UNIVERSITY OF EDUCATION, WINNEBA

INVESTIGATING PUPILS' STRATEGIES ON MATHEMATICS ACHIEVEMENT FROM PRIVATE AND PUBLIC BASIC SCHOOLS IN THE CHORKOR CIRCUIT OF THE ACCRA METROPOLIS

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DECLARATION

STUDENT'S DECLARATION

I Hatsu Edo declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and acknowledge is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE ……..

DATE ……..

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on the supervision of thesis laid down by the University of Education, winneba.

SUPERVISOR'S NAME: MR. JONES APAWU

SIGNATURE ……...

DATE ……

DEDICATION

This work is dedicated to my lovely wife Vivian Ofori- Hatsu for her love, support and encouragement. It is also dedicated to my children Aaron Mawunyo, Louisa Mawusi Hatsu and finally Emmanuella Hatsu who suffered for my quest for academic laurels. I finally dedicate this work to my best friend the late Ibrahim Seidu, who was also a graduate student in the department of mathematics education.

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ABSTRACT

This study sought to investigate the mathematics achievement of private and public schools in the Chorkor Circuit of Accra Metropolis. The population for the study was 617 J.H.S.3 pupils from private and public basic schools. Four hundred and fifty three (453) pupils were selected for the study, two hundred and eighty four (284) from public schools and one hundred and sixty nine (169) from private schools. The research design used for the study was survey with test as the instrument. Three research questions were formulated for the study, research questions one and two were on the strategies used by private and public basic school pupils for solving mathematics achievement test. Research question three was meant to find out whether there was a difference in terms of performance between the two schools (private and public). It was revealed that private schools performed better on mathematics achievement test than public schools. More private school pupils used appropriate techniques on Mathematics Achievement test than their counterpart in the public schools.

CHAPTER 1

INTRODUCTION

1.0 Overview

This chapter provides an introduction to the study. It discusses the background to the study, statement of the problem, purpose of the study, significant of the study, objective of the study, research questions and hypotheses, limitations of the study, delimitations of the study and organization of the study.

1.1Background to the Study

Mathematics is a compulsory and very important subject taken by learners in the primary and secondary level of education. It involves manipulation of algorithms and axioms in mathematical investigations (Wachira, 2016). The teaching syllabus on mathematics at the basic level by the Ghana Education Service noted that, the goal of mathematics is to enhance acquisition of numerical and logical skills by learners and assist them to think in a logical, accurate and precise way. The significant of mathematics is necessary to all learners that is why learners' performance (Achievement) in the subject was not taken for granted by researchers.

Mathematics Achievement refers to the accomplishment of a given task that is measured against predetermined standards of accuracy, completeness, cost, and speed (Kayode, 2016). In this study Mathematics Achievement refers to the act of academic in which students deal with how well they meet the standards set out by responsible examination body. The mathematics achievement of basic schools means the rate of students passing grades in the national examinations (Students' overall examination scores), it also measures the total performance (scores) of pupils on mathematics achievement test (Kiplagat, Role, & Makewa, 2012)

However, Iddi (2016) argued that, students' scores in mathematics (Achievement) from both private and public basic schools have been poor, though few had impressive mathematics performance in the Basic Education Certificate Examination (BECE). This poor performance from private and public basic schools in the Basic Education Certificate Examination could be apportioned to the fact that, students have very low subject matter knowledge (SMK) on mathematics and also do not use appropriate strategy for solving mathematics problems. The chief examiners report (2007) on the Basic Education Certificate Examination also stressed on the weakness of pupils performance, adding that most basic school pupils lack basic strategies and concepts for solving mathematical problems.

Meanwhile, over the years there have been series of investigations to determine the differences in performance between students in public (government) and private schools and had yielded mix findings (Akmal, 2016). Some scholars such as Khan, Igbal, and Tasneem (2012) devised that there is no statistical difference in terms of students' performance.

In Ghana, we have basically two types of schools. Schools owned by individuals (private) and schools owned by the public (government). However, students' academic success is greatly influenced by the type of school they attend and school factors affecting performance. Some of these factors include school structure, school composition and school climate. The school one attends is the institutional environment that sets the parameters of a students' learning experience and achievement (Kaino, Adewuyi, & Muganyizi, 2014). However, private schools invading the educational system in Ghana were very significant, because the education reform, initiated in 1987 failed to achieve one of its major objectives of providing universal access for all children at the basic education level (Akyeampong, 2009). This universal access

remained only on the drawing board and education quality was persistently falling (Asiedu, 2002). The structures and facilities that could permit universal access were grossly inadequate while teacher quality, morale and commitment which could ensure quality of basic education persistently dwindled and this offered a great opportunity to private schools. Private schools crashed in and since have made serious inroads into basic education provision (Ntim, 2014).

However, a private school charges high fees which in a way have detracted from the positive contribution they could make towards universal access. Nevertheless, they continue to be popular and to those who can afford the fees (Ntim, 2004). The continuing popularity of private schools may be explained in terms of the quality of education (at least academic) they provide. The generality of people in Ghana, especially parents perceived quality of education only in terms of the number of pupils who are able to pass the final examination with very good grades to make admission at the secondary level easy.

Nevertheless, the struggle to gain admission into Senior High institutions with weak grades after the Basic Education Certificate Examination can be very unpleasant experience. Most private schools were able to guarantee good grades to their students. The key, obviously lies in close supervision and effective time use. In Ghana, private schools have more effective and efficient supervisory capacity than public schools, hence better achievement (Donkoh, 2014).

The differences in performance between private and public schools in mathematics revealed that, there has been a persistent low performance in public schools as compared to private schools. This differences in mathematics performance between private and public schools was affected by several factors or variables (Ntim, 2004).

Parents, and other citizens often assume that private schools on the whole, are better academically especially in mathematics than public schools. However, this empirical assumption is not supported by evidence (Gakure, Mukuria, & Kithae, 2013). Decisions by parents or policy makers about private school choice are often rooted in the assumption that, by choosing private schools, families will improve the academic performance of their children (Ntim, 2014). This notion about private school performance rest on body of research that suggests that, private schools outperform public schools in mathematics. However, better quality of private schools (in terms of teaching, teacher attendance, school performance, small class size, and discipline) compared with public schools is a key factor in parents' choice of private schools (Asiedu, 2002).

Recent trends around the world also show that many developed and developing countries are seeking partnerships between the public and private sector to share costs and improve the provision of education. The Ghana Government is looking for alternate mechanisms of education delivery and financing outside the public realm. These initiatives by government are promoted by budgetary stringencies for it implementation.

In Ghana, public and private school distinction is relatively straightforward. The public sector includes government and community schools, both of which receive full government funding for recurrent costs (some of which are defrayed through the collection of school fees); the only difference between them pertains to the funding of school construction costs. For government schools, such costs are borne by the government while for community schools they are borne by local communities (Akyeampong, 2009). The private sector in Ghana comprises of a great diversity of schools, whose unifying feature is that they all depend almost exclusively on school

fees and private contributions to defray both recurrent and capital costs. Although the majority of private schools were created by religious and other community organizations in the early 1990s, there are now a lot of new schools which are operated by individuals or groups of individual for profit making.

The rapid growth of private basic schools in Ghana in the past decades offers some interesting lessons on the impact of government policies towards private education. Excess demand was indeed a major factor motivating the government's decision in the early 1980s to remove the barriers to private sector growth. The government's policy toward private education, particularly before the mid-1980s, has been ambiguous and impedes the progress of private schools in Ghana. In some years, when equity goals dominated the policy agenda, the government would prohibit the opening of new private basic schools (Ntim, 2014). In other years, the policy was reversed when the government became concerned about the exploding excess demand for basic schools. However, in a study of relatively new private schools in Ghana, Ntim (2014) found that public students outperformed their private peers in terms of national assessment achievement.

The government of Ghana underscores the fact that, the quality of education is the basis for national development. Therefore, the government attempts to create necessary conditions to provide children with high quality education. However, the policy adopted by the government mainly concerns primary and junior high school education, which is free for all Ghanaian children.

Also, Ntim (2014) put forth that since independence the ministry of education has been recruiting teachers directly from schools (clash programme teachers) and given them

short training ready to overcome the catastrophe of shortage of teachers in Ghanaian basic schools especially in mathematics.

Most teachers that were recruited by the government do not have enough teaching knowledge were forced to attend in- service training and attain Diploma in Education to provide the required knowledge to the students in the area of mathematics and science. However, majority of these teachers do not have the pre- requisite methodology, techniques and concepts for teaching mathematics and science. Pupils were not introduced to the appropriate techniques, strategy and concepts for solving problems in mathematics. Majority of pupils could not understand concepts taught by the teachers, hence pupils resort to memorization of mathematical concepts and formulas without any knowledge on when and how to use them. This was one of the reasons why pupils performed poorly in mathematics over years.

Meanwhile, basic school pupils having an in depth knowledge (subject matter knowledge) on the various topics in the school mathematics curriculum enhance mathematics achievement. Pupils' performance on mathematics depends on the understanding of mathematical concepts, facts and principles on mathematics test. In other words pupils' inability to understand concepts, principles and facts and also the application of these concepts, facts and principles in any mathematical problem has negative influence on performance.

Also, the use of appropriate strategy on mathematics problems enhances mathematics performance of learners. Memorization of strategies by pupils has negative correlation on performance, students' performance in mathematics need correct and appropriate strategy. Thus memorizing concepts and strategies is not enough for analyzing, reasoning, and communicating effectively in mathematics situations. Much more is needed in order to foster mathematics performance, including:

abilities to comprehend the problems, make connections between the problem at hand and problems the students solved in the past, and thoughtful reflection (Padmavathy & Mareesh, 2013).

Meanwhile, since pupils' performance in mathematics requires the use of appropriate teaching strategies by reinforcing such strategies to enhance performance, students should be able to adopt the strategy of reviewing prior knowledge and make connections to new knowledge and acquire new knowledge for problem solving to enhance performance (Barnes, 2007).

However, government had little improvement on mathematics performance (Achievement) of public school pupils even though there was much effort in training teachers, organizing in-service training and workshops for public school teachers, the private schools in Ghana still performs higher in mathematics than public schools (Ntim, 2014) . The public schools perform poorly on mathematics even though government put in a lot of effort to improve performance (Dafour, 2016). This poor performance of public school pupils drew the attention of researchers into the area of performance between private and public schools especially in mathematics.

Ankomah (2011) argued that, there were a lot of factors that may account for the differences in the mathematics performance (Achievement) of private and public school in Ghana. However, it is necessary to conduct further study into the issue of private and public school performance (Achievement) in mathematics, hence this study seek to explore the mathematics achievement between private and public basic schools in the Chorkor Circuit of the Accra metropolis with emphasis on which school performed better than the other on mathematics achievement test and why.

1.2 Statement of the Problem

Mathematics is made compulsory at the primary and secondary levels of education besides admission into higher institutions and professional institutions (Ntim, 2014). In Ghana, students' poor performance in mathematics have been attributed to factors such as poor teaching methods, unqualified and inexperienced teachers and inadequate or low subject matter knowledge on mathematics (Ofosua, 2013). These factors have negative effect on performance hence the low mathematics achievement of students in both public and private basic schools in Ghana, over the years.

However, private schools are now gaining more grounds in terms of mathematics performance or achievement in both internal and external examinations (Olatoye, Ademola, Agbatogun, & Olajumoke, 2009). Ankomah (2011) stressed that pupils in private basic schools have mostly untrained teachers but better supervision makes them outperform the pupils from public schools in mathematics. Consequently, more of the pupils from private basic schools gain admission into good secondary schools than their counterparts from the public schools since good grades in mathematics, science and English language serves as the basis for admission (Bonsu, 2016). Awan and Zia (2015) pointed that public basic schools performed poorly on mathematics achievement, and this is a very serious problem, since a higher percentage of them gain admission into the public secondary schools with such weak grades.

The consequences of this poor performance of public basic school pupils in mathematics could lead to drop-out because after secondary level most of them cannot progress to the university, at least a pass or credit is needed in mathematics as a requirement to the university (Khun - Inkeeree, Fauzee, & Othman, 2016). The implication of this poor performance of public schools in mathematics was that, students may not also pursue courses that are mathematics related (Ntim, 2014).

It can also be argued that private schools are doing better than public schools in mathematics, however many people have not taken time to analyze the issues that account for the difference (Nwafor, 2013). An effort to systematically work on issues contributing to the differences in mathematics performance between private and public basic school pupils at the Chorkor Circuit of the Accra Metropolis is the focus of this study. Given this scenario, there is the need to investigate the strategies used by pupils on mathematics Achievement from private and public basic school pupils with emphasis on which school performed better than the other and why.

1.3 Purpose of the Study

The purpose of this research was meant to investigate pupils' strategies on mathematics achievements from public and private basic schools at Chorkor. The study will also inform teachers and administrators as to what pertains in our basic schools with regards to mathematics performance. The study may also inform teachers and educational administrators to adopt strategies and measures on how to solve the issues of mathematics achievement of pupils especially in the private and public basic schools in the Chorkor Circuit of the Accra Metropolis.

1.4 Objective of the Study

The objectives of the study are

1. To identify the strategies used by public school pupils to solve mathematics achievement test.
2. To identify the strategies used by private school pupils to solve mathematics achievement test.
3. To compare the difference in students' mathematics performance between public and private basic schools' pupils.

1.5 Research Questions

In line with the objectives of the study, the following research questions were raised in this study:

1. What strategies did public school pupils' used to solve mathematics achievement test?
2. What strategies did private school pupils' used to solve mathematics achievement test?
3. Is there any difference in mathematics performance between public and private basic school pupils' in the Chorkor Circuit of the Accra Metropolis?

1.6 Research Hypotheses

To answer research question 3, the researcher formulated the following null and alternative hypothesis:

H_0: There is no significant difference in students' mathematics performance between Private and Public Basic School Pupils.

H_1: There is significant difference in students' mathematics performance between Private and Public Basic School Pupils.

1.7 Significance of the study

The study contributes to the existing body of knowledge on the reasons why private schools outperform public basic schools in mathematics. The study will also attract further studies on issues related to the performance between private and public basic schools and other levels of education. The empirical results from the field will help as an immediate indicator of the situation in private and public basic schools which can be directly taken to address the situation in case there is a need to do so and utilize the recommendations to further improve mathematics in basic education in Ghana.

1.8 Limitations of the Study

According to Best and Khan (2006) limitations are conditions beyond control of the researcher that will place restrictions on the conclusion on the study and its applications. The results of this research study could not be generalized due to the following reasons: the related literature which supported the study was more foreign than local so cultural variations might influence the findings to some extent. Also in Ghana, society is made up of different group of pupils, hence the result of the study from only Chorkor in the Accra Metropolis cannot be generalized.

1.9 Delimitations of the Study

The study would have been more representative if all the schools in the metropolis had been used. However, owing to limited time, materials, geographical locations of those schools and financial resources at the disposal of the researcher, the study was delimited to only schools in the Chorkor Circuit of the Accra Metropolis.

1.10 Organization of the Study

This study basically is made up of five chapters. The first chapter which is the introduction, was devoted solely to overview and the background to the study, statement of the problem, purpose of the study, objective of the study, research questions and hypotheses, significant of study, limitations of the study, delimitations of the study.

Chapter 2 is on literature review which highlights relevant views and ideas on the topic from other authors. Research methodology is in Chapter 3, and this covers research design, sample, sampling procedures, research instrument, validity and reliability, data collection procedures and data analysis procedures. Analysis of data and its findings are presented in Chapter 4. The fifth chapter focuses primarily on summary of the study, conclusion, and recommendations, suggestions for further research.

CHAPTER 2

LITERATURE REVIEW

2.0 Overview

This chapter primarily focused on varied views of authorities concerning the topic under study. It looks at the related literature from a conceptual perspective. The review has been done under the following headings:

1. The conceptual framework

2. The Concept of School Mathematics Achievement
3. Subject Matter Knowledge on Mathematics Achievement
4. Public Schools and Private Schools
5. Mathematics Performance between private and public basic school pupils
6. Strategies Used in Mathematics Achievement (Performance)

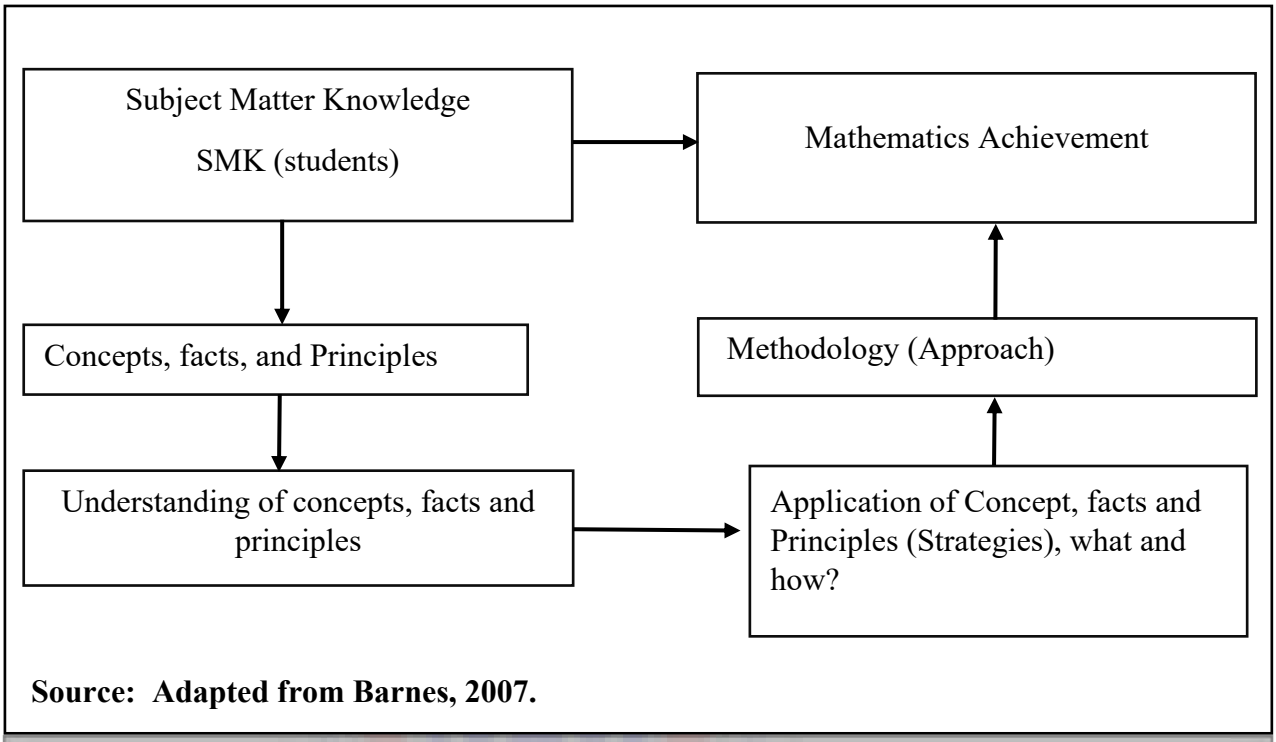
2.1 The Conceptual Framework

Conceptual frameworks, according to educational researcher Barnes (2007) are structured from a set of broad ideas that help a researcher to properly identify the problems they are looking at, frame their questions and find suitable literature. Conceptual framework helps the researcher to clarify his research questions and aims. This conceptual framework serves as a guide to the study. Specifically, the three purposes of the conceptual framework are to assist in the selection and development of appropriate methods of investigation, facilitate links with the relevant literature, and provide a structure for the analysis, reporting and discussion of findings of the investigation.

The conceptual framework for this study must provide a clear, coherent and comprehensive account of key factors that influence pupils' mathematics achievements. Subject matter knowledge which has to do with concepts, facts and principles of specific topics spelt out in the teaching syllabus of basic school pupils predict pupils' mathematics achievement (performance). Basic school pupils must understand the concepts, facts and principles underpinning the various topics in school mathematics curriculum (Pianta & Hamre, 2009). Application of the concepts, facts and principles using corrects strategies and methodology (approach) on mathematics achievement test enhances performance. Subject matter knowledge (SMK) of pupils, understanding of concepts, facts, principles and its application (strategies) with the appropriate

methodology were the major factors that can affects pupils mathematics Achievement (performance). These factors are also interconnected and they depend on each other to enhance performance as shown in Figure 2.1.

Figure 2.1: Conceptual framework on mathematics achievement



Source: Adapted from Barnes, 2007.

2.2 The Concept of School Mathematics Achievement

Komba, Hizza, and Winledy (2013) asserted that School Mathematics Achievement refers to the accomplishment of a given task that is measured against predetermined standards of accuracy, completeness, cost, and speed. In this study, schools Mathematics Achievement refers to pupils' performance and how well they meet the standards set out by responsible examination body. The mathematics achievement of basic schools means the rate of students passing grades in the national examinations (Students' overall examination scores), it also measures the total performance of pupils on mathematics achievement test.

Acharya (2017) stressed that mathematics achievement is the rate at which pupils score in a standardized examination to determine their progression to the next

level. Higher mathematics achievement depends on the linkage between new mathematical concepts and how to apply these concepts in any mathematical situation. However, lack of linkage between new mathematical concept and previously learned mathematics structure are the main causes of lower scores on Mathematics Achievement.

Chapman (2014) hold a different view that mathematics achievement of pupils decline as they show negative attitude such as anxiety and fear towards the subject. Students' attitudes toward the mathematics have notably been recognised as one of the determinants of mathematics achievement. Mathematics attitude correlates to students' personal mathematics achievement. However, majority of students held negative attitude toward mathematics (Wachira, 2016). Lawsha and Hussain (2011) opined that students' attitude towards mathematics has been a factor that is known to influence students' achievement in mathematics.

Similarly Chagwiza, Mutambra, Tatira and Nyaumwe (2013) analysed pupils' attitude and how they influence academic achievement in mathematics. The result revealed that pupils had positive attitudes towards mathematics and many believe that the subject is worthwhile to study and necessary for their future but performed badly in the subject due to their lack of understanding of basic concepts in mathematics.

Meremikwu and Enukoha (2010) conducted a study on instructional aids, school variables and pupil's mathematics achievement. The findings of the study emphasised that student's use of instructional support increases with mathematics achievements. The study of Olawojaiye (2008) was also in agreement that instructional support predict mathematics achievement of basic school pupils.

FIdler (2002) investigated the relationship between teacher instructional techniques and characteristics on students' mathematics achievement. The result

presented suggested that, teacher experience and status (credential), as well as classroom techniques and instruction, improve student achievement in mathematics. This was consistent with Anigbo (2016) recommending that government should organise refresher courses for mathematics teachers regularly from which teachers can be equipped with various effective instructional strategies. Effective teachers' instructional strategy improves mathematics achievement (Kunje, Selemani - Meke, & Ogawa, 2009).

Fajemidagba, Salman and Ayinla (2012) also examined the effect of instructional strategy on the achievement of Nigeria Senior Secondary School Students in Mathematics. The finding from the study revealed that the efficacy of instructional strategy pattern has positive effect on students' achievement in mathematics. Fajemidagba, Salman and Ayinla (2012) remarked that instructional time is also an important and costly resource in education. The effectiveness of instructional time varies substantially between different schools and that the additional instructional time, significantly increases subject specific test scores and achievement in mathematics.

Mbugua, Muthaa and Nkonke (2012) conducted a study on mathematics achievement of pupils. The study revealed that mathematics achievement of pupils is influenced by under staffing, inadequate teaching and learning materials. Similarly Omwenga (2014) also conducted a study on mathematics achievement among secondary school students. The finding of the study indicated the inadequacy of mathematics teachers and inadequate resources for teaching contributed to low mathematics achievement among secondary school students.

Kayode (2016) remarked that students' achievement in mathematics still remains low and class size had been identified as one of the important factors on

mathematics achievement. Senior secondary school students in small classes show higher achievement in mathematics relative to their colleagues in large class size

Teachers absenteeism and students' attendance in class has effect on mathematics achievement. This was evidence in the study of Nichols (2003) that there was a strong negative, inverse correlation existed between the state test results and average yearly absenteeism. Similarly, Roby (2004) researched on the correlation of student mathematics achievement and average school attendance rate. The finding revealed that there was an inverse relationship between students' attendance and achievement on state mathematics test, however private school have high school attendance than public schools. Burd and Hodgson (2006) indicated a correlation between attendance and attainment, as measured by final exams. Chen and Lin (2008) also reviewed relationship between class attendance and exam performances. The result supported previous research, showing diminished mathematics students' achievement on compulsory exams to be linked to interrupted attendance.

2.3 Subject Matter Knowledge of pupils on Mathematics Achievement

Ball,Thames and Phelps (1988) opined that understanding involve a melange of knowledge , beliefs and feeling about the subject. Substantive knowledge include prepositional and procedural knowledge of mathematics - that is, understanding of particular topics (e. g, fractions and trigonometry), procedural (e. g, long division and factoring quadratic equation) and concept (e .g, quadrilateral and infinity), and the relationships among these topics, procedures and concepts. The substantive knowledge of mathematics is what most easily recognised by others as ''Subject Matter Knowledge''

Another critical dimension, however, is knowledge about mathematics. This include understanding about the nature of knowledge in the discipline - where it come from,

how it changes, and how truth is established. Knowledge about mathematics also includes what it means to ‘‘know’’ and ‘‘do’’ mathematics, the relative centrality of different ideas, as well as what is arbitrary or conventional versus what is necessary or logical, and a sense of the philosophical debates within the discipline. Many of these aspect of mathematics are often communicated purely by the absence from traditional mathematical study, example understanding the history of mathematics (Hourigan, 2010).

Barnes (2007) defined subject matter Knowledge as concepts, facts and principles on mathematics with regards to the various topics in the school curriculum. Students having an in depth knowledge on the various topics in the school mathematics curriculum can enhance mathematics achievement. Pupils' performance (Achievement) on mathematics depend on their understanding of mathematical concepts, facts and principles on mathematics test. Fidler (2012) also stressed that not only do pupils understanding of concepts, principles and facts enhance mathematics achievement but also the application of these concepts, facts and principles in any mathematical problem is very necessary and improves performance (Achievement).

Fajemidagba, Salman, and Ayinla (2012) emphasized that the use of appropriate strategies and methods on mathematics test has a positive influence on performance. However, using inappropriate strategy and method on mathematics problems by pupils has a negative influence on mathematics achievement hence low performance. For a very good mathematics achievement, there must be a connection between mathematical concepts, facts, principles and its application in any mathematical problem, a disconnection may result into low achievement (Barnes, 2007).

Illiyas and Antony (2017) opined that, teaching and learning of mathematics essentially helps the students in acquiring essential mathematics knowledge, skills, interests and attitudes. Academic achievement has become an index of child's future in this highly competitive world. Academic achievement has been one of the most important goals of the educational process. Achievement encompasses student ability and performance. Mathematics achievement has influence on the learners' practical use of mathematical subject knowledge.

2.4 Public Schools and Private Schools

The issue of private versus public education has been of great significance both to the developed as well as developing countries. The study of the dynamics that occur between public and private schools is attracting educational researchers around the world. The concept of private and public may also vary depending on different education systems; and, for comparison it should be defined in a broad sense (Akinsolye, Olajumoke, & Olusola, 2015).

Gbenro (2014) defined public schools as those which are owned managed and financed by the state. Public schools have a uniform curriculum at district level, and sometimes even state wide. However, the public school may suffer from funding issues that private schools do not have. On the other hand, according to Bonsu (2016) private schools are those owned, managed and financed by parent association, business, non- profit organization or a religious institution.

In Ghanaian context, the public basic schools include government and community schools, both of which receive full government funding for recurrent costs (some of which are defrayed through the collection of school fees). The only difference between them pertains to the funding of school construction costs: for government

schools construction costs are borne by the government while for community schools they are borne by local communities (Ntim, 2014).

The private sector in Ghana comprises of a great diversity of schools, whose unifying feature is that they all depend almost exclusively on school fees and private contributions to defray both recurrent and capital costs. Although the overwhelming majority of private schools are created by religious and other community organizations, there are now a lot of new schools that are operated by individuals or groups of individuals for profit (Asiedu, 2002). For the purpose of this study, public basic schools are schools which are owned by government and private schools are schools owned by individuals.

2.5 Mathematics Performance between private and public basic school

The study carried out in Nigeria by Olasehinde and Olatoye (2014) compared the performance of pupils in private and public Secondary School Students achievement in Kasina State, Nigeria. The finding revealed that there is a significant difference between public and private school students in mathematics ($t = -3.537, p < 0.05$). The study of Olasehinde and Olatoye (2014) also emphasized that, small class size and school environment in private schools enhance mathematics performance as compared to public schools. Teachers tend to devote more time for teaching of students. In public schools, there is a poor attitude to the teaching (Telu, 2016).

Awan and Zia (2015) conducted a comparative analysis of public and private educational institutions. The findings stressed that private schools are becoming more favourite and attractive for majority of the pupils due to their better performance in mathematics, test criteria and knowledge creation than public schools, which comparatively very cheap but inefficiently losing their attraction. Parents prefer to send their children to private schools and avoid public schools (Ntim, 2014).

Kalagbor (2016) also examined factors that positively influence students' academic performance in public and private secondary schools in River State- Nigeria. The results of the study revealed that pupils in private schools have a higher mathematics performance than students in the public basic schools.In view of that, Crane (2010) opined that for several decades it has been a common belief that private schools do a better job of educating the nation's children than public schools (Ankomah &Warren, 2011).

Azigwe, Adda, Awuni, and Aweligeya (2016) investigated the private school effect on student achievement in mathematics: a longitudinal study in primary schools in Ghana. Students in private schools appear to do better than their peers in public schools. Also Olatoye, Ademola, Agbatogun and Olajumoke (2009) investigated the achievement of pupils in the public and private primary schools in mathematics and science. From the results of the study, parental involvement has a significant effect on mathematics achievement of primary school pupils. Parental involvement is an important predictor of mathematics and science achievement and it is higher in private schools than public schools (Sharlene, 2013).

Alimi, Ethinola and Alabi (2012) investigated school type, facilities and academic performance of students in Senior Secondary Schools in Ondo State, Nigeria. The predominant findings show that Private schools performance in mathematics is higher than public schools. Private schools generally outperform public schools on standardized mathematics test (Ntim, 2014).

Adeyemi (2014) compared pupils' academic performance between the private and public primary schools in mathematics. From the findings of Adeyemi (2014) pupils in the private primary schools performed better than their counterparts in the public schools. Similar research conducted by Gbadegesin and Akinsolye (2015)

compared the academic performance of students in the private and public basic school. The findings revealed that private schools did better in mathematics than their counterparts in public schools. Mathematics teaching is better in private schools than in public schools. Private school pupils also achieve better learning outcomes in mathematics than public schools (Ntim, 2014).

Performance of pupils in private schools especially in mathematics has been found to be persistently higher than that of pupils in public schools. (Azigwe, Adda, Awuni & Aweligeya 2016). The secret is greater commitment, motivation and supervision of teachers (Donkoh, 2014). Private schools performed better in mathematics than public schools in both internal and external examinations. In the Ghanaian educational system, private schools performed better in mathematics than public schools (Asiedu, 2002). There was a paradigmatic shift whereby private basic schools in Ghana began to perform better in mathematics achievement than the public schools (Jimenez & Lockheed, 1995).

Meremikwu and Enukoha (2010) investigated the use of instructional aids, and school variables on pupils' Mathematics achievement in both public and private schools in Cross River State, Nigeria. The results of the analysis showed that pupils' Mathematics achievement was significantly dependent on instructional aids, school type and school location. Private schools achieved significantly higher in mathematics than their counterparts in the public schools. However, in the urban areas, the difference between the mean Mathematics achievement of the pupils in private and public schools was not statistically significant. A similar research on the use of instructional aids by Asiedu (2002) remarked that mathematics achievement of basic school pupils significantly depends on the use of instructional aids.

Yogendra, Shivendra, and Gyan (2016) emphasized that private sector schools are well resourced in terms of facilities and teaching and learning materials and this has positive effect on mathematics achievement. Most public schools are not well resourced with regards to facilities, infrastructure and teaching learning materials (Ntim, 2014). These differences with regards to resources and learning materials in mathematics has affected the performance of private and public schools over the years. Alimi, Ethinola and Alabi (2012) emphasized that there was a significant difference in the facilities available between private and public schools. Private schools tend to have better facilities than public schools in Ghana (Ntim, 2014). Some of these facilities include infrastructure such as school buildings, libraries, and functional latrine, water and electricity. School type and the facilities available in the school make a difference in students' academic performance hence affecting the quality of education in a particular school (Onwuakpa, 1998). These differences in terms of facilities was one of the main reasons why private school students performed significantly better in all subjects including mathematics than government schools (Fabayo, 1999). Khun - Inkeeree, Fauzee and Othman (2016) also noted that there was a difference in mathematics performance between public schools and private schools, private schools shows better performance, as compared to public schools.

Duruji, Azuh, and Oviasogie (2014) emphasized that the quality of infrastructure and learning environmental conditions has strong bearing on mathematics performance among students. Learning infrastructure include the building, furniture, equipment, classroom, library or laboratory contribute to positive learning environment and quality education for both schools and students. The quality of learning facilities available in an educational institution has positive effect on the

quality of teaching and learning activities which in turn leads to the good mathematics performance (Ofosua, 2013).

Amuzu, Ankalibazuk, and Abdulai (2017) stressed that teacher factors that were found to contribute to the low mathematics performance were incidences of habitual lateness and absenteeism to school, inability to complete the syllabi and inadequate exercises. Also, Nwafor (2013) also compared students' academic performance in junior secondary school certificate examination (JSSCE) between public and private Schools in Ebonyi State Nigeria. The results obtained showed that private schools in both urban and rural areas performed better in mathematics than those in public schools(Iddi, 2016).

Amuzu, Ankalibazuk and Abdulai (2017) stressed that a major cause of poor mathematics performance of pupils was ineffective supervision. This awful performance of pupils among public schools had been largely attributed inadequate learning and teaching facilities in addition to inadequate learning environment (Iddi, 2016). The combined effect of these deficiencies which range from poor laboratories, library, classrooms, infrastructure and maintenance of facilities constituted a major hiccup in the quality of learning environment and thus result to poor mathematics performance among public school pupils (Gyan, Gmalifo, & Baffoe, 2014). Private schools performed better than the public schools in mathematics. The percentage performance trend of private schools was higher than those of public schools. Consequently, more parents and guardians who can afford are daily withdrawing their children and wards from the public to the private schools despite its expensive nature. finally stresses that private schools were better in mathematics achievement than public schools(Bonsu, 2016).

Rosado and Seabra (2015) investigated the relative performance of private and public schools. They concluded that private schools outperform public schools, even after controlling for differences in the background of students, not only in terms of scores, but also in terms of higher- high school and college graduation rates. Similarly report by the Ghana National Education Assessment (2016) stressed that private schools performance in mathematics was compared to their counterpart in the public schools, however the performance of pupils in stage four (P4) and stage six (P6) was generally low. They emphasised that although the scores were low for English and Mathematics, mathematics seemed to present a greater challenge to Ghanaian pupils, in both public and private schools.

Okyerefo, Fiaveh and Lamptey (2011) investigated factors promoting pupils' academic performance in privately owned Junior High Schools in Accra, Ghana. The study revealed that there was increasing poor performance of most public schools in Ghana. The finding of Okyerefo, Fiaveh and Lamptey (2011) was also in agreement with the study of Nwafor (2013) who compared students' academic performance in Junior Secondary School Certificate in public and private secondary schools, that private schools performed better than public schools. Nwafor (2013) recommended that students should be actively involved in the learning process and that government should provide opportunities for basic school teachers to attend seminars, and workshops to avail them the opportunity to facilitate instruction in schools.

Kamal, Khan, Khan, Matiullah and Rehman (2017) compared the academic performance of public and private schools' male students on the basis of regularity, Discipline, punctuality and the school environment. They concluded that private schools' students get better academic scores as compared to public schools' students. Private schools' students are more regular, well- discipline, punctual than public

schools' students; and private schools' students utilize their learning opportunities in the best learning environment rather than public schools' students.

Hernandez (2014) conducted a study on the effectiveness of public and private schools from a comparative perspective. The study revealed that, private schools are more effective in terms of performance than comparable public schools with the same students, parents and social composition.

On the contrary, Hendajany (2016) conducted a study on the effectiveness of public verses private schools. The study examines the effectiveness of public verses private schools using the national exit exam of Junior Secondary Schools in Indonesia. The study find evidence that graduates of the public schools have higher scores on the national exit exams than those of the private school controlling a wide variety of students' characteristics and family background.

Frenette and Chan (2015) also conducted a study on academic outcomes of public and private High School Students. The study stressed on the fact that private school students score significantly higher than public school students on reading mathematics and science. The findings also concluded that, the gap in academic performance between between private and public school students can be roughly interpreted as the estimated marginal impact of private school attendance.

Mills and Mereku (2016) conducted a study on students' performance on the Ghanaian Junior High School mathematics with regards to the national minimum standards in the Effutu Municipality. The results revealed in the Effutu Municipality, students in private JHS outperform their counterparts in the public JHS. Recommendations were made for improving the performance of the students, particularly in public schools, who are not reaching proficiency.

Ronguno (2017) also compared the academic performance between public and private secondary school. Ronguno (2017) opined that good performances in private schools have not only attracted many parent but also left the public school wondering what secret could be behind their success. Despite government investing heavily in public schools, not much in terms of performance is yet realised . Most public schools, especially in urban areas, are well staffed. Teachers in public schools are better paid compared to those private schools. The finding of Ronguno (2017) revealed that despite government investing generously public schools, private schools still outshine them. It was clear that private schools perform much better in mathematics than public schools. Similar study was conducted by Tuomo (2017) on management of private and public schools also revealed that private schools has effective administrative structure and management than public schools. The efficient impact of private school management systems improves the performance of students than public schools (Rosado, 2012).

Adamoah and Acquah (2016) determines students' performance in Basic Education Certificate Examination (B.E.C.E), it was revealed that there was a significant difference in the mathematics performance between public and private school. The result shows that, the percentage performance trend of private schools was higher than those of public schools. Consequently more parents and guardians who can afford are daily withdrawing their children and wards from public to fee - paying private primary schools despite it expensive nature. Many of the private schools are growing bigger and fatter at the expense of the public ones whose enrolment is daily dwindling (Iddi, 2016). The findings of Adamoah and Acquah (2016) coincided with the study of Muhammad, Zeeshan, Ashiq and Saba (2016) they conducted a study on educational management in public and private institutions. The findings revealed that, there was much difference in close supervision of students by academic staff of private

institutions than public educational institutions. Muhammad, Zeeshan, Ashiq and Saba (2016) stressed that, close supervision in private schools in terms of academic work has resulted into higher performance in private schools than public schools including mathematics.

2.6 Strategies Used in Solving Mathematical Problems

Mathematical problem is a task or experience which is being encountered by the individual for the first time and, therefore, there is no known procedure for handling it. The individual has to design his/ her own method of solution drawing upon the various skills, knowledge, strategies, and so forth, which have been previously learned. What the individual does in the process of working towards a solution is referred to as problem solving; so the emphasis is not on the answer but on the processes involved (Hoosain, 2004). Tan (2018) defines mathematical problems as non-routine problems that required more than ready-to-hand procedures or algorithms in the solution process. Every mathematical problem has a distinct approach or strategy of solution and this strategy differ from one problem to the other. This strategy or distinct approach for mathematical problems is termed mathematical strategy (Magno, 2011).

Mathematical strategy is defined as a general approach for accomplishing a task or solving a problem that may include sequences of steps to be executed, as well as the rationale behind the use and effectiveness of these steps. Unlike algorithm, which contains a sequence of steps that are intended to be executed in a particular order, a strategy may require a students to make choices based on the specifics of the problem as well as their problem solving goals (Tao, 2005).

Anne and McCallum (2015) maintain that there are numerous strategies for solving mathematical problems, however, students access to multiple strategies, can

help them to approach problems with flexibility, recognizing when to apply specific strategies, how to execute different solution strategies correctly, and which strategies are more appropriate for particular tasks. This can help students develop beyond the memorization of one approach, allowing them to extend their knowledge and think more abstractly.

Meanwhile a strategy can be correct or wrong, correct solution strategies can help deepen students' conceptual understanding and allow students to notice similarities and differences between problem structures and solution strategies. There was no a particular way or strategy that could be used for a particular mathematical problem, however the method or approach used by students may vary depending on the problem posed (Tan, 2018).

Comparing several strategies at once can overwhelm students who are trying to learn many new concepts at one time. Teachers can begin simply by introducing one strategy to students. After students are comfortable with this strategy, teachers may compare that strategy with one or two other new strategies for the purpose of deepening students understanding of the underlying mathematics (Hoosain, 2004). Additional strategies may be introduced after mastering a particular strategy. Often just one alternative strategy will help students acquire a strategic approach to problem solving. Reviewing multiple strategies at once may be useful prior to assessments to remind students of the many solution strategies available to them (Tao, 2005).

Students' use of alternative strategies creates a strong foundation of reasoning skills as students learn to select appropriate solution methods based on the mathematical problems they encounter. Teaching students multiple strategies equip them with an array of tools to use to master state standards (Anne & McCallum, 2015).

Magno (2011) further stressed that, in the process of acquiring knowledge and solving problems individuals must develop and make use of simple to complex strategies. In order for individuals to learn effectively and solve problems, they must use various methods and strategies in order to process information and solve problems at a certain time frame. Most often than not, the use of appropriate strategies were more clearly seen in the way students fulfilled their academic requirements. An important difference between a successful student and the student who is struggling is the way they go about learning and solving problems. Students who are able to use strategies effectively and appropriately are able to be more successful academically. Strategies have also served as tools to determine the strengths and needs of students.

Okpoti, Atteh, Andam, Obeng-Denteh and Amoako (2014) are of the view that if mathematics teachers are able to use the appropriate methods in teaching students such as problem solving strategy in teaching mathematical concepts which involves: Proper understanding and application of mathematics, sequencing lessons in a way that will place the student at the centre of learning and also seeing pattern throughout mathematics and making connections between concepts, this can enhance students' performance on any mathematical task..

The authors observed that students who previously employed the rote (traditional) learning method of solving mathematical problems were discourage and refrained from such methods. The observations made clear that students have putting a stop to their usual 'chew' and 'pour' (memorization and imitation) method of solving mathematical problems as well. The problem solving strategy of teaching through intervention processes has helped the students to now understand the concepts of solving mathematical problems systematically and not relying on the memorized procedures. With the problem solving strategy of teaching and learning, the students

can have the chance of using their own experience to their understanding rather than being delivered to them in an already organised form. Again, students discovered during the intervention that there are often several correct ways of finding a solution to mathematical problem (Okpoti, Atteh, Andam, Obeng-Denteh, & Amoako, 2014).

Jacobs, Clark and Borko (2005) emphasised that the strategy of Posing open-ended and challenging tasks that build on students' prior knowledge are conducive to discussions because they encourage students to think collaboratively and build upon one another's ideas. There are several strategies for solving mathematical problems. These strategies include breaking the problem down into more manageable components and continuously shifting between small- group and whole- group discussions as they work on different components. To further ensure that students with different ability levels would be able to progress successfully though the task.

Abdelkarim and Abuiyada (2016) stressed that there are several strategies for solving mathematical problems, significant among them is peer teaching strategy. They conducted a study on the effect of Peer Teaching on Mathematics Academic Achievement of the undergraduate students in Oman. The result of the study found that peer teaching strategy is an active tool to increase the mathematical achievement. The study recommended that instructors and college professors to use peer teaching in order to improve the performance of the students in mathematics.

Similarly according to Lacaba, Magalona and Lacaba (2018) peer tutoring is the instructional strategy were students are trained on how to work in pairs with their partner to improve their overall knowledge. Peer tutoring allows students to proceed with the content material at their own pace. It also provides separate time for the individual mastery of each student in the tutoring pair. The findings of Lacaba, Magalona and Lacaba (2018) revealed that peer teaching strategy was effective

intervention that had positive effect in increasing the proficiency level in mathematics. It shows enormous positive impact for both the teacher and the pupils learning development and solving mathematical problems. Finally students who participated in peer teaching significantly outperform those students who participated in teacher-guided note.

Nawaz and Rehman (2017) examine the effects of peer tutoring as a strategy on students success in the subject of mathematics, it was an experimental study. The study revealed that there was a significant difference between the pre - test and post - test of the experimental and control group. Nawaz and Rehman (2017) concluded that peer tutoring made a positive effect on students' mathematics achievement. The study provided a strong base to recommend that peer tutoring should be applied on regular basis as a strategy on mathematical problems.

Jacobs, Clarke and Borko (2005) investigated the impact of teaching strategies and teacher effect on students' academic achievement of students. Two different strategies, one with demonstration strategy using working models and other with lecture strategy were adopted. Demonstration strategy was found to be significantly better than lecture strategy. It was established from the findings that demonstration strategy had produced significantly better academic achievement among students.

Roh (2003) problem based learning as a strategy learning environment where problem derive learning. That is learning begins with a problem to be solved, and the problem is posed in such a way that students need to gain new knowledge before they can solve the problem. Rather than seeking a single correct answer, students interpret the problem, gather needed information, identify possible solutions, evaluate options

and present conclusions. Students successful experiences in managing their own knowledge also help them solve mathematical problem well.

The study of Roh (2003) was also consistent with the study of Adani, Eskay and Onu (2012) who investigated the effectiveness of problem based learning strategy (instructional method) in teaching the concepts of mathematics at the middle school level. The major finding of the study reveals that problem based learning method of teaching is more effective for teaching and solving mathematical problem. By adopting problem based method (strategy) teaching mathematics teacher can create a number of creative thinkers, critical decision makers, problem solvers which is very much needed for competitive world. Authur (2017) emphasised that problem based learning instructional strategy had effect on content knowledge of students which provides greater opportunities for the learners to learn a content with more involvement and increase students active participation, motivation and interest among learners. This leads the learner to have positive attitudes towards mathematics and help them to increase their achievement to a large extent and which will lead to long term memory.

2.7 Summary

Mbugua, Muthaa, and Nkonke (2012) stressed that several factors have been identified as hampering academic work and pupils' mathematics performance in both private and public basic schools. Abdullahi and Adamu (2014) revealed that academic performance is better in private schools than public schools. This was also similar to the findings of Ntim (2014) that private schools performed better than public schools especially in mathematics.

The study adapted the conceptual framework of Barnes (2007). This framework was based on the fact that, the subject knowledge of pupils has positive influence on mathematics achievement. This subject matter knowledge composed of concepts, facts

and principles underlying each topic in basic school mathematics curriculum. The study reviewed literature on the concepts of mathematics achievement, subject matter knowledge on mathematics achievement, strategies used in mathematics achievement, public and private basic schools' performance on mathematics.

Noorelawati and Masitah (2014) investigated the strategies used in solving algebra by secondary school students. The findings revealed that the majority of the participants only acquired instrumental understanding rather than rational understanding in their algebraic lessons. Participants also mention memorising quadratic formula without really understanding how the formula was derived. This suggested that teachers might be using a traditional method (strategy) of teaching in informing students about the quadratic formula, and it may be a typical procedure for the teacher to do the explaining and to give the necessary information to be used by students in solving a given question. They recommended that, it might be a better alternative to assign students into groups to explore how the quadratic formula is derived and present their findings to the class. It is our view that students better remember knowledge they acquired through self- discovery.

CHAPTER 3

METHODOLOGY

3.0 Overview

This chapter discusses the research design, population and sample as well as sampling procedures. It also covers the research instrument used and procedure for data collection. Finally, the method of data analysis was also discussed.

3.1 Research Design

Research design refers to a distinct plan on how a research problem will be attacked. It is also defined as the plan, structure and strategy of investigation conceived so as to obtain answers to research questions (Omari, 2011).

In this study, the researcher employed a survey research design. Surveys are designed to obtain information concerning the current status of phenomena. They are directed towards the nature of situation as it exists at the time of the study and they

focus in determining the status of a defined population with respect to certain variables. It is concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing. Survey describes data and characteristics about the population or phenomenon being studied. Survey answers questions like who, what, when, where and how (Best & Khan, 2006).

Survey research can be either quantitative or qualitative. It can involve collections of quantitative information that can be tabulated along a continuum in numerical form such as scores on test. In quantitative research, the researcher is ideally an objective observer who neither participates in nor influence what is being studied. Furthermore, the quantitative field studies also limit the research to particular context (Creswell, 2014). This study employed quantitative approach for data collection. The study explored and analyzed the issues with regards to mathematics achievement of private and public schools.

3.2 Population

The target population is the large group of people, which has one or more characteristics in common on which the research study will be focused (Kothari, 2004). The population targeted in this study was pupils from JHS3 in both private and public basic schools at Chorkor in the Accra metropolis. In all there were ten (10) private and five (5) public schools in the Chorkor Circuit of the Accra Metropolis. A total of six hundred and seventeen (617) pupils from both private and public schools.

3.3 Sample

Chorkor circuit is an area with ten private schools and five public schools, approximately there were 617 students from both private and public basic schools in JHS 3. Five private schools were selected with the five public schools in the circuit. A

sample size of four hundred and fifty – three (453) students from both private and public basic schools were selected for the study. One hundred and sixty-nine (169) pupils and two hundred and eighty-four (284) were selected from both private and public schools respectively.

3.4 Sampling Procedures

The study used two types of sampling procedures which were purposive and simple random sampling. Purposive sampling means that respondents were chosen on the basis of their knowledge of the information desired (Alvi, 2016). Moreover, random sampling was used in choosing sample unit from the entire population of private and public school pupils. To avoid bias when choosing pupils as part of the sample, pieces of paper labelled Yes or No were put in a box, the pupils were allowed to pick a piece of paper from the box. Those who picked papers written 'Yes' were involved in the sample. This was done because in random sampling procedure, each member of the population in the group had an equal chance of being selected (Cohen, 2000). The five private schools were purposively selected because some of the private schools don't have Junior High School and also Junior High School form three class (JHS3), therefore purposive sampling technique was necessary for the selection of the five private schools for the study. All the five public schools were selected since they all have Junior High School and also Junior High School form three class (JHS3). Hence the study constitute five private and five public schools in the Chorkor Circuit of the Accra Metropolis.

The study also adopted a proportional representation for the selection of samples from each school and this was done before choosing the sample from each class. Proportional representation was very necessary in this study, since the schools in the Chorkor Circuit of the Accra Metropolis do not have the same number of pupils in each

class. There was the need to take a proportional representation of the various schools in the metropolis depending on the number of pupils in each class.

With the concept of proportional representation, calculations were based on the total population of JHS3 pupils in public and private schools in the Chorkor Circuit of the Accra Metropolis which was 617 and a sample of 453. The number of pupils selected from each school was based on the number of pupils in each class. That is the number of pupils selected from each class is proportional to the total number of JHS3 pupils in a particular school, hence the term proportional representation. The number of pupils selected from each school sum up to 453 pupils which forms the sample of the study. Selecting pupils from each class, the researcher took the total number of pupils in each class divided by the total population (617), multiplied by the sample (453) for the study. This calculation was done for all the ten schools involved in the study (five private schools and public schools). The number of pupils from each school based on the concept of proportional representation, put together represented the sample for the study (453). The sample represent more than seventy percent (70) of the total population, this was large enough for the study. The sample (453) selected for the study was also in line with the study of Lumpur and Taherdoost (2016) that the sample of every population should be large enough to represent the population of a study.

$$\text{Sample from Each School} = \frac{\text{No. of students in Class}}{\text{Total Population}} \times \text{Sample (for the study)}$$

The selected pupils from the various classes (that is from private and public school) by proportional representation, constitute the sample of the study that is Four Hundred and Fifty- Three (453). Out of the 453 students which forms the sample of the study, we have One Hundred and Sixty-Nine (169) from private school and Two Hundred and Eighty-Four (284) from public schools.

3.5 Research Instrument

Standardized achievement test was the instrument for the study. The standardized achievement tests were administered to JHS3 students of both private and public basic schools in the metropolis. The achievement test was made up of five subjective questions, some of the questions have sub questions. To achieve standard questions, each achievement test was selected in reference to the topics in the teaching syllabus of the Ghana Education Service. The topics were also selected based on specific concepts in the teaching syllabus. The pupils were tested on the concepts of sets, linear graph, polygons, area, linear inequalities and linear equations, percentages and statistics. The marks from the achievement test and the item analyses with regards to public and private basic schools were meant to answer the research questions appropriately.

3.6 Pilot Testing

Pilot-testing in research plays a key role in ensuring the research instrument assist in elimination of vague and incomprehensible items to ensure relevant data is collected for use in the research. Pilot testing of the research instruments was done to make the instrument reliable (Wachira, 2016). In this study, the mathematics achievement test was pilot tested in two schools away from the geographical area from which the research was conducted. This helps to avoid contamination of respondents. The objectives of the pilot testing were: To establish clarity, meaning and comprehensibility of each item in the tests, to validate the instruments by cross checking their validity and reliability and to gain basic administrative experience in conducting the research in preparation for the actual study.

3.7 Validity and Reliability

Reliability and validity are very important in research because the credibility of the research study depends on the reliability of data, methods of data collection and also on the validity of the findings (Cohen, 2000).

3.7.1 Validity of Achievement Test

To establish validity of the instrument employed, the researcher conducted a pilot test prior to the actual data collection. The achievement test was also given to colleague teachers at the Chorkor circuit of the Accra Metropolis to ensure face validity. The instrument was presented to the supervisor and other researchers in academia for further comments and improvement hence all necessary adjustments were made, this also help the researcher to ensure content validity of the achievement test. This was also done to ensure that items which were found unsuitable were removed or replaced.

3.7.2 Reliability of Achievement Test

To ensure reliability of collected information, the test items, which were meant for the study, were administered to students in a similar geographical area by team of invigilators. This was done more than once to see if there was understanding and consistency in their responses (answers). This was in line with literature as Thatcher (2012) denoted that reliability is the extent to which an instrument will generate the same data after multiple applications. The tendency toward consistency found in repeated measurements is referred to as reliability (Dennick &Tavakol, 2011).

3.8 Data Collection Procedure

The researcher went to introduce himself and explain the purpose of the study to the Municipal Director of Education in charge of Accra Metropolis without any introductory letter. The Municipal Director Accra Metropolis requested for an

introductory letter from the researcher's institution of which he did. At the Accra Metro Education Office, the director asked the researcher to apply officially. These letters were personally handed over to them and approval given to carry out the pilot study and the actual study. The head teachers, and circuit supervisor in charge of Chorkor circuit were briefed about the purpose and the implications of the study. They were also assured that any information they gave were going to be kept confidential.

The students were informed through the head teachers of the various basic schools about the date, time and duration for the achievement test. Mathematics teachers in the various schools assisted the researcher to invigilate the test. Mathematics Achievement Test was administered to pupils and the test lasted for an hour and twenty minutes. The test was meant to assess the performance of both private and public basic school pupils with regards to mathematics in the metropolis.

3.9 Data analysis Procedures

According to Kothari (2004) data analysis is the process of editing, coding, classification and tabulation of collected data. The data collected was coded and analyzed using descriptive statistics. This involved presentation of statistical data in the form of frequency distribution tables and percentages. Percentages have a considerable advantage over more complex statistics because they are easy to interpret.

Finally, data from the item analysis was categorized into themes to extract relevant information. This helped the researcher to make description of the data collected from the field based on the research objectives and derived conclusion on what to take regarding its usefulness. The analysis and discussion of the data was done according to the research questions. Each research question was first stated and then findings were presented. Responses for question one and two were analyzed with the help of frequencies, and percentages with regard to the item analysis.

3.10 Item Analysis on Mathematics Achievement Test

In all the four hundred and fifty- three (453) scripts that were collected from the students (from, both private and public schools) were analyzed one after the other. Each question (item) was taken into consideration with regards to how it was solved by pupils. Themes were formed in relation to the way the tests were solved. This was done to ascertain the number of students that were able to fall under each theme depending on the concept, skill, and behavioural characteristics exhibited by the students. The table for the item analysis shows the frequencies and percentages under each theme. Some of the themes were different from each other and others were also similar in characteristics. Descriptive statistics was used to analyze such data based on the differences and similarities. The various tables constructed from the item analysis and the data obtained from the Statistical Package for the Social Scientist (SPSS) were presented in chapter four of this study.

3.11 Ethical procedures

This helps to ensure that good image of research enterprise in the world to be maintained (Omari, 2011). The Municipal Director Accra Metropolis requested for an introductory letter from the researcher's institution of which he did. At the Accra Metro Education Office, the director asked the researcher to apply officially. These letters were personally handed over to them and approval given to carry out the pilot study and the actual study.

The heads of the basic schools required the researcher to ensure that participants were aware of the purpose of the study so as to get their concern and participate freely. The statement of the research purpose and description of confidentiality were assured to respondents.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.0 Overview

This study investigates pupils' strategies on mathematics performance (Achievement) of private and public basic school pupils at Chorkor in the Accra Metropolis. The study was guided by three specific objectives and research questions. The first objective was to identify the strategy used by public school pupils to solve mathematics achievement test. The second objective was to identify the strategy used by private school pupils to solve mathematics achievement test. The third objective was meant to compare the difference in students' mathematics performance between public and private schools. The study took place at Chorkor, a town in Accra Metropolis. In line with the research objectives, the following research questions were formulated:

1. What strategies did public school pupils' use to solve mathematics achievement test?
2. What strategies did private school pupils' use to solve mathematics achievement test?
3. Is there any difference in mathematics performance between public and private basic school pupils in the Chorkor Circuit of the Accra Metropolis?

The presentation of data and findings on the main issues were juxtaposed with existing literature in the form of discussions to establish the extent of agreement or

disagreement between present study and existing literature on private and public schools' performance in mathematics.

4.1 Research Question 1

What strategies did public school pupils' use to solve mathematics achievement test?

The item analysis on mathematics achievement test of public school pupils was meant to answer the research question one. This was meant to answer how public school pupils attempted or solved mathematics achievement test. The item analysis on mathematics achievement of public school pupils was tabulated in accordance to each achievement test.

Item One

Item one on the Achievement test basically is on set where pupils were supposed to list a subset of a universal set and also a universal set. Pupils were supposed to describe set *P, Q,* and *R* as the subset of the universal set and also intersection of sets. This question was quite a challenge to public school pupils as most of them listed elements that do not belong to the main universal set. The following strategies were used by the pupils:

1. Defining elements in the Universal set U.
2. Description of elements of set P, Q and R.
3. Intersection of sets.

Table 4.1: Shows Subset of the Universal Set

THEME	FREQ	%
Subset Correctly listed	28	10
Subset Wrongly listed	87	31
Wrong Definition of Set	63	22
Failed to attempt Question	106	37

TOTAL	284	100

Field Data 2018

As in Table 4.1, Twenty-eight pupils (n=28, 10%) listed the correct element in subset P, Q, and R which was quiet insignificant as compared to the number of public school pupils. Eighty-seven of the students (n=87, 31%) listed the subset set wrongly, that is they could not define exactly members in the universal set. Sixty-three pupils (n=63, 22%) define element in set P, Q, and R wrongly. One Hundred and six pupils (n=106, 37%) failed to attempt the question and this was very significant.

Table 4.2: Shows Intersection and Relationship of Set

THEME	FREQ	%
Correct Intersections and Relationship of Set	24	9
Wrong Intersections and Relationships of Set	91	32
Unable to Write Intersections and Relationship	63	22
Failed to Attempt Question	106	37
TOTAL	284	100

Field Data 2018

In Table 4.2, only twenty-four pupils (n=24, 9%) could state the correct intersections and relationship of set P, Q, and R. Ninety-one pupils (n=91, 32%) had the intersection and relationship of wrong. Sixty-three pupils (n=63, 22%) were unable to write the intersections and relationship of P, Q, and R

Item Two

Item two is on coordinate system and graph. A larger proportion of public school pupils were able to demonstrate good understanding of the concept of scale. This question was attempted by all the students in the public school. Public school pupils had a challenge locating a point in the Cartesian plane as most of them located points

wrongly in the Cartesian plane. This was very evidence as most public school pupils could not identify the X – coordinate from the Y – coordinate. Most public school pupils were unable to complete the graph. Some pupils plotted the points correctly but failed to draw the graph. The following solution strategies were used by public school pupils:

1. Substitution
2. Solving
3. Graphing by plotting all the coordinates (X and Y)

Table 4. 3: Choosing of Scale

THEME	FREQ	%
Correct Scale	176	62
Wrong Scale	79	28
Unable to Provide Scale	29	10
Failed to Attempt Question	0	0
TOTAL	**284**	**100**

Field Data 2018

In Table 4.3, most of the students, that is one hundred and seventy- six pupils (n=176, 62%) had their scale correct. Seventy-nine pupils (n=79, 28%) had their scale wrong for the graph. Twenty-nine pupils (n=29, 10%) were unable to provide scale for the graph.

Table 4.4: Plotting of Points

TOTAL	284	100
Correct Points Plotted	95	33
Wrong Points Plotted	92	32
Unable to Plot Points	97	35
Failed to Attempt Questions	0	0
TOTAL	**284**	**100**

Field Data 2018

In Table 4.4, ninety-five pupils (n=95, 33%) plotted points correctly in the Cartesian plane. Ninety-two (n=92, 32%) plotted points wrongly in the Cartesian plane. Ninety-seven pupils (n=97, 35%) were unable to plot point in the Cartesian plane.

Table 4.5: Drawing and Completing of Graph

THEME	FREQ	%
Able to Complete Graph	83	29
Unable to Complete Graph	100	36
Able to Draw Line Graph	45	16
Unable to Draw Line Graph	56	19
Failed to Attempt Question	0	0
TOTAL	**284**	**100**

Field Data 2018

As in Table 4.5, eighty-three of the pupils (n=83, 29%) completed the graph work. Forty-five pupils (n=45, 16%) were able to draw line graph correctly. Fifty-six pupils (n=56, 19%) were unable to draw line graph. A larger proportion of hundred pupils (n=100, 36%) students out of two hundred and eighty – four (284) were unable to complete graph and this was very significant.

Item Three

Item three is on polygons, three exterior angles of a pentagon was given and pupils were supposed to find the size of the other two angles. The following strategies were used by pupils:

1. Representing the unknown by a variables in the equation
2. Equating the sum of the exterior angles to 360
3. Solving

Table 4.6: Shows Formation of Equation

TOTAL	**284**	**100**
Forming Correct Equation for Exterior Angles	65	23
Forming Wrong Equation for Exterior Angles	82	29
Unable to Write Equation for Exterior Angles	95	33
Failed to Attempt Question	42	15
TOTAL	**284**	**100**

Field Data 2018

In Table 4.6, sixty-five (n = 65 23%) form correct equation for exterior angles of a polygon, eighty-two (n=82, 29%) form wrong equation, ninety-five (n =95, 33%) were unable to write correct equation and forty-two (n =42, 15%) failed to attempt the question.

Table 4.7: Simplifying Equation

THEME	FREQ	%
Equation Simplified Correctly	48	17
Equation Simplified Wrongly	77	27
Unable to Simplified Equation	88	31
Failed to Attempt Question	71	25
TOTAL	**284**	**100**

Field Data 2018

In Table 4.7, most of the public school pupils had challenges simplifying the equation, and solving for a variable. Pupils were unable to add or subtract simple integers as well as grouping of like terms. Only forty-eight pupils (n=48, 17%), simplified equation correctly. Seventy-seven pupils (n=77, 27%) simplified equation wrongly. However, eighty-eight pupils (n=88, 31%) were unable to simplify the equation and finally seventy-one pupils (n=71, 25%) failed to attempt the question, and which was very significant. Pupils' inability to simplify, solve and group like terms correctly resulted in most of them getting the final answer wrong.

Table 4.8: Presentation of Answer

THEME	FREQ	%
Correct Answer	45	16
Wrong Answer	168	59
Failed to Attempt Question	71	25
TOTAL	**284**	**100**

Field Data 2018

In Table 4.8, sixteen (16) percent of the pupils had the final answer correct whereas fifty-nine (59) percent had the answer wrong.

Item 3c

Item three (3c) is on area of rectangles, pupils were supposed to form equation connecting the length and width of a rectangle and hence find the width and area of the rectangle. The pupils used the following strategies:

1. Formula for area and perimeter of a rectangle
2. Illustration (drawing a diagram)
3. Substituting one equation into another
4. Solving

Table 4. 9: Shows Equation for Area and Width

THEME	FREQ	%
Correct Equation for Area and Width	67	24
Wrong Equation for Area and Width	51	18
Unable to Write Equation	82	28
Failed to Attempt Questions	84	30
TOTAL	**284**	**100**

Field Data 2018

In table 4.9, the concept of area, and calculation of width was a challenge to public school pupils as most of them were unable to write the equation involving area and width in the context in which the question was posed. Sixty-seven pupils (n=67,

24%) were able to form the correct equation for area and width, fifty-one (n=51, 18%) had the equation wrongly and eighty-two pupils (n=82, 28%) were unable to write the equation. However, eighty-four pupils (n=84, 30%) failed to attempt the question.

Item Four

1. Identifying the lowest common multiples
2. Multiplication
3. Simplifying
4. Solving
5. Illustration (answer on the number line)

Table 4.10: Shows Multiplying Equation with the L.C.M

THEME	FREQ	%
Multiplying Correctly by the L.C.M	205	72
Multiplying Wrongly by the L.C.M	55	19
Unable to Multiply by the L.C.M	24	9
Failed to Attempt to Question	0	0
TOTAL	**284**	**100**

Field Data 2018

In Table 4.10, public school pupils were to solve a linear equation where the denominator was a fraction. Pupils were supposed to multiply through by the appropriate Lowest Common Multiple (L.C.M). Most public school pupils could not group like terms of the equation.

In Table 4.10, majority of the public school pupils were able to multiply through by the Lowest Common Multiple (L.C.M). Two hundred and five pupils (n=205, 72%) were able to multiply the equation by the correct lowest common multiple. Fifty-five (n=55, 19%) of the pupils could not multiply the equation correctly by the lowest

common multiple. Twenty-four (n=24, 9%) were unable to multiply by the lowest common multiple though they were using other method which was not appropriate.

Table 4. 11: Shows Students' Ability to Group like Terms

THEME	FREQ	%
Like Terms Grouped Correctly	193	68
Like Terms Grouped Wrongly	58	20
Unable to Group Like Terms	33	12
Failed to Attempt Question	0	0
TOTAL	**284**	**100**

Field Data 2018

In Table 4.11, collecting variables at one side and also numbers at another side with their appropriate signs was a challenge to some public school pupils, though (n=193, 68%) of pupils grouped like terms correctly. Twenty percent (n=58, 20 %) could not group like terms correctly while (n=33, 12%) were unable to group like terms. All pupils from public schools attempted the question.

Table 4.12: Shows Illustration of Answer on the Number Line

THEME	FREQ	%
Answer Illustrated Correctly on the Number Line	160	56
Answer Illustrated Wrongly on the Number Line	94	33
Unable to Illustrate Answer on the Number Line	30	11
Failed to Attempt Question	0	0
TOTAL	284	100

Field Data 2018

In Table 4.12, though majority of the pupils solve the equation correctly, some of the pupils could not represent the answer on the number line. One Hundred and sixty pupils (n=160, 56%) were able to represent the answer on the number line. Ninety four

pupils (n=94, 33%) illustrated the answer on the number line wrongly, eleven (n=30, 11%) were unable to represent the answer on the number line.

Item 4b

Item 4b is on percentages, pupils were supposed to find the percentage of a given quantity. They were also supposed to apply the concept of percentage. The following strategies were used by the pupils:

1. Identifying a percentage as a fraction of another quantity
2. Changing a percentage into decimal fraction
3. Multiplication of decimal fraction by a quantity
4. Finding the percentage of a quantity

Table 4.13: Converting Numbers into Percentages

THEME	FREQ	%
Correctly converting numbers into percentages	92	32
Wrongly converting numbers into percentages	67	24
Unable to convert numbers into percentages	56	20
Failed to Attempt Question	69	24
TOTAL	**284**	**100**

Field Data 2018

As in Table 4.13, question four was a challenge to most pupil as sixty-nine of the pupils (n=69, 24%) failed to attempt the question. Ninety-two of the pupils (n=92, 32%) can convert numbers into percentages, while sixty-seven (n=67, 24%) wrongly converted numbers into percentages. Fifty-six pupils (n=56, 20%) were unable to convert numbers into percentages.

Table 4.14: Application of Proportion

THEME	FREQ	%
Correct Application of Proportion	65	23
Wrong Application of Proportion	77	27
Unable to Apply the concept of Proportion	73	26
Failed to Attempt Question	69	24
TOTAL	284	100

Field Data 2018

As in Table 4.14, pupils could not apply the concept of proportion. Only Sixty-five pupils (n=65, 23%) could apply the concept of proportion. Seventy-seven pupils (n=77, 27%) could not apply the concept of proportion, seventy-three pupils (n=73, 26%) were unable to apply the concept of proportion and sixty- nine (n=69, 24%) failed to attempt the question.

Item Five

Item five consist of a frequency distribution table showing marks and frequency of pupils in a class. Pupils were supposed to draw a bar chart and also calculate the mean mark for the distribution. The following strategies were used by the pupils:

1. Displaying data on frequency tables
2. Multiplication of marks (x) and frequency (f)
3. Drawing of bar chart
4. Calculating mean

Table 4.15: Choosing Appropriate Scale for Graph

THEME	FREQ	%
Correct Scale	201	71
Wrong Scale	59	21
Unable to Provide Scale	24	8
Failed to Attempt Question	0	0
TOTAL	284	100

Field Data 2018

In Table 4.15, most public school pupils understood the concept of scale and were able to choose the correct scale for the graph work. Two hundred and one pupils (n=201, 71%) chose the correct scale for the graph work in question five. Fifty-nine pupils (n=59, 21%) chose a wrong scale for the graph work, twenty four pupils (n=24, 8%) were unable to provide a scale. All pupils attempted the question.

Table 4.16: Drawing of Bar Chart

THEME	FREQ	%
Bar Chart Correctly Drawn	101	36
Bar Chart Wrongly Drawn	62	22
Unable to draw Bar Chart	30	10
Unequal Spaces between Bars	35	12
Others	56	20
Failed to Attempt Question	0	0
TOTAL	284	100

Field Data 2018

As in Table 4.16, one hundred and one pupils (n=101, 36%) could draw the bar chart correctly, sixty-two (n=62, 22%) had it wrong. Thirty-five pupils (n=35, 12%) provided unequal spaces between the bars, thirty pupils (n=30, 10%) were unable to draw the bar chart. Fifty-six pupils (n=56, 20%) represent others.

Table 4.17: Calculating Mean from Frequency Distribution Table

THEME	FREQ	%
Mean correctly calculated	145	51
Mean wrongly calculated	73	26
Unable to calculate Mean	66	23
Failed to Attempt Question	0	0
TOTAL	284	100

Field Data 2018

In Table 4.17, one hundred and forty-five pupils (n=145, 51%) calculated the mean from the frequency distribution correctly, seventy-three pupils (n=73, 26%) had it wrong, and sixty six pupils (n=66, 23%) were unable to calculate for the mean.

4.2 Research Question 2

What strategies did private school pupils' used to solve mathematics achievement test?

The item analysis on mathematics achievement test of private school pupils was meant to answer the research question two. This was meant to answer how private school pupils attempted or solved mathematics achievement test. The item analysis on mathematics achievement of private school pupils was tabulated in accordance to each item.

Item One

Item one basically is on set, this question was quite a challenge to private school pupils as some of them listed element that do not belong to the universal set. Pupils were supposed to describe set $P, Q, and\ R$ as the subset of the universal set and also intersection of sets. The pupils used the following strategies

1. Defining elements in the Universal set U.
2. Description of elements of set P, Q and R.
3. Intersection of sets.

Thirty-nine pupils (n=39, 23%) could not define the element in the universal set. Twenty-six pupils (n=26, 15%), define set P, Q, and R wrongly, that is they could not define exactly members in the universal set. Finally, a proportion of the fifty-nine pupils (n=59, 35%), define element in set P, Q, and R correctly. Forty-five pupils (n=45, 27%) failed to attempt the question and this was also quite a significant number as compared to the total number of private school pupils as shown in the table 4.18.

Table 4.18: Subset of a Set

THEME	FREQ	%
Subset Correctly listed	59	35
Subset Wrongly listed	39	23
Wrong Definition of Set	26	15
Failed to attempt Question	45	27
TOTAL	169	100

Field Data 2018

In Table 4.18, thirty – nine pupils (n =39, 23%) could not define element in the subset correctly. Twenty – six pupils (n =26, 15%) defines correctly elements in the universal set. Forty- five pupils (n=45, 27%) failed to attempt the question.

Table 4.19: Intersection and Relationship of Set

THEME	FREQ	%
Correct Intersections and Relationship of Set	55	33
Wrong Intersections and Relationships of Set	44	26
Unable to Write Intersections and Relationship	25	15
Failed to Attempt Question	45	26
TOTAL	169	100

Field Data 2018

In Table 4.19, only fifty-nine pupils (n=55, 33%), could state the correct intersections and relationship of set P, Q, and R. Forty-four (n=44, 26%) pupils could not state correct intersections and relationship of set P, Q, and R. Twenty-five pupils (n=25 15%) were unable to write the intersections and relationship of set P, Q, and R.

Item Two

Item two is on coordinate system and graph. A larger proportion of private school pupils were able to demonstrate good understanding of the concept of scale. In Table 4.20, majority of private school pupils do not have any challenge in locating a point in the Cartesian as most of them were able to located points correctly in the Cartesian plane. This was very evidence as most private school pupils could identify the X – coordinate from the Y – coordinate. The following strategies were used by pupils:

1. Substitution
2. Solving
3. Graphing by plotting all the coordinates (X and Y)
4. Graphing using x and y intercepts

Table 4.20: Choosing of Scale

THEME	FREQ	%
Correct Scale	152	90
Wrong Scale	14	8
Unable to Provide Scale	3	2
Failed to Attempt Question	0	0
TOTAL	**169**	**100**

Field Data 2018

In Table 4.20, one hundred and fifty-two pupils (n=152, 90%) had their scale correct. Only fourteen pupils (n=14, 8%) had their scale wrong for the graph. Three (n=3, 2%) of the private school pupils were unable to provide scale for the graph. This question was attempted by all the students in private school.

***Table 4.21*: Plotting of Points**

THEME	FREQ	%
Correct Points Plotted	97	58
Wrong Points Plotted	43	25
Unable to Plot Points	29	17
Failed to Attempt Questions	0	0
TOTAL	**169**	**100**

Field Data 2018

In Table 4.21, ninety-seven (n=97, 58%) plotted points correctly in the Cartesian plane. Forty-three pupils (n=43, 25%) plotted points wrongly in the Cartesian plane. Only twenty-nine pupils (n=29, 17%) were unable to plot point in the Cartesian plane.

***Table 4.22*: Completing of Graph**

THEME	FREQ	%
Able to draw line Graph	116	77
Unable to Draw Line Graph	53	31
Failed to Attempt Question	0	0
TOTAL	**169**	**100**

Field Data 2018

In Table 4.22, most private school pupils were able to complete the graph, majority of them had the idea of line graph. Only few pupils plotted the point correctly but failed to draw the graph. Ninety-one private school pupils (n=91, 54%) completed the graph work. Twenty-five pupils (n=25, 15%) were able to draw line graph correctly. Thirteen pupils (n=13, 8%) were able to draw line graph. Forty pupils (n=40, 23%) were unable to complete graph.

Item Three

1. Representing the unknown by a variables in the equation

2. Equating the sum of the exterior angles to 360

3. Solving

Table 4.23: Shows Students Ability to Simplify Equation

THEME	FREQ	%
Equation Simplified Correctly	98	58
Equation Simplified Wrongly	31	18
Unable to Simplified Equation	21	13
Failed to Attempt Question	19	11
TOTAL	169	100

Field Data 2018

In Table 4.23, most of the private school pupils were able to simplified equation correctly, and solving for a variable. Only few pupils were unable to add or subtract simple integers as well as grouping of like terms. Ninety-eight pupils (n=98, 58%) simplified equation correctly. Thirty-one pupils (n=31, 18%) simplified equation wrongly. However, twenty-one pupils (n=21, 13%) were unable to simplify the equation and finally nineteen pupils (n=19, 11%) failed to attempt the question and this was quiet insignificant.

Table 4.24: Forming Equation for Exterior Angles

THEME	FREQ	%
Forming Correct Equation for Exterior Angles	84	50
Forming Wrong Equation for Exterior Angles	39	23
Unable to Write Equation for Exterior Angles	30	18
Failed to Attempt Question	16	9
TOTAL	169	100

Field Data 2018

In Table 4.24, eighty-four pupils (n=84, 50%) form equation correctly. Thirty-nine pupils (n=39, 23%) could write the equation in relation to the question posed, thirty pupils (n=30, 18%) were unable to form equation for exterior angle. However, sixteen pupils (n=16, 9%), failed to attempt the question.

Item 3c

The pupils used the following strategies:

1. Identifying the formula for area and perimeter of a rectangle

2. Illustration (drawing a diagram)

3. Substituting one equation into another

4. Solving

Table 4.25: Equation for Area and Width

THEME	FREQ	%
Correct Equation for Area and Width	78	46
Wrong Equation for Area and Width	40	24
Unable to Write Equation	29	17
Failed to Attempt Questions	22	13
TOTAL	169	100

Field Data 2018

In Table 4.25, the concept of area, and calculation of width was a challenge to private school pupils as most of them were unable to write the equation involving area and width in relation to the question posed. Seventy-eight pupils (n=78, 46%) were able to form the correct equation for area and width, forty pupils (n=40, 24%) had the equation wrong and twenty-nine pupils (n=29, 17%) were unable to write the equation. However, twenty-two (n=22, 13%) of the pupils failed to attempt the question.

Item Four

1. Identifying the lowest common multiples

2. Multiplication

3. Simplifying

4. Solving

5. Illustration (answer on the number line)

Private school pupils were given a linear equation where the denominator was a fraction. Pupils were supposed to multiply through by the appropriate Lowest Common Multiple (L.C.M). Majority of the private school pupils were able to multiply through by the Lowest Common Multiple (L.C.M).

Table 4.26: Multiplying Equation with the L.C.M

THEME	FREQ	%
Multiplying Correctly by the L.C.M	141	83
Multiplying Wrongly by the L.C.M	22	13
Unable to Multiply by the L.C.M	6	4
Failed to Attempt to Question	0	0
TOTAL	**169**	**100**

Field Data 2018

In Table 4.26, one hundred and forty-one pupils (n=141, 83%) were able to multiply the equation by the correct lowest common multiple. Twenty-two pupils (n=22, 13%) could not multiply the equation correctly by the lowest common multiple. Six pupils (n=6, 4%) were unable to multiply by the lowest common multiple.

Table 4.27: Grouping like Terms of an Equation

TOTAL	**169**	**100**

Like Terms Grouped Correctly	130	77
Like Terms Grouped Wrongly	27	16
Unable to Group Like Terms	12	7
Failed to Attempt Question	0	0
TOTAL	169	100

Field Data 2018

In Table 4.27, one hundred and thirty pupils (n =130, 77%) grouped like terms correctly. twenty-seven pupils (n = 27, 16%) could not group like terms correctly, twelve pupils (n = 12, 7%) were unable to group like terms.

Table 4.28: Illustrating Answer on the Number Line

THEME	**FREQ**	**%**
Answer Illustrated Correctly on the Number Line	104	62
Answer Illustrated Wrongly on the Number Line	42	24
Unable to Illustrate Answer on the Number Line	23	14
Failed to Attempt Question	0	0
TOTAL	169	100

Field Data 2018

In Table 4.28, though majority of the pupils solve the equation correctly, some of the pupils could not represent the answer on the number line. One hundred and four pupils (n=104, 62%) were able to represent the answer on the number line correctly. Forty-two pupils (n=42, 24%) illustrated the answer on the number wrongly, twenty-three pupils (n=23, 14%), were unable to represent the answer on the number line.

Item 4b

Item 4b is on percentages, pupils were supposed to find the percentage of a given quantity. They were also supposed to apply the concept of percentage. The following strategies were used by the pupils:

1. Identifying a percentage as a fraction of another quantity

2. Changing a percentage into decimal fraction

3. Multiplication of decimal fraction by a quantity

4. Finding the percentage of a quantity

Table 4.29: Converting Numbers into Percentages

THEME	FREQ	%
Correctly converting numbers into percentages	79	47
Wrongly converting numbers into percentages	22	13
Unable to convert numbers into percentages	44	26
Failed to Attempt Question	24	14
TOTAL	169	100

Field Data 2018

In Table 4.29, twenty-four pupils (n=24, 14%) failed to attempt the question. Seventy-nine pupils (n=79, 47%) can convert numbers into percentages, while twenty-two pupils (n=22, 13%) wrongly converted numbers into percentages. Forty-four pupils (n=44, 26%) were unable to convert numbers into percentage.

Table 4.30: Applying the Concept of Proportion

TOTAL	**169**	**100**
Correct Application of Proportion	75	45
Wrong Application of Proportion	60	27
Unable to Apply concept of Proportion	24	14
Failed to Attempt Question	24	14
TOTAL	169	100

Field Data 2018

In Table 4.30, Seventy-five pupils (n=75, 45%) correctly apply the concept of proportion. Forty-six pupils (n=46, 27%) wrongly apply the concept of proportion, twenty-four pupils (n=24, 14%), were unable to apply the concept of proportion.

Item Five

The following strategies were used by the pupils:

1. Displaying data on frequency tables

2. Multiplication of marks (x) and frequency (f)

3. Drawing of bar chart

4. Calculating mean

Table 4.31: Choosing of Appropriate Scale

THEME	**FREQ**	**%**
Correct Scale	146	86
Wrong Scale	23	14
Failed to Attempt Question	0	0
TOTAL	**169**	**100**

Field Data 2018

In Table 4.31, one hundred and forty-six pupils (n=146, 86%) chose the correct scale for the graph work in question five. Twenty-three pupils (n=23, 14%) chose a wrong scale for the graph work. All pupils attempted the question five.

Table 4.32: Drawing of Bar Chart

TOTAL	**169**	**100**
Bar Chart Correctly Drawn	121	72
Bar Chart Wrongly Drawn	21	12
Unable to draw Bar Chart	16	9
Unequal Spaces between Bars	8	5
Others	3	2
Failed to Attempt Question	0	0
TOTAL	169	100

Field Data 2018

In Table 4.32, one hundred and twenty-one pupils (n=121, 72%) could draw the bar chart correctly, twenty-one pupils (n=21, 12%) had it wrong. Eight pupils (n=8, 5%) provided unequal spaces between the bars, sixteen pupils (n=16, 9%) were unable to draw the bar chart. Three pupils (n=3, 2%) represent others.

Table 4.33: Calculating Mean from Frequency Table

THEME	FREQ	%

Mean correctly calculated	120	71
Mean wrongly calculated	20	12
Unable to calculate Mean	29	17
Failed to Attempt Question	0	0
TOTAL	169	100

Field Data 2018

In Table 4.33, one hundred and twenty pupils (n=120, 71%) calculated the mean from the frequency distribution correctly, twenty pupils (n=20, 12%) had it wrong, and twenty-nine pupils (n=29, 17%) were unable to calculate for the mean.

4.3 Research Hypothesis

There is no significant difference in students' mathematics performance between Public and Private Basic School Pupils.

To answer research question three, the individual marks obtained from both private and public schools on the mathematics achievement test were coded and keyed into statistical package for the social scientist program (SPSS) for analysis. An independent t - test in Table 4.34, shows that there was significant difference in the performance between public and private basic pupils' mathematics achievement in the Chokor Circuit of the Accra Metropolis.

Table 4.34: An independent t-test showing the mean performance between Public and Private Basic Schools

School Type	Mean	SD	N	Sig

				(2- tailed)
Private	28.6826	19.66867	169	0.000
Public	12.3601	12.75242	284	0.000

As in Table 4.34, private schools mathematics performance was significantly higher (M=28.6826, SD=19.66867) than public schools (M=12.3601, SD=12.75242). The mean scores and standard deviation of private schools was higher than public schools. As in Table 4.34, there exists a statistically significant difference in the mean performance in the test of students between private and public schools. The observed probability significance is 0.00 < 0.05. This indicates that the performance between private and public school was significant. It also implies that the null hypothesis is rejected, the study finally concludes that there was significant difference in students' mathematics performance between Private and Public Basic School Pupils. Hence private schools performed better on mathematics achievement test than public schools.

Table 4.35: Shows Levine's Test for Equality of Variance

	Levine's Test for Equality of Variance	Levine's Test for Equality of Variance		t- Test for Equality of Means		
		F	Sig	T	Df	Sig(2-tailed
Result of Test	Equal Variances Assumed	44.546	.000	10.704	451	.000
	Equal Variances not Assumed			9.610	248.765	.000

In Table 4.35, the assumption of equality of variance between the mean performance of private and public basic schools is significant under the Levine's test.

4.4 Interpretation of the Findings in Reference to Literature

This study was aimed at comparing the performance of private and public basic schools in mathematics at Chorkor in the Accra Metropolis. The study conducted at Chorkor in the Accra Metropolis revealed that private schools performed better than public schools in the Chorkor Circuit of the Accra Metropolis. In line with the results of this study was Azigwel, Adda, Awuni, and Aweligeya (2016) they stressed that there has been a persistent low performance in public schools' mathematics as compared to private schools. Ntim (2014) also emphasized that private school pupils performed better than public school pupils in most subjects including mathematics. Adeyemi (2014) who compared pupils' academic performance between the private and public primary schools in mathematics, also realized that pupils in the private primary schools performed better than their counterparts in the public schools and this was also consistent with this study. Similar research conducted by Duwaila (2012) that the academic performance of pupils in private schools was higher than public school. Duwaila (2012) finally concluded that the pupils in private schools did better in mathematics than their counterparts in public schools.

Also, students in private schools performed better in mathematics than their counterparts in the public schools. Mathematics teaching is better in private schools than in state schools. Private school pupils achieve better learning outcomes in mathematics than state schools (Adeyemi, 2014). The works of other authorities in mathematics education as mention earlier those private schools performed better than public schools affirms the result of this study.

4.4.1 Discussion of Research Objective 1

The first objective was to discuss the strategies used by public school pupils to solve mathematics achievement test. The discussions were based on how public school pupils solved each item, the techniques and strategies adopted.

Item One

Public school pupils used four strategies for solving the first item. The strategies were grouped under the following headings:

1. *Defining Elements in the Universal Set*

The strategy or techniques of which element was to be included in the universal set was a challenge to public school pupils. The universal set $U = \{ 18 \leq x \leq 36\}$, posed a lot of challenges to pupils. Majority of public school pupils included elements which were not supposed to be part of the universal set U. The universal set only consist of elements from 18 to 36 inclusive. Pupils included the element 17 and 37 and others as part of the universal set U, however few pupils were able to list exactly elements in the universal correctly. Pupils' definition of elements in the universal set and their errors were shown below.

$U = \{18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36\}$

The group of pupils who listed the universal from 18 to 36 inclusive were correct. The reason been that the number eighteen with the sign "$18 \leq$ " will consider the numbers from eighteen (18) and above and also the number thirty six with the sign "≤ 36" will take numbers up to 36 which was the limit. The few pupils who defined the universal set from 18 to 36 as shown were correct.

Another group of pupils also define the universal set as shown:

$U = \{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18 \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 36\}$

This group of pupils deviated entirely from the definition of the universal set because the elements from 1 to 17 were not part of the universal set. Also this group of pupils had the intersection of set $P, Q \; and \; R$ wrongly since the set $P, Q, and \; R$ were subsets of the universal set U.

The third group of pupils also define the universal set like this:

$U = \{17,18,19,20,21,22,23,24,25,26, \ldots \ldots \ldots \ldots \ldots \ldots \ldots 36\}$

This was also not correct for public school pupils since the number seventeen (17) was not part of the universal set.

Finally, the last group of pupils also define the universal as:

$U = \{17,18,19,20,21,22,23,24,25 \ldots \ldots \ldots \ldots \ldots .37\}$

This was also wrong because the number 17 and 37 by definition were not part of the universal set U.

2. *Describing the Elements of a Set*

The set P, Q and R were subsets of the universal set U, majority of public school pupils ignore the concept of a subset. This was done by including elements in set P, Q and R which were not in the universal set. Once the set P, Q and R, were subsets of U it implies elements in set P, Q and R should belong to the universal set. Majority of public school Pupils could not describe set P, Q and R correctly. The elements in the Universal sets were not in set P, Q and R and vice versa. Pupils' description of set $P, Q, and \; R$ are shown below:

The set$P = \{multiples\ of\ 3\}$. Two different descriptions for the set P by public school pupils as shown:

A. $P = \{3,6,9,12,15,18,21,24,27, \ldots \ldots \ldots .36\}$. Majority of public school pupils define set Pas shown. Pupils were not able to identify the set P as a subset of the universal set, there were a lot of elements in set P which were not part of the universal set U. This description was wrong as the numbers in the universal set will only consider numbers that are multiples of 3 which are part of the universal set U. The concept here is not only the ability to list multiples of 3, however the multiples of 3 should be part of the universal set U.

Few public school pupils describe set P as:

B. $P = \{18, 21, 24, 27, 30, 33, 36\}$. This was correct since the numbers in set P are multiples of 3 from 18 to 36 within the universal set U.

The set $Q = \{factors\ of\ 72\}$.

Two different description for the set Q by public school pupils as shown:

A. $Q = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36\}$. These were exactly factors of 72, however most of the numbers in the set Q as listed by some group of public school pupils were also not part of the universal set U, hence the majority who listed the set Q merely as factors of 72 had set Q wrong. Here pupils can list factors of 72, however, the answer was wrong because the set Q was not a subset of the universal set U.

The second group of pupils describe set Q as:

B. $Q = \{18, 24, 36\}$. This was correct, the elements in set Q were factors of 72 and also within the universal set U. Only few public school pupils could describe the elements in set Q correctly.

The set $R = \{even\ numbers\}$.

Two different descriptions for the set R by public school pupils as shown:

A. $R = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, \ldots\ldots\ldots\ldots 72\}$.These were exactly even numbers of 72, however most of the elements in the set R as listed by some group of public school pupils were not part of the universal set U, hence the majority who listed the set R merely as even numbers of 72 had set R wrong. Here pupils can list even numbers which were also multiples of 72, however, the answer was wrong because the set R was a subset of the universal set U.

B. R= {18, 20, 22, 24, 26, 28, 30, 32, 34, 36}. Few public school pupils describe the set R correctly. The elements in the set R are set of even numbers within the universal set U.

3. *Intersection of Set*

The strategy of intersecting two sets was done appropriately by majority of public school pupils. However, since set P, Q, R and the universal set U were not correctly defined by the majority, the intersections of sets P ∩ Q, Q ∩ R and P ∩ R were also wrong by majority of public school pupils.

Item Two

Public school pupils used three strategies for solving the second item. The strategies were grouped under the following headings:

1. *Substitution*

With regards to item two, majority of public school pupils were able to attempt the question. A lot of pupils were interested in the graph work than calculations. However, pupils were asked to complete a table for the graph. Pupils were supposed to

substitute the values of the variable x into a linear function to obtain the values of y. public school pupils were able to substitute the values of x into the linear function $2y + 3x = 6$ for the values of y.

2. *Solving*

Solving the equation after the values of x has been substituted was also a challenged to some public school pupils. Pupils ignore the sign when a positive number crosses the equal sign and also a negative number. Grouping like terms and also dividing the equation by the coefficient of y was also a challenge to some pupils.

Also some public school pupils could not identify the correct signs, when a negative number multiplies a positive number and when a negative number multiplies another negative number. Pupils' inability to identify these signs affected their results for the variable y. As a result, some public school pupils had wrong values in the table for the graph. For instance substituting $x = -3$ into the relation $2y + 3x = 6$, pupils substituted the value of x correctly as $2y + 3\,(-3) = 6$, this was a good substitution. However, most of the pupils were not mindful of the negative sign in front of the figure three, they rather ignore the negative sign and pick the number as a positive value. The results of these errors was the wrong values for the values of y.

3. *Graphing by plotting all the coordinates of* x *and* y.

The strategy of graphing poses a lot of challenges to pupils. Graphing in this context include plotting or locating the coordinates in Cartesian plane, drawing the line graph and also using the line graph to interpret or answer questions.

Plotting or locating the coordinates in the Cartesian plane was a challenge to some public school pupils since some of the y coordinate of x was not solved correctly. Plotting such coordinates in the Cartesian plane gives wrong points since the

coordinates were also wrong. This changes the entire nature of the graph plotted by some public school pupils.

Some public school pupils also misrepresented some of the coordinate in the Cartesian plane.

Points such as $(-3, 7.5)$, $(-2, 6)$, $(-1, 4.5)$, $(0, 3), (1, 1.5), (2, 0), (3, -1.5)$ were major challenges to some public pupils hence instead of a linear graph the points were rather scattered on the graph sheet. Some public school pupils interchange the x value for y and vice versa in the Cartesian plane. For example, instead of $(-3, 7.5)$, it was rather plotted as $(7.5, -3)$ and also instead of $(2, 0)$, this was plotted as $(0, 2)$. Some Pupils also plotted both points as negative, instead of $(4, -3)$, it was plotted as $(-4, -3)$ and this also affected the performance of pupils on item two.

Another challenge with the second item, was that some pupils could not complete the graph work. This was in two folds, few pupils plotted the points correctly but could not draw the linear graph and others were able to draw the linear graph but could not answer the questions that follows the graph.

Item three (3a)

Public school pupils used two strategies for solving the third item.

1. Distribution

Public school pupils used distribution as a strategy for item three (3a), with the equation 10 (y + 2) = 6 (y + 2) + 16 . The number 10 and 6 attached to the brackets were distributed over the mathematical expression$(y + 2)$. Distribution means the equation is expanded to remove the brackets as follows$10y + 20 = 6y + 12 + 16$.

2. Solving

The expanded equation in strategy (a) was solved by public school pupils. Solving the equation means grouping the same variables at one side and numbers at the other side of the equation and then dividing the equation by the coefficient of y for the value of y. The solution for y by public school pupils is shown below.

$10y - 6y = 12 + 16 - 20$

$4y = 28 - 20$

$4y = 8$

$\frac{4y}{4} = \frac{8}{4}$

$y = 2$

Question (3a) was a bit easier for the majority of public school pupils, however few pupils could not expand the equation correctly.

Item three (3b)

Public school pupils used three strategies for solving the third item. The strategies were grouped under the following headings:

1. *Representing the Unknown by Variables in the Equation*

Formation of equation and representing the "unknown" in the equation by variables was quiet challenging to public school pupils. Pupils were supposed to find the exterior angles of a polygon, when three of the exterior angles were given. The other two of the exterior angles were the same. The challenge here was that, the majority of public school pupils got the equation wrong because they ignore the fact that the two angles were equal. Public school pupils used different variables to represent the "unknown"

for calculating the exterior angles of the polygon. Meanwhile, few pupils formed the correct equation for the exterior angles of a polygon.

2. *Equating the Equation to the sum of the Exterior Angles (i.e. 360°)*

After forming the equation, few public school pupils equated the supposed equation to 360° which was the sum of the exterior angles of a polygon. However, majority could not continue the solution from this point. For instance setting the equation like this

$x + x + 51 + 87 + 100 = 360$, was a problem to some public school pupils.

3. *Solving*

Solving the equation involves techniques, the few pupils who could equate the suppose equation to 360° went ahead to solve the equation. The major techniques used by pupils include summing numbers and variables and grouping like terms. Few public school pupils solved the equation correctly for the exterior angles of the polygon.

Item 3c

Public school pupils used four strategies for solving item 3c. The strategies were grouped under the following headings:

1. *Formula for area and perimeter of rectangle*

Majority of public school pupils could identify the correct formula for area and perimeter of rectangle. Public school pupils identify three formulas, equation two and equation three was on perimeter and area of a rectangle. The first equation was supposed to be deduced from the question.

Equation 2 and 3 was not a problem to pupils at all, as majority could state the formula for perimeter and area of a rectangle with ease. However, equation 1 was the major problem to public school pupils, deducing that the length of the rectangle is three times

the width was a major problem to pupils. Majority of public school pupils could not deduce from the question posed that the length of the rectangle is three times the width as in equation 1.

A. $L = 3W$ ... ... 1 where A is area of rectangle, P is perimeter

B. $P = 2L + 2W$ ... ...2 L is length, W is width of the rectangle

C. $A = L\ X\ W$ 3

2. *Illustration (drawing diagrams)*

Some public school pupils drew a diagram of the rectangle with the length and width. Diagram gives a clear picture of the problem at hand.

3. *Substitution*

Here few public school pupils' substituted equation 1 into equation 2 as identified in strategy 1, the perimeter of the rectangle was also substituted. The substitution was done as follows:

$P = 2(3W) + 2W, \quad P = 44$

$44 = 2(3W) + 2W$ 4

4. *Solving*

Few public school pupils multiplied and sum the variable in equation 4 as in strategy 3. This was done as

$44 = 6W + 2W$, and also $44 = 8W$

Finally some pupils divided by the coefficient of the variable "W" for the solution.

Item Four (4a)

Public school pupils used three strategies for solving the fourth item. The strategies were grouped under the following headings:

1. *Clearing Fractions by Multiplication*

Pupils were to solve linear inequality involving fraction. Majority of public school pupils could multiply this equation $-\frac{1}{2}(3x-4) > 3x-7$, by the lowest common multiples as shown $2\left(-\frac{1}{2}\right)(3x-4) > 2(3x)-2(7)$

2. *Simplifying and Solving*

Majority of public school pupils simplified the equation after multiplying through by the lowest common multiples as in strategy 1. Pupils collect the term involving the variable at one side and also numbers at the other side to solve for the value of x. However, the solution poses quite a challenge to few public school pupils, as some could not change the sign of the inequality after dividing through by the coefficient of a negative number. Public school pupils had two different solutions as

A. $x < 2$ B. $x > 2$.

The correct solution for x was A.

4. *Illustration*

Here public school pupils were supposed to illustrate the value of x on the number line. Pupils who had solution A or B illustrated their answers on the number line as such. However, some pupils had challenges with symbol "less than" ($<$) and "greater than" ($>$), so illustrating the value on the number line with regard to the sign was a problem.

Item 4b

Public school pupils used a strategy for solving item 4b. The strategies were grouped under the following headings:

1. *Percentage of another a quantity*

Here the strategy pupils used was to change the percentage given in the question into fraction before multiplying by the quantity. For instance 10% of 6,000 was calculated as $^{10}/_{100} \times 6000$

Another techniques used by pupil was to change the given percentage into decimal before multiplying by the quantity. For instance 10% of 6,000 was calculated as $0.1 \times 6{,}000$.

Item Five (5)

Public school pupils used the following strategies for solving the fifth item. The strategies were grouped under the following headings:

1. *Forming a Frequency Table*

Majority of public school pupils represented the data on frequency table. Pupils multiplied the marks x scored by pupils in a test multiplied by frequency f. This was presented on the table as a distribution.

Calculating the mean from frequency distribution table wasn't much of a problem for the majority of public school pupils. Pupils were able to multiply each mark and frequency in the column. Public school pupils were able to add correctly the products of the marks (x) and frequencies correctly, majority of public school pupils could divide the sum of the products of the marks (x) and frequency (f) by the total frequencies as the mean of the distribution

2. Drawing of bar chart

The strategy of drawing a bar chart was a problem to the majority of pupils. Few pupils had unequal spaces between each of the bars, which was not accepted for bar chart. Some pupils could not draw the bar chart, a significant number of public school pupils could not differentiate bar chart from histogram and other types of graph. Pupils presented histogram instead of bar chart.

4.4.2 Discussion of Research Objective 2

The second objective was to discuss the strategy used by private school pupils to solve mathematics achievement test. The discussions were based on how private school pupils solved each item, the techniques and strategies adopted.

Item One

Private school pupils used four strategies for solving the first item. The strategies were grouped under the following headings:

1. *Defining Elements in the Universal Set*

The strategies or techniques of which element was to be included in the universal set was not a challenge for the majority of private school pupils. The universal set $U = \{ 18 \leq x \leq 36\}$, did not pose much of challenges to pupils. Majority of private school pupils define exactly the element in the universal set U. The universal set only consist of elements from 18 to 36 inclusive. Pupils' definition of elements in the universal set and their errors were shown below.

$U = \{18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36\}$

The group of pupils who define the universal from 18 to 36 inclusive were correct. The reason been that the number eighteen with the sign "$18 \leq$ " will consider

the number eighteen (18) and above and also the number thirty six (36) with the sign " ≤ 36" will take numbers up to 36 which was the limit. Majority of private school pupils defined the universal set from 18 to 36 as shown were correct.

Another group of pupils also define the universal set as shown:

$U = \{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18 \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 36\}$

This group of pupils deviated entirely from the definition of the universal set because the numbers from 1 to 17 were not part of the universal set. Also this group of pupils had the intersection of set $P, Q\ and\ R$ wrongly since the set $P, Q, and\ R$ were subsets of the universal set U.

Another group of pupils also define the universal set like this:

$U = \{17,18,19,20,21,22,23,24,25,26, \ldots \ldots \ldots \ldots \ldots \ldots \ldots 36\}$

This was also not correct for private school pupils since the number seventeen (17) was not part of the universal set.

Finally, the last group of pupils also define the universal as:

$U = \{17,18,19,20,21,22,23,24,25 \ldots \ldots \ldots \ldots \ldots . .37\}$

This was also wrong because the number 17 and 37 by definition were not part of the universal set U. Majority of private school pupils define the universal set correctly.

2. *Describing the Elements of a Set*

The set P, Q and R were subsets of the universal set U, few private school pupils ignore the concept of a subset. Private school pupils included elements in set P, Q and R which were not in the universal set. Once the set P, Q and R, were subsets of U it implies elements in set P, Q and R should belong to the universal set. Majority of private school

Pupils could describe set P, Q and R correctly. Pupils' description of set $P, Q, and\ R$ are shown below:

The set$P = \{\ multiples\ of\ 3\}$.

Two different descriptions for the set P by private $school\ pupils\ as\ shown$:

A. $P = \{3,6,9,12,15,18,21,24,27, \ldots\ldots\ldots..36\}$. Few private school pupils define set Pas shown. This description was wrong as the numbers in the universal set will only consider numbers that are multiples of 3 which are part of the universal set U. The concept here is not only the ability to list multiples of 3, however the multiples of 3 should be part of the universal set U.

Private school pupils describe set P as:

B. $P = \{18, 21, 24, 27, 30, 33, 36\}$. This was correct since the numbers in set P are multiples of 3 from 18 to 36 within the universal set U.

The set$Q = \{factors\ of\ 72\},\ Q = \{18, 24, 36\}$. This was correct, the numbers in set Q were factors of 72 and also within the universal set U. Only few private school pupils could not describe the elements in set Q correctly.

The set$R = \{even\ numbers\ \}$. Private school pupils describe the set R as shown

1. R= {18, 20, 22, 24, 26, 28, 30, 32, 34, 36}. Majority of Private school pupils describe the set R correctly. The elements in the set R are set of even numbers within the universal set U.

3. *Intersection of Set*

The strategy of intersecting two sets was done appropriately by majority of private school pupils. However, since few pupils could not define P, Q, R and the universal set U, the intersections of sets $P \cap Q$, $Q \cap R$ and $P \cap R$ were also wrong for some few private school pupils.

Item Two

Private school pupils also used four strategies for solving the second item. The strategies were grouped under the following headings:

1. *Substitution*

With regards to item two, all private school pupils were able to attempt the question. A lot of pupils were interested in the graph work than calculations. However, pupils were asked to complete a table for the graph. Pupils were supposed to substitute the values of the variable x into a linear function to obtain the values of y. Private school pupils were able to substitute the values of x into the linear function $2y + 3x = 6$ for the values of y.

2. *Solving*

Solving the equation after the values of x has been substituted was not much of a challenge to private school pupils. Pupils were mindful of the fact that when a positive number crosses the equal sign and vice versa, the sign will change respectively. Grouping like terms and also dividing equation by the coefficient of y was not a challenge to the majority pupils.

Also private school pupils could identify the correct signs, when a negative number multiplies a positive number and when a negative number multiplies another negative number. Pupils' ability to identify these signs has positive results for the variable y. As a result, most private school pupils had correct values in the table for the graph. For

instance substituting $x = -3$ into the relation $2y + 3x = 6$, pupils substituted the value of x correctly as $2y + 3\ (-3) = 6$, and this was a good substitution. Pupils were mindful of the negative sign in front of the figure three. The results of this was correct values for the variable y values.

3. *Graphing by plotting all the coordinates of x and y.*

Graphing in this context include plotting or locating the coordinates in Cartesian plane, drawing the line graph and also using the line graph to interpret or answer questions.

Plotting or locating the coordinates in the Cartesian plane was not a challenge to private school pupils, most of the y coordinates of x was solved correctly. Plotting such coordinates in the Cartesian plane gives correct points since the coordinates were also correct. This has positive effects on the entire nature of the graph plotted by majority of private school pupils. However, few private school pupils also misrepresented some of the coordinate in the Cartesian plane. Points such $(-3, 7.5)$, $(-2, 6)$, $(-1, 4.5), (0, 3), (1,1.5), (2, 0), (3, -1.5)$ were a challenge to few private pupils hence instead of a linear graph the points were rather scattered on the graph sheet. Also few private school pupils interchange the x value for y and vice versa in the Cartesian plane. For example, instead of $(-3, 7.5)$, it was rather plotted as $(7.5, -3)$ and also instead of $(2, 0)$, this was plotted as $(0, 2)$.

Another challenge with the second item, was that some pupils could not complete the graph work. This was in two folds, few pupils plotted the points correctly but could not draw the linear graph and others were able to draw the linear graph but could not answer the questions that follows the graph.

4. Graphing using x and y intercepts

Few private school pupils used another strategy for drawing the linear graph. Pupils used the concept of intercept, instead of plotting all the coordinates of $x\ and\ y$, the strategy was accepted mathematically since we need only two points to form a line. It was also accepted because the distance between two points is a straight line. However, the disadvantage here was that, not all coordinates on the table (i.e. $x\ and\ y$) could be plotted. Pupils tend to loose marks for the coordinates that were not plotted. The steps used by private school pupils in this strategy was as follows:

A. *Intercept on the x axis*

Put $y = 0$ and substitute the value of $y = 0$ into the linear function $2y + 3x = 6$ for the value of x. The substitution is done as: $2\ (0) + 3x = 6$, the coordinates for $x\ and\ y$ is $(2, 0)$

A. *Intercept on the y axis*

Put $x = 0$ and and substitute the value of $x = 0$ into the linear function $2y + 3x = 6$ for the value of y. The substitution is done as:$2y + 3(0) = 6$, the coordinates for $x\ and\ y$ is $(0, 3)$.The coordinates $(2, 0)\ and\ (0, 3)$ are plotted on the on the Cartesian plane as two distinct points. Private school pupils join the distance between the two points for a straight line.

Item three (3a)

Private school pupils used two strategies for solving the third item. The strategies were grouped under the following headings:

Strategy 1

a. *Distribution*

Private school pupils used distribution as a strategy for item three (3a), with the equation$10(y + 2) = 6(y + 2) + 16$. The number 10 and 6 attached to the brackets

was distributed over the mathematical expression$(y + 2)$. Distribution means the equation is expanded to remove the brackets as follows:$10y + 20 = 6y + 12 + 16$

b. *Solving*

The expanded equation in strategy (a) was solved by private school pupils. Solving the equation means grouping the same variables at one side and numbers at the other side of the equation and then dividing the equation by the coefficient of y for the value of$y$. The solution for y by private school pupils was shown below.

$10y - 6y = 12 + 16 - 20$

$4y = 28 - 20$

$4y = 8$

$\frac{4y}{4} = \frac{8}{4}$

$y = 2$

Strategy 2

Private school pupils used another strategy for solving the equation $10(y + 2) = 6(y + 2) + 16$. Few pupils solved the equation by subtracting $6(y + 2)$ from both sides, dividing both sides by four (4) and finally subtracting 2 from both sides. The solution strategy is as shown:

$10(y + 2) = 6(y + 2) + 16$	Subtract $6(y + 2)$ on both sides
$4(y + 2) = 16$	Divide by 4 on both sides
$y + 2 = 4$	Subtract 2 from both sides
$y = 2$	

Item three (3b)

Private school pupils used three strategies for solving the third item. The strategies were grouped under the following headings:

1. *Representing the Unknown by Variables in the Equation*

Formation of equation and representing the "unknown" in the equation by variables was quiet challenging to some private school pupils. Pupils were supposed to find the exterior angles of a polygon, when three of the exterior angles were given. The other two of the exterior angles were the same. The challenge here was that, few of private school pupils got the equation wrong because they ignore the fact that the two angles were equal. Majority of private school pupils used different variables to represent the "unknown" for calculating the exterior angles of the polygon. The majority of private school pupils also formed the correct equation for the exterior angles of a polygon.

2. *Equating the Equation to the sum of the Exterior Angles (i.e. 360°)*

After forming the equation, private school pupils equated the supposed equation to 360° which was the sum of the exterior angles of a polygon. For instance setting the equation like this $x + x + 51 + 87 + 100 = 360$, was not a problem to the majority private school pupils.

3. *Solving*

Solving the equation involves techniques, the majority of private school pupils could equate the suppose equation to 360° went ahead to solve the equation. The major techniques used by pupils include summing numbers and variables and grouping like terms. Majority of Private school pupils solved the equation correctly for the exterior angles of the polygon.

Item 3c

Private school pupils used three strategies for solving item 3c. The strategies were grouped under the following headings:

1. *Formula for area and perimeter of rectangle*

Majority of private school pupils could identify the correct formula for area and perimeter of rectangle. Private school pupils identified three formulas, equation two and equation three was on perimeter and area of a rectangle. The first equation was supposed to be deduced from the question.

Equation 2 and 3 was not a problem to pupils at all, as majority could state the formula for perimeter and area of a rectangle with ease. However, equation 1 was a problem to private school pupils, deducing that the length of the rectangle is three times the width was a problem to few pupils. few private school pupils could not deduce formula from the question posed, that the length of the rectangle is three times the width as in equation one (1) .

A. $L = 3W$ ... ... 1 where A is area of rectangle, P is perimeter

B. $P = 2L + 2W$ ... ... .2 L is length, W is width of the rectangle

C. $A = L\,X\,W$ 3

2. *Substitution*

Here private school pupils' substituted equation 1 into equation 2 as identified in strategy 1, the perimeter of the rectangle was also substituted. The substitution was done as follows:

$P = 2(3W) + 2W, \quad P = 44$

$44 = 2(3W) + 2W$ 4

3. *Solving*

Private school pupils multiplied and sum the variable in equation 4 as in strategy 3. This was done as:

$44 = 6W + 2W$, and also $44 = 8W$

Finally pupils divided both sides of the equation by the coefficient of the variable "W" for the solution.

Item Four (4a)

Private school pupils used three strategies for solving the fourth item. The strategies were grouped under the following headings:

1. *Clearing Fractions by Multiplication*

Pupils were to solve linear inequality involving fraction. Majority of private school pupils could multiply this equation $-\frac{1}{2}(3x - 4) > 3x - 7$, by the lowest common multiples as shown $2\left(-\frac{1}{2}\right)(3x - 4) > 2(3x) - 2(7)$

2. *Simplifying and Solving*

Private school pupils simplified the equation after multiplying through by the lowest common multiples as in strategy 1. Pupils collect the term involving the variable at one side and also numbers at the other side to solve for the value of x. However, the solution poses quite a challenge to few private school pupils, as some could not change the sign of the inequality after dividing through by the coefficient of x. Private school pupils also had two different solutions as

A. $x < 2$ B. $x > 2$.

The correct solution for x was A.

4. *Illustration*

Here private school pupils were supposed to illustrate the value of x on the number line. Pupils who had solution A or B illustrated their answers on the number line as such. However, some pupils had challenges with symbol "less than" ($<$) and "greater

than" (>), so illustrating the value on the number line with regard to the sign was a problem, and few could not illustrate their answers at all.

Item 4b

Private school pupils used a strategy for solving item 4b.

1. *Percentage of another a quantity*

Here the strategy pupils used was to change the percentage given in the question into fraction before multiplying by the quantity. For instance 10% of 6,000 was calculated as $\frac{10}{100} x\ 6000$

Another techniques used by pupil was to change the given percentage into decimal before multiplying by the quantity. For instance 10% of 6,000 was calculated as $0.1\ x\ 6{,}000$.

Item Five (5)

Private school pupils used the following strategies for solving the fifth item. The strategies were grouped under the following headings:

1. *Forming a Frequency Table*

Majority of private school pupils represented the data on frequency table. On the table private school pupils multiplied the marks x scored by pupils in a test and the frequency(f). This was presented on the table as a distribution.

Calculating the mean from frequency distribution table wasn't much of a problem for the majority of private school pupils. Pupils were able to multiply each mark and frequency in the column. Private school pupils were able to add correctly the products of the marks (x) and frequencies correctly (f), majority of private school pupils could divide the sum of the products of the marks (x) and frequency (f) by the total frequencies as the mean of the distribution.

2. Drawing of bar chart

The strategy of drawing a bar chart was a problem to the few of pupils. Few pupils had unequal spaces between each of the bars, which was not accepted for bar chart. Some pupils could not draw the bar chart, a significant number of private school pupils could not differentiate bar chart from histogram and other types of graph. Few Pupils presented histogram instead of bar chart.

4.4.3 Discussion of Research Objective 3

The third objective was to compare the difference in students' mathematics performance between public and private basic schools' pupils. The study conducted at Chorkor in the Accra Metropolis revealed that private schools performed better than public schools in the Chorkor Circuit of the Accra Metropolis. The mean performance and standard deviation of private schools was (M=28.6826, SD=19.66867) and that of public schools was (M=12.3601, SD=12.75242). The observed probability significance is $0.00 < 0.05$. This indicates that the performance between private and public school pupils was significant. This implies that the null hypothesis is rejected, the study finally concludes that there was significant difference in students' mathematics performance between Private and Public Basic School Pupils in the Chorkor Circuit of Accra Metropolis. This finding was consistent with previous literature that private school performed better than public schools in mathematics achievement (Ntim, 2014).

The subject matter knowledge on each mathematics achievement test was higher among private school pupils than their comparable public school pupils. Majority of Public school pupils demonstrated weak or no subject matter on most of the Mathematics Achievement test, though few public school pupils demonstrated a strong subject matter knowledge. On the other hand, private school pupils demonstrated

stronger subject knowledge in mathematics test than public schools. This was one of the main reasons why private school performed higher than public schools in the Chorkor Circuit of Accra Metropolis. The subject matter knowledge of pupils influence mathematics achievement (Barnes, 2007).

4.5 Mathematical Strategies between public and private schools

The use of appropriate mathematical strategies and methods on mathematics problems is necessary for higher and better achievement. However, every problem on mathematics has its own strategy and method of approach. In line with the mathematics achievement test administered to the pupils in the Chorkor circuit of the Accra metropolis, majority of private schools pupils used appropriate strategies and methods than public schools. The conceptual framework adapted from Barnes (2007) emphasized on application and the use of appropriate strategies and methods on mathematics achievement (performance). The appropriate use of strategies and methods positively influence mathematics achievement of pupils.

4.6 Private and Public Schools Performance on Achievement Test

Private basic schools performed better on the mathematics achievement test than public private schools. This implies that the total marks of most private school pupils on the achievement test was higher than their counterparts in the public schools, since Mathematics Achievement measures the total performance of pupils on a test. Also the item analysis conducted on each achievement test was better for private schools than public schools in the Chorkor Circuit of the Accra Metropolis.

The differences in performance was due to several reasons, significant among them was that, majority of public school pupils lack basic subject matter knowledge on the mathematics achievement test administered to them. There was much disconnection

on mathematical concepts and application from public schools' pupils than private schools' pupils. Private school pupils performed better than public school pupils because a higher percentage of private school pupils were able to apply the correct mathematical concepts on Mathematics Achievement Test. Mathematical strategies and methods used by private school pupils were better and appropriate than public school pupils' hence higher performance. These findings of higher performance on Mathematics Achievement test from private schools was consistent with the conceptual framework of this study (Barnes, 2007).

The conceptual framework adapted from Barnes (2007) emphasized that subject matter knowledge (SMK) consists of concepts, facts and principles. Pupils' Mathematics Achievement depends on ability to apply mathematical concepts with appropriate strategies and methods.

4.7 Summary

In this chapter, the data on the performance of mathematics achievement test and the item analysis have been discussed in relation to research questions and objectives. Discussions were also done in relation to literature reviewed. The chapter also discussed research findings with regards to private and public schools' performance and strategies used on mathematics Achievement. The discussions on the various research objectives point to the fact that private schools' performance was higher than public schools.

The strategies used by public and private school pupils' were also discussed, both schools used the same or similar strategies on mathematics achievement test. However, private schools pupils used more strategies than public schools pupils on mathematics achievement test.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter presents a summary of the study and highlights the key findings. It further outlines recommendations and avenues for further research.

5.1 Summary of the Study

The primary purpose of the study was to investigate pupils' strategies on Mathematics Achievement from private and public schools at the Chorkor Circuit of the Accra Metropolis. The research design was survey, the study used two types of sampling procedures which were purposive and simple random sampling**.** The population targeted in this study was pupils from JHS3 in both private and public basic schools at Chorkor in the Accra metropolis. Chorkor circuit is an area with ten private schools and five public schools, approximately there were 617 students from both private and public basic schools in JHS 3. Five private schools were selected with the five public schools in the circuit. A sample size of four hundred and fifty – three (453) students from both private and public basic schools was selected for the study.

Standardized achievement test was the main instrument for the study. The standardized achievement tests were administered to JHS3 students of both private and public basic schools in the metropolis. In all the four hundred and fifty- three (453) scripts that were collected from the students (from, both private and public schools) were analyzed one after the other. Each question (item) was taken into consideration with regards to how the questions were solved by students. Themes were formed in relation to the way the tests were solved. This was done to ascertain the number of students that were able to fall under each theme depending on the concept, skill, and behavioural characteristics exhibited by the students. The individual marks of pupils from private and public schools in terms of performance was coded and processed in to statistical package for social scientist (SPSS) for analysis.

5.2 Summary of Key Findings

These findings were derived from private and public schools pupils' strategies on Mathematics Achievement Test. The findings are :

1. Private schools performed better than public schools on mathematics achievement test.
2. Majority of private schools' pupils used better and appropriate strategy on mathematics achievement test than public schools.
3. The concept and strategy of stating the subset of a Universal set was a major challenge to both private and public schools' pupils.
4. The concept and strategy of writing or forming equation was a major challenge to private and public school pupils.
5. Majority of Private and public school pupils have weak background in Algebra.
6. The strategy representing a variable in algebra and deducing an algebraic equation from a problem statement was difficult for both private and public school pupils.
7. Public school pupils have a major challenge locating a point in the Cartesian plane, since most of them could not locate point in the Cartesian plane.
8. The strategy of simplifying and solving equations was difficult for majority of public school pupils.
9. Higher proportion of public school pupils exhibited weak concepts and poor strategies on mathematics achievement test.
10. Majority of public school pupils left questions not attempted.

5.3 Conclusion

This study was aimed at investigating pupils' strategies on Mathematics Achievement (performance) from public and private basic schools at Chorkor in the Accra Metropolis. The study conducted at Chorkor in the Accra Metropolis revealed that private schools performed better than public schools in the Chorkor Circuit of the Accra Metropolis. The mean performance and standard deviation of private schools

was (28.6826, 19.66867) and that of public schools was (12.3601, 12.75242). The observed probability significance is 0.00 < 0.05. This indicates that the mean performance in private school is 28.6826 was greater than that of the public schools. The implication was that the null hypothesis was rejected, the study finally concludes that there was significant difference in students' mathematics performance between Private and Public Basic School Pupils. However, pupils (private and public schools) exhibited weak concepts and poor strategies with regards to solving mathematics achievement test. The finding is consistent with previous literature that private school performed better than public schools in mathematics achievement (Ntim, 2014).

5.4 Recommendations

On the basis of the conclusions drawn from this study, which tend to investigate pupils strategies on mathematics Achievement (performance) between private and public basic schools, the following recommendations were made:

1. This study adapted a conceptual framework by Barnes (2007) on students' mathematics achievement. The framework considers that a student's subject matter knowledge is very necessary for good performance on mathematics achievement. The subject matter knowledge comprises of concepts, facts and principles on the various topics in the basic mathematics curriculum. It is imperative that private school authorities and heads of public basic schools encourage mathematics teachers to emphasize on concepts, facts and principle during mathematics instruction on the various topics of the curriculum, since it forms part of students Subject Matter Knowledge (SMK). Both public and private basic school pupils lack basic concepts with regards to algebra, formation and writing mathematical equations. Mathematics teachers must emphasize on concepts especially on algebra and equations during mathematics

lessons. Workshops must also be organized by personnel of the Ghana Education Service on topics that poses major challenges to students, the workshop must be directed toward the area where pupils had challenges in this study.

2. Most basic school pupils used wrong strategies or approach to most of the achievement test. Those strategies may be learnt from text books that are not approved by the Ghana Education Service or from teachers who do not have an in-depth knowledge on how (pedagogy) and what to teach (content). Private school authorities, heads of public schools and the Ghana Education Service must emphasize on the use of appropriate pedagogy in the classroom during teaching and learning. In-service training must also be organized periodically to update the knowledge and content level of both private and public basic school teachers.

5.5 Suggestions for Further Research

Although the study was limited to only schools in the Chorkor circuit of the Accra Metropolis, the findings provide a conceptual framework for further research into mathematics achievement of basic school pupils.

It is suggested that the study should be replicated in many more circuit in the Accra Metropolis to get the general picture of pupils' achievement on mathematics. Also after a consistent review of literature it was realised that pupils strategy for solving mathematical problems has direct influence on mathematics achievement. For this reason it will appropriate to conduct a further study in the area of mathematical strategies on mathematics achievement, to find out which of the strategy influence mathematics achievement the most and why.

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APPENDIX A

MATHEMATICS ACHIEVEMENT TEST

(To be answered by JHS 3 pupils from both public and private basic schools)

QUESTION 1

The set P ={multiples of 3}, Q = {factors of 72} and R ={even numbers} are subsets of U ={18≤ x ≤36}.

(a)List the element of P, Q *and* R

(b)Find:

(i) $P \cap Q$ (ii) $Q \cap R$ (iii) $P \cap R$

(c)What is the relationship between $P \cap Q$ and $Q \cap R$?

QUESTION 2

(a) Copy and complete the following table for the relation $2y + 3x = 6$

X	-3	-2	-1	0	1	2	3	4
Y		6	4.5		1.5			-3

(b)Using a scale of 2cm to 1 unit on the x-axis and 2cm to 2 units on the y-axis, draw the graph of the relation$2y + 3x = 6$.

(ii)Use your graph to find:

x When $y = -1$

y When $x = 4.6$

QUESTION 3

(a)Find the value of y in the equation $10(y + 2) = 6(y + 2) + 16$

(b) Three exterior angles of a pentagon are 51^0, 87^0 and 100^0.The remaining two exterior angles are equal. Find the size of each of the remaining angles.

(c)The length of a rectangle is three times its width and its perimeter is 44cm.Find its

(i) Width (ii) area

QUESTION 4

(a)(i)Solve $-\frac{1}{2}(3x - 4) > 3x - 7$

(ii) Illustrate your answer on the number line.

(b) A man bought two chairs, one for 6,000 and the other for 2,000. He sold the first at a profit of 10% and the second at a loss of 5%.

(i) Find the total selling price of the chairs.

(ii) What was his total percentage profit or lost?

QUESTION 5

The table shows the distribution of marks of students in a class.

Marks	1	2	3	4	5	6
Frequency	5	6	5	3	4	2

(a) Using a graph sheet, draw a bar chart for the distribution.

(b) Calculate the mean mark of the distribution and correct to the nearest whole number.

UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF MATHEMATICS EDUCATION

May 03, 2017

LETTER OF INTRODUCTION

I would be please if you provide the necessary assistance to MR. HATSU EDO, a second year M.Phil. student with index number 8160110015, to conduct his research in your institution.

He is pursuing Master of Philosophy in Mathematics Education in the Department of Mathematics Education, UEW and wishes to conduct his research on "COMPARATIVE STUDY OF MATHEMATICS ACHIEVEMENT OF PUPILS FROM PRIVATE AND PUBLIC BASIC SCHOOLS IN THE CHORKOR CIRCUIT OF THE ACCRA METROPOLIS"

I hope your assistance will help him greatly.

Yours faithfully,

SIGN

DATE

LYDIA [illegible] (MS)
Principal Administrative Assistance

APPENDIX B

7/4/17

C/O Prove Jesus Alive Ministry

P. O. BOX WY 2808

Kwabenya- Accra

6th April 2017.

District Director

Ghana Education Service

Accra Metropolis

Dear Sir/ Madam,

A LETTER OF INTRODUCTION

I am a student from the University of Education Winneba, I am conducting research on the topic **''Comparative Study of Mathematics Achievement of pupils from Private and Public Basic Schools: A survey at Chorkor in the Accra Metropolis''.** With regard to the topic I will need data from both private and public basic schools in mathematics from the metropolis for this research. I am humbly appealing to you to assist me obtain the data for the research. Thank you in advance.

Yours faithfully,

HATSU EDO

0241481465

APPENDIX C

APPENDIX D

GHANA EDUCATION SERVICE

In any reply the number and date of this letter should be quoted

My Ref. No. GES/ACC/PQ.48

Your Ref. No:

3rd August, 2017

THE CIRCUIT SUPERVISORS
ABLEKUMA SOUTH SUB-METRO
ACCRA

PERMISSION TO COLLECT DATA FROM SCHOOLS IN THE CHORKOR CIRCUIT OF THE ACCRA METROPOLIS

Your letter dated 6th July 2017, requesting for permission to collect data from schools in the Chorkor area within the Accra Metropolis, has been received.

This is to inform you that permission has been granted to the following schools:

PUBLIC

1. Mamprobi Girls Basic School
2. Chorkor Boys School
3. Mamprobi 'D' Basic School
4. Mamprobi South 'A' Basic School
5. Chorkor Basic School

PRIVATE

1. 31st December Women Movement Basic School
2. Lotte 'D' Basic School
3. Universe Academy
4. Joshua Memorial School
5. Kaide Class Basic School

However, note that schools are on holiday since 27th July to 12th September 2017. The Office would like to have a copy of your findings after the research.