO (2005) in seminars and training workshops on test development came up with the following stages when developing a test:

> Decision to gather evidence, Decision to locate resources, Content analysis and test blueprint, Item writing, Item review1,Planning item scoring, Production of trial tests, Trial testing, Item review 2, Amendment (revise/replace/discard), More items needed? and Assembly of final test.

The researcher has decided to adapt the UNESCO (2005) test development because it is an international organizational view rather than an individual work and it is a more recent study. These are considered:

Decision to gather evidence

The first thing that comes to the mind as soon as the decision of test development is taken or is being considered is to know what type of information is required, how quickly it is needed and likely actions that are to be taken according to the results on the test. The crucial question therefore is "what information is needed about pupils' standardized Mathematics achievement test? For who and for what purpose? (Okpala, Onocha & Oyedeje, 1993). It also includes time availability and the purpose of the study. The answer to these questions will guide the researcher on the purpose of the test. The test is designed for formatives evaluation to help monitor the learning progress of middle basic Mathematics pupils. Such formative evaluation will enable their teachers modify defective aspects to enhance pupils improvement before writing their primary six placement examination. Part of the test can also be used for continuous assessment of pupils during their middle basic education course.

Decision to locate resources

The next important question is can we (i) afford the resources needed to gather this information? These resources include the cost involved in providing human resources or manpower, word processing and computing facilities, materials and equipments for photocopying and printing. They mainly have to do with financial cost and security demand, which also involve manpower and finance. Achievement test is an expensive project to run,

Content analysis and test blueprints

At this stage, it is advisable that the researcher or test constructor read syllabus and recommended textbook extensively. He should examine similar instrument developed in the past. He should make a list of behavioural patterns, which the test is designed to test that characterize members of the populations who possess the trait he intends to measure since achievement test is based on syllabus, course content or curriculum.

Benett and Westman (1974) says test blueprint or table of specifications is a two way dimensional table showing the content (sub-scale) covered in the test and specific behaviour objectives measured by the test. The behavioural objectives are placed along the horizontal part of the table, while the sub-scales are placed along the vertical part of the table.

An ideal test blueprint should therefore contain the following information:

- ✓ Test title
- ✓ The sub-scale (components of achievement test) or topics being covered.
- ✓ The specific objectives being measured by the test
- ✓ The weight assigned to each objective
- ✓ The weight assigned to each sub-scale or topic
- ✓ Total number of items measured by each sub-scale or topic
- ✓ The total number of items generated in the entries test
- ✓ A matrix cell containing specific number of items (Murphy & Shotten,1981).

A test blueprint is a specification of what the test should cover rather than a description of what the curriculum covers (UNESCO, 2005). The test blueprint gives assurance that the test will measure in a balance form the instructional objectives and the content area. It ensures the content validity of the test. For the purpose of this research, a test blueprint for220-item achievement test from the middle basic education Mathematics curriculum was developed.

Item writing

Item writing stage is very crucial. The test developer would need to write a pool of sufficient test items, following the test blueprint rigidity, making use of different sources such as similar tests, past questions and various textbooks. The basic four, five and six-placement examination conducted by state Ministry of Education in Nigeria use the theory and objective formats in assessing pupils' level of achievement in Mathematics. The theory type allows the pupil to express himself as much as possible to provide information in a précised form. Although the theory type of test is very subjective in marking, time consuming and restrict coverage of curriculum content. However, in this research the researcher is interested in the objectives test. Although Ebel (1979) and Nworgu (2003) pointed out the main weakness of the objective test include consumption of time and difficulties in setting, waste of materials, promotion of guesswork and does not promote organization of ideals. It is still preferred to the theory test format. The researcher's choice of objective test is better because it will cover a large content area of the subject matter and scoring will be subjective with the large number of testees involved. These reasons are in agreement with the reasons given by Opong (2006), Nworgu (2003) among others. Nworgu (2003) gave the following guidelines for items writing. They are:

- ➢ Constructed items should neither be too difficult nor easy;
- ➢ Construct more items than required to ensure that enough items survive the item analysis (Ohuche & Akeji, 1983);

- The use of ambiguous and flamboyant words should be avoided;
- Items should be written in such a way that the task is clear to the testee;
- The test developer must ensure that clues to the right answers are not given;
- Ensure that the time given is enough to complete the tasks;
- To ensure reliability, the test developer must build in a good scoring guide and must adhere to it.

Item Review 1

Izard (2005) item review is the first form of item analysis, checking the intended against the actual, writing assessment tasks for use in test requires skill. Sometimes the item seems clear and correct to the person who wrote it but it may not necessarily be so to others. Before empirical trial, assessment tasks need to be reviewed by a review panel of experts, with question like:

- ✓ Is the task clear in each item?
- ✓ Is it likely that the person attempting an item will know what is expected?
- ✓ Are items expressed in the simplest possible language?
- ✓ Is each item fair item for assessment at this level of education?
- ✓ Are there unintended clue to the correct answer?
- ✓ Is there a single correct (or best) answer for each item?
- ✓ Is the type of question appropriate to the information required?
- ✓ Are the items representatives of the behaviour to be assess?

These reviews generally help to avoid multiple, negatives, redundant words and distracters, which are not plausible (Izard, 2005).

Planning Item Scoring

The necessary guidance and marking schemes for the tests has to be developed. For a multiple choice test items experts judgments are needed to establish which option is the best (or correct) answer for each item. Once the correct answers have been decided, the score key can be used.

Objective test can be scored on the question paper (if the space is provided) or on a separate answer sheet provided for examiners. Generally, separate answer sheets afford more accurate and reliable marking. This is very important for machine marking.

Production of Trial Test

This has to do with getting the test items ready in paper form and specifying the test conditions. For multiple choice test items, the options have to be arranged in some logical order. The items have to be placed from easiest to most difficult. According to

Psychometriciants (Ukwuije, 2003; Okpala, Onocha & Oyedeji, 1993), this arrangement normally encourages candidates to continue through the test.

Trial Testing

Considering the best efforts of item writers and item reviewers as a means of eliminating faulty items and improving the quality of items. It is necessary to subject the proposed items to empirical trial with pupils similar to those who are going to use the final form of the test. Akinades (2009) suggested that at the end of the test exercise, the test administrators should ensure that the number of copies of tests returned is the same as the number given out. Osadebe (2001) identified the following as the general purpose for the trail testing. Identifying weak or defectives items, difficulty index of each item, discriminative index of each item and appropriate time limit for the final test and determines the inter-correlation among the items and discover the weakness in the instruction to the testee and test administrator.

Item Review 2

Most authorities on test construction refer to as item analysis. This is the statistical procedure for determining the suitability or unsuitability of an item. According to UNESCO (2005) this review after pilot-testing allows the gathering of evidence about each item whether the item can distinguish those students who are knowledgeable from those lacking knowledge, whether items are of an appropriate difficulty level and in the case of multiple choice test item, whether the various options, both 'correct' and 'incorrect' performed as expected. The item analysis also provides an opportunity to collect information about each item performance relative to other items in the same test and to judge the consistency of the whole test. Another important aspect of item analysis is, test items that discriminate positively should be kept for future use. This create a pool of effective test item is build up for use to ensure reliability and validity of test result (Shokare, 2006; Ipaye, 1983). Usually, the upper one-third and the lower one-third of the scores obtained by the trial sample are statistically analyzed. There are three indices of importance in item analysis. These are:

Difficulty index

Discriminative index and

Distracter index (pattern of response to the various distracters or options).

Item difficulty Index (IDI)

A good test must be of moderate level of difficulty and should discriminate between those who know and those that do not know. In order words, it gives an indication

of the proportion of the candidates who answered an item right (Olatuji & Onofeghara, 2008). As suggested by Ebel (1979), test analysis is stated in steps:

Arrange the scored test or answer sheets in order of score from the highest to the lowest. Separate two subgroups of the test paper, an upper and lower group consisting of approximately 27 percent of the total group. Count the number of times each possible response to each item will be chosen on the papers of the upper group. A separate listing of the same data for the papers of the lower group. Record these responses of the upper and lower group. Add the count from the upper and lower group to the keyed correct response then divide the sum by the maximum possible sum. Express the quotients as a percentage that is, multiply the decimal fraction by 100. The result is difficulty index. P usually represents it. The formula for the computation of difficulty index is:

$$P = \frac{HS + LS}{N} \quad x \quad \frac{100}{1}$$

Where P = Item difficulty percentage

HS = Number of pupils in the upper group who got the item right

LS = Number of pupils in the lower group who got the item right.

N = Total number of pupils who attempt the item.

Nworgu (2003) stated that an ideal item difficulty index should have a P value of about 0.50 but realistically, it could range from 0.30 to 0.70. Akpoguma (2008); Opong (2006) and Osiobe (2012) stated that an idea difficulty index should range from 0.3-0.7 and Osadebe (2001) says items with difficulty index should range from 0.3- 0.69. The higher the difficulty index of an item the easier the test item is and vice versa. Item difficulty index varies from 0.00 to 1.00. When it is 1.00, it means that the item is very simple since all the pupils from the upper and lower group must have picked the correct option. Again when it is at 0.00, it implies that none of the pupils from the upper and lower group picked the option. This is an indication that the item is too difficult. This implies that the lower the index the more difficult the item. In the process of test development, a major reason for measuring item difficulty index is to choose items of suitable difficulty level. As such items should be arranged with relatively easy items and proceed to items of increasing difficulty. This arrangement will give the pupil confidence in approaching the test and reduces the likelihood of wasting too much time on items that are beyond his/her ability to the peril of the easier items he/she can answer correctly. The researcher decided to use difficulty index of 0.30 – 0.60.

Item Discriminative Index (IDI)

The discrimination power of an item refers to the degree to which it discriminates between learner with high and low achievers. It is represented by the letter "D" (Ughamadu, Onwuegbu & Osunde, 2000:83). Discrimination index is a measure of the extent to which an item discriminates between the bright and dull pupils. Subtract the sum of the lower group count of correct response from the sum of the upper group count of correct response. Divide the difference by the maximum possible difference. Although the upper and the lower group of 25, 27, 33 and 50 percent have been suggested by experts in the field of measurement and evaluation such as, Nworgu (2003) favoured the use of 27 percent. Ughamadu el at (2000) noted that the upper and lower 27 percent are frequently use for refined analysis. As such, the researcher used the 27 percent for this research work. The formula for discrimination index is

$$D = \frac{HS - LS}{\frac{1}{2}N}$$

Where D = Item discriminative index

HS = Number in the high scorer group who got the items right.

LS = Number in the lower scorer group who got the items right.

N = Total number of pupils who attempted the item.

Usually D lies between 0.0 - 1.0 (Shokare, 2006). When it is 1.00, this means that a large proportion of the knowledgeable pupils than dull pupils got the item right. If the value is 0.00, the item has zero discrimination. This can occur because it is ambiguous. Some items may be found to exhibit negative indices. In this case, the item tends to penalize more of the knowledgeable pupils than dull pupils do. This is an abnormal situation and thus such item should be reconstructed. According to Nworgu (2003) an ideal item should have a discriminating index of 1.00 but realistically it could range from 0.30 to 1.00. Akpoguma (2008)and Opong (2012) says items with discriminative index should range from 0.3-0.70. The researcher wish to work with 0.3-0.60.

Distracter Index

Ukwuije (2003) opined that a good test is one that attracts more pupils from the lower group than the upper group. Effectiveness of distracters are established by inspection (Egbule, 2007). The following example is considered:

Alternatives	A	B	C	D	Omissions
Upper 15	12	2	0	0	1
Lower 15	4	3	0	6	2

A is the correct option. Distracter number 'C' is not functioning it should be removed. Distracter 'D' is not effective because none of the upper group selected it. It should be refined. Distracter 'B' is good enough because it attracted more pupils in the lower than the upper group 'C' and 'D' should be removed or modified as to be plausible. Naturally all distracters should attract responses from both the upper and lower group and should even attract more respondents from the lower group than the upper group.

Amendment (Revise/Replace/Discard)

Nworgu (2003) refers to amending the test as item selection. It has to do with selecting the most suitable test items based on item statistics, which include item difficulty index, item discriminative index and distracters index after the pilot testing. At this stage, items are revised, discarded or replaced using specified criteria. The most suitable items are selected for inclusion into the final form of the test.

Need for more Test?

A situation where new items are added, item analysis has to be repeated. The basis for deciding whether an item is re-written deleted or if new ones should be written to replace old items include:

Responses or reaction of the testees to the instrument.

Factor loading of item; and

Reliability coefficient of sub-testy or the entire test (Olatunji & Onofeghara,2008).

Once the above conditions are satisfied, then the final assembly of item has to commence.

Assembly of Final Test

This is the rearrangement of the final copy of the test easiest questions are presented first. This is to encourage the pupils to proceed through the test and to ensure that the weaker candidates do not become discourage before providing adequate evidence of their ability. Minor changes to items may have to be made for layout reasons. The position of the correct option in multiple-choice test items (A, B, C, D or E) should also vary and each position is used to a similar extent (Ughamadu, 2008). The final test should be consistent with the test blueprint.

Reliability

Reliability is the degree to which a test or an instrument consistently measures what it does measure Osadebe and Kpolovie (2009). Reliability of a test is the extent or degree

of consistency and precision with which a test yields the same result as many times as it is used. This is the ability of a test to measure consistently when administered to the same person or group of persons at different times. According to Abonyi (2003) who stressed that when reliability index of an instrument is 0.50 or above, the instrument should be considered adequate. This is in agreement with Egbule (2002) who is of the option that a test is considered reliable if it has reliability co-efficient of 0.50 and above.

There are various ways of establishing reliability. They include:

Split half Method

Test-retest Method

Parallel or Equivalent Method

Kuder-Richardson Method

Split Half Method

This involves administering a single test to a group of pupils once and obtaining two separate scores for each pupil. The test that has been administered is usually split or subdivided into two halves–odd numbered and even numbered test items and then scored separately. Thus for each pupil, there would be scores for odd numbered test item and scores for even numbered items. The two scores are then correlated. The resulting correlation coefficient is a measure of internal consistency of the test. The Spearman Brown Reliability formula is

$$R_2 = \frac{2R_1}{1+R_1}$$

where R_2 = Reliability of the whole test

R_1 = Reliability of half test

1 = constant

2 = constant

Test-Retest Method

This method involves administering the test on two different times. Test 1 and Test 2, when this is done, the correlation between the two tests is computed. The coefficient obtained from the calculation is used in judging whether the test is reliable or not. The two test are given at different times, may be at one or two weeks interval. Coefficients computed by this method are called coefficient of stability (Ukwuje, 1996).

Equivalent/Parallel Form Method

These are tests built according to the same specification but composed of separate samples from the defined behaviour domain. The tests should be of the same difficulty

level and length of time. The two types of tests are given one after the other. The coefficient computed by this method is called the coefficient of equivalent.

Kuder-Richardson Method

This is a method for establishing the reliability of test scores obtained from a single administration of a single test form. The estimate of reliability obtained from the method is a measure of internal consistency as was the case with split-half method. In a case where test items are scored dichotomously (right or wrong), the problems of how to split a test is resolved with the use of any of the Kuder-Richardson formula 20 or 21.

$$K - D_{20} = \frac{K}{K-1}\left(1 - \frac{\sum pq}{SD^2}\right)$$

$$K - D_{21} = \frac{K}{K-1}\left(\frac{\overline{X}(K - \overline{X})}{KSD^2}\right)$$

Where K = number of items in test

SD^2 = variance of the total test

Pq = product of proportion of passes and failures on each test.

$\overline{X}$ = mean of total test

P = proportion of individual passing each item.

q = proportion of individual who fail each item.

Validity

Validity is one of the most essential psychometric properties of a test. The validity of a test is the extent to which a test measures what it desire to measure. It refers to the extent the results of the evaluation procedure serve the particular uses for which they are intended (Grolund, 1976). There are various types of validity but the researcher is focusing on content, construct and face validity.

Content Validity

Content validity is the extent to which the test items are the representative sample of all the possible items that measure the subject matter in any curriculum area in line with behavioural objectives. Content validity is the systematic examination of the degree to which a research instrument covers a representative sample of the universal content that may be cognitive, affective or psychomotor. Content validity provides adequate techniques for evaluating achievement test.

Construct Validity

Construct is a psychological attribute. Whenever we wish to interpret test performance

in terms of some psychological trait or quality, then we are concerned with construct validity (e.g. attitude, interest, aptitude, intelligence, critical thinking, reasoning ability and reading comprehension). The constructs we cannot see but their existence will infer by behaviours or characteristics that are manifested by individuals. Construct validity refers to how accurately a given test actually describes an instrument in terms of a stated psychological trait (Anastasi & Urbina, 2007).

Face Validity

Face validity is the cosmetic or physical appearance of the test presentation, the typing and the general outlook of the test. The evidence of face validity is the recognition of a test in terms of what it seeks to measure. This is the ability to recognize a Mathematics test because of the presence of numbers and other Mathematical sign and symbols, such that Mathematics test cannot be said to be an English test or a Chemistry test (Egbule, 2002 , 2007).

Administering the Standard Edition

The last in the development of standardized achievement test is to administer the final edition of the test to a representative sample of testees for establishing norm. The most important element in the standardization process is that of selecting a number of testees that is the representative of the testees for whom the tests was intended. The standardized edition was administered to them for the purpose of norming. In general, the final standardized edition of an achievement test usually include test question for each form of the test, answer sheet, marking scheme and test manual. Ughamadu, Onwegbu and Osunde, (2000) claim that a norm is a kind of common scale. Norms are very important in that they tell us how others have performed on a test and enable the comparison of a pupil who at any time takes the test with the reference group or standardization samples.

There are different types of test norms for educational and psychological test. They include grade (class) norms, age norms, percentile norms and standard score norms. The researcher was concerned primarily with standard score norms, making use of Z-score and T-score**.**

Test Manual

According to Ughamadu, Onwuegbu and Osunde (2000) test manual usually provide all essential information that would guide administration, scoring and evaluating the standardized test. Research has pointed out that it should contain detail description of the test and how the test was constructed, its main qualities and characteristics (p 63). The test manual contains detailed information concerning the nature of the test procedure for administering the test and scoring, norm tables, suggestion for interpretations and using the

results of the test, validity and reliability of the test and description of the norm sample and sampling (Okobia 1990; Brown 1983; Ipaye 1982).

Empirical Findings

According to Ludger (2001), the centralised examination made it obvious whether it is the student or the teacher who is to blame. This centralization reduces the teacher's leeway and creates incentives to use resources more efficiently. It makes the whole system transparent. Parents can assess the performances of a teacher, and government and administrators can assess the performance of different schools. Centralised examinations also alter the incentive structure for students by making their performance more transparent to employers and advanced educational institutions. Without external assessment, students in the class looking to maximise their collective welfare will encourage one another not to study very carefully. Centralised examinations render their strategy futile. Centralised examination is expected to boost students' performances.

Gender roles are somewhat rigid in Nigeria, particularly in Delta and Edo States where gender differences are recognised in the daily activities of boys and girls. Arigbadu and Mji (2004) state that gender generalisations are manifested in the type of vocation and profession in which boys and girl are involved. Some fields such as Medicine, Engineering and Architecture are traditionally regarded as male areas while fields such as Nursing, Catering, Typing and Arts are considered to be female areas. Gender differences persist even within the Mathematics classroom. Kolawole (2007) reported that there was not much gender gap in Mathematics performance at the elementary school level (age nine years), but there was a gender gap at the high level (15 years) as older boys performed better than girls. The mean difference between men and women on the Mathematics portion of the SAT (SAT-M) has remained virtually unchanged for the past 35 years, with men out-scoring women by an average of 38 points (College Board, 2009). In agreement Kaiser and Messmer (1994); Fennema (2000) says studies have shown that boys perform better than girls in Mathematics. In a meta-analysis of hundred studies published between 1963 and 1987 Hyde, Fennema and Lamon (1990) observed a complex pattern regarding gender differences in Mathematics performance. At the elementary and middle school level, girls are superior to boys in computation and equal to boys in understanding Mathematical concepts. Gender difference favouring boys emerge in high school on problem–solving tasks and the difference persists on SAT–M. The magnitude of the gender gap in Mathematics performance grows larger with more selective samples while gender–Mathematics difference were moderate for the sample of college students (d=0.33). The differences were much of students for highly selective colleges and graduate students.

Fryer and Levilt (2006) found that the gender gap in Mathematics not only existed in the early elementary school years but had also grown in each grade. In the past two decades, an alternate body of research has shown that the gender differences in Mathematics performances are diminishing. Perie, Moran and Lutkus (2005) found that the gap has been narrowing in the USA for the last several decades. Research in Australia indicates that gender difference in Mathematics achievement is reducing and shifting (Forgasz, Leder & Vale, 2000). Although, Vale (2009) found that many studies conducted between 2000 and 2004 in Australasia showed no significant difference in achievement in Mathematics between males and females, males were more likely to obtain higher mean scores. Girls in a single sex school who did not see Mathematics as an exclusive male domain tend to have higher Mathematics success. Kolawole (2007) reported that girls' involvement and interest improved in all girls' school. Obaji (2005) findings indicated that the difference in Mathematics and literacy attainment between males and females were very clear at all level of education in Nigeria. The aim of the Nigerian education policy is to promote among others, gender equity in access to all educational attainment. Despite this policy, it is still evident that more males derive benefits than females (National Policy on Education 2004). There just aren't gender difference anymore in Mathematics performance, says (Hyde, 2008).

Findings favouring females were evident more often in studies of primary pupils. Bassey, Joshua and Asin (2007) in their study in a rural secondary school in Nigeria involving 2000 students, found a significant gender gap in favour ofmales. The International Institute for Educational Planning (IIEP) UNESCO (2004) reported that in Mathematics, girls scored significantly higher than boys only in Seychelles. On the other hand, in Tanzania, Kenya, Mozambique, Zanzibar and Malawi, boys scored significantly higher than girls did. In the other school systems including South Africa, the differences were not significant. Halpern, Benbow, Geany, and Gur (2007) say women still score lower than men in Mathematics section of the high stakes standardised tests used for admission to college and graduate school including the SAT and Graduate Record Examination. In a cross-sectional analysis of scores on standardised Mathematics, test for grade 2 through 11 from 10 states (California, Connecticut, Missouri, New Jersey, New Mexico, West Virginia and Wyoming). Hyde, Lindberg, Iinn, Ellis and Williams (2008) found a weighted mean effect size of 0.0065, which indicates no gender difference in Mathematics performance. These results provide empirical evidence for teachers and parents to encourage girls to persist and excel in Mathematics.

According to Piaget & Inhelder (1956), four factors are responsible for the transition from one stage to another, one of which is the environmental factor. It appears logical, therefore, that children attending urban schools would perform differently from children in a rural location. Inomiesa (1987) supports the view that pupils in the urban area perform better than pupils in the rural area. Recently Governor Adams Aliyu Oshiomhole of Edo State and former Governor Ewetan Uduaghan of Delta state have given most primary and secondary schools in rural and urban areas a new look to improve students/pupils performance in the state. According to Maliki, Ngban and Ibu (2009) result showed that student from rural schools against all odds performed higher than those from urban school (p 23). A comparison of the performance on standardised achievement test of students from small, usually rural schools with those from larger, often urban institution has not produced definitive results. Several studies have not found any significant difference between the two groups. In research completed in the state of New York, Monk & Haller (1986) found those students from rural schools achieved as well as students found in urban schools. Agbola (1990) in his study of construction and validation of Mathematics achievement test for JSS3 students in Ondo state used 80 items in his final test. He involved both urban and rural schools. His calculated t-value was 7.74, which was greater than the critical value of 1.96 at 0.05 level of significant. He found out that there was a significant difference between the scores obtained by the students located in the urban /rural area in Ondo state JSC examination. Students in the rural area perform better than the students in urban areas.

However, Washington Post (April 31, 1981) reported contrary to this view when it ran the story concluding that private schools are more integrated than public schools and that private schools produce a better cognitive outcome. This view agrees with Abhuegbeude and Anavhe (2010) and Bali (1980) that private school gives a model for an ideal educational system because in general, they provide consumers with a greater choice of schooling, which in turn leads to higher attainment. Brown (1988) disagreed by pointing out that it is not clear whether private school provide a better education than their public counterparts do. He argued that financially powerful elites tend to use the private schools to distinguish themselves from the mass of the society.

According to Lubienski and Lubienski (2009) results, schools that hired more certified teachers and had more certified teachers and had a curriculum that de- emphasised learning by rote tended to do better on standardised Mathematics test and a public school had more of both. In previous research, Lubienskis discovered that after holding demographic factors constant, public school students performed just as well as, if not better

than private school students on standardised Mathematics test. Peterson and Liandet (2008) also did a study and could not conclude that private schools are superior to public schools because there were frustration discrepancies among Mathematics result between them. Lubienski and Lubienski's (2009) research found that public schools are at least as effective as private schools. Put in another way, Lubianski explains whether the school is public or private doesn't seem to make much difference. Academic achievement, however, may no longer be one of these reasons. They write that simply switching students from one type of schools to another will result in higher scores appear to be unfounded. They suggest, Moving away from a simple focus on school type and instead examining what happens within schools.

Appraisal of Literature Review

Test, simply, is an instrument used for measuring attributes. Tests are of various kinds, one of which is the achievement test and there are two types of an achievement test, which are Teacher-made achievement test and standardised achievement test. This study was concerned with the development and standardisation of an achievement test, its development and standardisation are in the subject area of Mathematics.

The theory that was used in explaining the rationale behind test development and standardisation was classical test theory and item response theory. CTT item analysis was utilised by calculating the item difficulty index and item discriminative index and IRT was used for unidimensionality and local independent assumption of the test. Content validity was established using test blueprint table and experts. Reliability was established using Kuder-Richardson formula 20, norming by converting to Z-score and T-score and test manual of the SMAT. Moreover, empirical studies on test development and standardisation were reviewed. The review carried out in this chapter indicated that much works had been done in test construction and standardisation in Mathematics in senior, and junior secondary schools but few were found in primary schools. Since the change from UPE to UBE no work on Middle basic education. The UBE emphasis on the new curriculum goals and objectives in the area of quantitative reasoning, problem solving and relating Mathematics to its environment, which UPE fails to emphasise on in its aims. Hence, the researcher identifies this gap and intends to fill it by developing the SMAT, which can be used in preparing and exposing pupils for standardised instrument similar to their placement examination. The study would help to establish the content validity, reliability, difficulty index and discriminative index of SMAT. It also provides information on norm profile of the middle basic education in Mathematics based on gender, location, school type and states since no much work has been carried out on it.

CHAPTER THREE
RESEARCH METHOD AND PROCEDURES

This chapter focuses on the followings:

Research Design

Population of the Study

Sample and Sampling Procedure

Development of Research Instrument

Validity of the Instrument

Reliability of the Instrument

Method of Data Collection

Method of Data Analysis

Research Design

The study is an instrumentation design because it aims at developing and standardising Mathematics achievement test for middle basic education pupils for use in schools. According to the International Centre for Educational Evaluation (1985) and Osadebe (2001), the instrumentation research design aims at introducing a new or modified instrument for educational practice. Nwafor (1999) noted that the ability of a researcher to design, construct or select appropriate research instrument or modifying the existing research tools for the collection of data for the study is the hallmark of a potent research activity.

Population of the Study

The population of this study comprises all middle basic education school pupils (basic four, five and six) in public and private middle basic schools in Delta and Edo States. The private schools are those recognised by the Ministry of Education. There are 3,016 public and private middle basic schools in Delta and Edo states with 339,944 public and private middle basic school pupils. Delta has 68,785 basic four pupils, 65,884 basic five pupils and 45,252 basic six pupils and Edo 53,050 basic four pupils, 49,663 basic five pupils and 57,310 basic six pupils. Source (State Ministry of Education, Delta and Edo States 2014)

Sample and Sampling Procedures

The sample size is 5,000 pupils of basic four, five and six that constitute the population of the selected schools. A sample size that cuts across the six senatorial districts, male/female, urban/rural and public/private. There are six senatorial districts in

Delta and Edo States. Edo has Edo North, Edo South and Edo Central, while Delta State has Delta North, Delta South and Delta Central.

The stratified multi-stage sampling technique was used to obtain an appropriate sample for this study. A stratified sampling is a probability sampling technique in which the researcher divides the entire target population into different subgroups or strata and then randomly selects schools from each senatorial district. Finally, ten schools were selected from the different strata, five public and five private schools making 60 schools. The pupils were drawn from the senatorial districts based on gender (male/female), location (urban/rural), types of schools (public and private) and states (Delta and Edo). The major advantage is that each state was well represented. A sample of ten (10) schools was randomly selected from the population of each senatorial district making a total of 60 schools. Each school in the six senatorial districts was assigned code numbers 1, 2,.. The numbers were squeezed and dropped into 12 different boxes. All public schools in rural and urban area male and female and all private schools in rural and urban areas in each senatorial district was in various boxes and six (6) pupils were asked to pick five (5) from his senatorial boxes.

There were three stages of sampling pupils from schools. The first sampling was for item analysis, the second sampling for reliability and the final sampling for norming. A sample of 540 pupils was randomly selected through simple balloting for the purpose of item analysis, and another sample of 30 pupils was randomly selected through simple balloting for the purpose of reliability. A sample size 5,000 pupils that are 1,500 pupils for basic four, 1,500 pupils for basic five and 2,000 pupils for basic six was used for the Standardized Mathematics Achievement Test in public and private basic schools in Delta and Edo States.

Development of Research Instrument

The basic research instrument was Mathematics Achievement Test that was designed by the researcher. The items in the instrumentwere drawn from Universal Basic Education scheme curriculum. The items cover the following areas of the basic four, five and six curriculum: Number and Numeration, basic operations, measurement, quantitative reasoning, algebraic process, geometry and mensuration and everyday statistics. 220 multiple items, that is, for basic four 60, basic five 60 and basic six 100 were drawn based on the table of specifications or test blueprint as presented in Appendix I, II, III, IV, V and VI. The multiple items have five options: a, b, c. d and e.

Validity of Instrument

The face and content validity of the instrument were established. The face validity process was carried out through proper typing of the items, arrangement, presentation of numbers, mathematical signs and symbols. While the content validity was determined through the following: Firstly, strictly adherence to the table of specifications to ensure adequate coverage of the curriculum in line with the behavioural objectives for Middle Basic Education pupils. Secondly, particular item analyses to ensure that weak and defective items are removed. Thirdly expert judgment, by presenting the items to project supervisor, two other psychometricians and experienced Mathematics teacher who have been teaching for at least ten years, for corrections, criticisms and modifications of the items. Lastly, removing defectives items and modifying weakitems. This action is to ensure that items were adequate, correct and appropriate for the basic four, five and six pupils

Reliability of Instrument

The reliability of the test was determined using Kuder - Richardson Formula 20. This method was used for the establishment of the reliability of test scores obtained from a single administration of a test form. The test was administered to 30 pupils in basic four, five and six different from those who were to take the final test. The pupils were randomly selected from the population for the purpose of reliability. This method ensures internal consistency of the instrument, which is necessary for the test instrument as multiple choice items instruments that require a response of pass (1) and fail (0).The reliability for basic four is 0.60, basic five 0.55 and basic six 0.65 indicating that the test is reliable.

Method of Data Collection

The MAT was administered to the selected schools and pupils in basic four, five and six. The researcher sought for the assistance of teachers in the chosen schools. The 220 items instrument that constitutes the MAT was administered to 540 pupils in each class similar to the ones that would take the SMAT. The pupils were informed two (2) weeks before they wrote the test. They were briefed about the purpose of the test. The researcher under favourable examination conditions with the help of the class teacher administered the test. It was timed and stopped as stipulated in the test. After the administration, the answer scripts were collected for marking. Each item was scored either right or wrong, by the researcher. The scored scripts were then ready for item analysis, that is, the item difficulty index and item discriminative index. An item with difficulty and discriminative index of 0.30 - 0.60 were selected. Thirty items were administered to pupils for the purpose of reliability using Kuder-Richardson formula 20 and finally the Standardised Mathematics

Achievement Test, which was the product of the item analysis, were administered to 5,000 pupils. That is; basic four 1,500, basic five 1,500 and basic six 2,000 for the purpose of standardisation. Basic four 30 items, basic five 40 items and basic six 60 items. They were informed two weeks before the test was taken and equally informed about the purpose of the test. The test was administered by the researcher under favourable examination conditions with the help of the class teacher. It was timed and stopped at exactly one hour as stipulated in the test. The scripts were collected immediately for marking. Each item was scored either right or wrong; no pupil was penalised for guessing. The number of all correct answers in each sheet was counted, and the raw score was taken as the score of the pupil out of the total 30, 40 and 60 marks as there were 130 items in the final test and it was converted to Z-score and T-score. The scores were organised, analysed and used to answer the research questions.

Method of Data Analysis

The test items were analysed statistically using the Kuder-Richardson formula 20 in establishing the reliability of the instrument. The difficulty and discriminative index range of 0.30 – 0.60 were used and their results presented. The pupils' sheets were re-arranged from the highest score to the lowest score. The upper group of 27% and the lower group of 27% were selected and used for the item analysis. Frequency distribution, mean, median, mode, range, standard deviation and norming of data by converting scores to Z-score and T-score for data analysis.

CHAPTER FOUR
PRESENTATION OF RESULT AND DISCUSSION

This chapter dealt with the analysis of data collected during this research. These data were analysed and the results presented according to the research questions.

Research Question 1: What is the content validity of the developed Standardised Mathematics Achievement Test for middle basic education pupils?

The data used to answer research question 1 is presented in tables 1, 2 and 3

Table 1: Table of Specifications for Basic Four Pupils for SMAT

Cognitive Domain of Behavioural Objectives.

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeration 15%	1	1	1	1	-	-	4
Basic operation 15%	1	1	1	1	-	-	4
Measurement 15%	1	1	1	1	1	-	5
Quantitative reasoning 15%	1	1	1	1	1	-	5
Algebraic process 15%	1	1	1	1	-	-	4
Geometry and mensuration 15%	1	1	1	1	1	-	5
Elementary statistics 10%	1	1	1	-	-	-	3
Total	7	7	7	6	3	-	30

The table revealed that questions set examined all the topics in the basic four component of the middle basic education.

Table 2

Table of Specifications for Basic Five Pupils for SMAT.

Cognitive Domain of Behavioural objectives.

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeration 15%	1	1	1	1	1	1	6
Basic operation 15%	1	1	1	1	1	-	5
Measurement 15%	1	1	1	1	1	1	6
Quantitative reasoning 15%	1	1	1	1	1	1	6
Algebraic process 15%	1	1	1	1	1	1	6
Geometry and mensuration 15%	1	1	1	1	1	1	6
Elementary statistics 10%	1	1	1	1	1	-	5
Total	7	7	7	7	7	5	40

The table revealed that questions set examined all the topics in the basic five component of the middle basic education.

Table 3

Table of Specifications for Basic Six Pupils for SMAT.

Cognitive Domain of Behavioural Objectives.

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeration 15%	2	2	2	1	1	1	9
Basic operation 15%	2	2	2	1	1	1	9
Measurement 15%	2	2	2	1	1	1	9
Quantitative reasoning 15%	1	1	1	1	1	1	6
Algebraic process 15%	2	2	2	1	1	1	9
Geometry and mensuration 15%	2	2	2	1	1	1	9
Elementary statistics 10%	2	2	2	1	1	1	9
Total	13	13	13	7	7	7	60

The table revealed that questions set examined all the topics in the basic six component of the middle basic education.

A table of specification for the 130 items of the SMAT was constructed. The table of specification was drawn to ascertain the extent of the content validity of the instrument SMAT. The analysis of the content validity of SMAT is shown in tables 1, 2 and 3. The major topics that formed the subject content are shown on the left hand side of the table of

specification in association with the cognitive level on the top side across from which the behavioural objectives were classified. The percentage allocated to the content and the cognitive level help to ensure that the topics in the Mathematics syllabus were well represented and that no aspect was neglected. All the topics that constitute the subject content were listed on the table of specification representing the topics indicated in the Universal Basic Education in Nigeria. All the items in SMAT covered the topics of the Mathematics curriculum, which ensure content validity of the instrument. Additionally the calculation of item analysis, Mathematics specialists and three measurement and evaluator specialists also established the face and content validity of SMAT.

Research Question 2: What is the difficulty index of each item of the developed Standardised Mathematics Achievement Test for middle basic education pupils?

To answer research question 2; tables 4, 5, 6, appendix VIIA, VIIB, VIIIA, VIIIB and 1XA, IXB were used. The 60 items were pre-tested on a sample of 540 pupils. Items with difficulty index of 0.30 -0.60 were selected. The data used to answer basic four was presented in table 4andappendix VIIA and VIIB. This is similar to Orluwene and Ukwuije (2004) who use difficulty index of 0.30-0.60.

Table 4

Basic four Items Difficulty Index Levels for SMAT

S/N	Difficulty Index Levels	Decisions
1.	0.50	Accept
2.	0.53	Accept
3.	0.41	Accept
4.	0.47	Accept
5.	0.46	Accept
6.	0.48	Accept
7.	0.48	Accept
8.	0.51	Accept
9.	0.41	Accept
10.	0.58	Accept
11.	0.60	Accept
12.	0.47	Accept
13.	0.35	Accept
14.	0.47	Accept
15.	0.48	Accept
16.	0.47	Accept
17.	0.46	Accept
18.	0.51	Accept
19.	0.48	Accept
20.	0.56	Accept
21.	0.43	Accept
22.	0.43	Accept
23.	0.47	Accept
24.	0.47	Accept
25.	0.39	Accept
26.	0.53	Accept
27.	0.55	Accept
28.	0.47	Accept
29.	0.53	Accept
30.	0.47	Accept

From appendix VII B, items with difficulty index less than 0.30 were rejected. One item was rejected due to its (P) value fall below 0.30. Nine items were rejected due to their (P) values above 0.60. 50 items were accepted with relatively high (P) values of 0.30 – 0.60 met the requirement for difficulty index for basic four for the final test. Hence, the items in the SMAT were taken from the items that fall on the accepted level as shown in table 4. Detail computation in appendix VIIA and VIIB.

The 60 items were pre-tested on a sample of 540 pupils for basic five. Items with difficulty index of 0.30 -0.60 were selected.

The data used to answer basic five is presented in table 5and appendix VIIIA and VIIIB. This is similar to Orluwene and Ukwuije (2009) who used difficulty index of 0.30-0.60.

Table 5

Basic five Items Difficulty Index Levels for SMAT

S/N	Difficulty Index Levels	Decisions
1.	0.34	Accept
2.	0.46	Accept
3.	0.48	Accept
4.	0.48	Accept
5.	0.49	Accept
6.	0.60	Accept
7.	0.48	Accept
8.	0.48	Accept
9.	0.45	Accept
10.	0.38	Accept
11.	0.60	Accept
12.	0.60	Accept
13.	0.43	Accept
14.	0.54	Accept
15.	0.60	Accept
16.	0.47	Accept
17.	0.40	Accept
18.	0.46	Accept
19.	0.56	Accept
20.	0.54	Accept
21.	0.45	Accept
22.	0.56	Accept
23.	0.40	Accept

24.	0.45	Accept
25.	0.48	Accept
26.	0.48	Accept
27.	0.48	Accept
28.	0.43	Accept
29.	0.44	Accept
30.	0.38	Accept
31.	0.51	Accept
32.	0.40	Accept
33.	0.48	Accept
34.	0.32	Accept
35.	0.54	Accept
36.	0.45	Accept
37.	0.54	Accept
38.	0.43	Accept
39.	0.47	Accept
40.	0.53	Accept

From appendix VIIIB, items with difficulty index less than 0.30 were rejected. Two items were rejected due to their (P) values that fall below 0.30. 13 items were rejected due to their (P) values above 0.60. 45items were accepted with relatively high (P) values of 0.30 – 0.60 met the requirement for difficulty index for basic five which were selected for the final test. Hence, the items in the SMAT were taken from the items that fall on the accepted level as showed in table 5.Detail computation is shown in appendix VIIIA and VIIIB.

The 100 items were pre-tested on a sample of 540 pupils. Items with difficulty index of 0.30 -0.60 were selected. The data used to answer research question 2 is presented in table 6 and appendix IXA and IXB. This is similar to Orluwene and Ukwuije (2009) who used difficulty index of 0.30-0.60.

Table 6: Basic Six Items Difficulty Index Levels of SMAT

S/N	Difficulty Index Levels	Decisions	S/N	Difficulty Index Levels	Decisions
1.	0.49	Accept	31.	0.49	Accept
2.	0.50	Accept	32.	0.48	Accept
3.	0.48	Accept	33.	0.48	Accept
4.	0.45	Accept	34.	0.48	Accept
5.	0.38	Accept	35.	0.50	Accept
6.	0.44	Accept	36.	0.50	Accept
7.	0.50	Accept	37.	0.38	Accept
8.	0.49	Accept	38.	0.43	Accept
9.	0.50	Accept	39.	0.41	Accept
10.	0.46	Accept	40.	0.49	Accept
11.	0.60	Accept	41.	0.50	Accept
12.	0.38	Accept	42.	0.47	Accept
13.	0.50	Accept	43.	0.46	Accept
14.	0.47	Accept	44.	0.48	Accept
15.	0.48	Accept	45.	0.50	Accept
16.	0.50	Accept	46.	0.47	Accept
17.	0.50	Accept	47.	0.47	Accept
18.	0.47	Accept	48.	0.40	Accept
19.	0.40	Accept	49.	0.38	Accept
20.	0.43	Accept	50.	0.47	Accept
21.	0.50	Accept	51.	0.49	Accept
22.	0.43	Accept	52.	0.50	Accept
23.	0.57	Accept	53.	0.41	Accept
24.	0.50	Accept	54.	0.45	Accept
25.	0.47	Accept	55.	0.49	Accept
26.	0.56	Accept	56.	0.48	Accept
27.	0.47	Accept	57.	0.48	Accept
28.	0.49	Accept	58.	0.48	Accept
29.	0.50	Accept	59.	0.38	Accept
30.	0.47	Accept	60.	0.43	Accept

From appendix 1X B, items with difficulty index of less than 0.30 were rejected. It shows that seven items with difficulty index (P) value fall within the confidence interval of 0.00 - 0.29. Therefore the seven items were rejected because the items were too difficult. Similarly, the only ten items having P value above confidence interval 0.60 were rejected because the items were too simple. Hence, 60 items in the SMAT were selected from the 83 items that have (P) values within confidence interval between 0.30 - 0.60 as clearly indicated in table 6.

Research Question 3: What is the discriminative index of each items of the developed Standardised Mathematics Achievement Test for middle basic education pupils?

The data used to answer research question 3 is presented in tables 7, 8, 9, appendix VIIA, VIID, VIIIA, VIIID, IXA and IXD. Items with discriminative index of 0.30 – 0.60 were used this is similar to Orluwene and Ukwuije (2009) and Osadebe (2001).

Table 7

Basic four Items Discriminative Index for SMAT

S/N	Discriminative Index Levels	Decisions
1.	0.37	accept
2.	0.31	accept
3.	0.32	accept
4.	0.44	accept
5.	0.32	accept
6.	0.41	accept
7.	0.45	accept
8.	0.36	accept
9.	0.33	accept
10.	0.34	accept
11.	0.31	accept
12.	0.37	accept
13.	0.37	accept
14.	0.32	accept
15.	0.34	accept
16.	0.34	accept
17.	0.30	accept
18.	0.36	accept
19.	0.45	accept
20.	0.30	accept
21.	0.36	accept
22.	0.37	accept
23.	0.44	accept
24.	0.44	accept
25.	0.36	accept
26.	0.45	accept
27.	0.44	accept
28.	0.44	accept
29.	0.36	accept
30.	0.32	accept

Items with discriminative index less than 0.30 were rejected. nine items were rejected due to their (D) values that fall below 0.30.51 items were accepted with relatively high (D) values of 0.30 – 0.60.At the end of the analysis, 30 items were selected from the 51 items as presented in table 7. Finally, 46 items meet the requirement for difficulty and discriminative index for basic four. 30 items were selected from the 46 items for the final test as presented in table7. Detail computation in appendix VIIA and VIID.

Table 8

Basic five Items Discriminative Index for SMAT

S/N	Discriminative Index Levels	Decisions
1.	0.32	accept
2.	0.32	accept
3.	0.47	accept
4.	0.45	accept
5.	0.51	accept
6.	0.59	accept
7.	0.47	accept
8.	0.45	accept
9.	0.53	accept
10.	0.32	accept
11.	0.30	accept
12.	0.36	accept
13.	0.37	accept
14.	0.49	accept
15.	0.59	accept
16.	0.44	accept
17.	0.37	accept
18.	0.32	accept
19.	0.35	accept
20.	0.34	accept
21.	0.37	accept
22.	0.51	accept
23.	0.37	accept
24.	0.36	accept
25.	0.42	accept
26.	0.59	accept
27.	0.47	accept

28.	0.45	accept
29.	0.53	accept
30.	0.36	accept
31.	0.36	accept
32.	0.33	accept
33.	0.37	accept
34.	0.41	accept
35.	0.49	accept
36.	0.34	accept
37.	0.36	accept
38.	0.34	accept
39.	0.36	accept
40.	0.32	accept

Items with discriminative index less than 0.30 were rejected.16 items were rejected due to their (D) values that fall below 0.30. 44 items were accepted with (D) values of 0.30 – 0.60 which discriminate between the bright and the dull pupils.

At the end of the analysis, 43 Items met the requirement for difficulty and discriminative index for basic five. 40 items were selected from the 43items for the final test. Detail computation in appendix VIII A and VIIID.

Table 9

Basic Six Items Discriminative Index for SMAT

S/N	Discriminative Index	Levels Decisions	S/N	Discriminative Index	Levels Decision
1.	0.47	accept	31.	0.37	accept
2.	0.40	accept	32.	0.47	accept
3.	0.45	accept	33.	0.41	accept
4.	0.54	accept	34.	0.45	accept
5.	0.32	accept	35.	0.37	accept
6.	0.36	accept	36.	0.37	accept
7.	0.37	accept	37.	0.32	accept
8.	0.40	accept	38.	0.36	accept
9.	0.38	accept	39.	0.32	accept
10.	0.36	accept	40.	0.40	accept
11.	0.59	accept	41.	0.35	accept
12.	0.35	accept	42.	0.32	accept
13.	0.35	accept	43.	0.32	accept
14.	0.36	accept	44.	0.41	accept
15.	0.40	accept	45.	0.38	accept
16.	0.38	accept	46.	0.34	accept
17.	0.38	accept	47.	0.33	accept
18.	0.46	accept	48.	0.44	accept
19.	0.37	accept	49.	0.32	accept
20.	0.37	accept	50.	0.42	accept
21.	0.38	accept	51.	0.38	accept
22.	0.36	accept	52.	0.42	accept
23.	0.41	accept	53.	0.31	accept
24.	0.37	accept	54.	0.36	accept
25.	0.32	accept	55.	0.56	accept
26.	0.30	accept	56.	0.41	accept
27.	0.32	accept	57.	0.45	accept
28.	0.40	accept	58.	0.47	accept
29.	0.38	accept	59.	0.32	accept
30.	0.44	accept	60.	0.36	accept

Items with discriminative index less than 0.30 were rejected.12 items were rejected due to their (D) values that fall below 0.30. Their low (D) values penalize more of the bright pupils than the dull ones, 88 items were accepted with (D) values of 0.30 – 0.60 which discriminate between the bright and the dull pupils. Hence, the items in the SMAT were taken from the items that fall on the accepted level as showed in table 9.

At the end of the analysis, 83 Items meet the requirement for difficulty and discriminative index for basic six. 60 items were selected from the 83 items for the final test as presented in table 9. Detail computation in appendix IXA and IXD.

Research Question4: What is the reliability of Standardised Mathematics Achievement Test for middle basic education pupils?

Kuder-Rechardson formular 20 was used to answer research question 4 as presented in tables 10, 11,12, and appendix X, XI,XII, XIII, XIV and XV for computation.

Table 10

Basic Four Kuder-Rechardson Formular 20 Analysis of SMAT Reliability

No of students	No of item	Pq	X	Sx	S^2x	R	Decision
30	30	7.44	17.90	4.20	17.53	0.60	Highly reliable

From the analysis in table 10 the SMAT has a reliability of 0.60 which show that the SMAT is high and reliable.

Table 11

Basic Five Kuder-Rechardson Formular 20 Analysis of SMAT Reliability

No of students	No of item	Pq	X	Sx	S^2x	R	Decision
30	40	10.67	22.06	4.76	22.63	0.55	Highly reliable

From the analysis in table11 the SMAT has a reliability of 0.55 which show that the SMAT is high and reliable.

Table 12,

Basic Six Kuder-Rechardson Formular 20 Analysis of SMAT Reliability

No of students	No of item	Pq	X	Sx	S^2x	R	Decision
30	60	14.83	29.3	6.40	40.97	0.65	Highly reliable

From the analysis in table 12 the SMAT has a reliability of 0.65 which show that the SMAT is high and reliable.

Research Question 5: What is the sex norm for the Standardised Mathematics Achievement Test for middle basic education pupils?

The Z-score and T-score were computed using mean and standard deviation of 16.6 and 3.4for basic four male, 21.3 and 5.2 for basic five and 31.1 and 11.4 for basic six while16.8 and 4.4forbasic four female, 20.8 and 4.9 for basic five and 30.9 and 11.2 for basic six Delta state. Edo state 15.7 and 4.8 for basic four male, 22.9 and 5.3 for basic five and 30.3 and 13.0 for basic six while 16.2 and 4.4 for basic four female, 23.1and 5.0 for

basic five and30.4 and 13.5 for basic six. The data used to answer research question 5 are presented in table 13, 14, 15, 16, 17 and 18.

Table 13

GENDERNORM PROFILE FOR BASIC FOUR PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	**Male**	**F**	**Female**	**Male**	**Female**
27	7	3.333	6	2.500	83	75
26	6	3.000	6	2.250	80	73
25	8	2.667	7	2.000	77	70
24	4	2.333	6	1.750	73	68
23	7	2.000	8	1.500	70	65
22	8	1.667	7	1.250	67	63
21	4	1.333	4	1.000	63	60
20	4	1.000	8	0.750	60	58
19	35	0.667	43	0.500	57	55
18	44	0.333	45	0.250	53	53
16	49	-3.333	44	-0.250	47	48
15	50	-0.667	52	-0.500	43	45
14	49	-1.000	51	-0.750	40	43
13	32	-1.333	30	-1.000	37	40
12	23	-1.667	21	-1.250	33	38
11	6	-2.000	4	-1.500	30	35
10	16	-2.333	12	-1.750	27	33
09	10	-2.667	4	-2.000	23	30
08	5	-3.000	7	-2.250	20	28
07	3	-3.333	3	-2.500	17	25
06	5	-3.667	4	-2.750	13	23
Total	**375**		**375**			

Table 14

GENDER NORM PROFILEFOR BASIC FOUR PUPILS IN EDO STATE.

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score =10z + 50	
	F	Male	F	Female	Male	Female
28	5	2.400	5	3.000	74	80
26	4	2.000	6	2.500	70	75
25	12	1.800	8	2.250	68	73
24	13	1.600	12	2.000	66	70
23	4	1.400	6	1.750	64	68
22	8	1.200	7	1.500	62	65
21	7	1.000	8	1.250	60	63
20	5	0.800	3	1.000	58	60
19	7	0 .600	5	1.750	56	58
18	47	0.400	42	0.500	54	55
17	35	0.200	43	0.250	52	53
16	48	0.000	48	0.000	50	50
15	52	-0.200	50	-0.250	48	48
14	42	-0.400	46	-0.500	46	45
13	27	-0.600	31	-0.750	44	43
12	21	-0.800	23	-1.000	42	40
10	4	-1.200	6	-1.500	38	35
9	6	-1.400	8	-1.750	36	33
8	19	-1.600	9	-2.000	34	30
7	7	-1.800	8	-2.250	32	28
6	2	-2.000	1	-2.500	30	25
Total	**375**		**375**			

Table 15

GENDER NORM PROFILEFOR BASIC FIVE PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	**Male**	**F**	**Female**	**Male**	**Female**
34	3	2.600	-	-	76	-
32	6	2.200	9	2.200	72	72
31	16	2.000	4	2.000	70	70
30	4	1.800	6	1.800	68	68
29	12	1.600	13	1.600	66	66
28	5	1.400	5	1.400	64	64
27	7	1.200	8	1.200	62	62
26	9	1.000	6	1.000	60	60
25	4	0.800	4	0.800	58	58
24	4	0.600	8	0.600	56	56
23	44	0.400	45	0.400	54	54
22	35	0.200	43	0.200	52	52
21	48	-0.000	48	-0.000	50	50
20	50	-0.200	52	-0.200	48	48
19	46	-0.400	42	-0.400	46	46
18	33	-0.600	25	-0.600	44	44
14	24	-1.400	20	-1.400	36	36
13	5	-1.600	5	-1.600	34	34
12	10	-1.800	4	-1.800	32	32
11	10	-2.000	28	-2.000	30	30
Total	**375**		**375**			

Table 16

GENDER NORM PROFILE FOR BASIC FIVE PUPILS IN EDO STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$		T-score = 10z + 50	
	F	**Male**	**F**	**Female**	**Male**	**Female**
36	3	2.600	5	2.600	76	76
34	4	2.200	4	2.200	72	72
33	9	2.000	6	2.000	70	70
31	4	1.600	6	1.600	66	66
30	7	1.400	8	1.400	64	64
29	13	1.200	12	1.200	62	62
28	6	1.000	14	1.000	60	60
27	5	1.800	5	0.800	58	58
26	18	0 .600	17	0.600	56	56
25	41	0.400	37	0.400	54	54
24	50	0.200	48	0.200	52	52
23	54	0.000	56	0.000	50	50
22	50	-0.200	50	-0.200	48	48
21	43	-0.400	42	-0.400	46	46
19	12	-0.800	13	-0.800	42	42
18	16	-1.000	14	-1.000	40	40
15	13	-1.600	10	-1.600	34	34
14	6	-1.800	9	-1.800	32	32
13	10	-2.000	8	-2.000	30	30
12	6	-2.200	6	-2.200	28	28
11	5	-2.400	5	-2.400	26	26
TOTAL	**375**		**375**			

Table 17

GENDER NORM PROFILE FOR BASIC SIX PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	Male	F	Female	Male	Female
58	7	2.455	3	2.455	75	75
56	4	2.273	8	2.273	73	73
54	8	2.091	7	2.091	71	71
48	29	1.545	31	1.545	65	65
46	10	1.364	20	1.364	64	64
45	31	1.273	21	1.273	63	63
42	28	1.000	22	1.000	61	61
40	17	0.818	23	1.818	58	58
36	49	0.455	49	0.455	55	55
34	50	0.273	40	0.273	53	53
30	49	0.091	59	-0.091	49	49
28	62	-0.273	68	-0.273	47	47
26	26	-0.455	20	-0.455	45	45
23	40	-0.727	40	-0.727	43	43
22	29	-1.818	31	-1.818	42	42
18	21	-1.182	19	-1.182	38	38
13	17	-1.500	18	-1.636	34	34
12	9	-1.727	8	-1.727	33	33
09	6	-2.000	4	-2.000	30	30
0	8	-2.818	9	-2.818	22	22
Total	**500**		**500**			

Table 18

NORM PROFILE FOR PRIMARY SIX EDO STATEGENDER

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	Male	F	Female	Male	Female
58	5	2.154	8	2.000	72	70
56	17	2.000	4	1.857	70	69
45	8	1.923	12	1.786	69	68
49	22	1.462	18	1.357	65	64
47	20	1.308	23	1.214	63	62
45	31	1.154	29	1.071	62	61
43	40	1.000	30	1.929	60	59
38	30	0.615	40	1.571	56	56
36	28	0.462	40	0.429	55	54
30	80	0.000	80	0.000	50	50
28	39	-0.154	41	-0.143	48	49
26	33	-0.308	35	-0.286	47	47
23	25	-0.538	5	-0.500	45	45
22	25	-0.615	15	-0.571	44	44
18	26	-1.923	26	-1.857	41	41
15	30	-1.154	20	-1.071	38	39
13	10	-1.308	20	-1.214	37	38
10	7	-1.538	13	-1.429	35	36
06	10	-1.846	20	-1.714	32	34
04	14	-2.000	21	-1.857	30	31
Total	**500**		**500**			

Table 19: Analysis of Male and Female Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta basic 4	Male	375	49.6	49.0	48.9	70.0	9.4
	Female	375	49.5	47.3	50.3	52.0	9.2
Edo basic 4	Male	375	49.7	48.0	50.0	44.0	10.2
	Female	375	50.4	48.4	46.6	55.0	9.9
Delta basic 5	Male	375	50.2	48. 4	46.8	46.0	9.9
	Female	375	49.7	48.3	47.4	42.0	9.7
Edo basic 5	Male	375	50.0	49.8	50.9	50.0	8.1
	Female	375	49.5	49.8	49.6	50.0	9.6
Delta basic 6	Male	500	50.7	49.7	46.9	53.0	10.8
	Female	500	50.7	49.3	46.7	53.0	10.7
Edo basic 6	Male	500	51.1	48.5	51.4	39.0	10.7
	Female	500	50.1	48.2	45.9	42.0	11.5

Tables 13, 14 15, 16, 17 and 18,presented the conversion of raw score of male and female pupils in basic four, five and six in Delta and Edo states to Z-score and T-score. It can be seem that there is similarity in performance of pupils in the Z-score and T-score across gender. Also in table 19 the mean range for Delta and Edo basic four male mean range is from 49.6–49.7, female from 49.5–50.4. Delta and Edo basic five male mean range from 50.0 – 50.2 and female from 49.5 – 49.7 finally Delta and Edo basic six male range from 50.7 – 51.1and female from 50.1 – 50.7which indicate a close mean range of average performance of the developed test. The median and mode were similar. The standard deviation is generally high which indicate a wide range of performance. The developed SMAT is therefore appropriate for pupils in basic four, five and six, as in terms of gender, they perform averagely.

Research Question 6: What is the location norm for the Standardised Mathematics Achievement Test for middle basic education pupils?

The Z-score and T-score were computed using mean and standard deviation of 15.7 and 4.4 for basic four rural, 20.7and 4.9 for basic five and 31.1 and 11.6 for basic six while 15.7 and 4.4 for basic four urban, 21.2 and 5.2 for basic five and 31.1 and 11.4 for basic six Delta state. Edo state 15.9 and 4.6 for basic four rural, 23.1 and 5.7 for basic five and 29.5 and 13.0 for basic six while 16.0 and 4.4 for basic four urban, 22.7 and 5.7 for basic five and 30.0 and 13.5 for basic six. The data used to answer research question 5 are presented in table 20, 21, 22, 23, 24, 25 and 26.

Table 20

LOCATION NORM PROFILEFOR BASICFOUR PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$		T-score = 10z + 50	
	F	**Urban**	**F**	**Rural**	**Urban**	**Rural**
27	6	2.750	7	2.750	78	78
26	5	2.500	7	2.000	75	75
25	7	2.250	8	2.250	73	73
24	6	2.000	4	2.000	70	70
23	8	1.750	7	1.750	68	68
22	8	1.500	7	1.500	65	65
21	4	1.250	4	1.250	63	63
20	4	1.000	8	1.000	60	60
19	38	0.750	40	0.750	58	58
18	45	0.500	44	0.500	55	55
16	50	0.000	46	0.000	50	50
15	52	-0.250	50	-0.250	48	48
14	49	-0.500	51	-0.500	45	45
13	30	-0.750	32	-0.750	43	43
12	21	-1.000	23	-1.000	40	40
11	5	-1.250	5	-1.250	38	38
10	15	-1.500	13	-1.500	35	35
9	9	-1.750	5	-1.750	33	33
8	5	-2.000	7	-2.000	30	30
7	3	-2.250	3	-2.750	28	28
6	5	-2.500	4	-2.500	25	25
Total	**375**		**375**			

Table 21

LOCATION NORM PROFILE FOR BASIC FOUR PUPILS IN EDO STATE

Raw Score	Z-Scores = $\frac{X - \bar{X}}{SD}$				T-score = 10z + 50	
	F	Rural	F	Urban	Urban	Rural
28	5	2.400	5	3.000	74	80
26	4	2.000	6	2.500	70	75
25	12	1.800	8	2.250	68	73
24	13	1.600	12	2.000	66	70
23	4	1.400	6	1.750	64	68
22	8	1.200	7	1.500	62	65
21	7	1.000	8	1.250	60	63
20	5	0.800	3	1.000	58	60
19	7	0 .600	5	0.750	56	58
18	47	0.400	42	0.500	54	55
17	35	0.200	43	0.250	52	53
16	48	0.000	48	0.000	50	50
15	52	-0.200	50	-0.250	48	48
14	42	-0.400	46	-0.500	46	45
13	27	-0.600	31	-0.750	44	43
12	21	-0.800	23	-1.000	42	40
10	4	-1.200	6	-1.500	38	35
9	6	-1.400	8	-1.750	36	33
8	19	-1.600	9	-2.000	34	30
7	7	-1.800	8	-2.250	32	28
6	2	-2.000	1	-2.500	30	25
Total	**375**		**375**			

Table 22
LOCATION NORM PROFILE FOR BASIC FIVE PUPILS IN DELTA STATE

Raw Score		Z-Score	= $\frac{X - \bar{X}}{SD}$		T-score = 10z + 50	
	F	**Rural**	**F**	**Urban**	**Rural**	**Urban**
34	1	2.6000	2	2.6000	76	76
32	11	2.2000	4	2.2000	72	72
31	3	2.0000	17	2.0000	70	70
30	4	1.8000	6	1.8000	68	68
29	10	1.6000	15	1.6000	66	66
28	7	1.4000	3	1.4000	64	64
27	9	1.2000	6	1.2000	62	62
26	6	1.0000	9	1.0000	60	60
25	3	0.8000	5	0.8000	58	58
24	8	0.6000	4	0.6000	56	56
23	44	0.4000	45	0.4000	54	54
22	38	0.2000	40	0.2000	52	52
21	50	-0.0000	46	-0.0000	50	50
20	47	-0.2000	55	-0.2000	48	48
19	48	-0.4000	40	-0.4000	46	46
18	29	-0.6000	29	-0.6000	44	44
14	23	-1.4000	21	-1.4000	36	36
13	3	-1.6000	7	-1.6000	34	34
12	8	-1.8000	6	-1.8000	32	32
11	23	-2.0000	15	-2.0000	30	30
Total	**375**		**375**			

Table 23

LOCATION NORM PROFILE FOR BASIC FIVE PUPILS IN EDO STATE

Raw Score	Z-Scores = $\frac{X - \bar{X}}{SD}$				T-score =10z + 50	
	F	Rural	F	Urban	Urban	Rural
36	4	2.167	4	2.167	72	72
34	3	1.833	5	1.833	68	68
33	9	1.667	6	1.667	67	67
31	5	1.333	5	1.333	63	63
30	8	1.167	7	1.167	62	62
29	13	1.000	12	1.000	60	60
28	14	1.833	6	1.833	58	58
27	4	0.667	6	0.667	57	57
26	20	0.500	15	0.500	55	55
25	38	0.333	40	0.333	53	53
24	47	0.167	51	0.167	52	52
23	58	0.000	52	0.000	50	50
22	48	-0.167	52	-0.167	48	48
21	40	-0.333	45	-0.333	47	47
19	12	-0.667	13	-0.667	43	43
18	16	-0.833	14	-0.833	42	42
15	10	-1.333	13	-1.333	37	37
14	6	-1.500	9	-1.500	35	35
13	10	-1.667	8	-1.667	33	33
12	4	-1.833	8	-1.833	32	32
11	6	-2.000	4	-2.000	30	30
Total	**375**		**375**			

Table 24

LOCATION NORM PROFILE FOR BASICSIX PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	Rural	F	Urban	Rural	Urban
58	4	2.250	6	2.455	73	75
56	7	2.083	5	2.273	71	73
54	6	1.917	9	2.091	69	71
48	33	1.417	27	1.545	64	65
46	16	1.250	14	1.364	63	64
45	25	1.167	27	1.273	62	63
42	23	1.917	27	1.000	59	60
40	21	0.750	19	1.818	58	58
36	53	0.417	45	0.455	54	55
34	41	0.250	49	0.273	53	53
30	54	0.083	54	-0.091	49	49
28	60	-0.273	70	-0.273	47	47
26	28	-0.417	18	-0.455	46	45
23	39	-0.667	41	-0.727	43	43
22	30	-1.818	30	-1.818	42	42
18	22	-1.183	18	-1.182	39	38
13	16	-1.500	19	-1.636	35	34
12	8	-1.583	9	-1.727	34	33
09	7	-1.833	3	-2.000	32	30
0	7	-2.818	10	-2.818	22	22
Total	**500**		**500**			

Table 25

LOCATION NORM PROFILE FOR BASIC SIX PUPILS IN EDO STATE

Raw Score	Z-Scores= $\frac{X - \bar{X}}{SD}$				T-score = 10z + 50	
	F	Rural	F	Urban	Rural	Urban
58	3	2.154	10	2.000	72	70
56	14	2.000	7	1.857	70	69
55	9	1.923	11	1.786	69	68
49	19	1.462	21	1.357	65	64
47	16	1.308	27	1.214	63	62
45	25	1.154	35	1.071	62	61
43	37	1.000	33	1.929	60	59
38	36	0.615	34	1.571	56	56
36	40	0.462	28	0.429	55	54
30	79	0.000	81	0.000	50	50
28	45	-0.143	35	-0.143	48	49
26	36	-0.286	32	-0.286	47	47
23	15	-0.500	15	-0.500	45	45
22	20	-0.571	20	-0.571	44	44
18	20	-1.857	32	-1.857	41	41
15	30	-1.071	20	-1.071	38	39
13	14	-1.214	16	-1.214	37	38
10	12	-1.429	8	-1.429	35	36
06	19	-1.714	11	-1.714	32	33
04	11	-1.857	24	-1.857	30	31
Total	**500**		**500**			

Table 26

Analysis of Rural and Urban Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta basic 4	Rural	375	49.9	47.4	46.3	53.0	10.6
	Urban	375	50.2	47.6	46.6	55.0	10.8
Edo basic 4	Rural	375	49.7	48.0	50.0	44.0	4.6
	Urban	375	50.4	48.4	46.7	55.0	4.4
Delta basic 5	Rural	375	49.9	50.0	51.0	46.0	11.2
	Urban	375	50.9	50.5	50.9	46.0	10.8
Edo basic 5	Rural	375	50.2	50.7	51.0	42.0	8.0
	Urban	375	50.3	50.3	50.9	42.0	8.0
Delta basic 6	Rural	500	51.1	50.6	48.8	53.0	9.0
	Urban	500	50.4	48.7	46.6	51.0	10.7
Edo basic 6	Rural	500	50.4	51.0	52.6	42.0	10.5
	Urban	500	51.2	51.4	52.9	39.0	10.3

Tables 20, 2122, 23, 24 and 25, presented the conversion of raw score of rural and urban pupils in basic four, five and six in Delta and Edo states to Z-score and T-score. It can be seem that there is similarity in performance of pupils in the Z-score and T-score across location. Also in table 26 the mean range for Delta and Edo basic four Rural mean range is from 49.7 - 49.9, Urban from 50.2 – 50.4. Delta and Edo basic five Rural mean range from 49.2 –50.2 and Urban from 50.3 – 50.9 and Delta and Edo basic six Rural range from 50.4 – 51.1 and Urban from 50.4 – 51.2 which indicate a close mean range of average performance of the developed test. The median and mode were similar. The standard deviation is generally high which indicate a wide range of performance. The developed SMAT is therefore appropriate for pupils in basic four, five and six, as in terms of location, they perform averagely.

Research Question 7: What is the school type norm for the Standardised Mathematics Achievement Test for middle basic education pupils?

Tables 27, 28, 29, 30, 31, and 32 were used to answer research question **7.** The Z-score and T-score were computed using mean and standard deviation of 15.8 and 4.5 for basic four public, 20.9 and 4.7 for basic five and 31.3 and 11.6 for basic six while 16.6 and 4.5 for basic four private, 20.9 and 5.0 for basic five and 30.8 and 11.1 for basic six Delta state. Edo state 15.8 and 4.3 for basic four public, 23.2 and 5.7 for basic five and 29.8 and

13.0 for basic six while 16.1 and 4.5 for basic four female, 22.7and 6.0 for basic five and29.7 and 13.2 for basic six.

Table 27
SCHOOL TYPE NORM PROFILEFOR BASIC FOUR PUPILSIN DELTA STATE

Raw Score **Z-Scores = $\frac{X - \bar{X}}{SD}$** **T-score = 10z + 50**

	F	Public	F	Private	Public	Private
27	6	2.200	7	2.000	72	70
26	6	2.000	6	1.800	70	68
25	8	1.800	7	1.600	68	66
24	5	1.600	5	1.400	66	64
23	7	1.400	8	1.200	64	62
22	7	1.200	8	1.000	62	60
21	4	1.000	4	0.800	60	58
20	6	0.800	6	0.600	58	56
19	37	0.600	38	0.400	56	54
18	45	0.400	44	0.200	54	52
16	48	0.000	51	-0.200	50	48
15	53	-0.200	49	-0.400	48	46
14	50	-0.400	50	-0.600	46	44
13	31	-0.600	31	-0.800	44	42
12	23	-0.800	21	-1.000	42	40
11	5	-1.000	5	-1.200	40	38
10	13	-1.200	15	-1.400	38	36
9	8	-1.400	6	-1.600	36	34
8	5	-1.600	7	-1.800	34	32
7	2	-1.800	4	-2.000	32	30
6	6	-2.000	3	-2.200	30	28
Total	**375**		**375**			

Table 28
SCHOOL TYPE NORM PROFILE FOR BASIC FOUR PUPILS INEDO STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
F		**Public**	**F**	**Private**	**Public**	**Private**
28	5	3.000	5	2.400	80	74
26	4	2.500	6	2.000	75	70
25	8	2.250	12	1.800	73	68
24	12	2.000	13	1.600	70	66
23	5	1.750	5	1.400	68	64
22	8	1.500	7	1.200	65	62
21	7	1.250	8	1.000	63	60
20	3	1.000	5	0.800	60	58
19	6	0 .750	6	0.600	58	56
18	44	0.500	45	0.400	55	54
17	37	0.250	41	0.200	53	52
16	50	0.000	46	0.000	50	50
15	51	-0.250	51	-0.200	48	48
14	46	-0.500	42	-0.400	45	46
13	30	-0.750	28	-0.600	43	44
12	22	-1.000	22	-0.800	40	42
10	6	-1.500	4	-1.200	35	38
9	6	-1.750	8	-1.400	33	36
8	16	-2.000	12	-1.600	30	34
7	8	-2.250	7	-1.800	28	32
6	1	-2.500	2	-2.000	26	30
Total	**375**		**375**			

Table 29
SCHOOL TYPE NORM PROFILE FOR BASIC FIVE PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	**Public**	**F**	**Private**	**Public**	**Private**
34	1	2.600	2	2.600	76	76
32	8	2.200	7	2.200	72	72
31	12	2.000	8	2.000	70	70
30	3	1.800	4	1.800	68	68
29	13	1.600	12	1.600	66	66
28	4	1.400	6	1.400	64	64
27	8	1.200	7	1.200	62	62
26	7	1.000	8	1.000	60	60
25	6	0.800	2	0.800	58	58
24	4	0.600	11	0.600	56	56
23	43	0.400	46	0.400	54	54
22	39	0.200	39	0.200	52	52
21	47	-0.000	49	-0.000	50	50
20	48	-0.200	54	-0.200	48	48
19	43	-0.400	45	-0.400	46	46
18	38	-0.600	20	-0.600	44	44
14	19	-1.400	25	-1.400	36	36
13	4	-1.600	6	-1.600	34	34
12	6	-1.800	8	-1.800	32	32
11	22	-2.000	16	-2.000	30	30
Total	**375**		**375**			

Table 30

SCHOOL TYPE NORM PROFILE FOR BASIC FIVE PUPILS IN EDO STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	Public	F	Private	Public	Private
36	4	2.167	4	2.167	72	72
34	3	1.833	5	1.833	68	68
33	9	1.667	6	1.667	65	65
31	5	1.333	5	1.333	63	63
30	8	1.167	7	1.167	62	62
29	13	1.000	12	1.000	60	60
28	14	0.833	6	1.833	58	58
27	4	0.667	6	1.667	57	57
26	20	0.500	15	0.500	55	55
25	38	0.333	40	0.333	53	53
24	47	0.167	51	0.167	52	52
23	58	0.000	52	0.000	50	50
22	48	-0.167	52	-0.167	48	48
21	40	-0.333	45	-0.333	47	47
19	12	-0.667	13	-0.667	43	43
18	16	-0.833	14	-0.833	42	42
15	10	-1.333	13	-1.333	37	37
14	6	-1.500	9	-1.667	35	35
13	10	-1.889	8	-1.889	33	33
12	4	-2.000	8	-2.000	32	32
11	6	-2.111	4	-2.111	31	31
Total	**375**		**375**			

Table 31
SCHOOL TYPE NORM PROFILE FOR BASIC SIX PUPILS IN DELTA STATE

Raw Score		Z-Scores = $\frac{X - \bar{X}}{SD}$			T-score = 10z + 50	
	F	Public	F	Private	Public	Private
58	5	2.250	5	2.455	73	75
56	7	2.083	5	2.273	71	73
54	6	1.917	9	2.091	69	71
48	31	1.417	29	1.545	64	65
46	13	1.250	17	1.364	63	64
42	38	0.917	12	1.000	59	60
40	21	0.750	19	1.818	58	58
36	40	0.417	58	0.455	54	55
34	45	0.250	35	0.273	53	53
30	68	0.083	40	-0.091	49	49
28	49	0.027	81	-0.273	47	47
26	20	-0.417	26	-0.455	46	45
23	36	-0.667	44	-0.727	43	43
22	34	-1.818	26	-1.818	42	42
18	17	-1.083	23	-1.182	39	38
13	20	-1.500	15	-1.636	35	34
12	10	-1.583	7	-1.727	34	33
09	5	-1.833	15	-2.300	32	30
0	9	-2.818	8	-2.818	22	22
Total	**500**		**500**			

Table 32
SCHOOL TYPE NORM PROFILE FOR BASIC SIX PUPILS IN EDO STATE

Raw Score	Z-Scores = $\frac{X - \bar{X}}{SD}$				T-score = 10z + 50	
	F	**Public**	**F**	**Private**	**Public**	**Private**
58	9	2.154	4	2.154	72	72
56	8	2.000	13	2.000	70	70
55	10	1.923	10	1.923	69	69
49	16	1.462	24	1.462	65	65
47	25	1.308	18	1.308	63	63
45	30	1.154	30	1.154	62	62
43	38	1.000	32	1.000	60	60
38	33	0.615	37	1.615	56	56
36	34	0.462	34	0.462	55	55
30	90	0.000	70	0.000	50	50
28	30	-0.154	50	-0.154	48	48
26	38	-0.308	30	-0.308	47	47
23	12	-0.538	18	-0.538	45	45
22	19	-0.615	21	-0.615	44	44
18	28	-1.923	24	-1.857	41	41
15	25	-1.154	25	-1.154	38	38
13	12	-1.308	18	-1.308	37	37
10	10	-1.538	10	-1.538	35	35
06	16	-1.846	14	-1.846	32	32
04	17	-2.000	18	-2.000	30	30
Total	**500**		**500**			

Table 33

Analysis of Public and Private Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta Basic 4	Public	375	49.8	48.5	47.9	42.0	8.8
	Private	375	50.0	50.5	48.3	42.0	9.1
Edo Basic 4	Public	375	50.6	49.6	48.3	54.0	10.9
	Private	375	50.7	50.3	49.5	44.0	9.2
Delta Basic 5	Public	375	50.4	50.4	50.4	46.0	10.2
	Private	375	50.3	50.4	51.5	46.0	10.0
Edo Basic 5	Public	375	50.3	50.7	51.2	41.0	7.9
	Private	375	49.7	49.5	49.2	41.0	9.6
Delta Basic 6	Public	500	50.8	49.6	47.7	41.0	10.2
	Private	500	50.2	48.9	47.0	43.0	11.8
Edo Basic 6	Public	500	51.6	51.9	51.0	42.0	10.4
	Private	500	52.5	51.0	49.5	40.0	9.4

Tables27, 2829, 30, 31 and 32, presented the conversion of raw score of public and private pupils in basic four, five and six in Delta and Edo states to Z-score and T-score. It can be seem that there is similarity in performance of pupils in the Z-score and T-score across school type. Also in table 33 the mean range for Delta and Edo basic four range public is from49.8 - 50.6, Private from 50.0 - 50.7. Delta and Edo basic five Public mean range from 50.3 – 50.4 and Private from 49.7 – 50.3 and Delta and Edo basic six Public range from 50.8 – 51.6 and Private from 50.2 – 52.3. That indicates an average performance of the developed test. The median and mode were similar. The standard deviation is generally high which indicate a wide range of performance. The developed SMAT is therefore appropriate for pupils in basic four, five and six as in terms of school type, they perform averagely.

Research Question 8: What is the state norm for the Standardised Mathematics Achievement Test for middle basic education pupils?

The Z-score and T-score were computed using mean and standard deviation of 15.0 and 4.3 for basic four, 20.9 and 4.7 for basic five and 30.0 and 12.0 for basic six Delta state while 16.0 and 4.1 for basic four, 22.0 and 4.7 for basic five and 29.7 and 13.8 for basic six Edo state. The data used to answer research question 8 are presented in tables 34, 35, 36 and 37.

Table34

STATESNORM PROFILE OF BASIC FOUR PUPILS

Raw Score	**Z-Scores = $\frac{X - \bar{X}}{SD}$**				**T-score = 10z + 50**	
	F	**DELTA**	**F**	**EDO**	**DELTA**	**EDO**
28	-	-	10	3.000	-	80
27	13	3.000	-	-	80	-
26	12	2.750	10	2.500	78	78
25	15	2.500	20	2.250	75	75
24	10	2.250	25	2.000	73	73
23	15	2.000	10	1.750	70	70
22	15	1.750	15	1.500	68	68
21	8	1.500	15	1.250	65	65
20	12	1.250	8	1.000	63	63
19	75	1.000	12	0.750	60	60
18	89	0.750	89	0.500	58	55
17	-	-	78	0.250	-	53
16	99	0.250	96	0.000	53	50
15	102	0.000	102	-0.250	50	48
14	100	-0.250	88	-0.500	48	45
13	62	-0.500	58	-0.750	45	43
12	44	-0.750	44	-1.000	43	40
11	10	-1.000	-	-1.250	40	-
10	28	-1.250	10	-1.500	38	35
9	14	-1.500	14	-1.750	35	33
8	12	-1.750	28	-2.000	33	30
7	6	-2.000	15	-2.250	30	28
6	9	-2.250	3	-2.500	28	26
Total	**750**		**750**			

Table 35

STATES NORM PROFILE OF BASICFIVE PUPILS

Raw score	Z-Scores = $\frac{X - \bar{X}}{SD}$				T-score = 10z + 50	
	F	**DELTA**	**F**	**EDO**	**DELTA**	**EDO**
36	-	-	8	2.800	-	78
34	3	2.600	8	2.400	76	74
33	-	-	15	2.200	-	72
32	15	2.200	-	-	72	-
31	20	2.000	10	1.800	70	68
30	7	1.800	15	1.600	68	66
29	25	1.600	25	1.400	66	64
28	10	1.400	20	1.200	64	62
27	15	1.200	10	1.000	62	60
26	15	1.000	35	0.800	60	58
25	8	0.800	78	0.600	58	56
24	15	0.600	98	0.400	56	54
23	89	0.400	110	0.200	54	52
22	78	0.200	100	0.000	52	50
21	96	0.000	85	-0.200	50	48
20	102	-0.200	-	-	48	-
19	88	-0.400	25	-0.600	46	44
18	58	-0.600	30	-0.800	44	42
15	-	-	23	-1.400	-	36
14	44	-1.400	15	-1.600	36	34
13	10	-1.600	18	-1.800	34	32
12	14	-1.800	12	-2.000	32	30
11	38	-2.000	10	-2.200	30	28
Total	**750**		**750**			

Table36
STATES NORM PROFILE OF BASIC SIX PUPILS

Raw Score	Z-Scores = $\frac{X - \bar{X}}{SD}$				T-score = 10z + 50	
	F	**Delta**	**F**	**Edo**	**Delta**	**Edo**
58	10	2.333	13	2.000	73	70
56	12	2.167	21	1.857	72	69
55	-	-	20	1.786	-	68
54	15	2.000	-	-	70	-
49	-	-	40	1.351	-	64
48	60	1.500	-	-	65	-
47	-	-	43	1.214	-	62
46	30	1.333	-	-	63	-
45	52	1.250	60	1.071	63	61
43	-	-	70	0.929	-	59
42	50	1.000	-	-	60	-
40	40	0.830	-	-	58	-
38	-	-	70	-0.571	-	56
36	98	0.500	68	-0.429	55	54
34	90	0.333	-	-	53	-
30	108	0.000	160	0.000	50	50
28	130	-0.167	80	-0.143	48	49
26	46	-0.333	68	-0.286	47	47
23	80	-0.583	30	-0.500	44	45
22	60	-0.667	40	-0.571	43	44
18	40	-1.000	52	-0.857	40	41
15	-	-	50	-1.071	-	39
13	35	-1.417	30	-1.214	36	38
12	17	-1.500	-	-	35	-
10	-	-	20	-1.429	-	36
09	10	-1.750	-	-	32	-
06	-	-	30	-1.714	-	33
04	-	-	35	-1.857	-	31
0	17	-2.500	-	-	25	-
Total	**1000**		**1000**			

Table 37: Analysis of Delta and Edo states School Norm

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta	Basic 4	750	50.1	50.1	48.7	52.0	11.0
	Basic 5	750	50.3	50.2	51.0	46.0	10.8
	Basic 6	1000	51.6	51.1	53.4	48.0	8.8
Edo	Basic 4	750	50.2	48.4	46.8	56.0	12.5
	Basic 5	750	52.0	53.2	54.0	50.0	9.7
	Basic 6	1000	51.9	52.5	51.6	39.0	9.5

Tables 34, 35 and 36 present the conversion of raw score of pupils in basic four, five and six in Delta and Edo states to Z-score and T-score. It can be seem that there is similarity in performance of pupils in the Z-score and T-score across states. Also in table 37 the mean range for Delta and Edo basic four ranges is from 50.1 - 50.2. Delta and Edo basic five mean range from 50.3 – 52.0 and Delta and Edo basic six mean range from 51.6 – 51.9 which indicate an average performance of the pupils in the developed test. The median and mode is similar. The standard deviation is generally high which indicate a wide range of performance. The developed SMAT is therefore appropriate for pupils in basic four, five and six, as in terms of states, they perform averagely.

Summary of the Results

The following are the main findings from the data analysis:

i. The SMAT has face and content validity.
ii. All the items in the SMAT have difficulty index range of 0.30 – 0.60.
iii. All the items in the SMAT have discriminative index range of 0.30–0.60.
iv. The SMAT has reliability of 0.60, 0.55 and 0.65 hence is reliable.
v. The norm profile of gender, school type, location and states were established
vi. The gender, school location, school type and states mean score were relatively close.

Discussions of Results

The discussion centred on the SMAT and their main findings after answering the research questions.

The validity of SMAT

Validity is one of the most outstanding psychometric properties of an instrument. In this research, the content and face validity were emphasised because it is an achievement test. Content validity is the best and most recommended. This position agrees with UNESCO (2005), who said that aggregation is another better way of improving test

validity because a test with many questions that covers the content of the subject area and many objectives items has a better chance of reviewing the ability of the testees than a test with few items. Many objectives items were constructed to cover the Mathematics content that was used for this study. To ensure the content validity of SMAT, a table of the specification was developed by the researcher using the Universal Basic Education curriculum scheme for Middle Basic Education. The topics were carefully examined with their instructional objectives and weighing their relative importance. The 30 items for basic four, 40 items for basic five and 60 items for basic six of the SMAT came out after item analysis of the 60, 60 and 100 items. The test items covered the six main section of the Mathematics scheme; hence, the SMAT is of content validity. Lastly, to ensure content and face validity, two Mathematics specialist and three experts examined the table of the specification and approved that the test has face and content validity.

The Reliability of SMAT

In ascertaining the reliability of the test, the test was administered to 30 sampled pupils. After which the results were correlated using Kuder-Richardson formula 20. The use of theformula became necessary because the multiple choice objective test is with expected response of either pass (1) or fail (0).The computed analysis showed a high correlation coefficient of 0.60 for basic four, 0.55 for basic five and 0.65 for basic six which is significant for a standard test. It shows internal consistency of scores. It is in agreement with Okpala, Onocha and Oyedeji (1996) that a longer test will yield higher reliability coefficient than a shorter test. Opong (2006) in his study, reported reliability of 0.65 which he judged to be significant for a standard test. Abonyi (2003) and Egbule (2002) stressed that when reliability index of an instrument is 0.50 or above, the instrument should be considered reliable. This study has found that SMAT has a reliability coefficient of 0.60, 0.55 and 0.65 that agreed with Abonyi (2003), Egbule (2002) and Opong (2006).

Difficulty and Discriminative index of the SMAT

The items that made up the SMAT were highly selected using Classical Test Theory for item analysis. Their difficulty index and discriminative index were computed. Experts in measurement and evaluation such as Nworgu (2003) reported that an ideal item shows facility index of 0.50 but in real life situation, it will range from 0.30 – 0.70. A critical look at the indices showed that in basic four (4), two(2) items of the thirty items which represented 7% have difficulty indices ranging between 0.30 - 0.40. 18 items ranging between 0.41 - 0.50 which represented 60%. These items are of moderate difficulty index. Ten items have difficulty indices ranging from 0.51- 0.60 which represented 33% of the thirty items. In basic five (5), four (4) items which represented 10%

have difficulty indices ranging between 0.30 -0.40. Twenty-four items which represented 60% have difficulty indices ranges between 0.41 - 0.50. These items are of moderate difficulty index. Twelve items which represented 30% have difficulty indices range between 0.51- 0.60 of the forty items. All the items in the SMAT were within this confidence level, making them suitable and efficient. In basic six (6), seven (7) items have difficulty indices ranging between 0.30- 0.40 which represented 12% of the sixty items. 51 items which represented 85% have difficulty indices ranging between 0.41 -0.50. These items are of moderate difficulty indices. Two (2) items which represented 3% have difficulty indices ranging between 0.51- 0.60. All the items therefore are of high quality as their difficulty (p) value is the confidence interval of 0.30 - 0.60 which agree with Orluwene and Ukwuije (2009) which says that difficulty index should range from 0.30 – 0.60.

The discriminative indices that measure the extent items discriminate between the bright, and dull pupils were also computed. Discriminative index of an item varies between 0.00 -1.00 but realistically it shows a range of 0.30 - 0.70. Osadebe (2001) agreed that ideal items should possess adiscriminative index of 0.30 -0.60. To include only high-quality items, the researcher used a range of 0.30 – 0.60 to select the items in the SMAT. In basic four (4), twenty-one items which represented 70% of discrimination index ranging between 0.30 – 0.40. Nine (9) items which represented 30% have discriminative indices ranges between 0.41 -0.50. In basic five (5), twenty-two items which represented 55% of discrimination index range between 0.30 – 0.40. Ten items which represented 25% have discrimination indices ranges between 0.41- 0.50. Eight (8) items have discrimination index of 0.51 - 0.60. It represents 20%. In basic six (6), forty-two items which represented 70% of discrimination index ranges between 0.30 – 0.40. Fifteen items which represented 25% have discrimination indices ranges between 0.41- 0.50. Three (3) items have discrimination index of ranges between 0.51 - 0.60 which represents 5%. All the items in the SMAT fall between the ranges of 0.30 – 0.60. This finding is in agreement with Orluwene and Ukwuije (2009) and Osadebe (2001) said that discriminative index should range from 0.30 – 0.60.

The Norm Profile of Pupils Performance across Gender, Location, School Type and States.

The norm scores of the basic four, five and six pupils in the SMAT were analysedregarding gender, location school types and states and their results were discussed.

Regarding gender, the findings indicate that the mean score of male pupils was relatively close to the average score of female pupils. It may be due to the pupils'

preparation for the test and their examination which was very close. These findings are in agreement with no gender difference anymore in Mathematics performance as reported by Hyde (2008). Vale (2009), Fennema, Lindberg, Linn, Ellis and Williams (2008) and Fryser and Levitt (2006) were also in agreement that there is no gender gap in Mathematics in elementary school years.However, disagreed with Obaji (2005) that the difference in Mathematics between boys and girls were very clear at all level of education. These results provide empirical for teachers and parents to encourage girls to persist and excel in Mathematics

School location whether Rural and Urban was observed in their scores of SMAT, rural mean scores was there latively close to urban means score. This observation indicates that pupils from rural schools perform as well as pupils from urban schools showing that they were prepared for the test.It agrees with Monk and Haller (1986); who reported that rural pupils performed equivalently with urban pupils. Also, the finding disagreed with Agbola (1990); Bassey, Joshua and Asin (2007); Maliki, Ngban and Ibu (2009) and Okonji (1996) that students from rural schools performed higher than those from urban schools.

School types (Private and Public) were observed in their scores in SMAT. The private and public pupils mean scores indicates that the pupils perform averagely and that the pupils in private and public basic schools possess the same latent trait abilities. This conclusion was highly supported by Lubienski and Lubienski (2009) that public schools are as effective as private schools but disagreed with Brown (1988) who said that is not clear whether private school provide a better education than their public counterparts do. These results provide empirical evidence for teachers and parents that are simply switching pupils from one type of school to another will results in higher scores appear to be unfounded. Rather educators and parents should examine what happens within the schools.

States (Delta and Edo) were also observed in their scores in SMAT, analysis of SMAT of pupils in Delta and Edo basic four mean ranges from 50.1- 50.2, basic five mean ranges from 50.3 -52.0 and basic six mean ranges from 51.6 -51.9. The result indicates that the pupils perform averagely and possess the same latent trait ability in Mathematics and that the test did not discriminate between states.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter briefly gives a summary of the study, conclusion, recommendation, contribution to knowledge and suggestion for further research.

Summary of the Study

This study aimed at the development and standardisation of Mathematics achievement test for basic four, five and six pupils in Delta and Edo states. Eight research questions were raised to guide the study. Literature relevant to the study were reviewed on procedures for test development and standardisation, classical test theory (CTT), item response theory (IRT), validity and reliability as well as norms and test manual were reviewed. Moreover, empirical studies on gender, location, and school type as it affects pupils' achievement in Mathematics were also critically examined.

The design of the study was instrumentation as Mathematics Achievement Test instrument was developed. The population size was 339,944 of basic four, five and six pupils from 3,016 public and government-approved private schools in Delta and Edo states. A sample size of 5,000 pupils was used from the selected 60 schools picked through simple random technique from the stratified multi–stage sampling in this study. Two instrumentswere used; the MAT and the SMAT. The researcher generated 220 items that cut across the main six areas (number and numeration, basic operation, measurement, algebraic process, quantitative reasoning, geometry and mensuration and statistics) of Mathematics base on the Universal Basic Education Scheme of work for basic four, five and six. It was the tryout test that was administered to 540 pupils similar to the ones that took the final test. Item analysis was carried out to select, review, rewrite and edit the final test. The SMAT for basic four, five and six pupils in Delta and Edo states contained 130 (30 for basic 4, 40 for basic 5 and 60 for basic 6) test items. Test blueprint, specialists in Mathematics and Measurement and evaluation were used to establish the content and face validity of the SMAT. Kuder-Richardson formula 20 was used to determine the reliability of the test and a reliability coefficient of 0.60, 0.55 and 0.65 were obtained. The SMAT was used to gather data from the field. Frequency table, Mean, median, mode, standard deviation and range were used in analysing the data generated in the test. Also, the test norms were established using Z-score and T-score. The findings revealed that the SMAT has:

i. 130 test items for middle basic education.
ii. Content and face validity.

iii. Difficulty index falls within the confidence interval of 0.30 - 0.60.

iv. Discriminative index falls within the confidence interval of 0.30 – 0.60.

v. Reliability coefficient of 0.60, 0.55 and 0.65.

vi. The gender norms for the Standardised Mathematics Achievement Test for middle Basic education pupils were established.

vii. The location norms for the Standardised Mathematics Achievement Test for Middle basic education pupils were created.

viii. The school type norms for the Standardised Mathematics Achievement Test for Middle basic education pupils were created.

ix. The states norms for the Standardised Mathematics Achievement Test for Middle basic education pupils were established.

Conclusion

Based on the research findings, the researcher draws the following conclusion

The new Mathematics instrument developed by the researcher is a standardised test with very high and relevant psychometric qualities of a good test. As such it will serve as an effective formative evaluating instrument for Mathematics pupils.

On a general note, pupils scored 50% as most of them score averagely. The implication is that the pupils and their teachers in Delta and Edo states need more preparation for the pupils to score higher.

The Standardised Mathematics Achievement Test is a standardised test with the norm of gender, school type, location and states.

Recommendations

Based on the findings of this study, the researcher made the following recommendations:

i. The Standardised Mathematics Achievement Test should be officially recognised as a standard test in Delta and Edo States as it has all essential psychometric characteristics of good test.

ii. All basic four, five and six Mathematics teachers should seek and use the test on their pupils for evaluation purposes. This stance will help the pupils to face their basic six- placement examination in Mathematics with confidence.

iii. Testing instruments should possess or meet the required standard regarding psychometric properties for the instrument to be used in the school.

iv. Pupils in middle basic education should take the study of Mathematics more serious to obtain a higher score in Mathematics.

Contributions to Knowledge

This research has made the following contributions to knowledge in the following ways:

i. The study has provided a standardised Mathematics test that is based on the middle basic education curriculum.
ii. The study has provided classroom teachers with a standardised Mathematics test for formative, diagnostic and summative assessment of pupils' abilities in the middle basic education.
iii. The study has provided middle basic school teachers and those who are not testing expert on the procedure in developing teacher made achievement test for classroom use and how to convert raw scores to standard score to give a proper interpretation of pupils' performance.
iv. The study has generated data that compares the Mathematics performance of middle basic education pupils regarding gender, location, school types and states

Suggestion for Further Studies

This research work is limited to the Development and Standardisation of Mathematics Achievement Test for Middle Basic Education Pupils in Delta and Edo States. Hence, the researcher suggests that other researchers should look into the following areas:

i. The predictive validity of Standardised Mathematics Achievement Test Instrument and Primary Six Placement Examination should be compared.
ii. The study should be carried out in the Development and Standardisation in another subject area of achievement test in Middle Basic Education.
iii. A similar study should be conducted in other states.

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APPENDIX I

TABLE 1: TABLE OF SPECIFICATIONS FOR BASIC FOUR MAT

	Cognitive Domain of Behavioural Objectives						
Content	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Synthesis**	**Evaluation**	**Total**
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeration 15%	2	2	2	1	1	1	9
Basic operation 15%	2	2	2	1	1	1	9
Measurement 15%	2	2	2	1	1	1	9
Quantitative reasoning 15%	1	1	1	1	1	1	6
Algebraic process 15%	2	2	2	1	1	1	9
Geometry and mensuration 15%	2	2	2	1	1	1	9
Elementary statistics 10%	2	2	2	1	1	1	9
Total	13	13	13	7	7	7	60

APPENDIX II

TABLE 2: TABLE OF SPECIFICATIONS FOR BASIC FIVE MAT

	Cognitive Domain of Behavioural Objectives						
Content	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Synthesis**	**Evaluation**	**Total**
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeration 15%	2	2	2	1	1	1	9
Basic operation 15%	2	2	2	1	1	1	9
Measurement 15%	2	2	2	1	1	1	9
Quantitative reasoning 15%	1	1	1	1	1	1	6
Algebraic process 15%	2	2	2	1	1	1	9
Geometry and mensuration 15%	2	2	2	1	1	1	9
Elementary statistics 10%	2	2	2	1	1	1	9
Total	13	13	13	7	7	7	60

APPENDIX III

TABLE 3: TABLE OF SPECIFICATIONS FOR BASIC SIX MAT

	Cognitive Domain of Behavioural Objectives						
Content	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Synthesis**	**Evaluation**	**Total**
	20%	**20%**	**20%**	**15%**	**15%**	**10%**	**100**
Number and numeratioon 15%	3	3	3	2	2	2	15
Basic operation 15%	3	3	3	2	2	2	15
Measurement 15%	3	3	3	2	2	2	15
Quantitative reasoning 15%	3	3	3	2	2	2	15
Algebraic process 15%	3	3	3	2	2	2	15
Geometry and mensuration 15%	3	3	3	2	2	2	15
Elementary statistics 10%	2	2	2	2	1	1	10
Total	20	20	20	14	13	13	100

APPENDIX IV

The Mathematics Achievement Test (MAT).

Class: Basic four

Time: 2 hours

INSTRUCTIONS TO CANDIDATES:

(i) Write your centre number, examination number, name, the name of your school, and the subject in the spaces provided on the answer booklet.

(ii) Read each question carefully before answering it.

(iii) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(iv) Attempt all questions.

(v) If you shade more than one answer space for a question, you will score nothing for that question.

(vi) Please, work completely on your own.

1. Add 121, 345 and 987
   (a) 1453
   (b) 1553
   (c) 1653
   (d) 1253
   (e) 1303
2. Simplify XV - X
   (a) XV
   (b) XXV
   (c) V
   (d) XI
   (e) IV
3. Write Roman Numeral XCVIII in figures
   (a) 118
   (b) 108
   (c) 88
   (d) 58
   (e) 98

4. What is the place value of 7 in 71252?

   (a) 7 Thousands

   (b) 7 Hundreds of Thousands

   (c) 7 Hundreds

   (d) 7 Thousandths

   (e) 7 Hundredths of Thousand

5. What is thirty-seven thousand, four hundred and thirty in figure?

   (a) 374030

   (b) 3740030

   (c) 3743

   (d) 37430

   (e) 37340

6. What is the Highest Common Factors of 12, 18 and 36?

   (a) 6

   (b) 18

   (c) 36

   (d) 2

   (e) 4

7. What is the Lowest Common Multiple of 2 and 20?

   (a) 4

   (b) 5

   (c) 10

   (d) 20

   (e) 40

8. Subtract 768 from 854

   (a) 96

   (b) 86

   (c) 1522

   (d) 76

   (e) 114

9. Divide 40 by 5

   (a) 7

   (b) 9

   (c) 8

   (d) 10

   (e) 12

10. Edo State has a population of 190,000 and Delta State has a population of 129,000. What is the difference in their population?

    (a) 62.000

    (b) 319000

    (c) 3190

    (d) 6100

    (e) 61000

11. Change to improper fraction 7½

    (a) 14/2

    (b) 15/2

    (c) 3/2

    (d) 7/2

    (e) 10/2

12. Find the missing number 55 – [] = 29

    (a) 29

    (b) 16

    (c) 26

    (d) 48

    (e) 28

13. Change the following to kobo ₦4.00

    (a) 4000k

    (b) 405k

    (c) 40k

    (d) 400k

    (e) 4.000k

14. I have ₦84.05, I spent ₦37.02k. How much do I have?

    (a) ₦ 47.03k

    (b) ₦ 121.07k

    (c) ₦ 38.50k

    (d) ₦ 57.03k

    (e) ₦ 40.05k

15. Find the missing number 28÷4 =[]

    (a) 6

    (b) 0.2

    (c) 8

    (d) 5

    (e) 7

16. There are 948 biscuits; John has 316 and Mary 632. What are their ratios?

    (a) 1:2

    (b) 2:1

    (c) 3:2

    (d) 3:1

    (e) 2:3

17. Ali buys a watch for ₦ 54 and sells it for ₦ 71. What is his profit?

    (a) ₦ 18

    (b) ₦ 17

    (c) ₦ 19

    (d) 18k

    (e) 17k

18. Round off 961 to the nearest hundred

    (a) 971

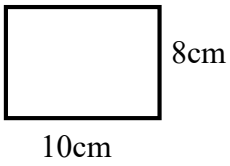
    (b) 961

    (c) 1000

    (d) 100

    (e) 960

19. Calculate the area of the rectangle



(a) 90cm^2

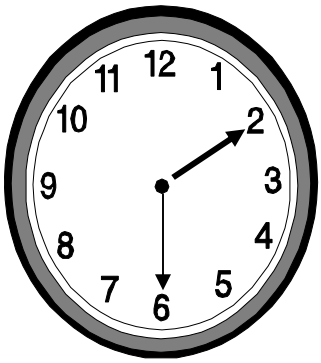
(b) 80cm

(c) 70cm^2

(d) 18cm

(e) 80cm^2

20. What time is it?



(a) Half pass 2

(b) Half pass 6

(c) 6'0 clock

(d) 2' 0 clock

(e) To 3

21. 7.24 litres x 4

(a) 2.896L

(b) 28.96L

(c) 289.6L

(d) 2896L

(e) 0.2896L

22. Change 3.581km to meters

(a) 3481m

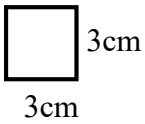
(b) 3.581m

(c) 35.81m

(d) 3581m

(e) 358.1m

23. Calculate the area of the square



(a) 6cm

(b) 12cm

(c) 9cm

(d) 9cm^2

(e) 6cm^2

24. One petrol tanker carries about 35000l of fuel. Another tanker carries about 45000l of fuel. How many litres of fuel do both petrol tanker carry?

(a) 7 000

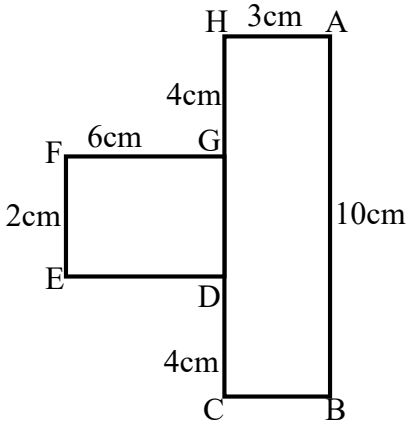
(b) 70 000

(c) 80 000

(d) 8 000

(e) 90 000

25. Find the perimeter of the figure below



(a) 38cm

(b) 30cm

(c) 31cm

(d) 42cm

(e) 40cm

26 H. Min.

2 15

\+ 1 50

_____

(a) 365

(b) 405

(c) 065

(d) 465

(e) 165

27. How many hours make one day?

(a) 36

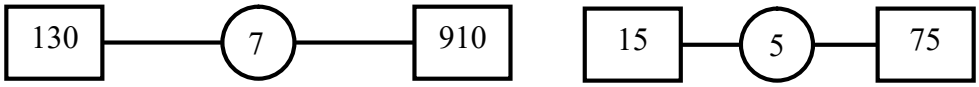
(b) 40

(c) 28

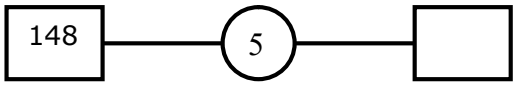
(d) 12

(e) 24

Example



28. Do these



(a) 740

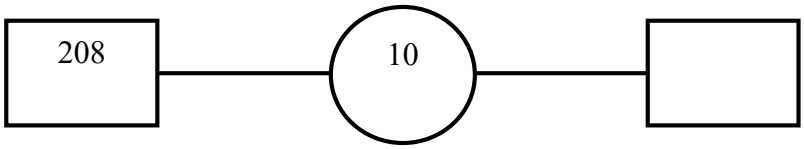
(b) 840

(c) 153

(d) 143

(e) 640

29.



(a) 198

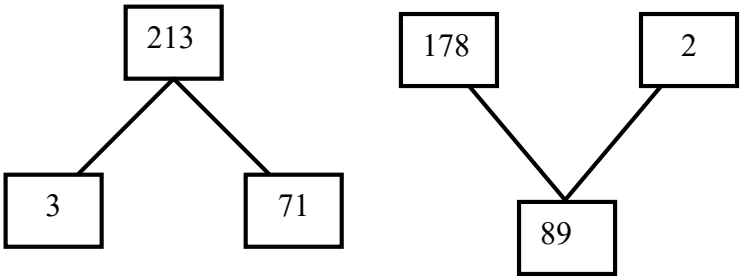
(b) 218

(c) 2080

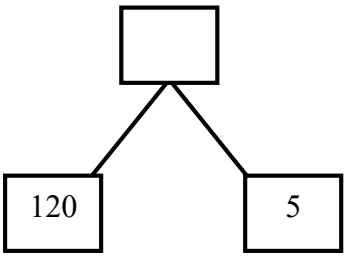
(d) 20800

(e) 2.08

Sample



30. Do these



(a) 24

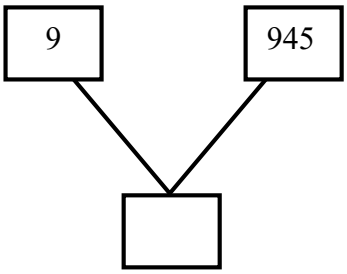
(b) 115

(c) 125

(d) 600

(e) 60

31.



(a) 936

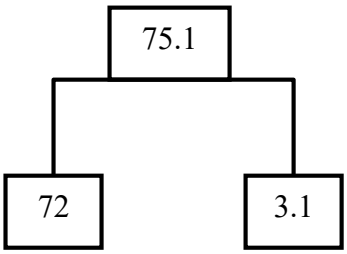
(b) 19

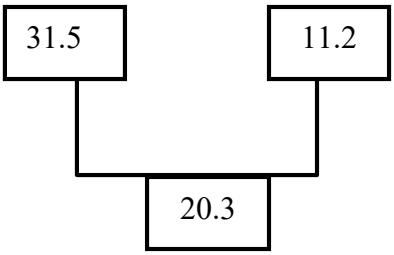
(c) 954

(d) 190

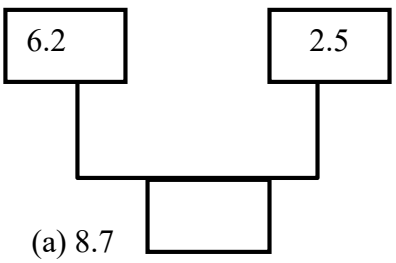
(e) 109

Sample





32.



(a) 8.7

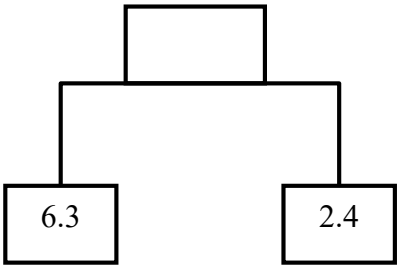
(b) 3.7

(c) 3.0

(d) 16.12

(e) 87

33.



(a) 8.7

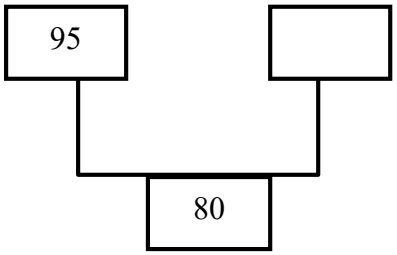
(b) 3.9

(c) 3.0

(d) 16.12

(e) 87

34.



(a) 165

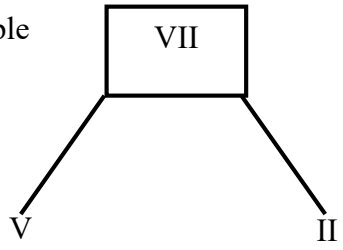
(b) 175

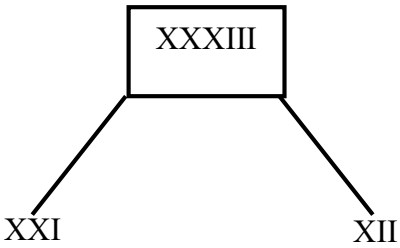
(c) 15

(d) 1.18

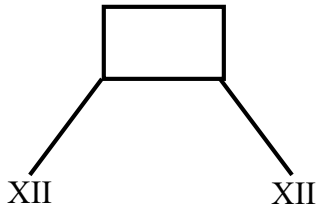
(e) 156

Sample





35.



(a) XXIV

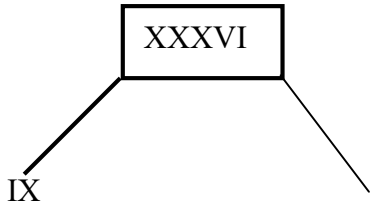
(b) XXIII

(c) XIV

(d) X

(e) VI

36



(a) XL

(b) XXXXV

(c) XXVII

(d) V

(e) IV

37. 12a + 2a + 2a =

(a) 8a

(b) 10a

(c) 16a

(d) 14a

(e) 15a

38. Find the value of Y. 3 x y = 15

(a) 3y

(b) 5

(c) 12

(d) 18

(e) 5y

39. Blessing has M books and John has N books. Find the sum of their books.

(a) m + n

(b) m - n

(c) m ÷ n

(d) m x n

(e) – m + n

40. Solve 2a + 3b + 4a + 6b

(a) 6a + 3b

(b) 5a + 9b

(c) 7a + 9b

(d) 6a + 10b

(e) 6a + 9b

41. Solve 20a ÷ 4

(a)1/5a

(b) 1/5

(c) 16

(d) 5a

(e) 5

42. 36z - 18z =

(a) Z

(b) 18

(c) 18z

(d) 54

(e) 54z

43. 4q x 3 =

(a) 12q

(b) 12

(c) 4q

(d) 7q

(e) 7

44. Add 50v, 150v and 5v

(a) 200v

(b) 205v

(c) 2115

(d) 1105v

(e) 1150

45. Solve 5a + 9 = 10

(a)5a

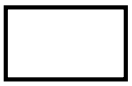
(b) 1/5a

(c) 5

(d) 1/5

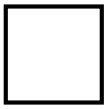
(e) 19/5a

46. Which one of these is a square

(a) 

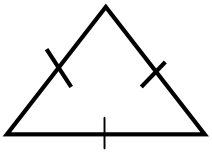
(b) 

(c) 

(d) 

(e) 

47. What is the name of this shape?



(a) Right angled triangle

(b) Rhombus

(c) Kite

(d) Rectangle

(e) Equilateral triangle

48. Which of the following is vertical line?

(a) 

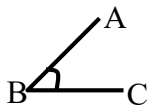
(b)

(c) 

(d) 

(e) 

49. ___ is use to measure the size of <ABC



(a) Protractor

(b) Ruler

(c) Set square

(d) Compass

(e) Divider

50. ___ and ___ has all sides equal

(a) Parallelogram and square

(b) Parallelogram and rhombus

(c) Rectangle and square

(d) Rhombus and square

(e) Rectangle and rhombus

51. How many lines of symmetry has a circle

(a) 2

(b) 3

(c) 1

(d) 4

(e) 5

52. A right angled triangle makes ___

(a) 180^0

(b) 90^o

(c) 45^o

(d) 360^o

(e) 60^o

53. This diagram  is called

(a) Chord

(b) Radius

(c) Diameter

(d) Semi circle

(e) Sector

54. A rectangle has all four angles __

(a) 90^o

(b) 180^o

(c) 45^o

(d) 60^o

(e) 120^o

55. Find the mode of 1, 2, 3, 3, 2, 1, 3

(a) 1

(b) 2

(c) 3

(d) 15

(e) 5

56. Find the median of 3, 4, 3, 3, 4, 5, 5, 2, 5, 2, 4, 4, 0

(a) 0

(b) 2

(c) 3

(d) 4

(e) 5

No. of pupils absent from school

Monday	4
Tuesday	3
Wednesday	2
Thursday	4
Friday	5

Use this information to answer questions 57 – 60

57. How many pupils were absent altogether?

(a) 7

(b) 9

(c) 13

(d) 17

(e) 18

58. How many pupils were absent on Tuesday?

(a) 3

(b) 4

(c) 5

(d) 6

(e) 7

59. How many pupils were absent on Thursday?

(a) 3

(b) 5

(c) 4

(d) 7

(e) 6

60. Which of the days have the least number of absences?

(a) Monday

(b) Wednesday

(c) Tuesday

(d) Thursday

(e) Friday

APPENDIX IVB

ANSWERS TO THE MATHEMATICS ACHIEVEMENT TEST (MAT) FOR BASIC FOUR

S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS
1.	A	13.	D	25	A	37.	C	49.	A
2.	C	14.	A	26.	B	38.	B	50.	D
3.	E	15.	E	27.	E	39.	A	51.	C
4.	B	16.	A	28.	A	40.	E	52.	A
5.	D	17.	B	29.	C	41.	D	53.	D
6.	A	18.	C	30.	D	42.	C	54.	A
7.	D	19.	E	31.	E	43.	A	55.	C
8.	B	20.	A	32.	B	44.	B	56.	D
9.	C	21.	B	33.	A	45.	D	57.	E
10.	E	22.	A	34.	C	46.	D	58.	A
11.	B	23.	D	35.	A	47.	E	59.	C
12.	C	24.	C	36.	C	48.	B	60.	B

APPENDIX V

The Mathematics Achievement Test (MAT).

Class: **Basic 5**

Time: 2 hours

INSTRUCTIONS TO CANDIDATES:

(i) Write your centre number, examination number, name, the name of your school, and the subject in the spaces provided on the answer booklet.

(i) Read each question carefully before answering it.

(ii) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(iii) Attempt all questions.

(iv) If you shade more than one answer space for a question, you will score nothing for that question.

(v) Please, work completely on your own

1. Write in words: 3 009018
    a. Thirty thousand, nine hundred and eighteen
    b. Three million, ninety thousand and eighteen
    c. Three million, nine thousand and eighteen
    d. Three billion, nine hundred and eighteen
    e. Three billion, nine thousand and eighteen
2. Write in figure: twenty one million, nine hundred and forty-five thousand and two hundred and eleven.
    (a) 21,000,945,211
    (b) 21,945.211
    (c) 21,294,521
    (d) 21,935,211
    (e) 21,925,211
3. What is the place value of digit 5 in 23 510 302
    (a) Five hundred
    (b) Fifty thousand
    (c) Five thousandths
    (d) Five hundred thousand
    (e) Five thousand

4. Find the difference between 121729 and 49007

   (a) 72736

   (b) 72617

   (c) 72717

   (d) 72322

   (e) 72722

5. Divide 984 by 12

   (a) 82

   (b) 42

   (c) 32

   (d) 52

   (e) 112

6. Find the H.C.F. of 16, 32 and 40

   (a) 12

   (b) 8

   (c) 5

   (d) 4

   (e) 2

7. Find the factors of 63

   (a) 1,3,7, 9 and 21

   (b) 1 ,3,7 and 5

   (c) 1,3, 6 and 7

   (d) 1,3,5 and 9

   (e) 1, 5, 7 and 21

8. Find the L.C.M. of 240 and 45

   (a) 1500

   (b) 378

   (c) 720

   (d) 620

   (e) 60

9. CCCIV – CLXIV leaving your answer in Roman figure.

(a) C

(b) XIV

(c) CXV

(d) CX

(e) CXL

10. Write $\frac{9}{1000}$ as decimal

(a) 0.09

(b) 0.9

(c) 0.009

(d) 0.0009

(e) 000.9

11. $6\ ^{2}/_{3} + 3\ ¾$

(a) $10\ ^{5}/_{12}$

(b) $10\ ^{17}/_{12}$

(c) $11^{17}/_{12}$

(d) $10\ ^{7}/_{12}$

(e) $9\ ^{5}/_{12}$

12. Find the value of ¼ of 12

(a) 12

(b) 4

(c) 2

(d) 3

(e) 5

13. Change $4\ ^{2}/_{3}$ to an improper fraction

(a) $^{9}/_{3}$

(b) $^{11}/_{3}$

(c) 14

(d) $^{14}/_{3}$

(e) $^{2}/_{3}$

14. Find product of 5 x 2 x 0

    (a) 0

    (b) 5

    (c) 10

    (d) 7

    (e) 20

15. A man bought goods for ₦200 and sold them for ₦240. Find his percentage profit

    (a) 50%

    (b) 20%

    (c) 40%

    (d) 60%

    (e) 10%

16. Write the ratio 36:72 in its simplest form

    (a) 2:3

    (b) 2:1

    (c) 1:2

    (d) 1:3

    (e) 3:1

17. Find the simple interest of ₦500.00 per 2% for 3 years

    (a) ₦25.00

    (b) ₦35.00

    (c) ₦40.00

    (d) ₦65.00

    (e) ₦30.00

18. Express 0.25 as a percentage

    (a) 25%

    (b) 35%

    (c) 15%

    (d) 45%

    (e) 65%

19. Divide 504 by 17

(a) 17.0

(b) 29.6

(c) 27.6

(d) 28.0

(e) 26.0

20. Change 3.2kg to grams

(a) 32g

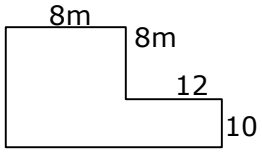
(b) 320g

(c) 3200g

(d) 32000g

(e) 320000g

21. Find the area of the figure below



(a) $264m^2$

(b) $184m^2$

(c) $176m^2$

(d) $130m^2$

(e) $120m^2$

22. A meeting started at 10:35am and ended at 3:15pm same day. How long did the meeting last?

(a) 7hr 20mins

(b) 5hr 40mins

(c) 4hr 50mins

(d) 4hr 40mins

(e) 4hr 30mins

23. Share 216 oranges among 3 pupils, how many will each get?

(a) 84 oranges

(b) 36 oranges

(c) 42 oranges

(d) 72 oranges

(e) 24 oranges

24. Find the perimeter of the rectangle 

(a) 16cm

(b) 10cm

(c) 13cm

(d) 8cm

(e) 30cm

25. Ade weighs 29kg, Eke weighs 38kg, Bose weighs 46kg, Blessing weighs 38kg, who is the heaviest?

(a) Ade

(b) Eke

(c) Bose

(d) Blessing

(e) Eke and Blessing

26. One book weighs 0.82kg and another book weighs 1.354kg. What is the total weight of the two books in g?

(a) 2282.0g

(b) 2182.0g

(c) 2082.0g

(d) 2382.0g

(e) 2174g

27. How many days make one week?

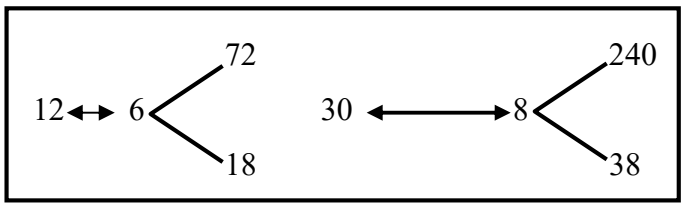
(a) 30

(b) 21

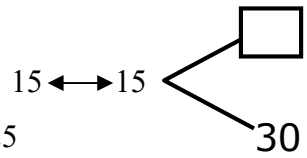
(c) 5

(d) 8

(e) 7

Sample 

Use the above information to answer questions 28-30

28. 

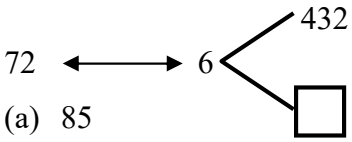
(a) 225

(b) 214

(c) 210

(d) 205

(e) 235

29. 

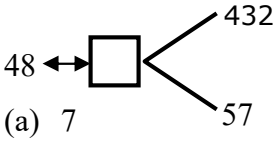
(a) 85

(b) 95

(c) 78

(d) 77

(e) 75

30. 

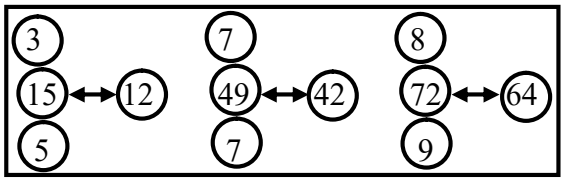
(a) 7

(b) 8

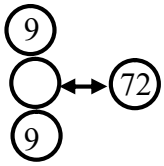
(c) 6

(d) 9

(e) 11

Sample 

Use the above information to answer questions 31-32

31. 

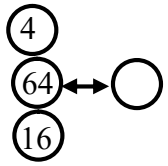
(a) 79

(b) 81

(c) 80

(d) 82

(e) 83

32. 

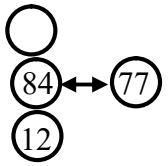
(a) 68

(b) 55

(c) 58

(d) 64

(e) 60

33. 

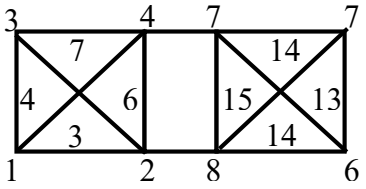
(a) 7

(b) 8

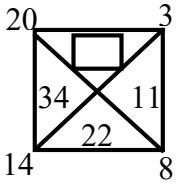
(c) 3

(d) 2

(e) 5

Sample 

Use the above information to answer questions 34 – 36.

34. 

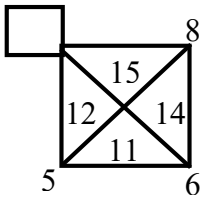
(a) 34

(b) 22

(c) 23

(d) 11

(e) 24

35. 

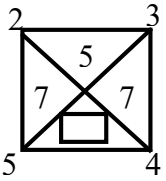
(a) 14

(b) 12

(c) 11

(d) 7

(e) 6

36. 

(a) 5

(b) 9

(c) 8

(d) 7

(e) 3

37. P x P = 144. Find P

(a) 24

(b) 18

(c) 20

(d) 12

(e) 6

38. Shola has ₦p. and Bisi has ₦d. They both have

(a) ₦(2p - d)

(b) ₦(p - d)

(c) ₦(2p + d)

(d) ₦(p + 2d)

(e) ₦(p + d)

39. Solve 3x + 8 = 17. The value of x is?

(a) 3

(b) 8

(c) 6

(d) 9

(e) 12

40. The cost of 3 cakes at ₦C each and 2 boxes of ice-cream at ₦b each is

(a) ₦(3 + 2)(c + b)

(b) ₦(3c + 2b)

(c) ₦6bc

(d) ₦bc

(e) ₦5bc

41. Solve 12y - 7y + 5y =

(a) 24

(b) 24y

(c) 0

(d) 10

(e) 10y

42. 5y = 225. Find y

(a) 5y/225

(b) 5/225

(c) 45

(d) 1/25y

(e) 1/45

43. Simplify 3a + 3a + 2a

(a) 18a

(b) 3a - (5a)

(c) $18a^2$

(d) -8a

(e) 8a

44. Find the product of 2x and 5y

(a) 10xy

(b) 7xy

(c) 10yx

(d) 10x

(e) 10y

45. Solve the equation 6rs ÷ 2r

(a) 1/3rs

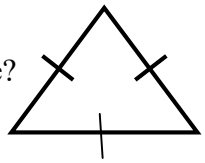
(b) 1/3s

(c) 1/3r

(d) 3s

(e) 3r

46. How many lines of symmetry has an equilateral triangle?



(a) 5

(b) 2

(c) 3

(d) 4

(e) 6

47. Which of the following has no line of symmetry?

(a) 

(b) 

(c) 

(d) 

(e) 

48. Which of the following has its three angles 60 each?

(a) Right angled triangle

(b) Square

(c) Equilateral triangle

(d) Isosceles triangle

(e) Rectangle

49. ___ is mainly use for measuring angels

(a) Protractor

(b) Set of squares

(c) Compasses

(d) Pair of divider

(e) Ruler

50. This diagram  is called __

(a) Chord

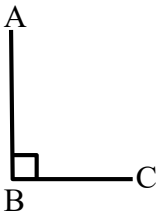
(b) Semi-circle

(c) Diameter

(d) Radius

(e) Sector

51. The perpendicular line makes an angle



(a) 180°

(b) 60°

(c) 120°

(d) 45°

(e) 90°

52. A rhombus has __sides

(a) 3

(b) 4

(c) 5

(d) 6

(e) 7

53. Which of the following is use to measure length and joining points?

(a) Compasses

(b) Set divider

(c) Protractor

(d) Ruler

(e) Square

54. ___ has its 4 angles at right angles

(a) Rectangle and square

(b) Rhombus and rectangle

(c) Parallelogram and square

(d) Trapezium and rectangle

(e) Square and rhombus

55. Find the mean of the sets of numbers: 6, 4, 2, 3, 5, 4, 6, 2

(a) 5

(b) 4

(c) 6

(d) 8

(e) 7

The scores of 100 pupils in a Mathematics test.

Score	3	4	5	6	7	8	9	10
No. of Pupils	4	12	6	15	23	12	18	10

Use the information above to answer questions 56 - 60

56. What is the modal score?

(a) 23

(b) 12

(c) 6

(d) 5

(e) 7

57. What is the median score?

(a) 6 and 7

(b) 7

(c) 15 and 23

(d) 6

(e) 8

58. What is the least score?

(a) 3

(b) 4

(c) 2

(d) 1

(e) 0

59. What is the highest score?

(a) 12

(b) 18

(c) 10

(d) 9

(e) 23

60. What is the difference between the highest score and the lowest score?

(a) 1

(b) 2

(c) 3

(d) 4

(e) 7

APPENDIX VB

ANSWERS TO THE MATHEMATICS ACHIEVEMENT TEST (MAT) FOR BASIC FIVE

S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS
1.	C	13.	D	25	C	37.	D	49.	A
2.	B	14.	A	26.	E	38.	E	50.	B
3.	D	15.	B	27.	E	39.	A	51.	E
4.	E	16.	C	28.	A	40.	B	52.	B
5.	A	17.	E	29.	C	41.	E	53.	D
6.	B	18.	A	30.	D	42.	C	54.	A
7.	C	19.	B	31.	B	43.	E	55.	B
8.	C	20.	C	32.	E	44.	A	56.	E
9.	E	21.	B	33.	A	45.	D	57.	B
10.	C	22.	D	34.	C	46.	C	58.	A
11.	A	23.	D	35.	D	47.	C	59.	C
12.	D	24.	A	36.	B	48.	C	60.	E

APPENDIX VI

The Mathematics Achievement Test (MAT).

Class: Basic Six

Time: 2 hours

INSTRUCTIONS TO CANDIDATES:

(i) Write your centre number, examination number, name, the name of your school, and the subject in the spaces provided on the answer booklet.

(ii) Read each question carefully before answering it.

(iii) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(iv) Attempt all questions.

(v) If you shade more than one answer space for a question, you will score nothing for that question.

(i) Please, work completely on your own

1. Add 6432, 89, 807 and 7
   (a) 30372
   (b) 30272
   (c) 7335
   (d) 7135
   (e) 6225
2. Find the value of 3 351 – 5 143 + 2 859
   (a) 1064
   (b) 1065
   (c) 1066
   (d) 1067
   (e) 1068
3. Write in words 11025
   (a) One hundred and ten thousand and twenty five
   (b) Eleven hundred and twenty five
   (c) One thousand, one hundred and twenty five
   (d) Eleven thousand and twenty five
   (e) Eleven thousand two hundred and five

4. From nine thousand and ninety, subtract nine hundred and nine.

(a) 88081

(b) 8181

(c) 89081

(d) 8081

(e) 809

5. Write in Roman numeral M – DCCC

(a) C

(b) CXV

(c) CX

(d) CLX

(e) CC

6. Add MMXL and CLX

(a) MMXL

(b) MMIV

(c)MMCXL

(d)MMCC

(e)MMXLV

7. Find the missing numbers in the following addition

	3	7	4
+		x	x
	1	5	7
	5	5	3

(a) 2.2

(b) 4.2

(c) 3.2

(d) 1.2

(e) 0.2

8. Evaluate 987 x 400

(a) 39480

(b) 38380

(c) 394800

(d) 383800

(e) 49800

9. Simplify 385/1000

   (a) 38.5

   (b) 3.85

   (c) 0.385

   (d) 0.0385

   (e) 0.00385

10. Evaluate 3952÷13

   (a) 3004

   (b) 3040

   (c) 340

   (d) 304

   (e) 34

11. Find the highest common factor (H.C.F.) of

   2 x 2 x 2 x 3 x 5 x 7

   2 x 2 x 2 x 2 x 3 x 3 x 5

   2 x 3 x 3 x 5 x 7

   (a) 2

   (b) 2 x 3 x 5

   (c) 3

   (d) 2 x 3

   (e) 2 x 3 x 5 x 7

12. Find the least common multiple of 2, 3 and 6

   (a) 2

   (b) 3

   (c) 6

   (d) 18

   (e) 9

13. Which of the following is equal to 120?

   (a) 2 x 3 x 5

   (b) 2^2 x 3 x 5^2

   (c) 2^2 x 3^3 x 5

   (d) 2^3 x 3 x 5

   (e) 2^4 x 3 x 5

14. What digit does 6 represent in 6852?
    (a) Ten of thousand
    (b) Thousand
    (c) Hundred
    (d) Ten
    (e) Unit
15. Find the place of 9 in 14 789
    (a) Units
    (b) Tens
    (c) Hundreds
    (d) Thousands
    (e) Tenths
16. List all the multiples of 4 that are less than 20
    (a) 8, 10
    (b) 12, 16, 18
    (c) 4, 8, 16, 18
    (d) 12, 16
    (e) 8, 12, 16
17. Find the sum of 1000 and 0.001
    (a) 1000.001
    (b) 1000.0
    (c) 1000.1
    (d) 101
    (e) 1001
18. Express 13/50 in decimal
    (a) 0.00026
    (b) 0.0026
    (c) 0.026
    (d) 0.26
    (e) 2.6

19. Express 0.54 as a fraction in its lowest terms

(a) 27/100

(b) .27/50

(c) 2.7/50

(d) 27/50

(e) 13/25

20. What is the square root of 36?

(a) 6

(b) 4

(d) 7

(e) 9

21. Correct 0.006678 to 3 decimal places

(a) 0.00668

(b) 0.007

(c) 0.00667

(d) 0.01

(e) 0.006

22. Change 20/3 to the nearest whole number

(a) 3

(b) 6

(c) 7

(d) 10

(e) 8

23. Approximate 30.74 correct to three significant figure

(a) 21.7

(b) 30.0

(c) 31.0

(d) 31.4

(e) 30.7

24. Find the simple interest on ₦200 for 5 years at 3% per annum

(a) ₦10.00

(b) ₦15.00

(c) ₦20.00

(d) ₦30.00

(e) ₦ 40.00

25. Find 6% of ₦24.00

(a) ₦40.00

(b) ₦4.40

(c) ₦4.00

(d) ₦1.44

(e) ₦0.24.

26. The ratio of three days to six weeks is same as

(a) 1:2

(b) 1:20

(c) 1:7

(d) 1:6

(e) 1:14

27. Solve 5 1/3 x ¼ ÷ 1 3/5

(a) 2 2/15

(b) 13 1/5

(c) 5/6

(d) 1 1/5

(e) 1/6

28. Find 33 1/3% of ₦900.00

(a) ₦9, 000.00

(b)₦3, 000.00

(c)₦30,000

(d)₦90.00

(e) ₦30.00

29. Express 3/8 as a percentage

(a) 75%

(b) 40%

(c) 37.5%

(d) 4%

(e) 0.375%

30. Which of the following fractions is the largest? 2/3, 4/5, 7/10, 5/6, ¾

(a) ¾

(b) 5/6

(c) 7/10

(d) 4/5

(e) 2/3

31. If 25% profit was made on an article by selling it for ₦800.00, what was the cost price?

(a) ₦1,000.00

(b) ₦900.00

(c) ₦640.00

(d) ₦600.00

(e) ₦200.00

32. Olu and Ade shared ₦52.00 in the ratio of their ages. If Olu's share was ₦20.00 find the ratio of their ages?

(a) 4:13

(b) 5:13

(c) 8:13

(d) 5:8

(e) 3:8

33. If 20kg of pork meat cost ₦16.00 what is the cost of 100kg?

(a)₦1, 600.00

(b) ₦800.00

(c) ₦180.00

(d) ₦100.00

(e) ₦80.00

34. Find the cost of 50 articles at ₦0.20 each.

(a) ₦1, 000.00

(b) ₦100.00

(c) ₦10.00

(d) ₦1.00

(e) ₦0.10

35. If ₦1.00 exchanges for ¢40.00, how much will a trader pay for ¢1,680.00?

(a) ₦420.00

(b) ₦400.00

(c) ₦42.00

(d) ₦40.00

(e) ₦32.00

36. Find the area of a circle whose diameter is 28cm (Take $\pi = 22/7$)

(a) $616cm^2$

(b) $606cm^2$

(c) $176cm^2$

(d) $108cm^2$

(e) 88cm

37.

Hours	Minutes	Seconds
15	8	24
- 8	24	48

(a) 6hr. 42min. 36sec.

(b) 6hr. 43min. 36sec

(c) 6 hr. 43min. 26 sec.

(d) 6hr. 41min. 36sec

(e) 6 hr. 40in. 36sec

38. How many minutes are there between 9.00am and 1.15pm?

(a) 315

(b) 300

(c) 255

(d) 195

(e) 185

39. Simplify ₦4 – (₦1.45 + 73k + 65k)

(a) ₦2.17

(b) ₦2.07

(c) ₦1.71

(d) ₦1.70

(e) ₦1.17

40. A tank is 8m long, 4m wide and 2m high. Find its volume in litres. ($1000cm^2$ =1 litre)

(a) 64,000

(b) 6,400

(c) 640

(d) 64

(e).4

41. Find the total surface area of a cuboid whose dimensions are 2cm x 3cm and 4cm

(a) $52cm^2$

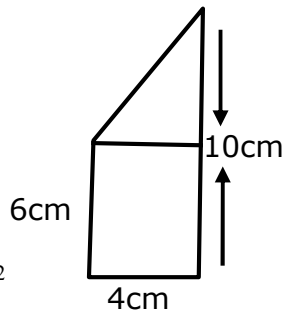
(b) $48cm^2$

(c) $36cm^2$

(d) $26cm^2$

(e) $24cm^2$

42. Find the area of the diagram show below



(a) $76cm^2$

(b) 60cm

(c) $44cm^2$

(d) $32cm^2$

(e) $20cm^2$

43. If 8km = 5 miles, find 40 miles in km

(a) 320km

(b) 200km

(c) 80km

(d) 64km

(e) 25km

44. The radius of a circle is 5cm. Find the circumference. (= 3.14)

(a) 3.56

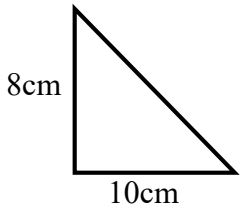
(b) 31.56

(c) 31.344cm

(d) 31.37

(e) 31.40

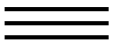
45. Find the area of the triangle



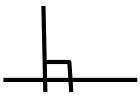
(a) 80cm²
(b) 40cm²
(c) 36cm²
(d) 26cm²
(e) 20cm²

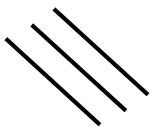
46. Which of the following shapes is perpendicular?

(a) 

(b) 

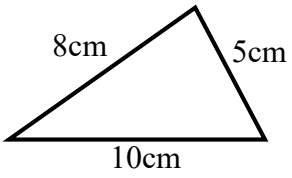
(c) 

(d) 

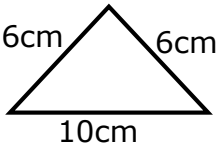
(e) 

47. Which of the diagram is an equilateral triangle?

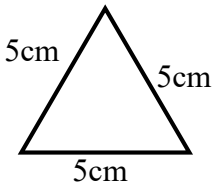
(a)



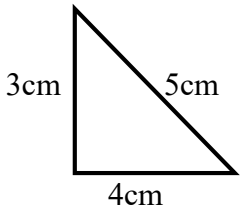
(b)



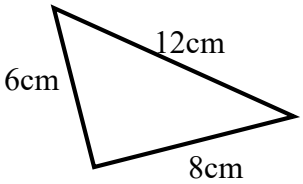
(c)

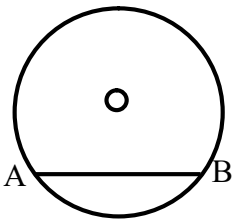


(d)



(e)





48. In the diagram above, 0 is the centre of the circle. What is line AB called?

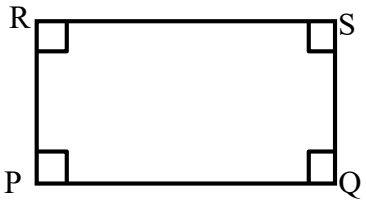
(a) Arc

(b) Sector

(c) Chord

(d) Segment

(e) Diameter



49. What is the name of the diagram PQRS shown above?

(a) Trapezium

(b) Cube

(c) Rectangle

(d) Triangle

(e) Square

50. A square has __

(a) 2 of its opposite sides equal

(b) 3 sides

(c) None of its sides equal

(d) All the sides equal

(e) 2 sides.

51. Which of the following is not true?

(a) Lengths are measured in cm

(b) Area are expressed in square units

(c) Times are measured in minutes

(d) Volumes are expressed in kg

(e) Angles are measured in degrees,

52. Which of the following is not a plane figure?

(a) Triangle

(b) Rectangles

(c) Cone

(d) Square

(e) Circle

53. An Isosceles triangle has_____

(a) 2 sides

(b) All the sides equal

(c) 4 sides

(d) 2 of its sides equal

(e) None of its sides equal

54. Two of the angles of a triangle are 80^0 and 40^0, find the third angle.

(a) 240^o

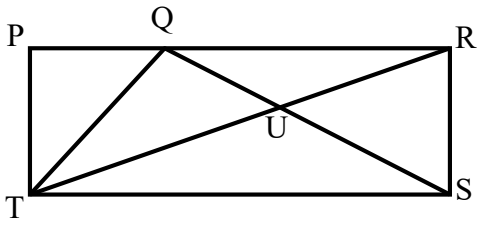
(b) 120^o

(c) 100^o

(d) 60^o

(e) 40^o

55. How many triangles are in the diagram below?



(a) 12

(b) 10

(c) 9

(d) 8

(e) 7

56. From question 55 which of the following pairs of triangles have equal area?

(a) TRS and PTR

(b) PRT and QTU

(c) USR and STR

(d) QTU and USR

(e) PTR and PQT

57. Which of the instruments is used to measure angle?

(a) protector

(b) square

(c) compass

(c) divided

(e) ruler

58.. We can bisect a straight line with a _____

(a) protector

(b) set square

(c) ruler

(d) pair of compasses

(e) pair of dividers

59. To measure the circumference of a circle __ is needed

(a) string and ruler

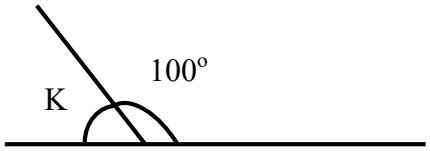
(b) pencil and ruler

(c) pin and ruler

(d) compass and ruler

(e) square and ruler.

60. Find the value of angle K in the figure below



(a)180°

(b) 80°

(c) 60°

(d) 40°

(e) 35°

61. If 3x – 60 = 180 find x

(a) 240

(b) 120

(c) 80

(d) 40

(e) 12

62. If m = 2 and n = 3, find $\frac{mn}{m+n}$

(a) 5/5

(b) 1 1/5

(c) 1

(d) 3 5/6

(e) 4

63. If x/5 = 3/5 find x

(a)10

(b) 7

(c) 5

(d) 3

(e) 2

64. If $x + y = 40$, find y when $x = 12$

(a) 52

(b) 48

(c) 38

(d) 28

(e) 24

65. Ade was x years old 5 years ago, what is his age in 10 years time?

(a) (x+5) years

(b) (x +25) years

(c) (x +15) years

(d) (x-15) years

(e) (x-5) years.

66. If $5x = 60$, find x

(a) 300

(b) 65

(c) 55

(d) 12

(e) 10

67. There are n boys in a class and each brings in m mangoes. They give y mangoes away. How many mangoes do they have left?

(a) m-y

(b) mt -n

(c) ny-m

(d) mn-y

(e) y-mn

68. Simplify $2a+3b + a$

(a) 3 (a+b)

(b) 3(a-b)

(c) $(2a^2+3b)$

(d) -3(a+b)

(e) -3(a-b)

69. If m=6, n=5 and p=4, what is the value of (3m+p) (m–4n)?

(a) 16

(b) 22

(c) 308

(d) 240

(e) 362

70. Simplify 2x x 5y

(a) 7xy

(b) 7yx

(c) 10x

(d) 10xy

(e) 10yx

71. Solve 12a ÷ 3

(a) 9a

(b) 9

(c) 4a

(d) 3a

(e) 4

72. Simplify 6rs÷ 2r

(a) 6rs/2r

(b) 3rs

(c) 3s

(d) 2r/6rs

(e) 1/3s

73. If 5 x u = 25 find u

(a) 2

(b) 3

(c) 4

(d) 5

(e) 6

74. Solve x +9 = 23

(a) 33

(b) -33

(c) 14x

(d) -14

(e) 14

75. Simplify 5m+6n-2m+3n-m

(a) 2m+9n

(b) 2m-9n

(c) 8m+9n

(d) 5m+6n

(e) 2m=-9n

76. Write these tally marks in figure

(a) 50

(b) 40

(c) 25

(d) 10

(e) 80

77. Find the mode from the following data table scores on mathematics test for primary 6B

Score	2	3	4	5	6	7	8	9
Frequency	3	8	8	9	6	11	3	3

(a) 2

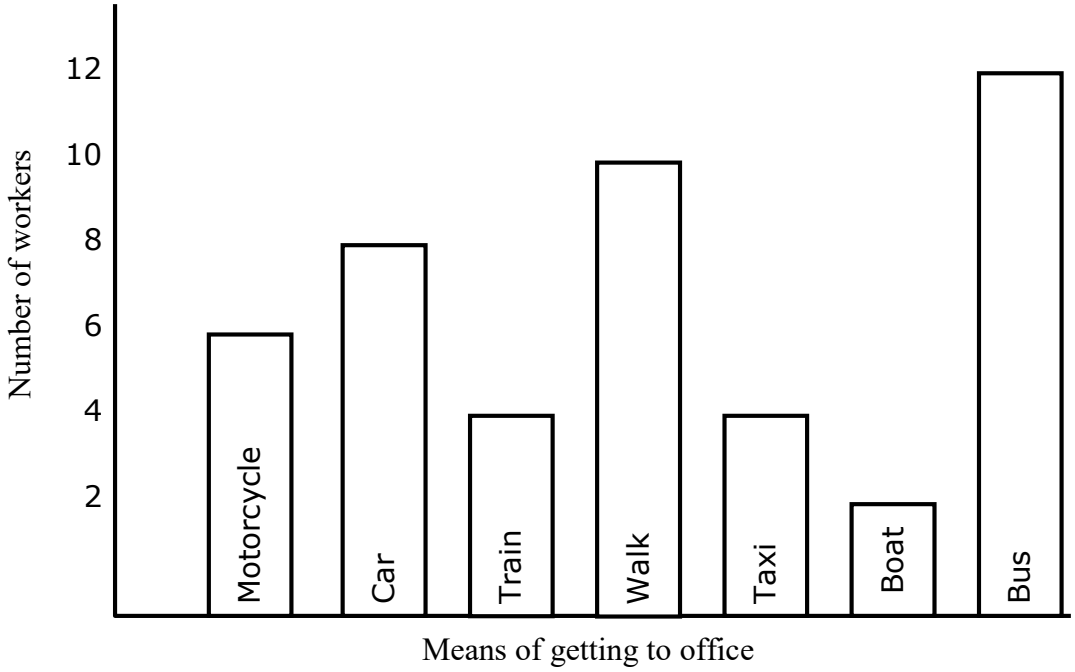
(b) 3

(c) 4

(d) 5

(e) 7

The bar chart below show the seven means of getting to office daily, by all workers of a particular department of a Ministry in Edo State. Use it to answer questions 78 – 80



78. How many workers are in the department?

(a) 84

(b) 56

(c) 46

(d) 44

(e) 36

79. What is the modal means of transport?

(a) walk

(b) car

(c) bus

(d) boat

(e) motorcycle

80. What is the difference between the number of workers that go to office by bus and those who go by boat?

(a) 12

(b) 10

(c) 8

(d) 4

(e) 2

81. Find the mean of 20, 5, 16, 24, 15

(a) 55

(b) 39

(c) 16

(d) 10

(e) 5

82. Find the median of 8, 4, 5, 8, 6, 5

(a) 5.5

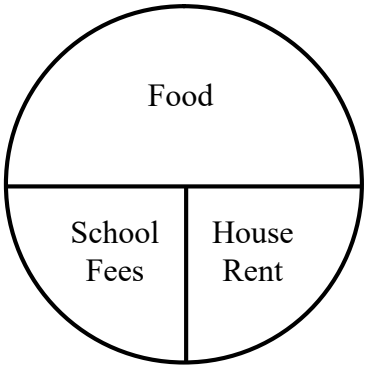
(b) 5

(c) 6

(d) 6.5

(e) 7

The chart below shows the proportion in which a man spends his monthly salary of N300.00. Use it to answer questions 86 – 88



83. How much did he spend on food for the month?

(a) ₦200

(b) ₦150

(c) ₦100

(d) ₦75

(e) ₦60

84. How much did he pay for house rent?

(a) ₦150

(b) ₦120

(c) ₦100

(d) ₦75

(e) ₦37.50

85. What is the difference between the money spent on food and money spent on school fees?

(a) ₦150

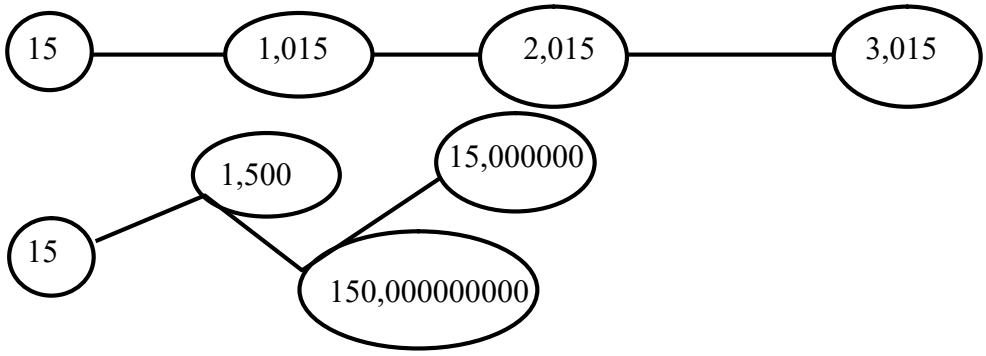
(b) ₦80

(c) ₦70

(d) ₦60

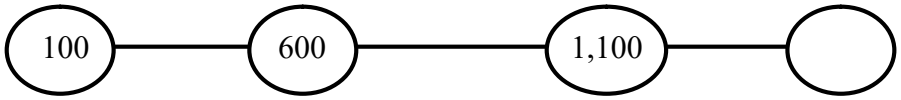
(e) ₦75

Example



Use the information above to answer questions 86 -- 88

86.



(a) 1800

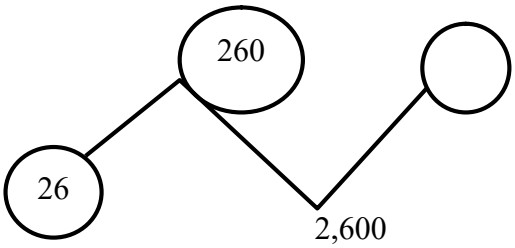
(b) 1700

(c) 500

(d) 1000

(e) 1600

87.



(a) 22,600

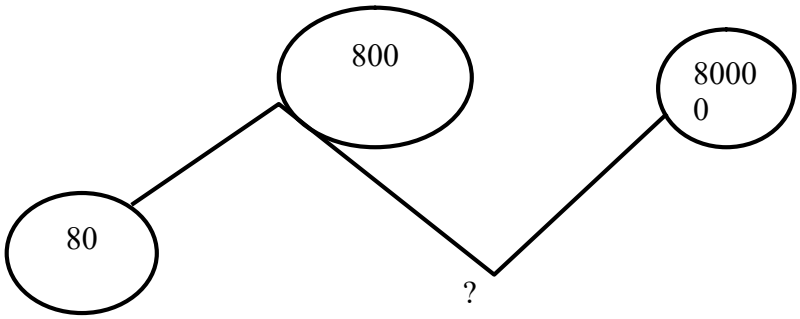
(b) 26,000

(c) 2,600,000

(d) 2, 0600,000

(e) 22,600,000

88.



(a) 880

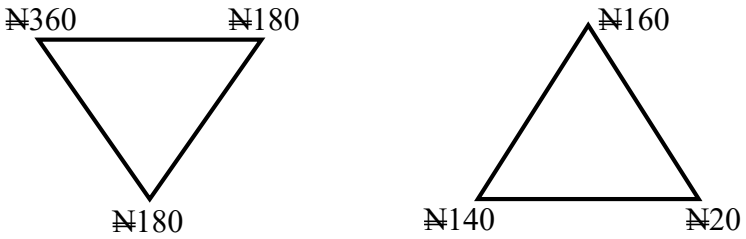
(b) 8 880

(c) 7 220

(d) 80 00

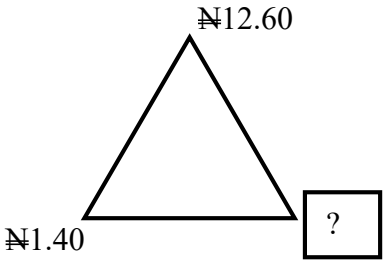
(e) 512 000 000

Example



Use the information above to answer questions 89 –91.

89.



(a) ₦11.20

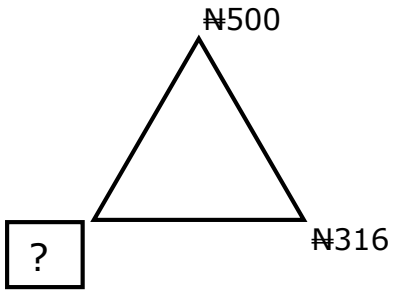
(b) ₦17.64

(c) ₦13.100

(d) ₦14.00

(e) ₦10.20

90.



(a) ₦180

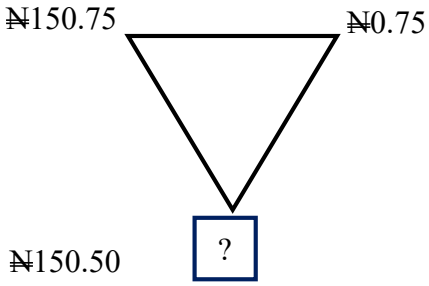
(b) ₦186

(c) ₦216

(d) ₦184.00

(e) ₦194

91.



(a) ₦150.50

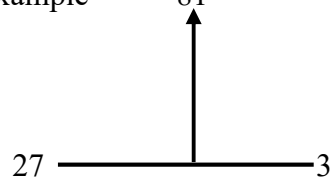
(b) ₦150.00

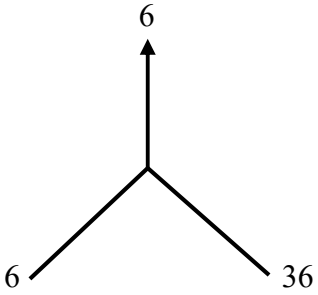
(c) ₦150.75

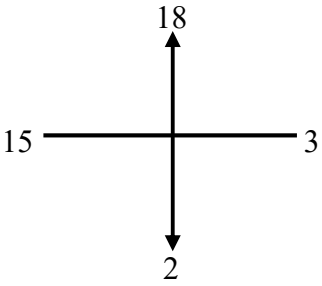
(d) ₦160.00

(e) ₦151.50

Example

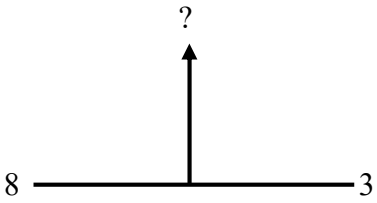






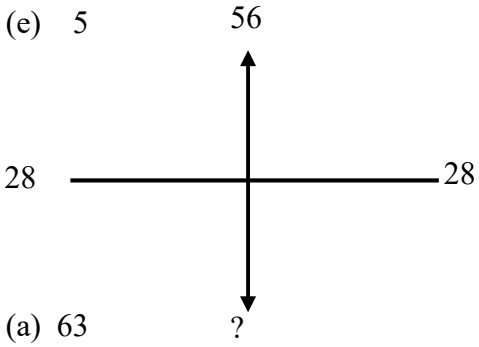
Use the information above to answer questions 92 – 94

92.



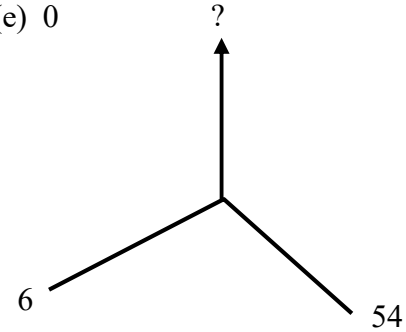
(a) 24
(b) 11
(c) 9
(d) 7
(e) 5

93.



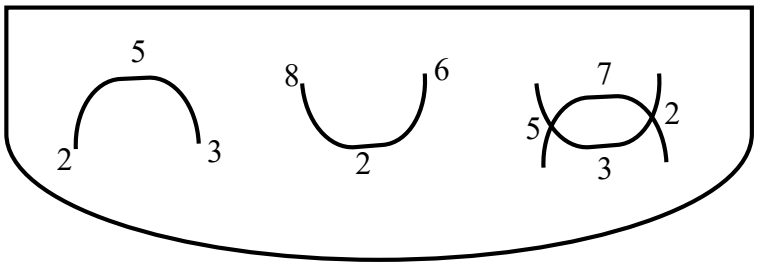
(a) 63
(b) 28
(c) 14
(d) 13
(e) 0

94.



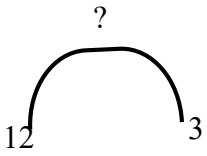
(a) 6
(b) 9
(c) 48
(d) 60
(e) 32

Example



Use the information to answer questions 95 – 98

95.



(a) 3.5

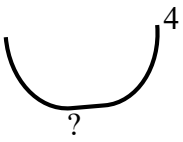
(b) 1 ½

(c) 15

(d) 1

(e) 6

96. 12



(a) 2

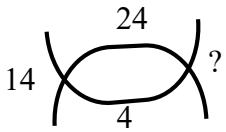
(b) 3

(c) 4

(d) 6

(e) 8

97.



(a) 20

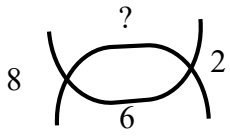
(b) 18

(c) 14

(d) 10

(e) 6

98.



(a) 14

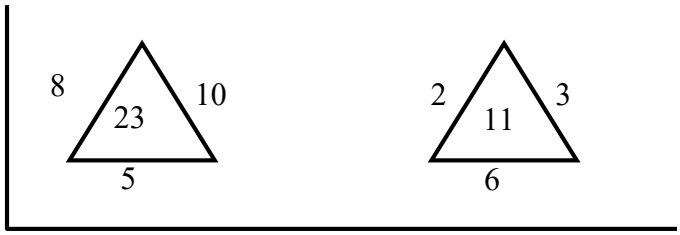
(b) 10

(c) 8

(d) 7

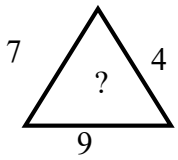
(e) 0

Example



Use the above example for questions 99 – 100.

99.



(a) 28

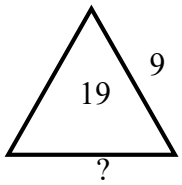
(b) 20

(c) 16

(d) 13

(e) 11

100.



(a) 5

(b) 4

(c) 8

(d) 12

(e) 14

APPENDIX VIB
ANSWERS TO MATHEMATICS ACHIEVEMENT TEST (MAT)
FOR BASIC SIX

S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS
1.	C	21.	B	41	A	61.	C	81.	C
2.	D	22.	C	42.	D	62.	B	82.	A
3.	D	23.	E	43.	D	63.	D	83.	B
4.	B	24.	D	44.	E	64.	D	84.	D
5.	E	25.	D	45.	B	65.	C	85.	E
6.	D	26.	E	46.	D	66.	D	86.	E
7.	A	27.	C	47.	C	67.	D	87.	B
8.	C	28.	C	48.	C	68.	A	88.	D
9.	C	29.	C	49.	C	69.	C	89.	A
10.	D	30.	B	50.	D	70.	D	90.	D
11.	B	31.	C	51.	D	71.	C	91.	B
12.	C	32.	D	52.	C	72.	C	92.	A
13.	D	33.	E	53.	D	73.	D	93.	E
14.	B	34.	C	54.	D	74.	E	94.	B
15.	A	35.	C	55.	B	75.	A	95.	C
16.	E	36.	A	56.	A	76.	A	96.	E
17.	A	37.	B	57.	A	77.	E	97.	D
18.	D	38.	C	58.	D	78.	C	98.	B
19.	D	39.	E	59.	A	79.	C	99.	B
20.	A	40.	A	60.	B	80.	B	100.	A

APPENDIX VIIA

BASIC FOUR COMPUTATIONS OF DIFFICULTY AND DISCRIMINATION INDEX AND THE MAT.

Items	Group	A*	B	C	D	E	Computation
1	Upper	100	10	13	13	10	Difficulty index = $\frac{100 + 46}{292} = 50.0$
	Lower	46	20	20	41	19	Discrimination index = $\frac{100 + 46}{146} = 0.37$
2	Upper	10	10	100*	16	10	Difficulty index = $\frac{100 + 55}{292} = 0.53$
	Lower	16	20	55	35	20	Discrimination index = $\frac{100 - 55}{146} = 0.31$
3	Upper	10	2	4	3	127*	Difficult index = $\frac{127 + 116}{292} = 0.83$
	Lower	10	6	6	8	116	Discrimination index=$\frac{127 - 116}{146} = 0.07$
4	Upper	16	84*	12	16	18	Difficulty index = $\frac{84 + 36}{292} = .041$
	Lower	40	36	19	30	21	Discrimination index = $\frac{84 + 26}{146} = 0.32$
5	Upper	2	6	4	130*	4	Difficulty index = $\frac{130 + 62}{292} = 0.66$
	Lower	4	24	32	62	20	Discrimination index = $\frac{130 + 62}{146} = 0.47$
6	Upper	100*	10	16	5	5	Difficulty index = $\frac{100+36}{292} = 0.47$
	Lower	36	20	30	34	26	Discrimination index =$\frac{100-36}{146} = 0.44$
7	Upper	9	5	5	121*	6	Difficulty index = $\frac{121 + 75}{292} = 0.67$
	Lower	20	20	11	75	20	Discrimination index= $\frac{121 - 75}{146} = 0.32$
8	Upper	11	10	22	85*	18	Difficulty index = $\frac{85 + 31}{292} = 0.40$
	Lower	45	20	26	31	24	Discrimination index = $\frac{85 - 31}{146} = 0.37$
9	Upper	24	10	82*	11	19	Difficulty index = $\frac{82 + 30}{292} = 0.41$
	Lower	36	20	30	37	23	Discrimination index = $\frac{82 - 30}{146} = 0.36$
10	Upper	20	20	6	10	90*	Difficulty index= $\frac{90\ \ 44}{292} = 0.46$
	Lower	28	30	12	32	44	Discrimination index = $\frac{90 - 44}{146} = 0.32$
11	Upper	16	100*	9	10	11	Difficulty index = $\frac{100+46}{292} = 0.50$
	Lower	32	46	14	12	38	Discrimination index = $\frac{100 - 46}{146} = 0.47$

12	Upper Lower	16 32	9 14	100* 40	10 22	11 38	Difficulty index = $\frac{100 + 40}{292}$ =0.48 Discrimination index = $\frac{100 - 40}{146}$ =0.41
13	Upper Lower	13 30	10 32	103* 38	10 28	10 18	Difficulty index = $\frac{103 + 38}{292}$ = 0.48 Discrimination index = $\frac{103 - 38}{146}$ = 0.45
14	Upper Lower	104* 26	9 14	12 45	10 45	11 16	Difficulty index = $\frac{104+26}{292}$ = 0.45 Discrimination index = $\frac{104 - 26}{146}$ =0.53
15	Upper Lower	10 28	11 24	16 20	9 26	100* 48	Difficulty index = $\frac{100+48}{292}$ =0.51 Discrimination index =$\frac{100 - 48}{146}$ = 0.36
16	Upper Lower	100* 46	15 25	10 27	10 18	11 20	Difficulty index = $\frac{100+46}{292}$ = 0.50 Discrimination index = $\frac{100 -46}{146}$=0.37
17	Upper Lower	8 36	78* 32	20 28	23 32	17 18	Difficulty index = $\frac{78 + 32}{292}$ = 0.38 Discrimination index = $\frac{78 - 32}{146}$ = 0.32
18	Upper Lower	106* 60	10 13	10 22	10 21	10 30	Difficulty index = $\frac{106 + 60}{292}$ = 0.57 Discrimination index = $\frac{106 - 60}{146}$ =0.37
19	Upper Lower	16 31	19 38	11 18	10 32	90* 37	Difficulty index =$\frac{90 + 37}{292}$ = 0.43 Discrimination index = $\frac{90 - 37}{146}$=0.36
20	Upper Lower	84* 36	16 40	16 30	12 19	18 21	Difficulty index = $\frac{84+ 36}{292}$= 0.41 Discrimination index = $\frac{84 -36}{146}$=0.30
21	Upper Lower	10 26	110* 60	13 20	10 19	3 21	Difficulty index = $\frac{110 + 60}{292}$ = 0.58 Discrimination index =$\frac{110 - 60}{146}$ = 0.34
22	Upper Lower	10 20	2 16	4 16	127* 76	3 18	Difficulty index = $\frac{127 +76}{296}$ = 0.65 Discrimination index = $\frac{127 - 76}{146}$ =0.35
23	Upper Lower	16 40	16 30	12 19	84* 36	18 21	Difficulty index = $\frac{84 + 36}{292}$ = 0.41 Discrimination index = $\frac{84-36}{146}$ = 0.33
24	Upper Lower	2 4	4 24	130* 62	6 20	4 36	Difficulty index = $\frac{130 + 62}{292}$ = 0.67 Discrimination index = $\frac{130 - 62}{146}$ =0.47

25	Upper Lower	6 21	15 20	9 20	110* 65	6 20	Difficulty index = $\frac{110+65}{292}$ = 0.60 Discrimination index = $\frac{110-65}{146}$ =0.31
26	Upper Lower	6 10	100* 36	20 30	5 26	5 44	Difficulty index = $\frac{100+36}{292}$ = 0.47 Discrimination index = $\frac{100-36}{142}$ =0.46
27	Upper Lower	10 20	11 45	22 26	18 24	85* 31	Difficulty index = $\frac{85+31}{292}$ = 0.35 Discrimination index = $\frac{85-31}{146}$ = 0.37
28	Upper Lower	62* 10	34 46	19 23	21 37	10 30	Difficulty index =$\frac{67+10}{292}$ =0. 25 Discrimination index = $\frac{62-10}{146}$ = 0.37
29	Upper Lower	20 30	10 32	90* 44	3 12	23 28	Difficulty index = $\frac{90+44}{292}$ = 0.47 Discrimination index = $\frac{90-44}{146}$ = 0.32
30	Upper Lower	12 21	10 30	94* 45	13 24	17 26	Difficulty index = $\frac{94+45}{292}$ = 0.48 Discrimination index = $\frac{94-45}{146}$ = 0.34
31	Upper Lower	11 48	9 0	16 52	10 2	100* 40	Difficulty index = $\frac{100+40}{292}$ = 0.48 Discrimination index = $\frac{100-40}{146}$= 0.42
32	Upper Lower	124* 64	7 17	3 24	2 15	10 26	Difficulty index = $\frac{124+64}{292}$ = 0.64 Discrimination index = $\frac{124-62}{146}$ = 0.41
33	Upper Lower	93* 43	13 30	20 28	10 25	10 20	Difficulty index = $\frac{93+43}{292}$ =0. 47 Discrimination index = $\frac{93-43}{146}$ = 0.34
34	Upper Lower	10 45	11 16	104* 26	12 45	9 14	Difficulty index = $\frac{104+26}{292}$ = 0.45 Discrimination index = $\frac{104-26}{146}$ = 0.59
35	Upper Lower	10 18	90* 48	26 30	11 24	9 26	Difficulty index = $\frac{90+48}{292}$ =0.46 Discrimination index= $\frac{90-48}{146}$ = 0.30
36	Upper Lower	1 5	3 2	140* 126	1 5	1 8	Difficulty index = $\frac{140+126}{292}$ =0 .91 Discrimination index = $\frac{140-126}{146}$ =0.18
37	Upper Lower	16 20	10 22	100* 48	9 36	11 20	Difficulty index = $\frac{100+48}{292}$ =0.51 Discrimination index = $\frac{100-48}{146}$ = 0.36

38	Upper Lower	10 26	112* 60	10 25	8 10	6 25	Difficulty index = $\frac{112+60}{292} = 0.59$ Discrimination index = $\frac{112-60}{146} = 0.36$
39	Upper Lower	103* 38	13 30	10 28	19 32	1 18	Difficulty index = $\frac{104+38}{292} = 0.48$ Discrimination index = $\frac{104-38}{146} = 0.45$
40	Upper Lower	10 20	20 24	10 16	6 8	100* 78	Difficulty index = $\frac{100+78}{292} = 0.61$ Discrimination index = $\frac{100-78}{146} = 0.15$
41	Upper Lower	11 18	10 20	10 18	104* 60	11 40	Difficulty index = $\frac{146 \times 100}{292} = 0.56$ Discrimination index = $\frac{100-46}{146} = 0.30$
42	Upper Lower	16 31	19 20	90* 37	11 18	10 32	Difficulty index = $\frac{90+37}{292} = 0.43$ Discrimination index = $\frac{90-37}{146} = 0.36$
43	Upper Lower	107* 66	9 20	10 19	8 22	12 19	Difficulty index = $\frac{107+66}{292} = 0.59$ Discrimination index = $\frac{107-66}{146} = 0.28$
44	Upper Lower	13 41	90* 36	16 26	10 20	17 20	Difficulty index = $\frac{90+36}{292} = 0.43$ Discrimination index = $\frac{90-36}{146} = 0.37$
45	Upper Lower	10 12	10 13	10 11	110* 100	6 10	Difficulty index = $\frac{110+100}{292} = 0.72$ Discrimination index = $\frac{110-100}{146} = 0.06$
46	Upper Lower	20 26	20 35	10 20	86* 50	10 15	Difficulty index = $\frac{86+50}{292} = 0.47$ Discrimination index = $\frac{86-50}{146} = 0.25$
47	Upper Lower	13 19	13 30	12 21	24 40	84* 36	Difficulty index = $\frac{84+36}{292} = 0.41$ Discrimination index = $\frac{84-36}{146} = 0.33$
48	Upper Lower	10 14	100* 52	16 30	14 24	6 36	Difficulty index = $\frac{100+52}{292} = 0.47$ Discrimination index = $\frac{100-52}{146} = 0.44$
49	Upper Lower	100* 36	16 30	10 20	5 34	5 26	Difficulty index = $\frac{100+36}{292} = 0.47$ Discrimination index = $\frac{83-36}{146} = 0.44$
50	Upper	13	20	12	83*	18	Difficulty index = $\frac{134 \times 100}{292} = 0.39$ Discrimination index = 90 – 44 = 0.3

	Lower	20	45	16	31	24	146
51	Upper	34	10	62*	21	19	Difficulty index = $\frac{62 + 30}{292} = 0.32$
	Lower	46	20	30	27	23	Discrimination index = $\frac{62 - 30}{146} = 0.22$
52	Upper	110*	10	10	6	10	Difficulty index = $\frac{110 + 64}{292} = 0.53$
	Lower	64	12	33	27	30	Discrimination index = $\frac{110 - 64}{146} = 0.45$
53	Upper	9	10	18	107*	12	Difficulty index = $\frac{107 + 58}{292} = 0.55$
	Lower	24	24	29	58	19	Discrimination index = $\frac{107 - 58}{146} = 0.36$
54	Upper	84*	16	16	12	18	Difficulty index = $\frac{84 + 36}{292} = 0.49$
	Lower	36	40	30	19	21	Discrimination index = $\frac{84 - 36}{146} = 0.32$
55	Upper	10	16	100*	5	5	Difficulty index = $\frac{100 + 36}{292} = 0.47$
	Lower	20	20	36	44	25	Discrimination index = $\frac{100 - 36}{146} = 0.44$
56	Upper	24	10	21	72*	19	Difficulty index = $\frac{72 + 46}{292} = 40$
	Lower	33	25	30	46	22	Discrimination index = $\frac{72 - 46}{146} = 0.17$
57	Upper	10	13	13	7	103*	Difficulty index = $\frac{103 + 51}{292} = 0.53$
	Lower	20	30	20	20	51	Discrimination index = $\frac{103-51}{146} = 0.36$
58	Upper	46*	20	40	21	19	Difficulty index = $\frac{46 + 45}{292} = 0.31$
	Lower	45	26	45	10	20	Discrimination index = $\frac{46-45}{146} = 0.01$
59	Upper	16	16	84*	12	18	Difficulty index = $\frac{84 + 36}{292} = 0.47$
	Lower	40	30	36	19	21	Discrimination index = $\frac{84- 36}{146} = 0.32$
60	Upper	10	90*	10	13	23	Difficulty index = $\frac{90 + 44}{292} = 0.46$
	Lower	20	44	20	28	30	Discrimination index = $\frac{90 -44}{146} = 0.32$

APPENDIX VII B

Table A: Items falling into various levels of difficulty (p) values.

Confidence interval	Below 0.00-0.29 reject	Within 0.30-0.60 accept	Above 0.61 reject
Items	28	1,2,4,8,9,10,11,12,13,14, 15,16,17,18,20,21,25,26, 2729,30,31,33,34,35,36,37, 38,39,41,42,44,47,48,49,50, 52,53,54,55,57,59,60	3,5,7,22,24,32,36, 40,45,
Total	1	43	9

APPENDIX VII C

Table B : Items falling into various levels of discriminative {d} values

Confidence interval	Below	Within	Above 0.71
D valve	0.00-0.29 reject	0.30-0.70 accept	reject
Items	3,36,40,43,45,46,51,56,58	1,2,4,5,6,7,8,9,10,11,12,13,14,15,16,17, 18,19,20,21,22,23,24,25,26,27,28,29, 30,31,32,33,34,35,37,38,39,41,42,44, 47,48,49,50,52,53,54,55,57,59,60,	
Total	9	51	

APPENDIX VII D

Table C: Items falling into various levels of difficulty and discriminative values

Confidence interval	Below	Within	Above 0.61
D valve	0.00-0.29 reject	0.30 - 0.60 accept	reject
Items	3, 7, 22, 24, 28, 32, 36, 40,43, 45, 46, 51, 56,58	1,2,4,5,6,8,9,10,11,12,13,14,15,16,17, 18,19,20,21,23,25,26,27,29,30,31,33, 34,35,37,38,39,41,42,44,47,48,49,50, 52,53,54,55,57,59,60,	
Total	14	46	

APPENDIX VIII A

BASIC FIVE COMPUTATIONS OF DIFFICULTY AND DISCRIMINATION INDEX OF THE MAT.

1	Upper	22	10	72*	21	19	Difficulty index = $\frac{72 + 26}{292} = 0.34$
	Lower	45	20	26	31	24	Discrimination index = $\frac{72 - 26}{146} = 0.32$
2	Upper	10	90*	13	23	10	Difficulty index = $\frac{90 + 44}{292} = 0.46$
	Lower	22	44	28	30	22	Discrimination index = $\frac{90 - 44}{146} = 0.32$
3	Upper	16	9	10	100*	11	Difficulty index = $\frac{100 + 40}{292} = 0.48$
	Lower	22	24	22	40	38	Discrimination index = $\frac{100 - 40}{146} = 0.45$
4	Upper	13	10	19	10	103*	Difficulty index = $\frac{103 + 38}{292} = 0.48$
	Lower	30	32	38	18	38	Discrimination index = $\frac{103 - 38}{146} = 0.45$
5	Upper	104*	10	11	11	12	Difficulty index = $\frac{104 + 30}{292} = 0.49$
	Lower	30	28	32	38	18	Discrimination index = $\frac{104 - 30}{146} = 0.51$
6	Upper	10	100*	16	11	9	Difficulty index = $\frac{100 + 78}{292} = 0.61$
	Lower	18	78	20	24	16	Discrimination index = $\frac{100 - 78}{146} = 0.15$
7	Upper	1	1	142*	1	1	Difficulty index = $\frac{142 + 126}{292} = 0.92$
	Lower	2	10	126	4	4	Discrimination index = $\frac{142 - 126}{146} = 0.11$
8	Upper	10	10	106*	10	10	Difficulty index = $\frac{106 + 100}{292} = 0.71$
	Lower	11	12	100	12	11	Discrimination index = $\frac{106 - 100}{146} = 0.04$
9	Upper	4	5	4	3	130*	Difficulty index = $\frac{130 + 111}{292} = 0.83$
	Lower	5	20	10	10	111	Discrimination index = $\frac{130 - 111}{146} = 0.13$
10	Upper	3	3	130*	5	5	Difficulty index = $\frac{130 + 44}{292} = 0.60$
	Lower	19	33	44	20	30	Discrimination index = $\frac{130 - 44}{146} = 0.59$
11	Upper	11	5	5	116*	9	Difficulty index = $\frac{116 + 105}{292} = 0.76$
	Lower	7	11	15	105	9	Discrimination index = $\frac{116 - 105}{146} = 0.08$
12	Upper	16	10	11	100*	9	Difficulty index = $\frac{100 + 40}{292} = 0.48$

	Lower	32	12	38	40	14	Discrimination index = $\frac{100- 40}{146}$ =0.47
13	Upper	1	2	1	140*	2	Difficulty index = $\frac{140 + 84}{292}$ = 0.76
	Lower	5	26	10	81	24	Discrimination index = $\frac{140 - 84}{146}$ = 0.40
14	Upper	103*	11	13	20	19	Difficulty index = $\frac{103 + 38}{292}$ = 0.48
	Lower	38	18	30	28	32	Discrimination index = $\frac{103 - 38}{146}$ = 0.45
15	Upper	10	104*	11	12	9	Difficulty index = $\frac{104 + 26}{292}$ = 0.45
	Lower	15	26	61	20	24	Discrimination index = $\frac{104 - 26}{146}$= 0.53
16	Upper	10	16	100*	9	11	Difficulty index = $\frac{100 + 78}{292}$ = 0.61
	Lower	12	20	78	16	20	Discrimination index = $\frac{100 - 78}{146}$= 0.15
17	Upper	8	20	23	17	78*	Difficulty index = $\frac{78 +32}{292}$ = 0.38
	Lower	18	36	32	28	32	Discrimination index = $\frac{78 -3 2}{146}$ = 0.32
18	Upper	90*	16	19	11	10	Difficulty index = $\frac{90 + 37}{292}$ = 0.43
	Lower	37	31	28	18	32	Discrimination index = $\frac{90 - 37}{146}$ =0.36
19	Upper	9	110*	7	8	12	Difficulty index = $\frac{110 + 66}{292}$ = 0.60
	Lower	20	66	19	22	19	Discrimination index = $\frac{110 - 66}{146}$ = 0.30
20	Upper	11	15	114*	11	5	Difficulty index = $\frac{114 + 62}{292}$ = 0.60
	Lower	19	22	62	19	24	Discrimination index = $\frac{114 -62}{146}$=0.36
21	Upper	10	90*	16	13	17	Difficulty index =$\frac{90 + 36}{292}$ = 0.43
	Lower	10	36	41	39	20	Discrimination index=$\frac{130 - 44}{146}$ = 0.37
22	Upper	3	3	11	104*	25	Difficulty index =$\frac{104 + 55}{292}$= 0.54
	Lower	6	4	20	55	51	Discrimination index = $\frac{104 -55}{146}$ =0.49
23	Upper	26	4	100	10*	6	Difficulty index = $\frac{10 + 2}{292}$ =0.0 4
	Lower	15	6	120	2	3	Discrimination index = $\frac{10 - 2}{146}$ = 0.05
24	Upper	146*	5	5	5	5	Difficulty index = $\frac{146 + 114}{292}$ = 0.89
	Lower	114	8	8	8	8	Discrimination index = $\frac{146- 114}{146}$ = 0.22
25	Upper	3	5	130*	5	3	Difficulty index = $\frac{130 + 44}{292}$ = 0.60

	Lower	12	33	44	27	30	Discrimination index = $\frac{130-44}{146} = 0.59$
26	Upper	10	5	16	5	100*	Difficulty index = $\frac{100 + 36}{292} = 0.47$
	Lower	26	10	30	44	36	Discrimination index = $\frac{100 - 36}{146} = 0.44$
27	Upper	10	10	22	18	85*	Difficulty index = $\frac{85 + 31}{292} = 0.40$
	Lower	20	26	45	24	31	Discrimination index = $\frac{85 - 31}{146} = 0.37$
28	Upper	90*	10	13	23	10	Difficulty index = $\frac{90 + 44}{292} = 0.46$
	Lower	44	12	20	30	40	Discrimination index = $\frac{90 -44}{146} =0.32$
29	Upper	9	4	107*	14	12	Difficulty index = $\frac{107 + 56}{292} = 0.56$
	Lower	20	19	56	22	29	Discrimination index = $\frac{107 - 56}{146} = 0.35$
30	Upper	8	8	23	90*	17	Difficulty index = $\frac{90 + 36}{292} = 0.43$
	Lower	25	25	40	36	19	Discrimination index = $\frac{90-36}{146} =0.37$
31	Upper	11	104*	3	3	25	Difficulty index = $\frac{104 + 55}{292} = 0.54$
	Lower	20	55	4	6	51	Discrimination index = $\frac{104-55}{146} = 0.34$
32	Upper	26	4	10	6	100*	Difficulty index = $\frac{100 + 90}{292} = 0.04$
	Lower	29	6	12	8	90	Discrimination index = $\frac{100-90}{146} = 0.05$
33	Upper	92*	14	10	10	20	Difficulty index = $\frac{92 + 40}{292} = 0.45$
	Lower	40	30	31	19	26	Discrimination index = $\frac{92-40}{146} = 0.37$
34	Upper	10	6	120*	5	15	Difficulty index = $\frac{120 + 44}{292} = 0.56$
	Lower	33	27	44	12	30	Discrimination index = $\frac{120 – 44}{146} = 0.51$
35	Upper	10	20	12	85*	18	Difficulty index = $\frac{85 + 31}{292} = 0.40$
	Lower	40	25	26	31	24	Discrimination index = $\frac{85 - 31}{146} =0.37$
36	Upper	4	126*	5	6	5	Difficulty index = $\frac{126 + 119}{292} = 0.84$
	Lower	6	119	8	7	8	Discrimination index= $\frac{126 - 119}{146}= 0.05$
37	Upper	4	28	20	92*	2	Difficulty index = $\frac{92 + 40}{292} = 0.45$
	Lower	20	21	46	40	19	Discrimination index = $\frac{9240}{146} =0.36$
38	Upper	6	4	2	4	130*	Difficulty index = $\frac{130 + 111}{292} = 0.83$

	Lower	7	10	8	10	111	Discrimination index = 130-111 / 146 = 0.13
39	Upper	130*	3	3	5	5	Difficulty index = 130 + 44 / 292 =0.60
	Lower	44	33	12	27	30	Discrimination index = 130 -44 / 146 =0.59
40	Upper	4	130*	4	4	4	Difficulty index = 130 + 125 / 292 =0.87
	Lower	6	125	5	5	7	Discrimination index =130 -125 / 146 = 0.03
41	Upper	16	11	9	10	100*	Difficulty index = 100 + 40 / 292 = 0.48
	Lower	52	28	14	12	40	Discrimination index = 100- 40 / 146 =0.47
42	Upper	13	20	103*	19	1	Difficulty index = 103 + 38 / 292 = 0.48
	Lower	30	28	38	32	18	Discrimination index = 103 - 38 / 146 = 0.45
43	Upper	12	10	11	9	104*	Difficulty index = 104 + 26 / 292 = 0.48
	Lower	30	20	32	38	26	Discrimination index = 104 - 26 / 146 = 0.53
44	Upper	142*	1	1	1	1	Difficulty index = 142 + 126 / 292 = 0.92
	Lower	126	2	5	8	5	Discrimination index = 14 2- 126 / 146= 0.11
45	Upper	1	1	1	142*	1	Difficulty index = 142 + 138 / 292 = 0.96
	Lower	2	2	2	138	2	Discrimination index = 142-138 / 146= 0.03
46	Upper	16	19	90*	11	10	Difficulty index = 90 +37 / 292 = 0.43
	Lower	31	38	37	18	22	Discrimination index = 90 - 37 / 146 = 0.36
47	Upper	16	10	19	21	90*	Difficulty index = 90 + 37 / 292 = 0.43
	Lower	31	18	28	22	37	Discrimination index = 90 - 37 / 146 =0.36
48	Upper	8	20	78*	23	17	Difficulty index = 78 + 32 / 292 = 0.38
	Lower	26	28	32	32	28	Discrimination index = 78- 32 / 146 = 0.32
49	Upper	90*	10	26	11	9	Difficulty index = 90 + 58 / 292 = 0.51
	Lower	58	20	30	20	18	Discrimination index = 90 -58 / 146=0.33
50	Upper	2	136*	2	3	3	Difficulty index =136 + 126 / 292 = 0.90
	Lower	4	126	5	5	6	Discrimination index=136-126 / 146= 0.07

51	Upper Lower	9 35	20 30	22 26	10 24	85* 31	Difficulty index =85 + 31= 0.40 292 Discrimination index = 85 -31 =0.37 146
52	Upper Lower	11 26	100* 40	16 30	10 30	9 20	Difficulty index = 100 + 40 =0.48 292 Discrimination index = 10/ - 40 = 0.41 146
53	Upper Lower	2 4	3 4	2 5	136* 127	3 6	Difficulty index = 136 + 127 = 0.90 292 Discrimination index = 136- 127 = 0.06 146
54	Upper Lower	82* 10	10 30	21 37	19 23	24 46	Difficulty index = 82 + 100 = 0.32 292 Discrimination inde\x =82-10 = 0.49 146
55	Upper Lower	25 41	104* 55	11 20	3 14	3 16	Difficulty index = 104 + 55 = 0.54 292 Discrimination index = 104 - 55 = 0.34 146
56	Upper Lower	20 36	28 31	2 19	4 20	92* 40	Difficulty index = 92 + 40 = 0.45 292 Discrimination index = 92 - 40 = 0.36 146
57	Upper Lower	25 51	104* 55	11 15	3 9	3 16	Difficulty index = 104 + 55 = 0.43 292 Discrimination index = 104 -55 =0.36 146
58	Upper Lower	90* 37	16 31	19 28	11 18	10 32	Difficulty index = 90 + 37 = 0.56 292 Discrimination index = 107 - 56 = 0.35 146
59	Upper Lower	10 30	26 44	100* 36	5 10	5 26	Difficulty index = 100 + 36 = 0.47 292 Discrimination index = 100-36 =0.44 146
60	Upper Lower	8 11	15 30	16 30	9 20	101* 55	Difficulty index = 101 + 55 = 0.53 292 Discrimination index = 101-55 = 0.32 146

APPENDIX VIII B

Table D: Items falling into various levels of difficulty (p) values.

Confidence interval	Below 0.00-0.29 reject	Within 0.30-0.60 accept	Above 0.61 reject
Items	23,53	1,2,3,4,5,10,12,14,15,17,18 19,20,21,22,25,26,27,28,29, 30,31,33,34,35,37,39,41,42, 43,44,46,47,48,49,50,51,52, 54,55,56,57,58,59,60	6,7,8,9,11,13,24,36,38 40,44,45,50
Total	2	45	13

APPENDIX VIII C

Table E: Items falling into various levels of discriminative {d} values

Confidence interval D valve	Below 0.00-0.29 reject	Within 0.30-0.60 accept	Above 0.61 reject
Items	6,7,8,9,11,16,23,24,32,36, 38,40,44,45,50,53	1,2,3,4,5,10,12,13,14,15,17,18,19, 20,21,22,25,26,27,28,29,30,31,33, 34,35,37,39,41,42,43,46,47,48,49,51, 52,54,55,56,57,58,59,60,	
Total	16	44	

APPENDIX VIII D

Table F: Items falling into various levels of difficulty and discriminative values

Confidence interval D valve	Below 0.00-0.29 reject	Within 0.30-0.60 accept	Above 0.61 reject
Items	6,7,8,9,11,13,16,23,24,32, 36,38,40,44,45,50,53	1,2,3,4,5,10,12,14,15,17,18,19, 20,21,22,25,26,27,28,29,30,31,33, 34,35,37,39,41,42,43,46,47,48,49,51, 52,54,55,56,57,58,59,60,	
Total	17	43	

APPENDIX IXA

BASIC SIX COMPUTATION OF DIFFICULTY AND DISCRIMINATION INDEX OF THE MAT.

Items	Group	A	B	C	D	E	Computation
1	Upper	16	10	100*	9	11	Difficulty index = $\frac{100 + 40}{292} = 0.49$
	Lower	52	2	4	40	48	Discriminative index = $\frac{100 - 40}{146} = 0.47$
2	Upper	10	12	10	100*	13	Difficulty index = $\frac{100 + 45}{292} = 0.50$
	Lower	25	26	26	45	24	Discriminative index = $\frac{100 - 45}{146} = 0.40$
3	Upper	13	19	20	103*	1	Difficult index = $\frac{103 + 38}{292} = 0.48$
	Lower	30	32	28	38	18	Discriminative index = $\frac{103 - 38}{146} = 0.45$
4	Upper	10	104*	9	12	11	Difficulty index = $\frac{104 + 26}{292} = 0.45$
	Lower	45	26	14	45	16	Discriminative index = $\frac{104 - 26}{146} = 0.54$
5	Upper	9	6	20	11	100*	Difficulty index = $\frac{100 + 46}{292} = 0.50$
	Lower	16	20	40	24	46	Discriminative index = $\frac{100 - 46}{146} = 0.37$
6	Upper	1	5	5	144*	2	Difficulty index = $\frac{144 + 100}{292} = 0.83$
	Lower	10	7	8	100	10	Discriminative index = $\frac{144 - 100}{146} = 0.30$
7	Upper	78*	20	23	8	17	Difficulty index = $\frac{78 + 32}{292} = 0.38$
	Lower	32	28	3	36	18	Discrimination index = $\frac{78 - 32}{146} = 0.32$
8	Upper	10	10	106*	10	10	Difficulty index = $\frac{106 + 44}{292} = 0.49$
	Lower	26	25	44	26	25	Discriminative index = $\frac{106 - 44}{146} = 0.42$
9	Upper	19	10	90*	11	16	Difficulty index = $\frac{90 + 37}{292} = 0.44$
	Lower	28	31	37	18	32	Discriminative index = $\frac{90 - 37}{146} = 0.36$
10	Upper	0	2	3	140*	1	Difficulty index= $\frac{140 + 96}{292} = 0.81$
	Lower	10	11	20	96	9	Discriminative index = $\frac{140 - 96}{146} = 0.30$
11	Upper	9	100*	10	17	10	Difficulty index = $\frac{100 + 46}{292} = 0.50$
	Lower	20	46	29	22	19	Discriminative index = $\frac{100 - 46}{146} = 0.37$
12	Upper	15	11	100*	15	5	Difficulty index = $\frac{100 + 42}{292} = 0,49$

	Lower	34	24	42	22	24	Discriminative index = $\frac{100 - 42}{146}$ =0.40
13	Upper	6	10	23	90*	17	Difficulty index = $\frac{90 + 39}{292}$ = 0. 43
	Lower	21	30	40	39	16	Discriminative index = $\frac{90 - 39}{146}$ = 0.35
14	Upper	25	100*	5	5	11	Difficulty index = $\frac{100 + 45}{292}$= 0.50
	Lower	51	45	14	16	20	Discriminative index = $\frac{100 - 45}{146}$ =0.38
15	Upper	50*	4	60	26	6	Difficulty index = $\frac{50 + 30}{292}$ = 0. 27
	Lower	30	6	83	15	12	Discriminative index = $\frac{50 - 30}{146}$ = 0.14
16	Upper	0	0	0	0	146*	Difficulty index = $\frac{146 + 139}{292}$ = 0.98
	Lower	1	2	4	0	139	Discriminative index = $\frac{146 - 139}{146}$ =0.05
17	Upper	92*	20	4	28	2	Difficulty index = $\frac{92 + 40}{292}$ = 0.46
	Lower	40	46	20	21	19	Discriminative index = $\frac{92 - 40}{146}$ = 0.36
18	Upper	0	16	0	130*	0	Difficulty index = $\frac{130 + 111}{292}$ = .083
	Lower	5	20	10	111	10	Discriminative index =$\frac{130 - 111}{146}$ =0.13
19	Upper	1	1	130*	4	10	Difficulty index = $\frac{130 + 44}{292}$ = 0.60
	Lower	12	33	44	27	30	Discriminative index = $\frac{130 - 44}{146}$ =0.59
20	Upper	116*	10	0	11	9	Difficulty index = $\frac{116 + 105}{292}$= 0.76
	Lower	105	14	11	7	9	Discriminative index = $\frac{116 - 105}{146}$=0.08
21	Upper	20	81*	10	16	19	Difficulty index = $\frac{81 + 30}{292}$ = 0, 38
	Lower	36	30	25	35	20	Discriminative index = $\frac{81 - 30}{146}$ = 0.35
22	Upper	10	2	127*	4	3	Difficulty index = $\frac{100 + 46}{296}$ = 0.50
	Lower	20	16	76	16	18	Discriminative index = $\frac{100 - 46}{146}$ =0.35
23	Upper	18	16	16	12	84*	Difficulty index = $\frac{84 + 36}{292}$ = 0. 47
	Lower	21	40	30	19	36	Discriminative index = $\frac{84-36}{146}$ = 0.36
24	Upper	12	14	10	100*	10	Difficulty index = $\frac{100 + 42}{292}$ = 0.48
	Lower	14	29	25	42	36	Discriminative index = $\frac{100 - 42}{146}$ =0.40
25	Upper	15	15	6	100*	10	Difficulty index = $\frac{100 + 45}{292}$ = 0. 50

	Lower	21	30	25	45	25	Discriminative index = $\frac{100 - 45}{146}$ =0.38
26	Upper	10	16	5	5	100*	Difficulty index = $\frac{100 + 36}{292}$ = 0.47
	Lower	10	30	26	44	36	Discriminative index = $\frac{100 - 36}{142}$ =0.46
27	Upper	1	20	85*	22	18	Difficulty index = $\frac{85 + 31}{292}$ = 0.40
	Lower	45	20	31	26	24	Discriminative index = $\frac{85 - 31}{146}$ = 0.37
28	Upper	34	10	72*	21	19	Difficulty index =$\frac{72 + 10}{292}$ = 0.25
	Lower	46	30	10	37	23	Discriminative index = $\frac{62 - 10}{146}$ = 0.37
29	Upper	23	10	90*	23	0	Difficulty index = $\frac{90 + 44}{292}$ = 0.46
	Lower	30	42	44	28	2	Discriminative index = $\frac{90 – 44}{146}$ = 0.32
30	Upper	12	54*	23	37	20	Difficulty index = $\frac{54 + 5}{292}$ = 0. 20
	Lower	41	5	24	36	40	Discriminative index = $\frac{54 – 5}{146}$ = 0.34
31	Upper	6	18	12	10	100*	Difficulty index = $\frac{100 + 46}{292}$ = 0. 50
	Lower	20	32	24	24	46	Discriminative index = $\frac{100 - 46}{146}$ = 0.37
32	Upper	5	11	15	100*	5	Difficulty index = $\frac{100 + 42}{292}$ = 0. 48
	Lower	24	19	22	42	19	Discriminative index = $\frac{100 - 42}{146}$ = 0.40
33	Upper	17	16	3	20	90*	Difficulty index = $\frac{90 + 36}{292}$ = 0.43
	Lower	20	31	10	49	36	Discriminative index = $\frac{90 - 36}{146}$ = 0.37
34	Upper	25	11	100*	17	3	Difficulty index =$\frac{100 + 45}{292}$ = 0.50
	Lower	51	20	45	24	6	Discriminative index = $\frac{100 - 45}{146}$ = 0.38
35	Upper	10	19	90*	21	6	Difficulty index = $\frac{37 + 90}{292}$ = 0. 43
	Lower	31	28	37	18	32	Discriminative index= $\frac{90 - 28}{146}$ = 0.36
36	Upper	10	10	10	10	106*	Difficulty index = $\frac{106 + 59}{292}$ = 0.56
	Lower	21	22	24	20	59	Discriminative index = $\frac{106 -59}{146}$ = 0.32
37	Upper	4	92*	20	28	2	Difficulty index = $\frac{92 + 40}{292}$ = 0.45
	Lower	20	40	46	21	19	Discriminative index = $\frac{92 - 40}{146}$ = 0.36
38	Upper	0	16	130*	0	0	Difficulty index = $\frac{130 + 111}{292}$ = 0.83

	Lower	5	20	111	10	10	Discriminative index = $\frac{130 - 111}{146} = 0.13$
39	Upper	10	10	16	10	100*	Difficulty index = $\frac{100 \times 44}{292} = 0.49$
	Lower	12	33	27	30	44	Discriminative index = $\frac{100 - 44}{146} = 0.38$
40	Upper	116*	10	11	10	9	Difficulty index = $\frac{116 + 51}{292} = 0.57$
	Lower	51	34	21	21	19	Discriminative index = $\frac{116 - 51}{146} = 0.41$
41	Upper	100*	13	10	13	10	Difficulty index = $\frac{100 + 46}{292} = 0.50$
	Lower	46	20	20	41	19	Discriminative index = $\frac{100 - 46}{146} = 0.37$
42	Upper	46	20	40	21*	19	Difficulty index = $\frac{21 + 0}{292} = 0.07$
	Lower	45	36	45	0	20	Discriminative index = $\frac{21 - 0}{146} = 0.14$
43	Upper	10	12	10	104*	10	Difficulty index = $\frac{104 + 60}{292} = 0.56$
	Lower	20	26	20	60	20	Discriminative index = $\frac{104 - 60}{146} = 0.14$
44	Upper	16	16	18	12	84*	Difficulty index = $\frac{84 + 36}{292} = 0.47$
	Lower	40	30	21	19	36	Discriminative index = $\frac{84 - 36}{146} = 0.32$
45	Upper	12	100*	14	16	4	Difficulty index = $\frac{100 + 42}{292} = 0.49$
	Lower	24	42	36	24	20	Discriminative index = $\frac{100 - 42}{146} = 0.40$
46	Upper	9	15	15	101*	6	Difficulty index = $\frac{101 + 45}{292} = 0.50$
	Lower	20	30	31	45	20	Discriminative index = $\frac{101 - 45}{146} = 0.38$
47	Upper	20	6	100*	15	5	Difficulty index = $\frac{100 + 36}{292} = 0.47$
	Lower	30	10	36	44	26	Discriminative index = $\frac{100 - 36}{146} = 0.44$
48	Upper	11	10	85*	22	18	Difficulty index = $\frac{85 + 31}{292} = 0.49$
	Lower	45	20	31	26	24	Discriminative index = $\frac{85 - 31}{146} = 0.37$
49	Upper	24	10	82*	11	19	Difficulty index = $\frac{82 + 10}{292} = 31.51$
	Lower	46	30	10	37	23	Discriminative index = $\frac{82 - 10}{146} = 0.49$
50	Upper	6	20	20	90*	10	Difficulty index = $\frac{90 + 44}{292} = 0.46$
	Lower	12	28	30	44	32	Discriminative index = $90 - 44 = 0.32$
							$\frac{}{146}$
51	Upper	10	16	9	100*	11	Difficulty index = $\frac{100 + 46}{292} = 0.48$

	Lower	12	32	4	46	48	Discriminative index = $\frac{100 - 46}{146} = 0.47$
52	Upper	9	16	100*	10	11	Difficulty index = $\frac{100 + 46}{292} = 0.48$
	Lower	22	50	40	20	28	Discriminative index = $\frac{100 - 46}{146} = 0.41$
53	Upper	10	13	13	100*	10	Difficulty index= $\frac{100 + 46}{292} = 0.50$
	Lower	20	21	30	46	29	Discriminative index = $\frac{100 - 46}{146} = 0.37$
54	Upper	13	20	19	103*	1	Difficulty index = $\frac{103 + 38}{292} = 0.48$
	Lower	30	28	32	38	18	Discriminative index = $\frac{103 - 38}{146} = 0.45$
55	Upper	12	100*	15	10	9	Difficulty index = $\frac{100 + 46}{292} = 0.50$
	Lower	35	46	16	35	14	Discriminative index = $\frac{100 - 46}{146} = 0.37$
56	Upper	100*	11	16	10	9	Difficulty index = $\frac{100 + 48}{292} = 0.50$
	Lower	46	24	22	28	26	Discrimination index = $\frac{100 - 46}{146} = 0.37$
57	Upper	100*	10	15	10	11	Difficulty index = $\frac{104 + 56}{292} = 0.54$
	Lower	46	24	24	28	24	Discriminative index = $\frac{104 - 56}{146} = 0.33$
58	Upper	8	23	20	78*	17	Difficulty index = $\frac{78 + 32}{292} = 0.38$
	Lower	36	32	28	32	18	Discriminative index = $\frac{78-32}{146} = 0.32$
59	Upper	106*	10	10	10	10	Difficulty index = $\frac{106 + 40}{292} = 0.50$
	Lower	40	24	34	25	23	Discriminative index = $\frac{106-40}{146} = 0.37$
60	Upper	16	90*	19	11	10	Difficulty index = $\frac{90 + 37}{292} = 0.43$
	Lower	31	37	38	18	32	Discriminative index = $\frac{90 - 37}{146} = 0.36$
61	Upper	15	13	100*	10	13	Difficulty index = $\frac{100 + 45}{292} = 0.50$
	Lower	26	25	45	29	21	Discriminative index = $\frac{100 - 45}{146} = 0.38$
62	Upper	20	21*	46	40	19	Difficulty index = $\frac{21 + 0}{292} = 0.078$
	Lower	36	0	45	45	20	Discriminative index = $\frac{21 - 0}{146} = 0.14$
63	Upper	10	12	14	100*	3	Difficulty index = $\frac{100 + 46}{292} = 0, 50$
	Lower	20	26	26	46	18	Discriminative index = $\frac{100-46}{146} = 0.37$
64	Upper	12	16	16	84*	18	Difficulty index = $\frac{84 + 36}{292} = 0.41$

	Lower	19	40	30	36	21	Discriminative index = $\frac{84 - 36}{146} = 0.32$
65	Upper	12	14	100*	14	6	Difficulty index = $\frac{100 + 42}{292} = 0.49$
	Lower	24	24	42	36	20	Discriminative index = $\frac{100 - 42}{146} = 0.40$
66	Upper	15	11	10	100*	10	Difficulty index = $\frac{100 + 45}{292} = 0.50$
	Lower	21	30	25	45	25	Discriminative index = $\frac{100 - 45}{146} = 0.38$
67	Upper	6	20	5	100*	5	Difficulty index = $\frac{100 + 36}{292} = 0.47$
	Lower	20	30	26	36	44	Discriminative index = $\frac{100 - 36}{146} = 0.32$
68	Upper	85*	22	11	10	18	Difficulty index = $\frac{85 + 31}{292} = 0.40$
	Lower	31	45	20	26	24	Discriminative index = $\frac{85 - 31}{146} = 0.37$
69	Upper	10	21	62*	19	34	Difficulty index = $\frac{62 + 10}{292} = 0.25$
	Lower	30	37	10	23	46	Discriminative index = $\frac{62 - 10}{146} = 0.37$
70	Upper	20	23	90*	10	3	Difficulty index = $\frac{90 + 44}{292} = 0.46$
	Lower	30	32	44	28	12	Discriminative index = $\frac{90 - 44}{146} = 0.32$
71	Upper	12	10	94*	13	17	Difficulty index = $\frac{94 + 45}{292} = 0.48$
	Lower	21	30	45	24	26	Discriminative index = $\frac{94 - 45}{146} = 0.34$
72	Upper	10	11	16	100*	9	Difficulty index = $\frac{100 + 40}{292} = 0.48$
	Lower	22	28	32	40	24	Discriminative index = $\frac{100 - 40}{146} = 0.41$
73	Upper	13	10	11	100*	12	Difficulty index = $\frac{100 + 45}{292} = 0.50$
	Lower	30	26	20	45	25	Discriminative index = $\frac{100 - 45}{146} = 0.38$
74	Upper	13	11	19	10	93*	Difficulty index = $\frac{93 + 43}{292} = 0.47$
	Lower	30	28	25	20	43	Discriminative index = $\frac{93 - 43}{146} = 0.34$
75	Upper	90*	11	14	12	9	Difficulty index = $\frac{90 + 26}{292} = 0.40$
	Lower	26	16	45	45	14	Discriminative index = $\frac{104 - 26}{146} = 0.44$
76	Upper	144*	0	1	1	0	Difficulty index = $\frac{144 + 1}{292}$ 126= 0.92
	Lower	126	2	10	0	8	Discriminative index = $\frac{144 - 126}{146} = 0.12$
77	Upper	9	11	10	20	96*	Difficulty index = $\frac{96 + 48}{292} = 0.47$

	Lower	26	24	18	30	48	Discriminative index = $\frac{96 - 48}{146}$ =0.33
78	Upper	20	23	78*	17	8	Difficulty index =$\frac{78 + 32}{292}$= 0.38
	Lower	28	36	32	28	22	Discriminative index = $\frac{78-32}{146}$ = 0.32
79	Upper	10	10	106*	10	10	Difficulty index = $\frac{106 + 40}{292}$ = 0.50
	Lower	27	26	40	28	25	Discriminative index = $\frac{106 - 40}{146}$ =0.45
80	Upper	16	99*	10	10	11	Difficulty index = $\frac{99 + 37}{292}$ = 0.47
	Lower	31	37	32	28	18	Discriminative index = $\frac{99 - 37}{146}$ = 0.42
81	Upper	13	13	100*	10	10	Difficulty index = $\frac{100 + 56}{292}$ = 0.53
	Lower	20	21	56	20	29	Discriminative index = $\frac{100 - 56}{146}$ =0.32
82	Upper	97*	10	18	9	12	Difficulty index = $\frac{97 + 46}{292}$ = 0.49
	Lower	46	19	32	20	29	Discriminative index = $\frac{97 - 66}{146}$ = 0.35
83	Upper	11	104*	11	15	5	Difficulty index = $\frac{104 + 42}{292}$ = 0.50
	Lower	29	42	29	24	22	Discriminative index = $\frac{104 - 42}{146}$ = 0.42
84	Upper	10	16	13	90*	17	Difficulty index = $\frac{90 + 30}{292}$ = 0.41
	Lower	25	41	30	30	20	Discriminative index = $\frac{90 - 30}{146}$ = 0.31
85	Upper	25	6	15	10	94*	Difficulty index = $\frac{94 + 45}{292}$ = 0.48
	Lower	41	16	20	24	45	Discriminative index = $\frac{94 - 45}{146}$ = 0.34
86	Upper	26	4	100	6	10*	Difficulty index = $\frac{10 + 2}{292}$ = 0.04
	Lower	15	2	124	3	2	Discriminative index = $\frac{10 - 2}{146}$ = 0.05
87	Upper	0	146*	0	0	0	Difficulty index = $\frac{146 + 139}{292}$ = 0.98
	Lower	1	139	4	0	2	Discriminative index =$\frac{146 - 139}{146}$ =0.05
88	Upper	20	18	2	92*	14	Difficulty index = $\frac{922 + 42}{292}$ = 0.45
	Lower	46	21	19	42	20	Discriminative index = $\frac{92 - 40}{146}$ = 0.36
89	Upper	108*	18	10	10	10	Difficulty index = $\frac{108 + 51}{292}$ = 0.54
	Lower	51	30	25	20	20	Discriminative index = $\frac{108 - 51}{146}$=0.39
90	Upper	16	3	20	100*	7	Difficulty index =$\frac{100 + 44}{292}$ = 0.49

	Lower	27	12	43	44	20	Discriminative index = $\frac{100 - 44}{146} = 0.56$
91	Upper	10	106*	10	11	9	Difficulty index = $\frac{106 \times 55}{292} = 0.51$
	Lower	21	55	24	27	19	Discriminative index = $\frac{106 - 55}{146} = 0.35$
92	Upper	100*	16	10	11	9	Difficulty index = $\frac{100 + 40}{292} = 0.48$
	Lower	40	32	20	38	24	Discriminative index = $\frac{100 - 40}{146} = 0.41$
93	Upper	13	10	12	10	101*	Difficulty index = $\frac{101 + 46}{292} = 0.50$
	Lower	25	25	30	20	46	Discriminative index = $\frac{101 - 46}{146} = 0.38$
94	Upper	10	103*	13	10	19	Difficulty index = $\frac{103 + 38}{292} = 0.48$
	Lower	18	38	30	28	32	Discriminative index = $\frac{103 - 38}{146} = 0.45$
95	Upper	10	11	104*	9	12	Difficulty index = $\frac{104 + 36}{292} = 0.48$
	Lower	35	26	36	24	25	Discriminative index = $\frac{104 - 36}{146} = 0.47$
96	Upper	10	16	11	9	100*	Difficulty index = $\frac{100 + 48}{292} = 0.50$
	Lower	28	30	25	16	48	Discriminative index = $\frac{100 - 48}{146} = 0.36$
97	Upper	1	0	0	144*	1	Difficulty index = $\frac{144 + 126}{292} = 0.92$
	Lower	10	2	8	126	0	Discriminative index = $\frac{144 - 126}{146} = 0.12$
98	Upper	18	78*	20	23	7	Difficulty index = $\frac{78 + 32}{292} = 0.38$
	Lower	36	32	28	32	18	Discriminative index = $\frac{78 - 32}{146} = 0.32$
99	Upper	10	96*	15	13	12	Difficulty index = $\frac{96 + 50}{292} = 0.50$
	Lower	25	50	28	20	23	Discriminative index = $\frac{96 - 50}{146} = 0.32$
100	Upper	90*	19	16	11	10	Difficulty index = $\frac{90 + 37}{292} = 0.43$
	Lower	37	28	31	18	32	Discriminative index = $\frac{90 - 37}{146} = 0.36$

APPENDIX IX B

Table G: Items falling into various levels of difficulty (p) values.

Confidence interval	Below 0.00-0.29 reject	Within 0.30-0.70 accept	Above 0.71 reject
	15,28,30,42,62,69,86	1,2,3,4,5,7,8,9,11,12,13,14,17 ,19,21,22,23,24,25,26,27,29,31, 32,33,34,35,36,37,39,41,43,44 45,46,47,48,49,50,51,52,53,54, 55,56,57,58,59,60,61,63,64,65, 66,67,68,70,71,72,73,74,75,76 78,79,80,81,82,83,84,85,88,89, 90,91,92,93,94,95, 96,98,99,100	6,10,16,18,20,38,40,77 87,97,
Total	7	83	10

APPENDIX IX C

Table H: Items falling into various levels of discriminative {d} values

Confidence interval D valve	Below 0.00-0.29 reject	Within 0.30-0.70 accept	Above 0.71 reject
Items	15,16,18,20,38,40, 42,62,77,86,87,97	1,2,3,4,5,6,7,8,9,10,11,12,13,14,17,19,21, 22,23,24,25,26,27,28,29,30,31,32,33, 34,35,37,39,41,43,44,45,46,47,48,49,50, 51,52,53,54,55,56,57,58,59,60,61,63,64, 65,66,67,68,69,70,71,72,73,74,75,76,78, 79,80,81,83,84,88,89,90,91,92,93,94,95 ,96,98,99,100	
Total	12	88	

APPENDIX IXD

Table I: Items falling into various levels of difficulty and discriminative values

Confidence interval D valve	Below 0.00-0.29 reject	Within 0.30-0.60 accept	Above 0.61 reject
Items	6,10,15,16,18,20,28,30,38, 42,43,62,69,76,86,87,97,	1,2,3,4,5,7,8,9,11,12,13,14,17,19,21,22, 23,24,25,26,27,29,31,32,33,34,35,36,37 39,40,41,44,45,46,47,48,49,50,51,52,53 54,55,56,57,58,59,60,61,63,64,65,66,67 68,70,71,72,73,74,75,77,78,79,80,81,82 83,84,85,88,89,90,91,92,93,94,95,96,98 ,99,100	
Total	17	83	

APPENDIX X

BASIC FOUR KUDER-RICHARDSON FORMULA 20 COMPUTATION.

$R = n/n\text{-}1\ [1- pq/s^2x]$

$n = 30$

$pq = 7.44$

$S^2x = 17.53$

$R = 30/29[1\text{-}7.44 / 17.53]$

$R = 30/29[1\text{-}0.4244]$

$R = 1.0345 \times 0.5756$

$R = 0.5954$

$R = 60$

APPENDIX X1

BASIC FIVE KUDER-RICHARDSON FORMULAR 20 COMPUTATION

$R = n/n\text{-}1\ [1- pq/s^2x]$

$n = 40$

$pq = 10.67$

$S^2x = 22.63$

$R = 40/39[1\text{-}10.67 / 22.63]$

$R = 40/39[1\text{-}0.47]$

$R = 1.03 \times 0.53$

$R = 0.55$

APPENDIX XII

BASIC SIX KUDER-RICHARDSON FORMULAR 20 COMPUTATION

$R = n/n\text{-}1\ [1- pq/s^2x]$

$n = 60$

$pq = 14.63$

$S^2x = 40.93$

$R = 60/59[1\text{-}14.63 / 40.97]$

$R = 60/59[1\text{-}0.3619]$

$R = 1.0648 \times 0.6380$

$R = 0.65$

APPENDIX XIII...

PRIMARY 4 KUDER-RICHADSON FORMULA 20 ANALYSIS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL
1	1	1	0	1	1	0	1	1	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	19
2	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	13
3	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0		0	1	0	1	0	0	0	0	0	0	1	1	20
4	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	26
5	1	0	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0	0	0	1	20
6	0	0	0	0	1	1	0	0.	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	8
7	1	1	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	19
8	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	1	0	1	0	0	15
9	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	1	25
10	0	0	0	0	1	0	1	0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1	10
11	1	1	1	1	0	1	0	0	1	1	1	1	0	1	0	0	1	1	0	1	0	1	1	0	1	0	1	1	0	0	19
12	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0	1	1	0	1	1	1	0	12
13	1	1	0	1	1	1	0	0	1	1	0	0	1	0	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0	1	25
14	1	1	1	0	1	0	1	1	0	0	1	1	0	1	0	1	1	1	0	1	0	0	1	1	0	1	0	1	1	0	18
15	0	0	0	1	0	1	0	1	0	1	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	0	0	1	15
16	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	15
17	1	1	0	1	1	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	17
18	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	15
19	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	15
20	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	15
21	1	0	1	1	1	0	1	0	1	1	0	1	1	1	1	0	1	1	1	1	0	1	1	0	0	0	1	1	1	0	20
22	1	1	1	0	0	1	1	1	0	1	1	0	0	1	0	1	0	1	0	1	1	0	0	1	1	0	0	0	1	1	17
23	0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	14
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	25
25	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	20
26	1	1	1	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	17
27	0	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	16
28	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	20
29	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	24
30	1	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1	0	1	1	1	0	1	20
T	17	19	15	20	17	18	16	16	16	18	17	15	17	17	17	17	17	15	16	16	13	17	15	16	14	15	15	16	15	18	537
p	0.57	0.63	0.5	0.67	0.57	0.6	0.53	0.53	0.6	0.57	0.5	0.57	0.57	0.57	0.57	0.5	0.53	0.53	0.53	0.6	0.5	0.5	0.47	0.5	0.5	0.53	0.5	0.6	0.53	0.53	
q	0.43	0.37	0.5	0.33	0.43	0.4	0.47	0.47	0.4	0.43	0.5	0.43	0.43	0.43	0.43	0.5	0.47	0.47	0.47	0.4	0.5	0.5	0.53	0.5	0.5	0.47	0.5	0.4	0.47	0.47	
pq	0.25	0.24	0.25	0.24	0.25	0.24	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.25	0.3	0.25	0.25	0.25	0.25	0.24	0.25	0.25	0.24	7.44

APPENDIX XIV

PRIMARY 5 KUDER-RICHADSON FORMULA 20 ANALYSIS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	TOTAL
1	1	0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	1	24
2	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	0	0	1	0	18
3	1	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	19
4	0	1	1	1	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	29
5	1	1	1	1	1	1	0	0	1	0	1	1	0	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	1	18
6	0	0	0	1	1	1	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	0	20
7	0	1	0	1	1	0	0	0	1	1	0	1	1	0	0	1	0	1	1	1	1	0	1	0	1	0	1	0	1	1	1	0	0	1	1	0	0	1	0	1	21
8	1	0	0	0	0	1	1	1	0	0	1	0	0	1	1	0	1	1	0	0	0	1	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	1	21
9	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	1	0	1	0	1	1	0	1	0	0	1	0	1	0	1	16
10	0	0	1	1	1	0	1	0	0	0	1	1	1	1	0	0	1	1	0	1	0	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0	1	0	1	0	20
11	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	1	13
12	1	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	22
13	0	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1	0	1	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1	1	1	1	1	0	0	1	21
14	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	0	1	0	1	1	0	0	0	1	1	0	1	0	1	1	0	1	24
15	1	0	1	0	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	1	0	1	1	0	1	0	26
16	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	0	1	0	1	20
17	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	1	1	0	22
18	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	1	20
19	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	0	0	1	1	0	1	0	19
20	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	0	1	0	0	1	1	0	0	20
21	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	0	1	0	1	23
22	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	1	0	0	0	1	21
23	1	0	1	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	27
24	0	0	1	0	1	0	1	0	1	0	1	0	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	35
25	0	1	0	1	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	0	1	1	1	0	0	13
26	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	1	1	1	0	1	0	1	1	0	1	1	1	1	0	1	0	1	1	0	1	1	1	23
27	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	1	0	1	27
28	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	0	1	0	1	26
29	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	1	0	1	1	0	1	1	1	0	1	29
30	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1	1	0	1	1	0	1	0	0	1	1	1	1	12
T	16	16	17	18	16	17	14	14	16	17	16	19	18	17	15	18	16	16	16	17	18	17	18	17	15	17	21	16	18	20	15	14	20	17	19	16	19	17	15	20	662
																																					0.6			
p	0.5	0.5	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.6	0.53	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.7	0.5	0.6	0.7	0.5	0.5	0.7	0.6	0.6	0.5	0.6	0.6	0.5	67	
q	0.5	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.47	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.5	0.4	0.4	0.5	0.5	0.3	0.4	0.4	0.5	0.4	0.4	0.5	0.3	
pq	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.25	0.2	0.24	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.25	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.3	0.2	10.7

PRIMARY 6 KUDER-RICHADSON FORMULA 20 ANALYSIS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
1	1	1	0	1	1	0	1	1	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	37
2	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	x	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	27
3	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	29
4	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	45
5	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	1	0	1	1	0	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	34
6	0	0	0	0	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	1	0	0	0	0	1	1	25
7	1	1	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	1	0	0	0	1	1	0	1	1	0	0	1	0	1	1	1	1	0	1	0	1	0	1	0	1	1	34
8	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	1	0	0	1	1	1	0	0	0	28
9	0	1	0	1	0	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	1	0	1	0	1	1	0	0	1	1	0	29
10	0	0	0	0	1	0	1	0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	1	1	1	0	1	0	0	0	1	1	1	1	0	0	1	1	0	1	0	1	0	1	1	1	0	1	0	1	0	27
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12	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	0	1	0	1	0	0	1	1	1	1	0	0	1	1	1	1	1	0	1	0	0	1	1	0	31
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17	1	1	0	1	1	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	32
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21	0	0	1	1	1	0	1	0	1	0	0	1	1	0	1	0	1	0	1	1	0	1	1	0	0	0	1	1	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1	33
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T	17	19	15	20	17	18	16	16	16	18	17	15	17	17	17	17	17	15	16	16	13	17	15	16	14	15	15	16	15	18	16	16	17	18	16	17	14	14	16	17	15	18	18	17	15	18	15	15	16	17	18	17	18	16	15	16	20	16	18	19	879
p	0.57	0.63	0.5	0.67	0.57	0.6	0.53	0.53	0.6	0.57	0.5	0.57	0.57	0.57	0.57	0.5	0.53	0.53	0.53	0.57	0.5	0.5	0.47	0.5	0.5	0.53	0.5	0.6	0.53	0.53	0.57	0.6	0.53	0.57	0.47	0.47	0.53	0.57	0.5	0.6	0.6	0.57	0.5	0.6	0.5	0.57	0.53	0.59	0.53	0.57	0.6	0.57	0.6	0.53	0.5	0.53	0.67	0.53	0.6	0.63	
q	0.43	0.37	0.5	0.33	0.43	0.4	0.47	0.47	0.4	0.43	0.5	0.43	0.43	0.43	0.43	0.5	0.47	0.47	0.47	0.43	0.5	0.5	0.53	0.5	0.5	0.47	0.5	0.4	0.47	0.47	0.43	0.4	0.47	0.43	0.53	0.53	0.47	0.43	0.5	0.4	0.4	0.43	0.5	0.4	0.5	0.43	0.47	0.41	0.47	0.43	0.4	0.43	0.4	0.47	0.5	0.47	0.33	0.47	0.4	0.37	
pq	0.25	0.24	0.25	0.24	0.25	0.24	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.25	0.25	0.25	0.25	0.24	0.25	0.25	0.24	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.24	0.25	0.25	0.25	0.24	0.25	0.24	0.25	0.25	0.25	0.25	0.24	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.24	0.23	14.63

APPENDIX XVI

The Standardized Mathematics Achievement Test (SMAT).

Class: Basic four

Time: 1 hour

INSTRUCTIONS TO CANDIDATES:

(vii) Write your centre number, examination number, name, the name of your school, and the subject in the spaces provided on the answer booklet.

(viii) Read each question carefully before answering it.

(ix) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(x) Attempt all questions.

(xi) If you shade more than one answer space for a question, you will score nothing for that question.

(xii) Please, work completely on your own.

1. Add 121, 345 and 987
   (a) 1453
   (b) 1553
   (c) 1653
   (d) 1253
   (e) 1303
2. Simplify XV - X
   (a) XV
   (b) XXV
   (c) V
   (d) XI
   (e) IV
3. What is the place value of 7 in 71252?
   (a) 7 Thousands
   (b) 7 Hundreds of Thousands
   (c) 7 Hundreds
   (d) 7 Thousandths
   (e) 7 Hundredths of Thousand

4. What is the Highest Common Factors of 12, 18 and 36?

   (a) 6

   (b) 18

   (c) 36

   (d) 2

   (e) 4

5. Edo State has a population of 190,000 and Delta State has a population of 129,000. What is the difference in their population?

   (a) 62.000

   (b) 319000

   (c) 3190

   (d) 6100

   (e) 61000

6. Find the missing number 55 – [] = 29

   (a) 29

   (b) 16

   (c) 26

   (d) 48

   (e) 28

7. Change the following to kobo ₦4.00

   (a) 4000k

   (b) 405k

   (c) 40k

   (d) 400k

   (e) 4.000k

8. Find the missing number 28÷4 =[]

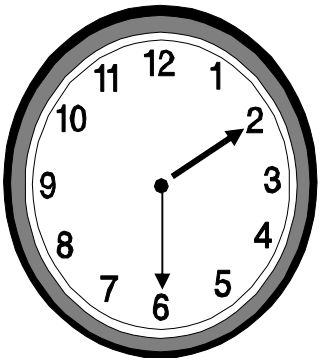
   (a) 6

   (b) 0.2

   (c) 8

   (d) 5

   (e) 7



9. What time is it?

(a) Half pass 2

(b) Half pass 6

(c) 6’0 clock

(d) 2’ 0 clock

(e) To 3

10. 7.24 litres x 4

(a) 2.896L

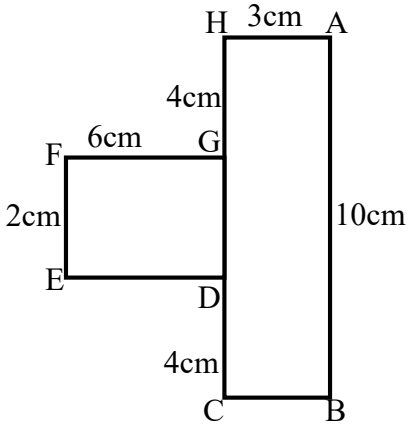
(b) 28.96L

(c) 289.6L

(d) 2896L

(e) 0.2896L

11. Find the perimeter of the figure below



(a) 38cm

(b) 30cm

(c) 31cm

(d) 42cm

(e) 40cm

12 H. Min.

2 15

\+ 1 50

_____

(a) 365

(b) 405

(c) 065

(d) 465

(e) 165

13. How many hours make one day?

(a) 36

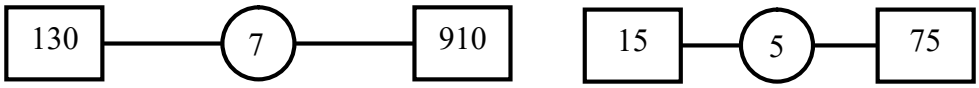
(b) 40

(c) 28

(d) 12

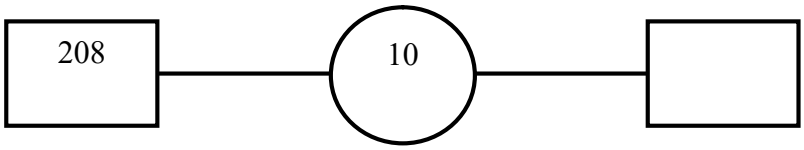
(e) 24

Example



Do these

14.



(a)198

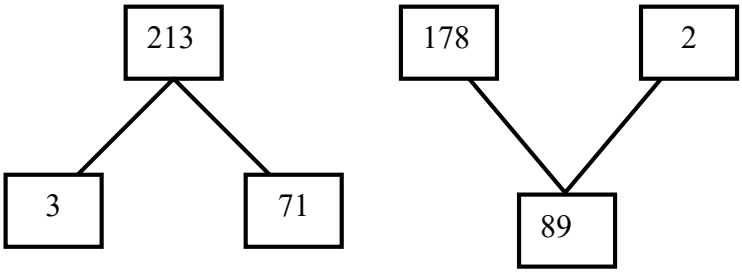
(b) 218

(c) 2080

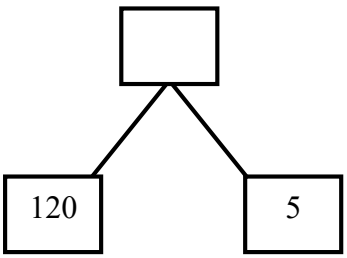
(d) 20800

(e) 2.08

Sample



`15. Do these



(a) 24

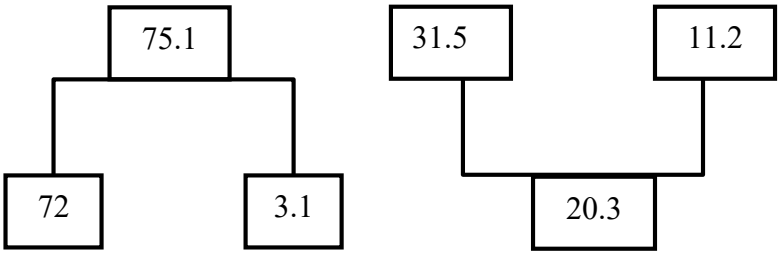
(b) 115

(c) 125

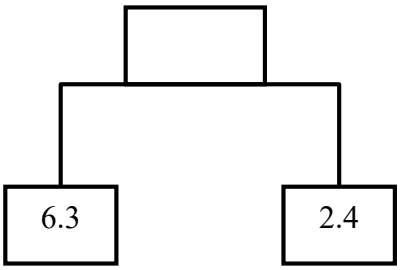
(d) 600

(e) 60

Sample



16.



(a) 8.7

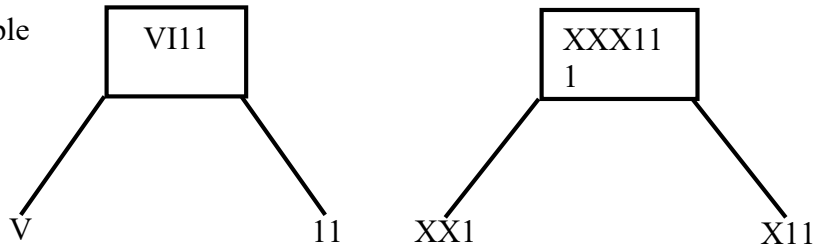
(b) 3.9

(c) 3.0

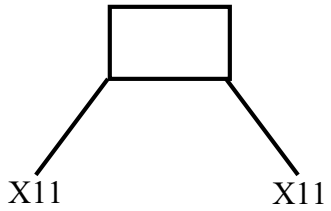
(d) 16.12

(e) 87

Sample



17.



(a) XX1V

(b) XX111

(c) X1V

(d) X

(e) V1

18. 12a + 2a + 2a =

(a) 8a

(b) 10a

(c) 16a

(d) 14a

(e) 15a

19. Blessing has M books and John has N books. Find the sum of their books.

(a) m + n

(b) m - n

(c) m ÷ n

(d) m x n

(e) – m + n

20. Solve 20a ÷ 4

(a)1/5a

(b) 1/5

(c) 16

(d) 5a

(e) 5

21. 36z - 18z =

(a) Z

(b) 18

(c) 18z

(d) 54

(e) 54z

22. Add 50v, 150v and 5v

(a) 200v

(b) 205v

(c) 2115

(d) 1105v

(e) 1150

23. Which of the following is vertical line?

(a) 

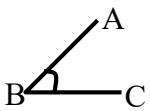
(b)

(c) 

(d) 

(e) 

24. ___ is use to measure the size of <ABC



(a) Protractor

(b) Ruler

(c) Set square

(d) Compass

(e) Divider

25. ___ and ___ has all sides equal

(a) Parallelogram and square

(b) Parallelogram and rhombus

(c) Rectangle and square

(d) Rhombus and square

(e) Rectangle and rhombus

26. A right angled triangle makes ___

(a) 180^0

(b) 90^o

(c) 45^o

(d) 360^o

(e) 60^o

27. This diagram  is called

(a) Chord

(b) Radius

(c) Diameter

(d) Semi circle

(e) Sector

28. Find the mode of 1, 2, 3, 3, 2, 1, 3

(a) 1

(b) 2

(c) 3

(d) 15

(e) 5

No. of pupils absent from school

Monday	4
Tuesday	3
Wednesday	2
Thursday	4
Friday	5

Use this information to answer questions 57 – 60

29. How many pupils were absent altogether?

(a) 7

(b) 9

(c) 13

(d) 17

(e) 18

30. How many pupils were absent on Thursday?

(a) 3

(b) 5

(c) 4

(d) 7

(e) 6

APPENDIX XVIB

ANSWERS TO THE STANDARDIZED MATHEMATICS ACHIEVEMENT TEST (SMAT) FOR BASIC FOUR

S/N	ANS	S/N	ANS	S/N	ANS
1	A	11	A	21	C
2	C	12	B	22	B
3	B	13	E	23	B
4	A	14	C	24	A
5	E	15	D	25	D
6	C	16	A	26	B
7	D	17	A	27	D
8	E	18	C	28	C
9	A	19	A	29	E
10	B	20	D	30	C

APPENDIX XVII

The Standardized Mathematics Achievement Test (SMAT).

Class: **Basic 5**

Time: 1 hour

INSTRUCTIONS TO CANDIDATES:

(i) Write your centre number, examination number, name, the name of your school, and the subject in the spaces provided on the answer booklet.

(vi) Read each question carefully before answering it.

(vii) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(viii) Attempt all questions.

(ix) If you shade more than one answer space for a question, you will score nothing for that question.

(x) Please, work completely on your own

1. Write in words: 3 009018
    a. Thirty thousand, nine hundred and eighteen
    b. Three million, ninety thousand and eighteen
    c. Three million, nine thousand and eighteen
    d. Three billion, nine hundred and eighteen
    e. Three billion, nine thousand and eighteen
2. Write in figure: twenty one million, nine hundred and forty-five thousand and two hundred and eleven.
    (a) 21,000,945,211
    (b) 21,945.211
    (c) 21,294,521
    (d) 21,935,211
    (e) 21,925,211
3. What is the place value of digit 5 in 23 510 302
    (a) Five hundred
    (b) Fifty thousand
    (c) Five thousandths
    (d) Five hundred thousand
    (e) Five thousand

4. Find the difference between 121729 and 49007

   (a) 72736

   (b) 72617

   (c) 72717

   (d) 72322

   (e) 72722

5. Divide 984 by 12

   (a) 82

   (b) 42

   (c) 32

   (d) 52

   (e) 112

6. Write $\frac{9}{1000}$ as decimal

   (a) 0.09

   (b) 0.9

   (c) 0.009

   (d) 0.0009

   (e) 000.9

7. Find the value of ¼ of 12

   (a) 12

   (b) 4

   (c) 2

   (d) 3

   (e) 5

8. Find product of 5 x 2 x 0

   (a) 0

   (b) 5

   (c) 10

   (d) 7

   (e) 20

9. A man bought goods for ₦200 and sold them for ₦240. Find his percentage profit

   (a) 50%

   (b) 20%

   (c) 40%

   (d) 60%

   (e) 10%

10. Find the simple interest of ₦500.00 per 2% for 3 years

   (a) ₦25.00

   (b) ₦35.00

   (c) ₦40.00

   (d) ₦65.00

   (e) ₦30.00

11. Express 0.25 as a percentage

   (a) 25%

   (b) 35%

   (c) 15%

   (d) 45%

   (e) 65%

12. Change 3.2kg to grams

   (a) 32g

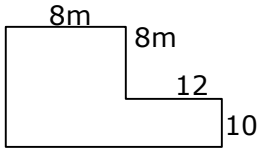
   (b) 320g

   (c) 3200g

   (d) 32000g

   (e) 320000g

13. Find the area of the figure below



   (a) $264m^2$

   (b) $184m^2$

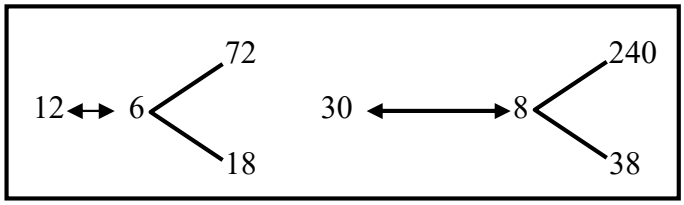
   (c) $176m^2$

   (d) $130m^2$

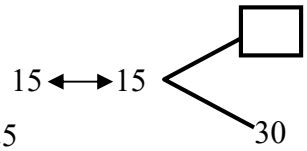
   (e) $120m^2$

14. A meeting started at 10:35am and ended at 3:15pm same day. How long did the meeting last?
    (a) 7hr 20mins
    (b) 5hr 40mins
    (c) 4hr 50mins
    (d) 4hr 40mins
    (e) 4hr 30mins
15. Ade weighs 29kg, Eke weighs 38kg, Bose weighs 46kg, Blessing weighs 38kg, who is the heaviest?
    (a) Ade
    (b) Eke
    (c) Bose
    (d) Blessing
    (e) Eke and Blessing
16. One book weighs 0.82kg and another book weighs 1.354kg. What is the total weight of the two books in g?
    (a) 2282.0g
    (b) 2182.0g
    (c) 2082.0g
    (d) 2382.0g
    (e) 2174g
17. How many days make one week?
    (a) 30
    (b) 21
    (c) 5
    (d) 8
    (e) 7

Sample



Use the above information to answer questions 28-30

18. 

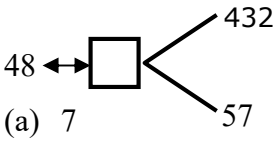
(a) 225

(b) 214

(c) 210

(d) 205

(e) 235

19. 

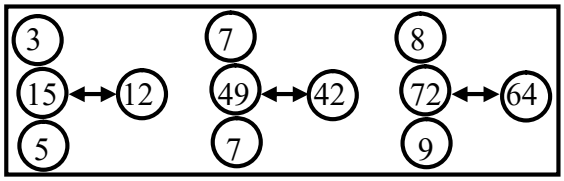
(a) 7

(b) 8

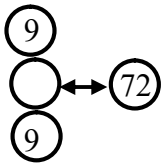
(c) 6

(d) 9

(e) 11

Sample 

Use the above information to answer questions 31-32

20. 

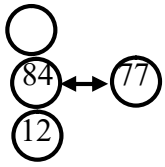
(a) 79

(b) 81

(c) 80

(d) 82

(e) 83

21. 

(a) 7

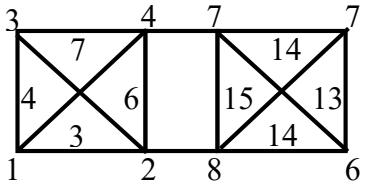
(b) 8

(c) 3

(d) 2

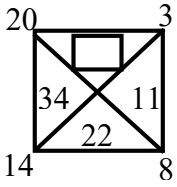
(e) 5

Sample



Use the above information to answer questions 24 – 25.

22.



(a) 34

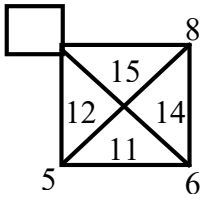
(b) 22

(c) 23

(d) 11

(e) 24

23.



(a) 14

(b) 12

(c) 11

(d) 7

(e) 6

24. P x P = 144. Find P

(a) 24

(b) 18

(c) 20

(d) 12

(e) 6

25. Shola has ₦p. and Bisi has ₦d. They both have

(a) ₦(2p - d)

(b) ₦(p - d)

(c) ₦(2p + d)

(d) ₦(p + 2d)

(e) ₦(p + d)

26. Solve 3x + 8 = 17. The value of x is?

(a) 3

(b) 8

(c) 6

(d) 9

(e) 12

27. Solve 12y - 7y + 5y =

(a) 24

(b) 24y

(c) 0

(d) 10

(e) 10y

28. 5y = 225. Find y

(a) 5y/225

(b) 5/225

(c) 45

(d) 1/25y

(e) 1/45

29. Simplify 3a + 3a + 2a

(a) 18a

(b) 3a - (5a)

(c) $18a^2$

(d) -8a

(e) 8a

30. How many lines of symmetry has an equilateral triangle?

(a) 5

(b) 2

(c) 3

(d) 4

(e) 6

31. Which of the following has no line of symmetry?

(a) 

(b) 

(c) 

(d) 

(e) 

32. ___ is mainly use for measuring angels

(a) Protractor

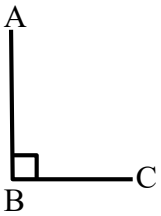
(b) Set of squares

(c) Compasses

(d) Pair of divider

(e) Ruler

33. The perpendicular line makes an angle



(a) 180°

(b) 60°

(c) 120°

(d) 45°

(e) 90°

34. A rhombus has __sides

(a) 3

(b) 4

(c) 5

(d) 6

(e) 7

35. ___ has its 4 angles at right angles
(a) Rectangle and square
(b) Rhombus and rectangle
(c) Parallelogram and square
(d) Trapezium and rectangle
(e) Square and rhombus

36. Find the mean of the sets of numbers: 6, 4, 2, 3, 5, 4, 6, 2
(a) 5
(b) 4
(c) 6
(d) 8
(e) 7

The scores of 100 pupils in a Mathematics test.

Score	3	4	5	6	7	8	9	10
No. of Pupils	4	12	6	15	23	12	18	10

Use the information above to answer questions 56 - 60

37. What is the modal score?
(a) 23
(b) 12
(c) 6
(d) 5
(e) 7

38. What is the median score?
(a) 6 and 7
(b) 7
(c) 15 and 23
(d) 6
(e) 8

39. What is the least score?
(a) 3
(b) 4
(c) 2
(d) 1
(e) 0

40. What is the difference between the highest score and the lowest score?

(a) 1

(b) 2

(c) 3

(d) 4

(e) 7

APPENDIX XVIIB

ANSWERS TO THE STANDARDIZED MATHEMATICS ACHIEVEMENT TEST (SMAT) FOR BASIC FIVE

S/N	ANS	S/N	S/N	S/N	ANS	S/N	ANS
1	C	11	A	21	A	31	C
2	B	12	C	22	C	32	A
3	D	13	B	23	D	33	E
4	E	14	D	24	D	34	B
5	A	15	C	25	E	35	A
6	C	16	E	26	A	36	B
7	D	17	E	27	E	37	E
8	A	18	A	28	C	38	B
9	B	19	D	29	E	39	A
10	E	20	B	30	C	40	E

APPENDIX XVIII

The Standardized Mathematics Achievement Test. (SMAT).

Class: **Basic 6**

Time: 1 hour

INSTRUCTIONS *TO CANDIDATES:*

(i) Write your centre number spaces, examination number, name, the name of your school, and the subject in the provided on the answer booklet.

(ii) Read each question carefully before answering it.

(iii) Do not waste time on any question. If you find one difficult, go on to others and finish them before you come again to the difficult one(s).

(iv) Attempt all questions.

(v) If you shade more than one answer space for a question, you will score nothing for that question.

(vi) **Please, work completely on your own.**

1. Add 6432, 89, 807 and 7
   (a) 30372
   (b) 30272
   (c) 7335
   (d) 7135
   (e) 6225
2. Write in word 11025
   (a) One hundred and ten thousand and twenty five
   (b) Eleven hundred and twenty five
   (c) One thousand, one hundred and twenty five
   (d) Eleven thousand and twenty five
   (e) Eleven thousand two hundred and five
3. From nine thousand and ninety, subtract nine hundred and nine.
   (a) 88081
   (b) 8181
   (c) 89081
   (d) 8081
   (e) 809

4. Simplify 4/11 of 2 3/4

(a) 16/121

(b) 1/11

(c) 8/11

(d)2

(e)1

5. Express 0.54 as a fraction in its lowest terms

(a) 27/100

(b) .27/50

(c) 2.7/50

(d) 27/50

(e) 13/25

6. What is the square root of 36?

(a) 6

(b) 4

(c) 8

(d) 7

(e) 9

7. Change 20/3 to the nearest whole number

(a) 3

(b) 6

(c) 7

(d) 10

(e) 8

8. Find the highest common factor (H.C.F.) of

2 x 2 x 2 x 3 x 5 x 7

2 x x 2 x 2 x 2 x 3 x 3 x 5

2 x 3 x 3 x 5 7

(a) 2

(b) 2 x 3 x 5

(c) 3

(d) 2 x 3

(e) (e) 2 x 3 x 5 x 7

9. Approximate 30.74 correct to three significant figure

(a) 21.7

(b) 30.0

(c) 31.0

(d) 31.4

(e) 30.7

10. Find the cost of 50 articles at ₦0.20 each.

(a) ₦1, 000.00

(b) ₦100.00

(c) ₦10.00

(d) ₦1.00

(e) ₦0.10

11. Solve 5 1/3 x ¼ ÷ 1 3/5

(a) 2 2/15

(b) 5/6

(c) 13 1/3

(d) 1 1/5

(e) 1/6

12. Simplify 385/1000

(a) 38.5

(b) 3.85

(c) 0.385

(d) 0.0385

(e) 0.00385

13. Evaluate 3952 ÷ 13

(a) 3004

(b) 3040

(c) 340

(d) 304

(e) 34

14. Find the sum of 1000 and 0.001

(a)1000.001

(b) 1000.01

(c) 1000.1

(d) 10

(e) 1001

15. Find 33 1/3% of ₦900.00

(a) ₦9, 000.00

(b) ₦300.00

(c) ₦30, 000.00

(d) ₦90.00

(e) ₦30.00

16. Express 3/8 as a percentage

(a) 0.375%

(b) 40%

(c) 37.5%

(d) 4%

(e) 75%

17. If ₦1.00 exchanges for ¢40.00, how much will a trader pay for ¢1,680.00?

(a) ₦420.00

(b) ₦400.00

(c) ₦42.00

(d) ₦40.00

(e) ₦32.00

18. 5/8 + 3/7 = ?

(a) 15/56 + 21/56

(b) 18/56 + 30/56

(c) 27/50 + 36/36

(d) 35/56 + 24/56

(e) 25/56 + 15/56

19. Find the area of a circle whose diameter is 28cm (Take $\pi = 22/7$)

(a) $616cm^2$

(b) $606cm^2$

(c) $176cm^2$

(d) $108cm^2$

(e) 88cm2

20. Find the perimeter of a circle whose radius is 3.5cm (Take $\pi = 22/7$)

(a) 88cm

(b) 44cm

(c) 38.5cm

(d) 22cm

(e) 14cm

21.

	Hours	Minutes	Seconds
	15	8	24
-	8	24	48

(a) 6hr. 42min. 36sec.

(b) (b) 6hr. 43min. 36sec

(c) (c) 6 hr. 43min. 26 sec.

(d) (d) 6hr. 41min. 36sec

(e) (e) 6 hr. 40in. 36sec.

22. Angle 180 is called_____

(a) angle on a straight line

(b) chord

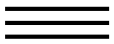
(c) sector

(d) diameter

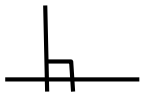
(e) segment.

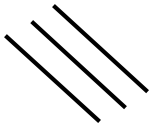
23. Which of the following shape is perpendicular?

(a) 

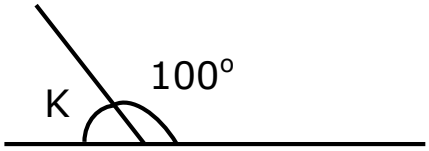
(b) 

(c) 

(d) 

(e) 

24. Find the value of the angle k in the figure below



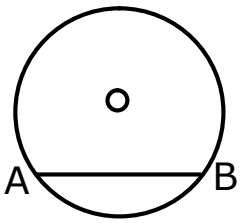
(a) 180

(b) 80

(c) 60

(d) 40

(e) 35



25. In the diagram above, 0 is the centre of the circle. What is line AB called?

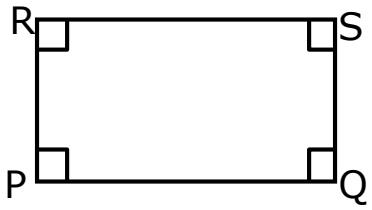
(a) chord

(b) sector

(c) arc

(d) segment

(e) diameter



26. What is the name of the diagram PQRS shown above?

(a) trapezium

(b) cube

(c) rectangle

(d) triangle

(e) square

27. A square has __

(a) 2 of its opposite sides equal

(b) 3 sides

(c) none of its sides equal

(d) all the sides equal

(e) 2 sides.

28. Which of the following is not true?

(a) Lengths are measured in cm

(b) Volumes are expressed in kg

(c) Area are expressed in square units

(d) Times are measured in minutes

(e) Angles are measured in degrees,

29. Find the total surface area of a cuboid whose dimensions are 2cm x 3cm and 4cm

(a) $52cm^2$

(b) $48cm^2$

(c) $36cm^2$

(d) $26cm^2$

(e) $24cm^2$

30. Two side of a triangle are 80^0 and 40^0 find the third angle.

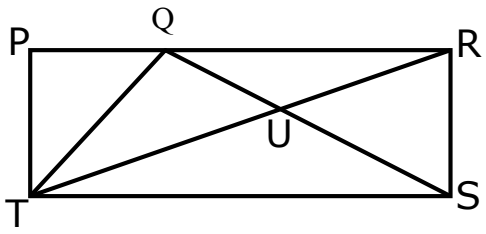
(a) 240^o

(b) 120^o

(c) 100^o

(d) 60^o

(e) 40



31. From the diagram above which of the following pairs of triangles have equal area?.

(a) TRS and PTR

(b) PRT and QTU

(c) USR and STR

(d) QTU and USR

(e) PTR and PQT

32. Which of the instruments is use to measure angle?

(a) ruler

(b) square

(c) compass

(d) divided

(e) protector

33. To measure the circumference of a circle __ is needed

(a) string and ruler

(b) pencil and ruler

(c) pin and ruler

(d) compass and ruler

(e) square and ruler.

34. An ant walks round a square of side 8cm four times. Find the distance covered by the ant

(a) 256cm

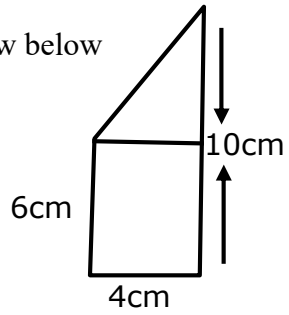
(b) 128cm

(c) 64cm

(d) 32cm

(e) 16cm

35. Find the area of the diagram show below



(a)76cm^2

(b) 60cm^2

(c)44cm^2

(d) 32cm^2

(e) 20c

36. If 8km = 5miles, find 40miles in km

(a) 320km

(b) 200km

(c) 80km

(d) 25km

(e) 64km

37. If m = 2 and n =3, find $\frac{mn}{m+n}$

(a) 5/5

(b) 1 1/5

(c) 1

(d) 3 5/6

(e) 4

38. If x + y = 40, find y when x = 12

(a) 28

(b) 48

(c) 38

(d) 52

(e) 24

39. There are n boys in a class and each brings in m mangoes. How many mangoes do they have left?

(a) m-y

(b) mt-n

(c) ny-m

(d) mn-y

(e) y-mn

40. Simplify 2a+3b+a

(a) 3(a+b)

(b) 3(a-b)

(c) $(2a^2+3b)$

(d) -3(a+b)

(e) -3(a-b)

41. If m=6, n=5 and p=4, what is the value of (3m+p) (m–4n)?

(a) 16

(b) 22

(c) 308

(d) 240

(e) 362

42. Simplify 2x x 5y

(a) 7xy

(b) 7yx

(c) 10x

(d) 10xy

(e) 10yx

43. Solve 12a ÷ 3

(a) 9a (b) 9

(c) 4a

(d) 3a

(e) 4

44. Solve x +9 = 23

(a) 33

(b) -33

(c) 14x

(d) -14

(e) 14

45. Simplify 5m+6n-2m+3n-m

(a) 2m+9n

(b) 2m-9n

(C) 8m+9n

(d)5m+6n

(e) 2m=-9n

46. Write these tally marks in figure

(a) 50

(b) 40

(c) 25

(d) 10

(e) 80

47. Find the mode from the following data table scores on mathematics test for primary 6B

Score	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Frequency	**3**	**8**	**8**	**9**	**6**	**11**	**3**	**3**

(a) 2

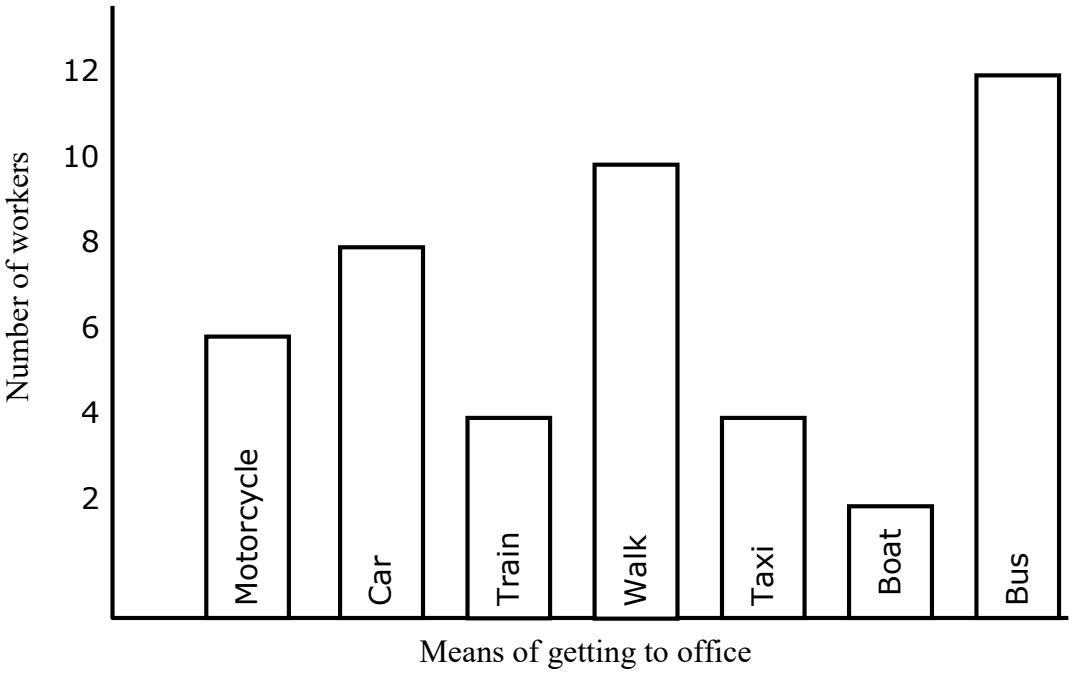
(b) 3

(c) 4

(d) 5

(e) 7

The bar chart below show the seven means of getting to office daily, by all workers of a particular department of a Ministry in Edo State. sUse it to answer questions 48 – 50



48. How many of the workers go to office by boat?
    (a) 46
    (b) 44
    (c) 2
    (d) 10
    (e) 12

49. How many workers are in the department?
    (a) 84
    (b) 56
    (c) 46
    (d) 44
    (e) 36

50. What is the modal means of transport?
    (a) bus
    (b) walk
    (c) car
    (d) boat
    (e) motorcycle

51. Find the mean of 20, 5, 16, 24, 15

(a) 55

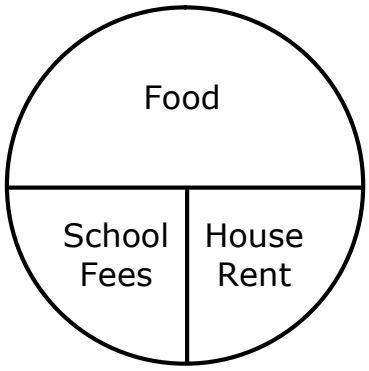
(b) 39

(c) 5

(d) 10

(e) 16

The chart below shows the proportion in which a man spends his monthly salary of N300.00. Use it to answer questions 52 – 54



52. How much did he spend on food for the month?

(a) ₦200

(b) ₦150

(c) ₦100

(d) ₦75

(e) ₦60

53. How much did he pay for house rent?

(a) ₦150

(b) ₦120

(c) ₦75

(d) ₦100

(e) ₦37.50.

54. What is the ratio of the amount spent on food to that on house rent?

(a) 1:3

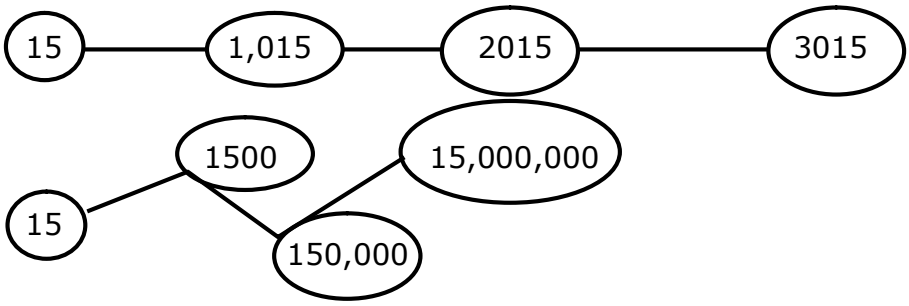
(b) 3:4

(c) 4:1

(d) 2:1

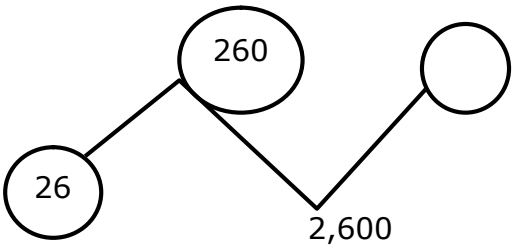
(e) 2:3

Example



Use the information above to answer questions 55

55.



(a) 22,600

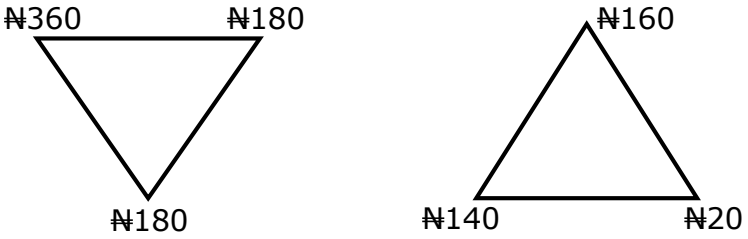
(b) 26,000

(c) 2,600,000

(d) 2,0600,000

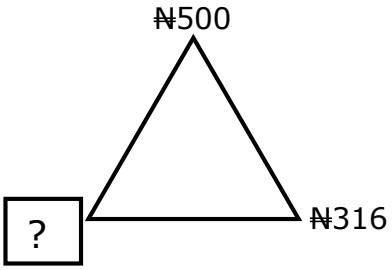
(e) 22,600,000

Example



Use the information above to answer questions 56.

56



(a) ₦180

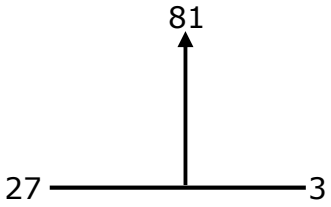
(b) ₦186

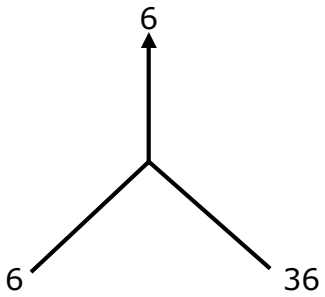
(c) ₦182

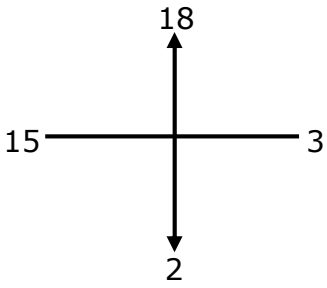
(d) ₦184

(e) ₦194

Example

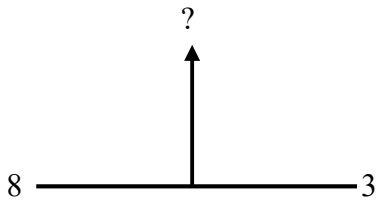






Use the information above to answer questions 57 - 58

57.



(a) 24

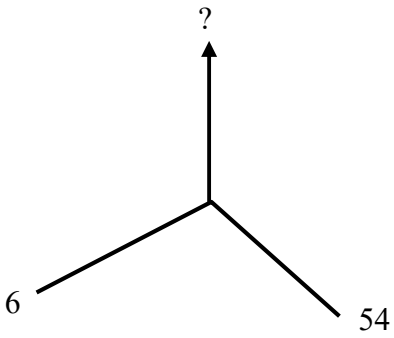
(b) 11

(c) 9

(d) 7

(e) 5

58.



(a) 6

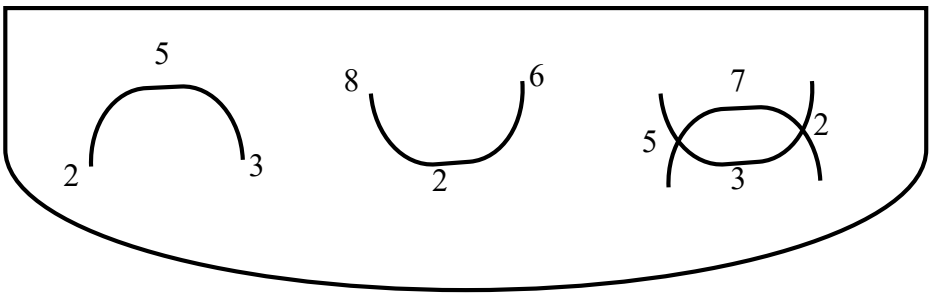
(b) 9

(c) 48

(d) 60

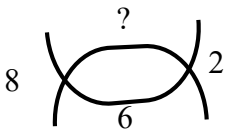
(e) 324

Example



Use the information to answer questions 59

59.



(a) 14

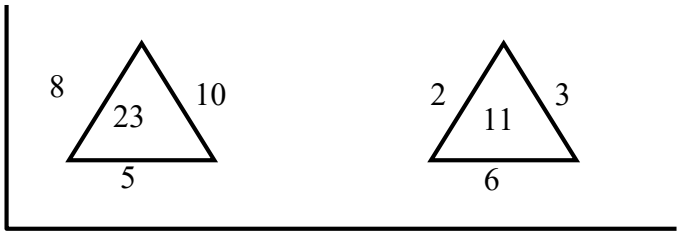
(b) 10

(c) 8

(d) 7

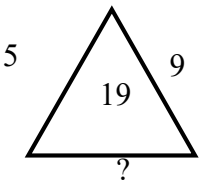
(e) 0

Example



Use the above example for questions 60

60.



(a) 5

(b) 4

(c) 8

(d) 12

(e) 3

APPENDIX XVIIIB

ANSWERS TO THE MATHEMATICS ACHIEVEMENT TEST FOR BASIC SIX

S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS	S/N	ANS
1.	C	13.	D	25	A	37.	B	49.	C
2.	D	14.	A	26.	C	38.	A	50.	A
3.	B	15.	C	27.	D	39.	D	51.	E
4.	E	16.	C	28.	B	40.	A	52.	B
5.	D	17.	C	29.	A	41.	C	53.	C
6.	A	18.	D	30.	D	42.	D	54.	D
7.	C	19.	A	31.	A	43.	C	55.	B
8.	B	20.	D	32.	E	44.	E	56.	D
9.	E	21.	B	33.	A	45.	A	57.	A
10.	C	22.	A	34.	B	46.	A	58.	B
11.	B	23.	D	35.	D	47.	E	59.	B
12.	C	24.	B	36.	E	48.	C	60.	A

APPENDIX XIX

Standardised Mathematics Achievement Test (SMAT) Answer Sheet.

Fill the Appropriate Column

Section A

Student's Personal Data:

Name of Student: _____

Name of School: _____

Sex Male [ ] Female [ ]

Location: Urban [ ] Rural [ ]

School Type: Public [ ] Private [ ]

State: Delta [ ] Edo [ ]

S/N	ANSWER	S/N	ANSWER	S/N	ANSWER	S/N	ANSWER
1		16		31		46	
2		17		32		47	
3		18		33		48	
4		19		34		49	
5		20		35		50	
6		21		36		51	
7		22		37		52	
8		23		38		53	
9		24		39		54	
10		25		40		55	
11		26		41		56	
12		27		42		57	
13		28		43		58	
14		29		44		59	
15		30		45		60	

APPENDIX XX

Sampled Schools in Delta and Edo States for (SMAT).

Edo

1. Ekepengal primary school
2. Eweva primary school
3. Ojeaboni primary school
4. Ohobo primary school
5. Usobua primary school
6. Central primary school Ubiaja
7. Eguare primary school Oria
8. Eguare primary school Ugboha
9. Okaigen primary school Ewohimi
10. Orhuen primary school Ubiaja
11. Agbado primary school Benin City
12. Oguola primary school Benin City
13. Payne primary school Benin City
14. Usi primary school Benin City
15. Uwa primary school Benin City
16. Hope primary school Warake
17. Hope primary school Ivbiaro
18. Abumere primary school Afuze-Emai
19. Ase primary school Ihevbe
20. Idodo primary school Otuo
21. Ubiaja union primary school
22. Owobu primary school Ubiaja
23. Japajou primary school Ubiaja
24. Marismon primary school Ewatto
25. Adesuwa primary school Idinwe Ewatto
26. New Benin Baptist primary school
27. Edokpolor primary school
28. Christian Education primary school
29. Travis Christian primary school
30. Word of Faith primary school

Delta

31. Asagba primary school Asaba
32. Ethiope primary school Umutu
33. Anishi primary school Ogwashi-Uku
34. Esume-Uku primary school Obiaruku
35. Diai primary school Umunede
36. Bride Academy primary school Agbor
37. Orogodo primary school Agbor
38. Rock of Ages primary school Boji –Boji Owa
39. Agbor Modern primary school Agbor
40. Alasi primary school Boji-Boji Owa
41. Isoko Central school Oleh
42. Odoro primary school Oleh
43. Evoja primary school Oleh
44. Solution primary school Oleh
45. Bright star primary school Oleh
46. Elite Academy Uzere
47. Bright Future Aviara
48. Okpolo primary school Enwhe
49. Fortress Int'l school Olomor
50. Urie primary school Emede
51. Aboko primary school Sapele
52. Ethiope primary school 111 Amukpe
53. Okokie-Eboh primary school Sapele
54. Obada primary school Obada Elume
55. Ikeresan primary school Ikeresan
56. Pathfinder primary school sapele
57. Blessed primary school sapele
58. Bethel Baptist primary school sapele
59. Aniontment primary school Jesse
60. St Naomi primary school Jesse

APPENDIX XXI

Test Manual of Standardised Mathematics Achievement Test (SMAT) for Middle Basic Education.

This test manual is an essential document that contains all necessary information about the SMAT. It is a summary of the purpose of the test, guidelines for the administration, scoring, evaluation and interpretation of the test. The reliability and validity estimates and procedures as well as the norms were stated.

The Purpose of the Test.

The test is designed for Development and Standardisation of Mathematics Achievement Test for Middle Basic Education Pupils in Delta and Edo States. Consequently, 30, 40 and 60 items were selected based on item analysis. The developed SMAT was prompted in order to reduce the problem of shortage of standardized instrument for basic four, five and six pupils.

Description of the Standardised Mathematics Achievement Test.

The SMAT covers major sections: Number and Numeration, Basic operation, Measurement, Algebraic process, Quantitative Reasoning, Geometry and Mensuration and everyday Statistics. Description of each of the section and percentage for each topic was presented in table of specification in tables 1, 2 and 3.

Guideline for Administration of the Test

The question papers were produced, packed and sealed in an envelope. The Mathematics teacher who is teaching basic four, five and six should be the supervisor. Other responsible and honest teachers should act as invigilators. One or two invigilator when the pupils exceed 30-60 respectively. A day before the test is administrated all arrangement should be completed for the venue and seats. The hall should be well ventilated. On the testing day, both the supervisor and invigilators be present 30 minutes before the test and make sure of a conductive and a clean environment for maximum performance of pupils. Answer sheets would be provided but pupils should come with their writing materials e.g. pencil, biro and eraser. Pupils should be well spaced to avoid cheating. During the test, the supervisor and invigilators should avoid undue attention that would distract pupils.

The test instruction should be clearly read out by the supervisor then pupils are checked in before they start. Wall clock for keeping the time be place at the front of the hall. By the end of the test, pupils should leave their question and answer sheets on top of their desk as they go out of the classroom. On no account should any question papers or sheets leave the hall whether use or unused be removed from the testing room .The invigilators should then collect them.

Scoring Procedure.

Scoring was mechanically by hand by few trained/untrained clecks on the pupils answer sheets under the supervision of the constructor. One mark should be awarded to any item got correctly by the pupils making total 30, 40 and 60 marks No pupil was penalized for guessing. The raw scores were taken and all correct marks of each pupil are added together and base over 30, 40 and 60 the raw scores was converted to standard score.

Psychometric Properties

Validity

The SMAT is an achievement test. The content validity that is most important was established by mean of a table of specification. The content covered the main topics. The face validity was also established with the use of both professional and non professionals in the field of Mathematics and Measurement and Evaluation. Item Respond Theory of Local Independent and Unindimensionality Assumption were used in developing the items and Classical Test Theory was use for item analysis of each item.

Reliability

The reliability of SMAT is 0.60 for basic four, 0.55 for basic five and 0.65 for basic six which were high. The Kuder- Richardson fomula 20 was used to compute the reliability, the test was administered to a sample of 30 pupils.

Difficulty and Discriminative Index

Classical Test Theory was used to establish the difficulty and discriminative of each items. The 540 testees were grouped into the upper and lower 27% scoring group. All the items selected were the items that fall between 0.30 – 0.60 for difficulty and discriminative index.

Grade Norms

The Z-score and T-score were used for the grading. The Z-score is a type of standard score norm that consider the raw score, mean and standard deviation in its computation. Performance is expressed in terms of standard deviation units. The formula for computing is

$$\text{Z} - \text{score} = \frac{\text{Raw score} - \text{Mean}}{\text{Standard Deviation}}$$

or $$\text{Z} = \frac{\text{X} - \bar{\text{X}}}{\text{SD}}$$

Where mean (X) = $\frac{\sum fx}{N}$

$$\text{SD} = \sqrt[w]{\frac{fd^2}{N} - \left(\frac{fd}{N}\right)^2}$$

From the formula, the raw score of pupils were changed to Z-score by arranging the raw score in descending order and then the Z-score computed. For easy comparison of pupils score,

the raw scores are transformed to T-score with a mean distribution of 50 and a standard deviation of 10. It is obtained from the Z-score. The formula for computing T-score is T = 10z + 50.

Norms of the SMAT

Table 38a Analysis of Gender Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta basic 4	Male	375	49.6	49.0	48.9	70.0	9.4
	Female	375	49.5	47.3	50.3	52.0	9.2
Edo Basic 4	Male	375	49.7	48.0	50.0	44.0	10.2
	Female	375	50.4	48.4	46.6	55.0	9.9
Delta Basic 5	Male	375	50.2	48.4	46.8	46.0	9.9
	Female	375	49.7	48.3	47.4	42.0	9.7
Edo Basic 5	Male	375	50.0	49.8	50.9	50.0	8.1
	Female	375	49.5	49.8	49.6	50.0	9.6
Delta Basic 6	Male	500	50.7	49.7	46.9	53.0	10.8
	Female	500	50.7	49.3	46.7	53.0	10.7
Edo Basic 6	Male	500	51.1	48.5	51.4	39.0	10.7
	Female	500	50.1	48.2	45.9	42.0	11.5

Table 38b Analysis of School Type Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta Basic 4	Public	375	49.8	48.5	47.9	42.0	8.8
	Private	375	50.0	50.5	48.3	42.0	9.1
Edo Basic 4	Public	375	50.6	49.6	48.3	54.0	10.9
	Private	375	50.7	50.3	49.5	44.0	9.2
Delta Basic 5	Public	375	50.4	50.4	50.4	46.0	10.2
	Private	375	50.3	50.4	51.5	46.0	10.0
Edo Basic 5	Public	375	50.3	50.7	51.2	41.0	7.9
	Private	375	49.7	49.5	49.2	41.0	9.6
Delta Basic 6	Public	500	50.8	49.6	47.7	41.0	10.2
	Private	500	50.2	48.9	47.0	43.0	11.8
Edo Basic 6	Public	500	51.6	51.9	51.0	42.0	10.4
	Private	500	52.5	51.0	49.5	40.0	9.4

Table 38c: Analysis of School Location Norm Performance of SMAT

Name	Variable	N	Mean	Median	Mode	Range	SD
Delta	Basic 4 Rural	375	49.9	47.4	46.3	53.0	10.6
	Urban	375	50.2	47.6	46.6	55.0	10.8
Edo	Basic 4 Rural	375	49.7	48.0	50.0	44.0	4.6
	Urban	375	50.4	48.4	46.7	55.0	4.4
Delta	Basic 5 Rural	375	49.9	50.0	51.0	46.0	11.2
	Urban	375	50.9	50.5	50.9	46.0	10.8
Edo	Basic 5 Rural	375	50.2	50.7	51.2	42.0	8.0
	Urban	375	50.3	50.3	50.9	42.0	8.0
Delta	Basic 6 Rural	500	51.1	50.6	48.8	53.0	9.0
	Urban	500	50.4	48.7	46.6	51.0	10.7
Edo	Basic 6 Rural	500	50.4	51.0	52.6	42.0	10.5
	Urban	500	51.2	51.4	52.9	39.0	10.3

Table 38d Analysis of States School Norm Performance of SMAT

Name	**Variable**	**N**	**Mean**	**Median**	**Mode**	**Range**	**SD**
Delta	Basic 4	750	50.1	50.1	48.7	52.0	11.0
	Basic 5	750	50.3	50.2	51.0	46.0	10.8
	Basic 6	1000	51.6	51.1	53.4	48.0	8.8
Edo	Basic 4	750	50.2	48.4	46.8	56.0	12.5
	Basic 5	750	52.0	53.2	54.0	50.0	9.7
	Basic 6	1000	51.9	52.5	51.6	39.0	9.0

The tables 38a, 38b, 38c and 38d should help users of the SMAT to compare and contrast other Mathematics middle basic education pupils' score in Delta and Edo state with the standardised (sample) groups.

Department of Guidance and counseling
(Measurement and Evaluation)
Faculty of Education
Delta State University Abraka.
10th Novermber, 2014 .

Dear Sir/Madam,

LETTER OF PERMISSION TO USE YOUR SCHOOL

The bearer Mrs Abhuegbeude. A. B. I is a PhD research student of Delta state university Abraka.

I am presently conducting a research work on development and standardization of Mathematics achievement test for middle basic education pupils in Delta and Edo state. Your school happens to fall within the population of the study. I will be very grateful, if you would permit me to administer the developed test to your pupils.

Thanks for your co-operation.

Yours Sincerely

_____

Abhuegbeude Augusta Bose Idowu