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MATHEMATICAL PERFORMANCE OF FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOLS AND ITS RELATIONSHIP TO STUDENT AND TEACHER RELATED RELATED VARIABLES

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By

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APPROVAL SHEET

In partial fulfillment of the requirements for the degree Bachelor of Science in Mathematics for Teachers, this thesis entitled **"MATHEMATICAL PERFORMANCE OF FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOLS AND ITS RELATIONSHIP TO STUDENT AND TEACHER RELATED VARIABLES"** has been prepared and presented by NANETTE P. CABANTAC, CHRISTINE B. DATOR, ELAINE KRIS V. LEE, JEANNE ROSE V. MANDIGMA, CELINA P. SARMIENTO and CHRISTIAN D. VALDEZ, who are hereby recommended for the corresponding oral examination.

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DEDICATION

To our families…

and to our fellow Math Majors…

Nannette P. Cabantac
Christine B. Dator
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ABSTRACT

Name	:	Cabantac, Nanette P. Dator, Christine B. Lee, Elaine Kris V. Mandigma, Jeanne Rose R. Sarmiento, Celina P. Valdez, Christian D.
Title of Thesis	:	Mathematical Performance of Fourth Year Students of Selected National High Schools and its Relationship to Student and Teacher Related Variables
Key Concepts	:	Mathematical Performance, Student-Related Variables, Teacher Related Variables
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A. Objectives

The purpose of this study was to determine the mathematical performance of fourth year high school students of selected national high schools and its relation to student and teacher related variables

Specifically, the study intends to:

1. Determine the profile of the student-respondents in terms of the following student-related factors:
    a. gender
    b. elementary school graduated from
    c. parents' educational attainment
    d. attitude towards mathematics
2. Determine the profile of the teacher-respondents in terms of the following teacher-related factors:
    a. educational attainment
    b. training(s)/seminar(s) attended
    c. length of service
3. Determine mathematical ability of the fourth year high school students in some content learning areas of Mathematics IV, specifically:
    a. Functions
    b. Linear Functions
    c. Quadratic Functions
    d. Polynomial Functions
    e. Exponential and Logarithmic Functions
4. Discover if there is a significant relationship between the student's mathematical ability and the following student related factors:
    a. gender
    b. elementary school where they were from

c. parents educational attainment

d. attitude towards mathematics

B. Research Methodology

The student respondents of this study were randomly selected students of Batasan Hills National High School (BHNHS), Dasmariñas National High School (DNHS) and Valenzuela National High School (VNHS). The number of sample used was determined using the Slovin's Formula with $\pm .06\%$ margin of error.

The teacher-respondents were high school mathematics teacher in the said schools who are teaching Mathematics IV.

In order to determine the mathematical performance of the students of the selected national high school and its relation to student and teacher related factors, the researcher used three types of questionnaire, the mathematical performance test questionnaire, attitude test questionnaire and the information questionnaire. The researchers used two types of information questionnaire; one for the teachers, which was used to determine the teacher related factors: educational attainment, training(s)/seminar(s) attended and length of teaching experience in mathematics; the other one was for the students, which was used to gather data about the student related factors: gender, elementary school graduated from and parents educational attainment.

The researchers used a 15 item attitude test questionnaire to determine the attitude of the students towards mathematics.

The mathematical performance test questionnaire was a 50 item multiple choice test, which was used to determine the performance of the students in Mathematics IV.

The researchers were the one who developed the test. It was based on the Desired Learning Competencies (DLC) of the selected national high schools. It was administered to Sergio Osmeña Jr. High School and then to Bacoor National High School to secure the validity of the test instrument.

To analyze the data gathered using the different questionnaires that were administered to the respondents, the researchers used the following statistical technique:

1. Frequency count and simple percentage were used to determine the profile of the student and teacher respondents.
2. Computation for the mean was used to determine the mathematical performance and the attitude of the student respondents towards mathematics.
3. Chi-Square test for Independent Proportions with .05 as the level of significance was used to correlate mathematical performance and student related factors.
4. Pearson r was used to determine if there is a significant relationship between mathematical performance and attitude towards mathematics.

C. Findings

1. The profile of the fourth year students of selected national high schools
    a. Majority of the Fourth year students of selected national high schools or respondents (174 or 66.16%) are females.
    b. More than three-fourths of the respondents (242 or 92.72%) were from public school in their elementary level or grade school years.

c. Most of the students' fathers (115 or 44.06%) are high school graduates. The same is true with students' mothers (113 or 43.30%).

d. All the students in the three national high schools showed a neutral attitude towards Mathematics with an overall mean of 3.37. Among the three schools only the students of DNHS had a moderately positive attitude towards mathematics and the other two have a neutral attitude towards mathematics.

2. The profile of the teacher-respondents

   a. The highest educational attainment is MA/MS (Units) having a frequency of 18 (36%).

   b. Training(s)/seminar(s) attended

      - The mainstream number of teachers (17 or 34%) attended 4-6 times division training or seminars only.
      - Majority of the teachers (33 or 66%) did not have any experiences attending regional seminars or training.
      - For about more than three fourths of the teachers (39 or 78%) have not attended any national seminars.

   c. Most of the teacher respondents (22 or 44%) had 6-10 years of teaching experience.

3. The students rated poor in all of the five content learning areas, specifically: Functions, Linear Functions, Quadratic Functions, Polynomial Functions and Exponential and Logarithmic Functions. Only the students from DNHS managed to have a satisfactory rating in one of the content learning areas, which is

polynomial functions. In addition, the students rated poor in the 50-item performance test.

4. Relationship of mathematical performance to selected student related variables

   - Gender

   The x^2 value associating mathematical ability and the gender is 18.85. This shows that there is a significant relationship between the students' mathematical ability and their gender.

   - Elementary School Graduated From

   As to the association of mathematical ability and the elementary school, the computed value was 3.30. This means that there is no significant relationship between the mathematical ability of the student.

   - Parents' Educational Attainment

   There is no significant relationship between mathematical performance and the parents' educational attainment, showing 13.53% for father's educational attainment and 18.01% for mother's educational attainment.

   - Attitude Towards Mathematics

   There is a significant relationship between mathematical performance and attitude towards mathematics of the respondents of this study.

D. Recommendations

For the students

1. Fourth-year students should be given enough time to have remedial classes as well as tutorial for them to improve their skills learned in Mathematics I until their Mathematics IV so they can apply them effectively in college.
2. Pre-test and post test examinations should be given for them to know if they have progressed in Mathematics IV.
3. The fourth year students must be aware of their progress in Mathematics for them to improve in areas where they are weak.

For the teachers

1. The teacher should be exposed to seminars and trainings for them to improve and develop their knowledge in math as well as the strategies and techniques in teaching mathematics in the simplest, easiest, and most innovative ways to help students to progress in learning and value mathematics more.
2. Teachers should be aware of the achievement of their students especially in math. They should conduct things that could detect the weakness and the strengths in the content of each student.
3. A comprehensive assessment of the child's mathematical ability and achievement is necessary before beginning to plan an educational program.
4. The teachers should know particular things such as achievement tests, ability tests, informal assessments, above-level testing, parent and teacher observations, and interest inventories to use when having assessment. They should also know

that interest in math, enjoyment of mathematical puzzles and games, and unusual problem-solving techniques are indicators of mathematical ability and only part of a comprehensive assessment.

5. The teacher who conducts assessment using standardized test to their students must be trained especially when it comes to interpreting the results. They should also inform parents of the results.

For the parents

1. The parents should encourage their children to study most especially those who have difficulties in math.
2. The parents should be aware of the academic progress of their children for them to help improve the study habits as well as attitudes towards mathematics.
3. Parents aside from teachers should encourage girls and boys into similar experiences in their pursuits of mathematics. Thus, they should show confidence in their child to allow them to engage in activities as Advanced Placement and honors classes, mathematical competitions, tutoring, mentoring, summer camps, and other related experiences.
4. Parents must continually understand the make-up of their child and must select mathematical experiences commensurate with the child's personality, interests, and goals.

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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

Introduction

Living creatures have special abilities that should be nurtured and developed as they grow. Man is living creature and is the most important and most significant creation on earth, who is gifted with different abilities. He is capable of learning, discovering new ideas and enhancing his abilities. Such abilities help him deal with the challenges of life.

Ability is defined as "the quality of a person of being able to perform or a quality that permits or facilitates achievement or accomplishment; possession of the qualities (especially mental qualities required to do something or get something done" (wikipedia.com). Ability can be categorized in many ways; one is the mathematical ability. Mathematics plays a vital role in the lives of man. Every individual should acquire the necessary competence and development of power in quantitative thinking and in the use of mathematical procedures in daily living. Mathematics is often defined as the study of topics such as quantity, structure, space, and change. Another view held by many mathematicians, is that mathematics is a body of knowledge justified by deductive reasoning, starting from axioms and definitions. (wikipedia.com)

Learning mathematics through practice and acquiring skills such as counting, analyzing, constructing, etc helps develop and nurture cognitive skills. To attain this, schools offer mathematics as a major part of their curriculum, starting with the young years where teachers prepare students to the different learning areas of Mathematics.

In mathematics, the students are expected to learn to compute, to develop understanding of mathematical concepts and to solve quantitative problems. Mathematics as one of the languages of survival plays a vital role in the adaptability of an individual in this fast pacing world.

Nowadays, where technology continuously advances and progresses, schools also change and teachers evolve. Thus, students are expected to learn more and be able to cope with these changes.

High school is much more challenging and provocative. Students now develop not only their creativity and openness but also their analytic skills. Before they enter college, they must be oriented in things that they should learn and things that they should do. But there are many problems that cause most youth not to accomplish these things. There are many factors that affect their ability, and which may help them improve these abilities or otherwise. So, the people who are responsible must allow students to discover their mathematical abilities for their future.

Background of the Study

This study aimed to discover the level of mathematical performance of the students in three national high schools, particularly Batasan Hills National High School, Dasmariñas National High School and Valenzuela National High School. To establish a background for this study additional information about the schools is presented.

Batasan Hills National High School is located in Barangray Batasan Hills in the Second District of Quezon City. It was enacted through Republic Act 07987, which was approved on April 22, 1995.

Dasmariñas National High School (DNHS) was established to cater the educational needs of the relocated families from Metro Manila and to mold the young people of Dasmariñas and its neighboring towns. By virtue of Republic Act No. 503, DNHS which was formerly known as Dasmariñas Relocation Center High School (DRCHS) started its operation in June 1975. In line with the government's thrust of democrizing access to education, DRCHS created its first annex school, the Bulihan Sites and Services High School in Bulihan, Silang which became operational in June 1984. From then on new annex schools were established and now the main school and its eight annexes attend to more than 20 thousand students. Embodied in Article 7122 is the law that changes the name of DRCHS to DNHS. This was officially endorsed by the Regional Office (Region IV) of the Department of Education Culture and Sports (DECS) on September 1996 (Handbook 2004. Dasmarinas National High School).

Valenzuela National High School started as a Barrio School in Maysan in 1968. In the succeeding years, additional annex schools were established now it has seven annex schools in different places in Bulacan.

On August 12, 1969, by virtue of Municipal Order No. 99, all barrio high schools were absorbed by the municipalities and converted into Municipal High School. Conformably to Republic Act No. 6655, all public high schools were nationalized on January 1989, and that includes Valenzuela National High School.

Statement of the Problem

This study aimed to determine the mathematical performance of fourth year high school students of selected national high schools in relation to selected student and teacher related variables.

Specifically, it sought answers to the following questions:

1. What is the profile of the student-respondents in terms of the following student-related factors:
    a. gender
    b. elementary school graduated from
    c. parents' educational attainment
    d. attitude towards mathematics
2. What is the profile of the teacher-respondents in terms of the following teacher-related factors:
    a. educational attainment
    b. training(s)/seminar(s) attended
    c. length of service
3. What is the level of mathematical ability of the fourth year high school students in some content learning areas of Mathematics IV, specifically:
    a. Functions
    b. Linear Functions
    c. Quadratic Functions
    d. Polynomial Functions
    e. Exponential and Logarithmic Functions

4. Is there a significant relationship between the student's mathematical performance and the following student-related factors:
    a. gender
    b. elementary school where they were from
    c. parents' educational attainment
    d. attitude towards mathematics

Assumptions

This study is grounded on the following assumptions:

1. The results of the mathematical performance test taken by the student-respondents were true assessment of their performance in mathematics.
2. The responses of the students in the attitude test reflected their attitude towards mathematics.
3. The information gathered from the students and teachers data sheet were true and correct.

Hypotheses

The following hypotheses were formulated:

1. There is no significant relationship between the student's mathematical ability and the following variables:
    a. Student-related variables
        a.1 gender
        a.2 elementary school were they were from
        a.3 parents' educational attainment
        a.4 attitude towards mathematics

Significance of the Study

This study is significant for the following reasons:

1. **The results gathered in this study would reveal the performance in Mathematics IV of the fourth year high school students of the selected national high school**

Knowing the level of the performance of an individual helps in determination of things that should be improved and developed. An ability test in Mathematics IV will help determine the level of performance of students for them to improve not only their cognitive ability but their whole personality as well.

2. **The output of this research would determine if the performance in mathematics of the students of the selected National High School is affected by the student related factors, specifically: gender, elementary school graduated from, parents' educational attainment and attitude towards mathematics.**

There are factors affecting one's performance in mathematics and these factors should be given consideration. These factors that are significantly related to mathematical performance should be determined to be given enough priority and use these factors to improve the mathematical performance of the students.

3. **The test developed in this study can help teachers assess students' performance in Mathematics**

The test will help the teachers know what to improve in their students performance. It is also a big help to have a change in their teaching strategies.

Scope and Delimitation of the Study

This study is delimited to the mathematical performance of fourth year students, randomly selected from Batasan Hills National High School, Dasmariñas National High School and Valenzuela National High School, school year 2005-2006.

The independent variables considered were the student-related and teacher-related factors, while the dependent variable is the students' mathematical performance.

The student related factors were gender, elementary school were they were from, attitude towards mathematics and parents' educational attainment.

On the other hand, the teacher-related factors were educational attainment, training(s)/seminar(s) attended and length of service.

The instrument used to measure mathematical performance is a 50-item test in five content learning areas in Mathematics IV, specifically; functions, linear functions, quadratic functions, polynomial functions and exponential and logarithmic functions. The

instrument was based on the Desired Learning Competencies (DLC) that the said national high schools use.

Conceptual Framework

To illustrate clearly the framework of the study, the model is presented in Figure I (see next page).

The concept of this study revolves around the paradigm where the independent variables, student-related and teacher-related, were interconnected with the dependent variable, which is the mathematical ability of fourth year high school students.

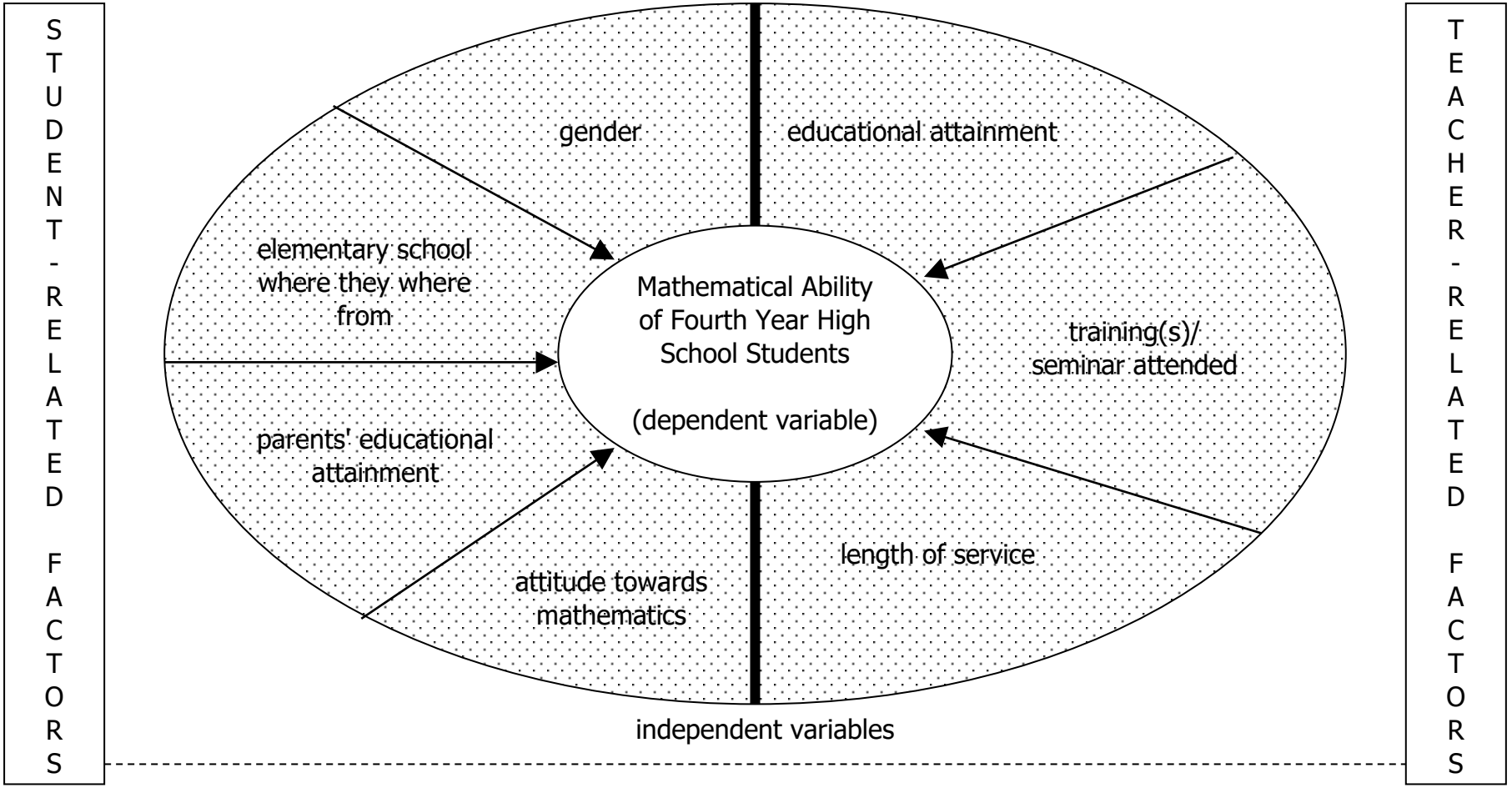

Figure 1

Conceptual Paradigm

Definition of Terms

Attitude towards mathematics. This refers to the opinion or feeling of the student-respondents towards mathematics.

Gender. This refers to the classification of an individual whether male or female.

Elementary school where they where from. This refers to the classification of elementary school, whether public or private.

Educational attainment. This refers to the highest educational attainment of teachers teaching Mathematics IV in the selected national high schools.

Length of service. This refers to the number of years that the teacher has been teaching mathematics.

Mathematical performance. This refers to the competency of the student-respondents to use and apply the principles and concepts of Mathematics IV.

Parents' educational attainment. This describes the highest level of education reached by the parents of the student-respondents.

Student-related factors. This term refers to the factors affecting the students' mathematical ability. In this study the factors considered are gender, elementary school where they were from, attitude towards mathematics and parents' educational attainment.

Teacher-related factors. This term refers to the educational attainment, length of service and training(s)/seminar(s) attended.

Training(s)/seminar(s) attended. This refers to the number of seminars, trainings, workshops, conferences, etc related to mathematics attended by the teacher.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RELATED STUDIES

Several readings were done on related literature and related studies in order to have enough background for this study. Several research studies that have significant contribution to this study were summarized and included in this chapter.

Review of Related Literature

Foreign Literature

As cited by Butterworth (1999), mathematical ability is regarded as a talent given to relatively few individuals. One either had it or one did not, was the prevailing view - and most believed they did not have it. Mathematics is a primary human trait that every one possesses in abundance. From his own research, and that of a growing group of scientists studying both human and non-human facility with numbers, Butterworth concluded that "we are born with brain circuits specialized for identifying small numerosities". This study pays attention to attitudes in coordination with the total ability of the student-respondents because student's attitude towards mathematics contributes on his/her ability to think mathematically.

In addition, Miller (1990) in Eric Clearinghouse on Disabilities and Gifted Education Digest, mentioned that mathematical talent refers to an unusually high ability to understand mathematical ideas and to reason mathematically, rather than just a high ability to do arithmetic computations or get top grades in mathematics. When considering

mathematical talent, many people place too much emphasis on computational skill or high ability in replicating taught mathematical procedures. unless mathematical talent is correctly perceived, however, important clues can be overlooked and less important clues can be given too much significance. Miller implied to some characteristics and behaviours yielded in discovering high mathematical talent as there is an unusually keen awareness of intense curiosity about numeric information, an unusual quickness in learning, understanding and applying mathematical ideas, a high ability to think and work abstractly and the ability to see mathematical patterns and relationships, ability to think and work with mathematical problems in flexible, creative ways rather than in a stereotypic fashion and ability to transfer learning to new, untaught mathematical situations. Terms such as mathematically talented, mathematically gifted, and highly able in mathematics are generally used to refer to students whose mathematical ability places them in the top 2% or 3% of the population. It is important to keep in mind the unusually high degree of talent that is being sought when looking for mathematically talented individuals.

Moreover, as cited in wikipedia.com, mathematical abilities are said to differ by gender. Males are supposedly more skilled in mathematical fields than females. Results of intelligence tests, such as the Differential Aptitude Test (DAT), provide evidence to this statement. Male 12th graders who took the DAT scored almost nine-tenths of a standard deviation higher on mechanical reasoning than females (Lupkowski, 1992). There are many theories on what may be causing this difference on mathematical ability between the genders. Environmentalists argue that this difference is caused by gender biased education, while some other researchers argue that it is the characteristics

of the genders that cause this ability gap. These are only a few of the possible reasons. The reason is still not certain. However, with this kind of thinking it may show certain variation to student's ability. The stereotype, that men are more intelligent than women, causes women to strive more in their mathematical abilities while men tend to relax with their abilities, which may appear in this study because mathematical abilities and attitudes that may cause low mathematical ability are the focus of this study.

In Mathematical Giftedness and Family Relationship, Weiss (1994) argued that the mathematical ability and achievement of school children have strong relationship to the jobs and professions of the parents as well as the relatives. The empirical findings were impressive as: (1) in cases where the gifted youngsters had a father who was a graduate in mathematics, physics or engineering (i.e., who belonged to the same professional group as 92 percent of the participants themselves), all siblings of the participants were above average in ability in such families where the mother is from any profession or be a housewife; (2) in cases where the gifted student had a father who did not belong to the group just mentioned, the siblings could have any job or profession; (3) even more impressive was a finding among the collaterals (i.e., siblings of parents of the gifted youngsters and their respective spouses): parents who both belonged to the same high IQ group as the gifted students nearly always had children (i.e. cousins of the gifted group) who were all of the same above average IQ. Unskilled parental pairs mostly only had children in unskilled jobs parental pairs where both spouses had an estimated IQ of about 110 had children who were scattered over all possible jobs and professions.

Some literature states that in order to succeed in higher level mathematics, and even to solve complex problems encountered in daily life, students must acquire the skills necessary to use mathematics with ease. Students must master procedures (addition and division, for example), but they must also understand the problem-solving strategies that apply to mathematical procedures and concepts. Effective school curricula are designed to build student's critical, creative, and logical problem-solving abilities (www.findarticles.com). This kind of readings support this study because, if the skills discussed were acquired possibilities of high mathematical ability would show.

Harling (1999) discussed about over 300 activities for cross-curricular work of the National Curriculum. These activities provide ample opportunities for work which makes direct use of the abilities for math curriculum. The activities cover a wide range of approaches and starting points. Some use mathematics for classification and explanation of phenomena, patterns or the results of surveys of the environment of children. Others make use of context more often seen in non-mathematical work to highlight the power and usefulness of math. And because such activities are given, math abilities of the students tend to uprise. If students were used in working with these activities it might manifest with attitudes towards mathematics which is the focus of this study.

Case, Griffin and Kelly (1999) in the book *Socioeconomic Gradients in Mathematical Ability and their Responsiveness to Intervention During Early Childhood*, designed and suggested a program called Rightstart, which targets the central conceptual structures required in the development of scientific and mathematical thought involved mostly in early years of a child. It centralized on the following changes as: (1) the

presence of additional elements in the curriculum consist of learning to count backwards as well as forwards, learning the increment and decrement rules, learning that movement forward and backward in the number string could be treated as a reliable guide to movement forward and backward in the sequence of cardinal values, learning that the entire sequence could be used as a basis for making dimensional judgements; and learning the conventional labels for referring to the relations in each row, as well as the elements themselves; (2) stronger and more explicit developmental emphasis whereby activities are sequenced developmentally, and teachers are provided with benchmark assessment devices for determining where any individual student is situated in his general developmental journey which allows appropriate adaptation to particular students, schools, and communities; (3) mix of pedagogical approaches that includes both classical didactic methods (exposition followed by drill and practise), and non-didactic methods (hands-on activities encouraging children to construct their own mathematical meanings and insights); (4) emphasis on board games and language is a heavy emphasis on affectively involving games, and the mathematical language that such games elicit. This program has been implemented now particularly in United States and Canada, and uses different kinds of evaluations and measures used to assess outcomes. When this program was implemented in the said countries, children who were under this program consistently performed better than those in the control groups, across a number of situations and measures. The most dramatic results to date come from a longitudinal study wherein low socioeconomic /low ability children were tracked over a three-year period, and given a follow-up treatment, in addition to the original program.

Nevertheless, there are ways to enhance mathematical ability depending on the students' orientation, attitudes or even usual activities.

Local Literature

In an article written by Villona (2004), she mentioned that researchers have shown that there is a link between student's generic thinking skills and his achievement in school subjects particularly in mathematics. The abundance of knowledge and information brought by technology demands that development of thinking skills be emphasized in schools to enable students to make choices and solve problems. Different kinds of thinking are used is dealing with real problems. This study will show if these technologies affect mathematical abilities and/or the student's attitudes towards mathematics.

Bagtas (2001) explained that in mathematics, students need to master not only the facts of the four fundamental operations or computation skills and memorize tables and formulas. They should also be trained to engage in logical thinking, pose problems, discover patterns, draw conclusions and the like which would tap their thinking processes to develop higher order thinking skills. This might be revealed in this study. If the respondents have developed higher order thinking skills it might show in the results and might be measured by the performance test instrument of this study.

Abrugar (2001) suggested that teachers should refrain from malpractice because poor performance of students is not a fault all their own. It is possible that the teacher's methods of teaching are not good enough to strike the "learning chord" of the students. Sometimes, poor performance of students is due to parental neglect as in the case of parents who just make the teacher as "baby sitters" for their children while they

go about their usual business unmindful of their children. In some cases, it is the social environment of the pupils that causes their poor performance as in the case of pupils who frequently are absent because of gambling, drinking etc. This may greatly affect the student's attitude, which is why the researchers agreed to the author's ideas.

Uy (1999) in her article *Mathematics for Today* argued that students of Mathematics have had and continue to have negative experiences with mathematics. But they are still studying the subject because of irresistible pressure from teachers, parents and the whole school system. As a consequence, a negative attitude towards mathematics prevails and it affects the learning of mathematical concepts. This study focused on the measurement and interpretation of the student-respondent's mathematical ability.

A discussion of Lee (1995) in her book states that many people suffer from math anxiety, which is triggered by certain symbols or terms that create mental blocks among students. So far, educators and psychologists in the country have been focusing in math inability as a result of environmental factors. At times they are successful, other times they can barely alleviate the weaknesses, for math inability can also stem from physiological causes, and in these cases, knowledge of neurology becomes essential. Tentatively, researchers have called this sort of inability as acaculia (acquired dyscaculia). Dyscalculia and acaculia have been used variously by different researchers and until now no single definition has sufficed. This article might explain to other readers what might be the problem if they have encountered such problem. Furthermore, the researchers might consider this as another factor if the result shows insignificant data.

Review of Related Studies

Foreign Studies

According to Cohen (1997), evidence with respect to formal math instruction shows that 80+% of high school graduates in the United States get no further than consumer math, general math, and introductory algebra (this ignores the 30% of students nationwide who do not graduate at all). Scores on the math portion of the Scholastic Aptitude Test (a college entrance exam) continue to decline. When he speaks to groups of adults, he sometimes asks how many fear or dislike math and how many consider themselves math-phobic or math illiterate. Consistently 1/3-1/2 of any adult audience identifies themselves as having a strained relationship the topic. This illustrates relatively low level of formal math course completion, the lack of math application skills, poor standardized test performance, and pervasive math anxiety in the general population.

Ones attitude toward mathematics affects how well or how often one does it, and how much enjoyment he/she derives from it. Many students taking mathematics courses in college have a negative attitude toward mathematics that can be described as "math anxiety" or "math avoidance." Math anxiety is a state of such tension or fear that the learning process in mathematics is blocked or interrupted. Math avoidance usually occurs because this fear or tension causes a person to react negatively to mathematical situations and therefore avoid them as much as possible. The math anxious or avoidant student has difficulty doing well in mathematics. But this difficulty is not related to ability but rather is related to the attitudes that are held about math. Researchers have found that one of the traits of mathematical problem solvers is low level of anxiety. In

this study, the researchers tried to know reasons why mathematical ability of students varies from their attitudes towards mathematics.

Social scientists report that Americans are the only citizens of developed nations that describe themselves as "not good at math", and point to supporting evidence from standardized tests administered worldwide--U.S. students rank below those of many other nations in math proficiency (www.findarticles.com). The researchers believe that there is no such thing as "not good at math" because there are other reasons why students feel that way.

Local Studies

Aguilar (2004), in his study Performance in Intermediate Algebra of Second Year High School in Sinait High School, argued that there is a relationship between the mathematical performance and student related variables; sex, and parents educational attainment. He also added that there is no relationship between the mathematical performance and the teacher related factors; teaching experience and in service training. The researchers agreed, that is why certain student-related factors was included in this study.

Somera (2002) found out that the mathematics achievement of the pupils in her study needed improvement especially in the cognitive skills in knowledge, comprehension and analysis with only “satisfactory” level of achievement. This indicates that the teachers teaching mathematics should grow professionally by attending seminars as this variable is significantly correlated with the pupil’s achievement. It was also cited in her study that the mathematics achievement of the pupils was not correlated with the

teacher's sex, teaching experience, area of concentration and school facilities and equipment. Moreover, the student's mathematical achievement was significantly correlated to the pupil-related factors as sex, place of residence and parents' educational attainment. The present study follows the same outline.

In a study conducted by Realina (2003), she cited that there is a relationship between the mathematical ability and some student related factors specifically sex and attitude towards mathematics but no relation between parents' educational attainments. She recommended the students should be encouraged to focus most of their attention to the content learning areas where they are weak, and content learning areas found as their strengths should further be strengthened. Likewise, teachers are encouraged to grow professionally either to pursue master's or attend seminars. She also added that in the teaching of mathematics, other methods should be employed to motivate and encourage students to participate and learn actively in the lesson.

Alibin (1999) found out in her study that majority of the respondents perceive mathematics as a challenging subject, where more than one-half of them involved in math-related activities through their membership in math club, officer ship in math club and joining math competition or Olympiad. Her study also revealed that the mathematical performance of the students needed improvement especially in the cognitive skills of analysis application, computation, with satisfactory along comprehension. This indicates the difficulty of students in tackling problems that require critical thinking ability and mastery of the fundamental operations involved in problem solving. She added that the level of low achievement in mathematics of the respondents was not significantly influenced by the type of the elementary school they graduated from

and media exposure. As a whole, the low achievement in mathematics of the students was influenced significantly by the students' general attitude toward mathematics. This shows that the general orientation of the students towards mathematics whether positive or negative had a great bearing on their performance.

They study entitled Mathematical Skills in Polynomial Functions of Senior High School Students in Selected Secondary School in the First Congressional District of Zamboanga Del Sur, conducted by Logdonio (1999), revealed fair attitudes toward mathematics. A considerable number had good attitudes while few of them had poor attitudes towards Math subjects. The study also revealed that students had fair mathematical skills among the topics. He also found out that students' performance in the assessment test on Polynomial Functions was generally low especially in graphing polynomial functions of degrees 1, 2, 3 and 4. The students encountered difficulties in arriving at the correct answers in most of the problems given in the test.

Espejo (1997) mentioned that children whose parents were of higher educational levels had better chances of getting high grades and passing than those children whose parents were of lower educational level. However, the researchers were aware that this may be a factor but then parent-respondents were not included in the study because it was not the focus of the study made.

The study and literature made the study more comprehensive on mathematical performance.

Some studies mentioned are related to this present study because they aimed to determine the mathematical performance of the students and its relationship to other student related factors. However, student related factors included in this research

are gender, elementary school graduated from, parents' educational attainment and attitude towards mathematics. Studies cited here include study habits, affiliations with organization related to mathematics, parents' occupation and others. Previous studies also determined the profile of the teacher respondents, as in this research, but the proponents did not correlate the teachers' profile with mathematical performance.

CHAPTER III

METHODOLOGY

This chapter discusses the research methods and procedures done in doing the study. This includes the Research Design, Instrumentation, Sampling Design, The Gathering Procedure and Analysis of Data.

The Research Design

This study made use of the descriptive design. It involves ascertaining students' mathematical performance along with the other independent variables; student related factors: gender, elementary school where they were from, parents' educational attainment and attitude towards mathematics; and the teacher related factors: educational attainment, training(s)/seminar(s) attended and length of service. It also aimed to determine the performance of fourth year high school students in five content learning areas of Mathematics IV, specifically: Functions, Linear Functions, Quadratic Functions, Polynomial Functions and Exponential and Logarithmic Functions.

This study focused on finding out the performance of fourth year high school students of selected National High School in Mathematics IV that was based on the data generated from the research instrument which the researchers develop.

The Instrumentation

The three types of questionnaires used in this study were the Information Questionnaire, Attitude Test Questionnaire and The Ability Test Questionnaire.

Information Questionnaire

The researchers used the information questionnaire to gather information that may affect the student's mathematical ability. In this study there were two information questionnaires used: one for the teachers (Appendix A), which aimed to collect information about their educational attainment, training(s)/seminar(s) attended and length of service; the second was for the students (Appendix B) which aimed to collect information about the students' gender, elementary school where they came from and parents' educational attainment.

Attitude Test Questionnaire

To determine the attitude of students towards mathematics the researchers adapted the attitudinal test from Gagto (2001), which he used in his research entitled "The Performance in College Algebra of First Year Students of UNP-Candon,". Gagto made a 33-item survey questionnaire but the researchers eliminated some of the items and came up with a 15-item survey questionnaire. The following scale was used for the descriptive rating:

4.50 – 5.00 Extremely Positive (EP)

3.50 – 4.49 ModeratelyPositive (MP)

2.50 – 3.49 Neutral (N)

1.50 – 2.49 Moderately Negative (MN)

1.00 – 1.49 Extremely Negative (EN)

Ability Test Questionnaire

The ability test questionnaire was used to measure the mathematical ability of the students. This section will further discuss the development of the said questionnaire and it is subdivided into the following phases:

Phase I – Planning

Phase II – Item Construction

Phase III – Try Out

Phase IV – Construction of the Final Ability Test Questionnaire

Phase I – Planning

The researchers focused on the construction and development of an instrument to measure the mathematical ability of the students. The planning procedures identified how the instrument would be constructed and how the researchers would test the validity and reliability of the instrument.

The researchers sent a letter to the selected National High Schools' (Appendices D - F) asking them to let them have a copy of the Desired Learning Competencies of their school. The DLCs were compared and it was discovered that all of the schools were using the same DLC (Appendix G). The DLC was then used as basis for the construction of the table of specifications. The table of specifications was then given to high school mathematics teachers for the judgemental review. Necessary revisions were made based on their suggestions and the researchers come up with a table of specifications for 50 items of multiple choice (Appendix H): Five items on Introduction to Functions, ten on Linear Functions, ten items on Polynomial Functions and fifteen items on Exponential Functions, covering the lessons that fourth year high school students of the selected

national high school have taken from the first grading period to the mid-third grading period.

Phase II – Item Construction

The items in the instrument were utilized to collect data needed for measuring the mathematical ability of the students. The instrument was created based on the table of specifications. The researcher used fourth year high school books, text books and manuals as a reference in the construction of the test items. Experts were consulted for judgmental review and to determine if the questions in each item are appropriate for the choices. Necessary revisions were made, and finally the final test questionnaire (Appendix I) was ready for the first try out.

Phase III – Try Out

First Try Out

Through a letter the researchers asked permission from the principal of Sergio Osmeña Jr. High School to let them administer their ability test questionnaire (Appendix J). They were given permission and administered the test to 70 homogenously selected students of the said school. The students were instructed to answer each item on the basis of what they have learned from the 1st Grading Period to the mid-3rd Grading period. The purpose of the try out was to determine the language suitability, clarity of the directions, testing time, the level of discrimination and the level of difficulty of the instruments for modification. The results of the try out were summarized to form the item analysis (Appendix K) and option analysis (Appendix L). The item analysis shows the level of discrimination and difficulty of an item while the option analysis shows the distribution of the answers of the students.

For item analysis, the researchers scored the test and arranged the papers from highest to lowest. They separated the upper and lower 27% of the cases and use the following formula to compute for the difficulty level and discrimination level of the test instrument:

Difficulty Level

$$D_{if}I = \frac{P_U + P_L}{2}$$

Discrimination level

$$D_{is}I = P_U - P_L$$

Where:

$D_{if}I$ - Level of difficulty

P_U - Proportion of the upper 27% who got the item correct

P_L - Proportion of the lower 27% who got the item correct

The scale below was used to rate the level of difficulty:

.96 and above	Very Easy
.76 - .95	Easy
.26 - .75	Average
.11 - .25	Difficult
.10 and below	Very Difficult

For the level of discrimination the scale below was used:

.41 and above	High Discrimination (HD)
.20 - .40	Moderate Discrimination (MD)
.19 and below	Low Discrimination (LD)

Retaining, revising or rejecting the item were based on the two ranges. Items with difficulty level within .26 to .75 and with discrimination level from .20 and above were retained. Items with difficulty index within .26 to .75 but with discrimination index of .19 and below or with discrimination index of .20 and above but with difficulty index not within .26 to .75 were revised. Items with difficulty level not within .26 to .75 and with discrimination level of .19 and below should be rejected but due to the importance of these items in the study, absence of an alternative entry and with the approval of the adviser the researchers decided to revise the questions.

In the first try out, 27 items were retained, 15 were revised and 8 items were rejected, but as mentioned above, the researchers decided to revise these items for the second try out.

The items that were revised were item number 1, 3, 5, 6, 13, 14, 17, 18, 19, 21, 23, 24, 26, 27, 28, 29, 30, 35, 37, 41, 43, 49 and 50. Items that appeared to be easy and very easy according to the difficulty index like item number 1, 6, 13, 19, 24, 27, 28, 29, 30, 41 and 43 were made more complicated. The researchers changed the given numbers to more complicated ones. However, the researchers did the opposite with items that showed to be difficult and very difficult. These were item number 17, 18, 23, and 6. The researchers also revised the items according to the result of the discrimination index. Items with low discrimination like item number 1, 3, 5, 6, 13, 14, 17, 18, 21, 23, 24, 26, 30, 35, 37, 43 and 49 were also revised. The researchers based the revision on the option analysis. Distracters which appeared to be too easy or too difficult to identify were revised to become a better option.

The items that were revised were changed in line with the table of specifications.

Second Try Out

The purpose of the second try out was almost the same with the first try out but this time it determined if the revisions made from the first try out improved the quality of the test. In this stage the researchers modified the ability test questionnaire based on the item analysis and option analysis on the first try out. Good items were retained and items that needed to be revised were improved. After the revision the researchers was able to come up with the ability test (Appendix M) that would be administered for the second try out.

The researchers asked permission from the principal of Bacoor National High School to let them administer their test for their second try out through a letter (Appendix N). They were given permission and the results of the test were summarized to form the item analysis (Appendix O) and option analysis (Appendix P). The method and scale used for the item analysis and option analysis was the same as in the first try out.

In the second try out, 32 items were retained, 13 items were revised and 5 items were originally rejected but were revised for the final performance test. Item number 13, 19, 38, 39 40, 42, 43, 45 and 47 which appeared to be easy or too easy were changed to be more complicated. The opposite was done in item number 33 which appeared to be very difficult.

Items with low discrimination like item number 1, 4, 18, 24, 26, 28, 31, 33, 38, 40, 42, 43, 44, and 50 were revised based on the options analysis. The revisions made in the second try out for the final performance test was in line with the table of specifications.

Phase IV – Construction of the Final Ability Test Questionnaire

The researchers formed the Final Ability Test Questionnaire (Appendix Q) based on the results of the First and Second Try out. Necessary revisions were made and because there was no alternative for the rejected items and due to the importance of their contribution for the ability test questionnaire, the researchers decided to revise the rejected items. The performance test that was constructed was used to measure the mathematical performance of the fourth year high school students of selected national high school. Table 1 shows the scale used in rating the mathematical performance of the students:

TABLE 1

RATING SCALE USED FOR THE MATHEMATICAL PERFORMANCE

Descriptive Rating	For 5 items	For 10 items	For 15 items	Total (50 items)
Outstanding (O)	4.1 – 5	8.1 - 10	12.1 – 15	41 – 50
Very Satisfactory (VS)	3.1 – 4	6.1 – 8	9.1 – 12	31 – 40
Satisfactory (S)	2.1 – 3	4.1 – 6	6.1 – 9	21 – 30
Poor (P)	1.1 – 2	2.1 – 4	3.1 – 6	11 – 20
Needs Improvement (N)	0 – 1	0 – 2	0 – 3	0 – 10

The Sampling Design

Students

The target respondents of this study were students from public high schools in the national level. The researchers have chosen Region V and NCR as their sample and administered the test to fourth year students of Batasan Hills National High School, Dasmariñas National High School and Valenzuela National High School.

The respondents were randomly selected. Table 2 presents the total population of the 4th year high school students of each school and the number of respondents in each sample population.

TABLE 2

FOURTH YEAR HIGH SCHOOL STUDENTS POPULATION AND SAMPLE USED IN THIS STUDY

	Population	Sample
Batasan Hills National High School	1771	100
Dasmariñas National High School	2035	115
Valenzuela National High School	803	46
Total	4609	261

The total number of respondents was determined using Slovin's Formula. The formula is:

$$n = \frac{N}{1 + Ne^2}$$

Where:

n - sample size

N - population size

e - desired margin of error

In this research the researchers used the $\pm 06\%$ of error due to economical reasons, which was approved by the adviser.

The sampling technique used was Random sampling. This method was used because each member of the population has an equal chance of being included in the sample and all possible combinations of size have an equal chance of being selected as the sample.

Teachers

The teacher respondents of this study were all high school teachers of 4th Year high school students of Batasan Hills National High School, Dasmariñas National High School and Valenzuela National High School. Table 3 shows the total number of teacher respondents in this study.

TABLE 3

NUMBER OF TEACHER RESPONDENTS OF THIS STUDY

	Total Number of Teacher Respondents
Batasan Hills National High School	14
Dasmariñas National High School	19
Valenzuela National High School	17
Total	50

Data Gathering

The researchers asked permission from the principals of the selected national high school to let them float their questionnaires in their schools (Appendix R - T). The questionnaires for the students were administered to randomly selected students of each school. Each student was given 20 minutes to answer the information questionnaire and the attitudinal test, and one hour to answer the ability test. The students of BHNHS took the test in the covered court of BHNHS, while the students of DNHS took the test in one of the classrooms. The students of DNHS were split into two. The first group took the test in the morning and the other in the afternoon. At VNHS, the students took the test in one of their classrooms. Furthermore, each teacher respondent was given enough time to answer the information questionnaires.

Analysis of Data

Profile of Student-Respondents and Teacher Respondents

To determine the profile of students in terms of gender, elementary school graduated from and parent's educational attainment, and the profile of math teachers in terms of educational attainment, training(s)/seminar(s) attended and length of service, frequency counts and simple percentage were used. The formula used was:

$$P = \frac{x}{n}(100)$$

Legend:

P - is the percentage

x - is the frequency count

n - is the total number of cases

Mathematical Performance

To determine the level of mathematical performance of the students, the researchers computed for the mean. The formula is:

$$\bar{x} = \frac{\sum x}{n}$$

Legend:

$\bar{x}$ - Mean

x - Number of Correct Items

n - Total Number of Respondents

Attitude Towards Mathematics

To determine the Attitude of the students towards Mathematics the researchers computed for the mean. The formula is the same as for the mathematical performance, however, x represents the rating of each student in each item.

Relationship between Mathematical Performance and Student-Related Factors

In determining if the student related factors like gender, school where they graduated from and parents' educational attainment were significantly related to their mathematical performance, the Chi-Square Test for Independent Proportions with .05 as the level of significance was used. The researchers used data analysis in Microsoft Excel.

Pearson r was used to determine if there was a significant correlation on the attitude of students towards mathematics and their mathematical performance. Computation of Pearson r using data analysis in Microsoft Excel was done.

CHAPTER IV

PRESENTATION, INTERPRETATION AND ANALYSIS OF DATA

This chapter presents, interprets and analyzes the data gathered in this study. The information gathered are presented in tabular form. Statistical treatments were used to identify the relationship of mathematical performance with some related factors.

This research aimed to answer the following queries:

1. What is the profile of the student-respondents in terms of the following student-related factors:
   a. gender
   b. elementary school where they were from
   c. parents' educational attainment
   d. attitude towards mathematics

Gender

TABLE 4

PROFILE OF THE FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOL IN TERMS OF GENDER

Gender	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
Male	43	43%	29	25.22%	15	32.61%	87	33.33%
Female	57	57%	86	74.78%	31	67.39%	174	66.66%
Total	**100**	**100%**	**115**	**100%**	**46**	**100%**	**261**	**100%**

As shown in Table 4, the three selected national high schools are dominated by female. The population of female in the three schools is greater than 50%. However, among the three schools Dasmariñas National High School (DNHS) has the greatest percentage of the total number of female which accounts for 74.78% of the sample from DNHS. Overall, there were 66.66% female in the total number of sample and 33.33% male. This data indicates that there is a greater population of female in the selected national high school.

Elementary School Graduated From

TABLE 5

PROFILE OF THE FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOL IN TERMS OF ELEMENTARY SCHOOL GRADUATED FROM

Elementary School	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	F	%
Private School	9	9%	8	6.96%	2	4.35%	19	7.28%
Public School	91	91%	107	93.04%	44	95.65%	242	92.72%
Total	**100**	**100%**	**115**	**100%**	**46**	**100%**	**261**	**100%**

Most students of the selected national high school were from public elementary schools. As shown in Table 5, 92.72% of the total number of samples studied in public elementary schools and only 7.28% studied in private elementary schools. In all of the schools, the number of students who studied in public elementary school was greater than 90% and Valenzuela National High School (VNHS) has the greatest number of students who studied in public elementary schools which accounts for 95.65% of the total sample population from VNHS.

Parents' Educational Attainment

Father

TABLE 6

PROFILE OF THE FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOL IN TERMS OF FATHERS' EDUCATIONAL ATTAINMENT

Fathers' Educational Attainment	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
College Graduate	13	13%	25	21.74%	11	23.91%	49	18.77%
College Undergraduate	14	14%	27	23.48%	14	30.43%	55	21.07%
High School Graduate	55	55%	45	39.13%	15	32.61%	115	44.06%
High School Undergraduate	9	9%	5	4.35%	2	4.35%	16	6.13%
Elementary Graduate	8	8%	7	6.09%	4	8.70%	19	7.28%
Elementary Undergraduate	1	1%	6	5.22%	0	0%	7	2.68%
Total	**100**	**100%**	**115**	**100%**	**46**	**100%**	**261**	**100%**

The result shows that most of the fathers of the students from selected national high school are high school graduates and only 2.68% of them are elementary undergraduate. Next to high school graduate is college undergraduate which is 21.07% of the sample. However, only 18.77% were able to finish college, 7.28% are elementary graduates and 6.13% are high school undergraduates.

Mother

TABLE 7

PROFILE OF THE FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOL IN TERMS OF MOTHERS' EDUCATIONAL ATTAINMENT

Mothers' Educational Attainment	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
College Graduate	13	13%	17	14.78%	16	34.78%	46	17.62%
College Undergraduate	9	9%	22	19.13%	9	19.57%	40	15.33%
High School Graduate	51	51%	51	44.34%	11	23.91%	113	43.30%
High School Undergraduate	18	18%	15	13.04%	4	8.70%	37	14.18%
Elementary Graduate	7	7%	7	6.09%	5	10.87%	19	7.28%
Elementary Undergraduate	2	2%	3	2.61%	1	2.17%	6	2.30%
Total	**100**	**100%**	**115**	**100%**	**46**	**100%**	**261**	**100%**

Most of the mothers of the students of the selected national high school are high school graduate. This is the same as the result gathered from their fathers' educational attainment. Also, the least percentage is the elementary undergraduate which is 2.30%. However, next to high school graduate is the college graduate, which accounts for 17.62% and the college undergraduate accounts for 15.33%. There is also a low percentage of elementary graduate, which is 7.28%.

Attitude towards mathematics

(See Table 8 on the next page)

TABLE 8

ITEM MEAN ON ATTITUDE TOWARDS MATHEMATICS OF FOURTH YEAR HIGH SCHOOL STUDENTS OF SELECTED NATIONAL HIGH SCHOOL

STATEMENTS	BHNHS		DNHS		VNHS		TOTAL	
	$\bar{x}$	DR	$\bar{x}$	DR	$\bar{x}$	DR	$\bar{x}$	DR
1. I find mathematics stimulating and challenging	3.39	N	4.34	MP	3.96	MP	3.89	MP
2. Mathematics is very interesting	3.17	N	4.10	MP	3.61	MP	3.66	MP
3. *Mathematics makes me feel irritable and impatient	3.35	N	3.23	N	2.91	N	3.22	N
4. *I feel sleepy in my mathematics class	3.69	MN	3.62	MN	3.52	MN	3.63	MN
5. Mathematics is my favorite subject	2.54	N	3.43	MN	2.70	N	2.96	N
6. I am confident that I can solve problem in Mathematics	2.77	N	3.58	MP	3.17	N	3.20	N
7. Mathematics develops my ability to think and reason accurately	3.11	N	4.25	MP	3.72	MP	3.72	MP
8. I always study and do my assignment in Mathematics without hesitation	2.68	N	3.61	MP	3.04	N	3.15	N
9. *I do not enjoy my Mathematics subject, so I do not attend my Mathematics class regularly	4.33	MN	4.52	EN	4.22	MN	4.39	MN
10. *I do not enjoy my Mathematics assignments without the help of my relatives, friends and classmates	3.70	MN	3.86	MN	3.52	MN	3.74	MN
11. *My mind goes blank and I cannot think clearly when working with mathematics	3.64	MN	3.73	MN	3.65	MN	3.67	MN
12. *I do not study Mathematics subjects regularly	3.75	MN	3.78	MN	3.65	MN	3.75	MN
13. I can learn Mathematics without the help of my teacher	2.30	MN	2.41	MN	2.33	MN	2.35	MN
14. I am happier in my Mathematics class than in my other class	2.46	MN	3.26	N	2.54	N	2.83	N
15. I wish I could take more Mathematics class than in my other class	2.58	N	3.31	N	2.65	N	2.92	N
Total	**3.16**	**N**	**3.67**	**MP**	**3.28**	**N**	**3.37**	N

Note: * Negative statements

Descriptive Rating (DR):

EP – Extremely Positive **MN** – Moderately Negative **MP** – Moderately Positive **EN** – Extremely Negative **N** – Neutral

Based on the data gathered in Batasan Hills National High School (BHNHS), it appeared that the rating of attitude of the students from the said school towards mathematics is neutral. The computed mean was 3.16 and it showed that in most of the 15 items the students rated neutral. There were also items were the students rated moderately negative. These are item number 4, 9, 10, 11, 12, 13 12 and 14. This shows that most of the students attend their class in mathematics regularly. However, it also shows that they still enjoy learning math without the help of others and their teachers.

Dasmariñas National High School is the only school among the three to have a moderately positive attitude towards mathematics. The data shows that students rated moderately positive in item number 1, 2, 6, 7 and 8 and this means that most if the students find mathematics stimulating, challenging and very interesting. It also appears that the students are confident enough to solve mathematics problems independently.

The students from Valenzuela National High School appeared to have a neutral attitude towards mathematics. As shown in Table 8, the students believe that mathematics help them to think and reason accurately and like in DNHS, the students find mathematics challenging and interesting.

Overall, the students have a neutral attitude towards mathematics. They rated moderately positive on items containing positive statements like item number 1, 2 and 7 and moderately negative on items containing negative statements like item number 4, 9, 10, 11 and 12. This shows that most of the students find mathematics stimulating, challenging and very interesting. They believe that math could help them develop their ability to think and reason accurately. It also shows that the students attend their math

class regularly and that they enjoy working on math assignments without the help of others.

2. What is the profile of the teacher-respondents in terms of the following teacher-related factors:
    a. educational attainment
    b. training(s)/seminar(s) attended
    c. length of service

Educational Attainment

TABLE 9

PROFILE OF MATHEMATIC IV TEACHERS OF THE SELECTED NATIONAL HIGH SCHOOL IN TERMS OF EDUCATIONAL ATTAINMENT

Educational Attainment	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
BS/AB	2	14.29%	3	15.79%	6	35.29%	11	22%
MA/MS (Units)	4	28.57%	10	52.63%	4	23.53%	18	36%
MA (Acad. Req.)	5	35.71%	5	26.32%	4	23.53%	14	28%
MA/MS Degree	2	14.29%	1	5.26%	2	11.76%	5	10%
Ed. D.	1	7.14%	0	0%	1	5.88%	2	4%
Total	**14**	**100%**	**19**	**100%**	**17**	**100%**	**50**	**100%**

Most of the teachers teaching Mathematics IV in the selected national high school have earned MA/MS units, which accounts for 36%. Mathematics IV teachers with MA Acad. Units accounts for 28% and only 10% of the teachers have MA/MS degree. There are only two teachers with Ed. D. degree, one from BHNHS and VNHS.

Training(s)/Seminar(s) attended

TABLE 10

PROFILE OF MATHEMATIC IV TEACHERS OF THE SELECTED NATIONAL HIGH SCHOOL IN TERMS OF TRAINING(S)/SEMINAR(S) ATTENDED

Division	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
19 and above	0	0%	1	5.26%	1	5.88%	2	4%
13 – 15	1	7.14%	1	5.26%	0	0%	2	4%
10 – 12	0	0%	1	5.26%	4	23.53%	5	10%
7 – 9	0	0%	2	10.53%	3	17.65%	5	10%
4 – 6	5	35.71%	1	5.26%	7	41.18%	13	26%
1 – 3	6	42.86%	9	47.37%	2	11.76%	17	34%
none	2	14.29%	4	21.05%	0	0%	6	12%
Total	**14**	**100%**	**19**	**100%**	**17**	**100%**	**50**	**100%**

Regional	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
13 – 15	0	0%	1	5.26%	0	0%	1	2%
4 – 6	0	0%	2	10.53%	1	5.88%	3	6%
1 – 3	5	35.71%	1	5.26%	7	41.18%	13	26%
none	9	64.29%	15	78.95%	9	52.94%	33	66%
Total	**14**	**100%**	**19**	**100%**	**17**	**100%**	**50**	**100%**

National	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
4 – 6	0	0%	4	21.05%	0	0%	4	8%
1 – 3	4	28.57%	0	0.00%	3	17.65%	7	14%
none	10	71.43%	15	78.95%	14	82.35%	39	78%
Total	**14**	**100%**	**19**	**100%**	**17**	**100%**	**50**	**100%**

Most of the teachers have only attended division trainings and seminars. Most of them have not yet experienced attending national conferences. Only 22% have attended a national training or seminar. Also, the teachers who have attended a regional conference are very few, accounting to only 34% and the other 66% have not yet

attendeded a regional training or seminar. Also, 12% of the teachers have not yet attend even a seminar or training in the division level.

Length of Teaching Experience in Mathematics

TABLE 11

PROFILE OF MATHEMATICS IV TEACHERS OF SELECTED NATIONAL HIGH SCHOOLS IN TERMS OF LENGTH OF TEACHING EXPERIENCE IN MATHEMATICS

Length of Teaching Experience in Mathematics	BHNHS		DNHS		VNHS		TOTAL	
	f	%	f	%	f	%	f	%
31 and above	0	0%	0	0%	2	11.76%	2	4%
26 – 30	0	0%	3	15.79%	0	0%	3	6%
21 – 25	1	7.14%	1	5.26%	0	0%	2	4%
16 – 20	1	7.14%	3	15.79%	2	11.76%	6	12%
11 – 15	0	0%	2	10.53%	6	35.29%	8	16%
6 – 10	10	71.43%	7	36.84%	5	29.41%	22	44%
1 – 5	2	14.29%	3	15.79%	2	11.76%	7	14%
Total	**14**	**100%**	**19**	**100%**	**17**	**100%**	**50**	**100%**

Most of the teachers in the selected national high school have been teaching Mathematics for 6 to 10 years. There are also teachers who have been teaching from one to 5 years, which is 14% of the total population. Teachers who have been teaching mathematics from 11 to 15 years account for 16 % of the population and 12% for and teachers teaching mathematics for 16 to 20 years. There is a small percentage of teachers who have been teaching mathematics for 21 years and above.

3. What is the level of mathematical ability of the fourth year high school students in some content learning areas of Mathematics IV, specifically:

   a. Functions

   b. Linear Functions

   c. Quadratic Functions

   d. Polynomial Functions

   e. Exponential and Logarithmic Functions

TABLE 12

LEVEL OF MATHEMATICAL PERFORMANCE OF THE FOURTH YEAR STUDENTS OF SELECTED NATIONAL HIGH SCHOOL

Content Learning Area	No. of Items	BHNHS		DNHS		VNHS		TOTAL	
		$\bar{x}$	DR	$\bar{x}$	DR	$\bar{x}$	DR	$\bar{x}$	DR
Functions	5	1.40	P	1.57	P	2.04	P	1.57	P
Linear Functions	10	3.15	P	3.62	P	4.7	P	3.61	P
Quadratic Functions	10	2.28	P	2.45	P	3.26	P	2.51	P
Polynomial Functions	10	3.72	P	5.07	S	3.98	P	4.33	S
Exponential and Logarithmic Functions	15	3.88	P	5.85	P	5.87	P	5.07	P
Total Mean Score	50	14.43	P	18.56	P	19.85	P	17.09	P

Descriptive Rating	For 5 items	For 10 items	For 15 items	Total (50 items)
Outstanding (O)	4.1 - 5	8.1 - 10	12.1 – 15	41 – 50
Very Satisfactory (VS)	3.1 – 4	6.1 – 8	9.1 – 12	31 – 40
Satisfactory (S)	2.1 – 3	4.1 – 6	6.1 – 9	21 – 30
Poor (P)	1.1 – 2	2.1 – 4	3.1 – 6	11 – 20
Needs Improvement (N)	0 – 1	0 – 2	0 – 3	0 – 10

The data gathered shows that in general the mathematical ability of the students from selected national high school is “Poor”. Also, the students rated poor in all of the content learning areas except in Polynomial Functions which is satisfactory. There is only one school, DNHS, where students managed to get a satisfactory in one of the content learning areas, which is Polynomial functions.

TABLE 13

FREQUENCY AND PERCENTAGE OF STUDENTS IN TERMS OF THEIR MATHEMATICAL PERFORMANCE TEST

	BHNHS		DNHS		VNHS		TOTAL	
Content Learning Area	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
Outstanding	0	0%	0	0%	1	2.17%	1	0.38%
Very Satisfactory	2	2%	6	5.22%	3	6.52%	11	4.21%
Satisfactory	6	6%	32	27.83%	12	26.09%	50	19.16%
Poor	76	76%	70	60.87%	29	63.04%	175	67.05%
Needs Improvement	16	16%	7	6.09%	1	2.17%	24	9.20%
Total	100	100%	115	100%	46	100%	261	100%

Table 13 shows the frequency and the percentage of the students in terms of their score in the 50-item mathematical performance test. As shown in the table, there is a large frequency of students who rated poor in the mathematical ability test. There were 175 students or 67.05% of the total population sample who are poor in the mathematical performance test. Also, there is only 0.38% or only one student, who came from Valenzuela National High School who manage to get an outstanding rating. Students who rated satisfactory in the mathematical performance test were 19.16%, 4.21% got very satisfactory and 9.20% of the students needs improvement.

4. Is there a significant relationship between the students' mathematical ability and the following student related factors:
    a. gender
    b. elementary school where they were from
    c. parents educational attainment
    d. attitude towards mathematics

TABLE 14

CORRELATION BETWEEN MATHEMATICAL ABILITY AND STUDENT RELATED FACTORS

Student Related Factors	BHNHS	DNHS	VNHS	TOTAL
Gender	3.37	12.38*	13.52*	18.85*
Elementary school they graduated from	3.76	6.56	0.74	3.30
Parents' Educational Attainment				
Father	17.54	21.87	17.59	13.53
Mother	27.29	11.99	15.25	18.01

* Significant at .05 level

The researchers computed the Chi-Square of Independence to correlate the mathematical ability and the student related factors. The researchers used .05 level as the level of significance. It was found that among gender, elementary school graduated from and parents' educational attainment, only gender has a significant relationship with mathematical ability. However, in DNHS none of the student related factors mentioned was considered significant. This shows that the mathematical ability is only affected by the students' gender.

TABLE 15

CORRELATION BETWEEN MATHEMATICAL PERFORMANCE AND THE ATTITUDE TOWARDS MATHEMATICS

	Frequency	**Computed Value of Pearson r**
Batasan Hills National High School	100	0.25*
Dasmariñas National High School	115	0.23*
Valenzuela National High School	46	0.17
Total	**261**	**0.29***

* significant at .05 level

Pearson r was used to correlate attitude towards mathematics and mathematical performance. Attitude towards mathematics of the students in Batasan Hills National High School and Dasmariñas National High School is significantly related to their mathematical performance. However, in Valenzuela National High School, it appears that there is no significant relationship between the mathematical performance and the attitude towards mathematics of the students. But in general, there is a significant relationship between mathematical performance and attitude towards mathematics. This means that the mathematical performance is affected by the students' attitude towards mathematics.

This study shows that among the three schools, the female population is bigger than the male. It shows that almost 90% of the students of the selected national high schools were graduates of public elementary school. It was also discovered that most parents of fourth year high school students of the selected national high schools, father or mother, were not able to finish college. In particular most of them were high school graduates.

Regarding the teachers, it appears that most of the teachers do not lack in the experience in teaching mathematics because most of them already have a 6 to 10 years experience in teaching mathematics. However, most of the teachers have not yet finished master's degree and have only attended seminars in the division level and very few on the regional and national level.

This study revealed that the students have a neutral attitude towards mathematics, however most of the students rated poor in the mathematical performance test and in almost all of the content learning areas included in this study.

It was found out that among the student related factors mentioned in this research, gender and attitude towards mathematics are the factors that are significantly related to mathematical ability.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary, findings, conclusion and recommendations proposed.

This study aimed to determine the mathematical performance of fourth year high school students of selected national high schools and its relation to selected student and teacher related factors.

Summary of Findings

Based on the data gathered, analyzed and interpreted, the researchers came up with the following findings:

1. **The profile of the fourth year students in selected national high schools**
    a. **Gender**

        Majority of the Fourth year students of selected national high schools or respondents (174 or 66.16%) are females.

    b. **Elementary school where they were from**

        More than three-fourths of the respondents (242 or 92.72%) were from public school in their elementary level or grade school years.

    c. **Parents' educational attainment**

Most of the students' fathers (115 or 44.06%) are high school graduates. The same is true with students' mothers (113 or 43.30%).

d. attitude towards mathematics

All the students in the three national high schools showed a neutral attitude towards Mathematics with an overall mean of 3.37. Among the three schools only the students of DNHS had a moderately positive attitude towards mathematics and the other two have a neutral attitude towards mathematics.

2. The profile of the teacher-respondents in terms of the following teacher-related factors

a. educational attainment

The highest educational attainment is MA/MS (Units) having a frequency of 18 (36%).

b. training(s)/seminar(s) attended

b1. Division

The mainstream number of teachers (17 or 34%) attended 4-6 times division training or seminars only.

b2. Regional

Majority of the teachers (33 or 66%) did not have any experiences attending regional seminars or training.

b3. National

For about more than three fourths of the teachers (39 or 78%) have not attended any national seminars.

c. length of service

Most of the teacher respondents (22 or 44%) had 6-10 years of teaching experience.

3. The level of mathematical performance of the fourth year high school students in some content learning areas of Mathematics IV:

Overall, the students rated poor in all of the five content learning areas, specifically: Functions, Linear Functions, Quadratic Functions, Polynomial Functions and Exponential and Logarithmic Functions. Only the students from DNHS managed to have a satisfactory rating in one of the content learning areas, which is polynomial functions. In addition, the students rated poor in the 50-item performance test.

4. The student's mathematical ability and the following student related factors

a. Gender

The x^2 value associating mathematical ability and the gender is 18.85. This shows that there is a significant relationship between the students' mathematical ability and their gender.

b. elementary school where they were from

As to the association of mathematical ability and the elementary school, the computed value was 3.30. This means that there is no significant relationship between the mathematical ability of the student.

c. parents educational attainment

There is no significant relationship between mathematical performance and the parents' educational attainment, showing 13.53% for father's educational attainment and 18.01% for mother's educational attainment.

d. attitude towards mathematics

There is a significant relationship between mathematical performance and attitude towards mathematics of the respondents of this study.

Conclusions

On the basis of the findings of the study, the following conclusions were drawn by the researcher:

1. Most of the students are female, studied in the public school during their elementary or grade school level, the parent's educational attainment is high school graduate and the attitude towards Mathematics is moderately positive.
2. Nearly every one of the teachers does have MA/MS degree, has experienced teaching not too long and has attended few training or seminars only in the division level, majority have not attended training in the regional and national training or seminars.

3. The level of the mathematical ability of the fourth year students of the selected national high schools is poor in five content learning areas of Mathematics IV particularly in Functions, Quadratic Functions and Exponential and Logarithmic Functions.
4. There is no significant relationship between the students' mathematical ability and the following variables as student related variables like elementary school were they from and parent's educational attainment. However, gender and attitude towards mathematics are significantly related to the students' mathematical ability.

Recommendations

Based on the synthesis of the findings and the conclusions, the following recommendations were drawn:

For the students

1. Fourth-year students should be given enough time to have remedial classes as well as tutorial for them to improve their skills learned in Mathematics I until their Mathematics IV so they can apply them effectively in college.
2. Pre-test and post test examinations should be given for them to know if they have progressed in Mathematics IV.
3. The fourth year students must be aware of their progress in Mathematics for them to improve in areas where they are weak.

For the teachers

1. The teacher should be exposed to seminars and trainings for them to improve and develop their knowledge in math as well as the strategies and techniques in teaching mathematics in the simplest, easiest, and most innovative ways to help students to progress in learning and value mathematics more.
2. Teachers should be aware of the achievement of their students especially in math. They should conduct things that could detect the weakness and the strengths in the content of each student.
3. A comprehensive assessment of the child's mathematical ability and achievement is necessary before beginning to plan an educational program.
4. The teachers should know particular things such as achievement tests, ability tests, informal assessments, above-level testing, parent and teacher observations, and interest inventories to use when having assessment. They should also know that interest in math, enjoyment of mathematical puzzles and games, and unusual problem-solving techniques are indicators of mathematical ability and only part of a comprehensive assessment.
5. The teacher who conducts assessment using standardized test to their students must be trained especially when it comes to interpreting the results. They should also inform parents of the results.

For the parents

1. The parents should encourage their children to study most especially those who have difficulties in math.
2. The parents should be aware of the academic progress of their children for them to help improve the study habits as well as attitudes towards mathematics.
3. Parents aside from teachers should encourage girls and boys into similar experiences in their pursuits of mathematics. Thus, they should show confidence in their child to allow them to engage in activities as Advanced Placement and honors classes, mathematical competitions, tutoring, mentoring, summer camps, and other related experiences.
4. Parents must continually understand the make-up of their child and must select mathematical experiences commensurate with the child's personality, interests, and goals.

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APPENDICES

Appendix A

DATA QUESTIONNAIRE FOR TEACHERS

(Date)

Dear Respondents:

We are third year college students of Philippine Normal University taking up Bachelor of Science major in Mathematics for Teachers. Currently, we are doing a study entitled "Mathematical Ability of Fourth Year Students in Selected National High School S.Y. 2005-2006."

In this regard, we hereby solicit your kind assistance to answer the questionnaires attached for the completion of their study.

Please be assured that the information that will be obtained will be treated confidentially.

Thank you very much.

Very truly yours,

Sgd. NANETTE CABANTAC

Sgd. CHRISTINE DATOR

Sgd. ELAINE KRIS LEE

Sgd. JEANNE ROSE MANDIGMA

Sgd. CELINA SARMIENTO

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA PUNZALAN
Course Adviser

PROFESSIONAL DATA QUESTIONNAIRE

1. Name (Optional): _____

2. School: _____

3. Educational Attainment: (Please check the highest level of Educational Attainment)

   _____ BS/AB

   _____ MA/MS (Units)

   _____ MA (Acad. Req.)

   _____ MA/MS Degree

   _____ MA with Doctoral Units

   _____ Ed. D.

   _____ Ph. D.

   _____ Others, please specify _____

4. Length of Teaching Experience in Mathematics: _____ years

5. Number of Training(s)/Seminar(s) attended:

   Division _____

   Regional _____

   National _____

Appendix B

DATA QUESTIONNAIRE FOR STUDENTS

Name (optional): _____

School: _____

Gender (please check one) _____ Male _____ Female

Elementary School (please check one):

_____ Private School _____ Public School

Parent's educational attainment (please check one):

Father

_____ College graduate _____ College undergraduate

_____ High School graduate _____ High School undergraduate

_____ Elementary graduate _____ Elementary undergraduate

Mother:

_____ College graduate _____ College undergraduate

_____ High School graduate _____ High School undergraduate

_____ Elementary graduate _____ Elementary undergraduate

Appendix C

MATHEMATICS ATTITUDE TEST

Adapted from Gagto (2001)

Direction: Rate each statement about your attitudes and feelings towards mathematics according to the rating scale below. This is not a test so there are no right or wrong answers. Just express your feelings toward mathematics honestly and precisely. Write the numbers that correspond to your choice on the space provided for.

1 – Strongly disagree	3 – Undecided	5 – Strongly Agree
2 – Disagree	4 – Agree	

_____ 1. I find mathematics stimulating and challenging
_____ 2. Mathematics is very interesting
_____ 3. Mathematics makes me feel irritable and impatient
_____ 4. I feel sleepy in my mathematics class
_____ 5. Mathematics is my favourite subject
_____ 6. I am confident that I can solve problem in Mathematics
_____ 7. Mathematics develops my ability to think and reason accurately
_____ 8. I always study and do my assignment in Mathematics without hesitation
_____ 9. I do not enjoy my Mathematics subject, so I do not attend my Mathematics class regularly
_____ 10. I do not enjoy my Mathematics assignments without the help of my relatives, friends and classmates
_____ 11. My mind goes blank and I cannot think clearly when working with mathematics
_____ 12. I do not study Mathematics subjects regularly
_____ 13. I can learn Mathematics without the help of my teacher
_____ 14. I am happier in my Mathematics class than in my other class
_____ 15. I wish I could take more Mathematics class than in my other class

Appendix D

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. Rowena A. Cacanindin
Principal, Batasan Hills National High School
Batasan Hills, Quezon City

Sir/Madame:

Warm greetings!

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to borrow a copy of the Desired Learning Competencies (DLC) that your school use to be a basis for the mathematical ability test that we would make.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. Nanette CABANTAC

Sgd. JEANNE ROSE MANDIGMA

Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix E

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. David Atas
Principal IV, Dasmariñas National High School
Dasmariñas, Cavite

Sir/Madame:

Warm greetings!

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to borrow a copy of the Desired Learning Competencies (DLC) that your school use to be a basis for the mathematical ability test that we would make.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. NANETTE CABANTAC	Sgd. JEANNE ROSE MANDIGMA
Sgd. CHRISTINE DATOR	Sgd. CELINA SARMIENTO
Sgd. ELAINE KRIS LEE	Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix F

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. Margarito B. Materum
Principal III, Valenzuela National High School
Valenzuela City

Sir/Madame:

Warm greetings!

In this regard, we would like to borrow a copy of the Desired Learning Competencies (DLC) that your school use to be a basis for the mathematical ability test that we would make.

In this regard, we would like to borrow a copy of the Desired Learning Competencies (DLC) that your school use to be a basis for the mathematical ability test that we would make.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. NANETTE CABANTAC

Sgd. JEANNE ROSE MANDIGMA

Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix G

GENERAL AND SPECIFIC CONPETENCIES IN MATHEMATICS IV
(Advanced Algebra)

A. Functions

1. Demonstrate knowledge and skill related to functions in general

Define a function

Differentiate a function to a mere relation

- real life situations
- set of ordered pairs
- graph of a given set of ordered pairs
- vertical line test
- given equation

Illustrate the meaning of the functional notation $f(x)$

Determine the value of $f(x)$ given the value for x

B. Linear Functions

1. Demonstrate knowledge and skill related to linear functions and apply in solving problems

Define the linear function $f(x) = mx + b$

Given a linear function $Ax + By = C$, write in the form $f(x) = mx + b$ and vice versa

Draw the graph of a linear function given the following

- any two points
- x and y intercepts
- slope and one point
- slope and the y-intercept

Given $f(x) = mx + b$, determine the following

- slope
- trend: increasing decreasing
- x and y intercepts
- some points

Determine $f(x) = mx + b$ given

- slope and y-intercept
- x and y intercepts
- slope and one point
- any two points

Solve problems involving linear functions

C. Quadratic Functions

1. Demonstrate knowledge and skill related to quadratic functions and apply these in solving problems

Identify the functions $f(x) = ax^2 + bx + c$

Rewrite a quadratic function $ax^2 + bx + c$ in the form $f(x) = a(x-h)^2 + k$ and vice versa

Given a quadratic function, determine:

- highest and lowest point (vertex)
- axis of symmetry
- direction or opening of the graph

Draw the graph of a quadratic function using the

- vertex
- axis of symmetry
- direction of the opening of the graph
- given points

Analyze the effects on the graph of changes in a, h and k in $f(x) = a(x-h)^2 + k$

Determine the "zeros of a quadratic function" by relating this to "roots of a quadratic equation"

Find the roots of a quadratic equation by

- factoring
- quadratic formula
- completing the square

Derive a quadratic function given:

- zeros of the function
- tables of values
- graph

Solve problems involving quadratic functions and equations

D. Polynomial Functions

1. Demonstrate knowledge and skill related to polynomial functions

Identify a polynomial function, from a given set of relations

Determine the degree of a given polynomial function

Find the quotient of polynomials by

Find by synthetic division the quotient and the remainder when $p(x)$ is divided by $(x-c)$

State and illustrate the Remainder Theorem

Find the value of $p(x)$ for $x = k$ by

- synthetic division
- Remainder Theorem

Illustrate the Factor Theorem

Find the zeros of polynomial functions of degree greater than 2 by

- Factor Theorem
- factoring

- synthetic division
- depressed equations

Draw the graph of polynomial functions of degree greater than 2 (use graphing calculator if available)

E. Exponential and Logarithmic Functions

1. Demonstrate knowledge and skill related to exponential functions

Identify certain relationships in real life which are exponential (e.g. population growth over time, growth of bacteria over time, etc.)

Given a table of ordered pairs, state whether the trend in exponential or not

Draw the graph of an exponential function $f(x) = a^x$

Describe some properties of the exponential function, $f(x) = ax$ from its graph

- $a > 1$
- $0 < a < 1$

Given the graph of an exponential function determine the

- domain
- range
- intercepts
- trend
- asymptote

Describe the behaviour of the graph of an exponential function

Use the law of exponents to find the zeros of exponential functions

Define inverse functions

Determine the inverse of a given function

2. Demonstrate knowledge and skill related to logarithmic functions

Define the logarithmic function $f(x) = \log_a x$ as the inverse of the exponential function $f(x) = a^x$

Draw the graph of the logarithmic function $f(x) = \log_a x$

Describe some properties of the logarithmic function from its graph

Apply the laws for logarithms

Solve simple logarithmic equations

Solve problems involving exponential and logarithmic functions (e.g. exponential growth or decay)

Appendix H

TABLE OF SPECIFICATIONS

Mathematical Ability

Item Placement	Skills in…				Content Area
	Knowledge	Comprehension	Application	Analysis	
1				√	Functions (10%)
2	√				
3			√		
4			√		
5			√		
6	√				Linear Functions (20%)
7		√			
8				√	
9	√				
10				√	
11				√	
12			√		
13	√				
14				√	
15			√		
16		√			Quadratic Functions (20%)
17				√	
18				√	
19	√				
20			√		
21			√		
22			√		
23			√		
24				√	
25				√	
26				√	Polynomial Functions (20%)
27	√				
28		√			
29		√			
30				√	
31			√		
32		√			
33				√	

34		√			
35				√	
36		√			Exponential and Logarithmic Functions (30%)
37			√		
38	√				
39	√				
40		√			
41		√			
42		√			
43		√			
44		√			
45		√			
46			√		
47			√		
48	√				
49	√				
50	√				
Total	11 (22%)	13 (26%)	13(26)	13 (26%)	50 (100%)

Appendix I

MATHEMATICAL PERFORMANCE TEST FOR THE FIRST TRY OUT

Direction: Choose the letter of the correct answer. Write your answers before each number.

C 1) Given that $f(3x-1)$, find $f(2x)$

a) $1+6x$ b) $1-6x$
c) $6x-1$ d) $6x+1$

A 2) A special type of relation such that for every value of x there corresponds a unique value of y?

a) function b) domain
c) range d) intercept

B 3) Given $f(x)=x+2$; $g(x)=4-x^2$, find $(f-g)(x)$.

a) x^2+x+6 b) x^2+x-2
c) x^2-x+2 d) x^2-x-2

B 4) If $f(x)=-2x$ and $g(x)=x-2$ find $(f \circ g)(2)$.

a) 2 b) -2
c) 6 d) -6

C 5) If $f(x)=x^2$ and $g(x)=x-2$ find $(f \cdot g)(3)$

a) 0 b) -9
c) 9 d) 36

B 6) A first degree polynomial function defined by $y=mx+b$ where m and b are constants and $m \neq 0$

a) circular function b) linear function
c) circular function d) none of these

B 7) Rewrite $2x+5y=4$ in the form of $y=mx+b$.

a) $5y=-2x+4$ b) $y=-\frac{2}{5}x+\frac{4}{5}$
c) $y=\frac{2}{5}x+\frac{4}{5}$ d) $y=-\frac{2}{5}x-\frac{4}{5}$

A 8) Find the linear function passing through $(2,-3)$ and has a slope of 1.

a) $y = x - 5$ b) $y = x + 5$

c) $y = x - 3$ d) $y = x + 3$

A 9) What is the slope of $2x - 2y + 11 = 0$

a) 1 b) -1

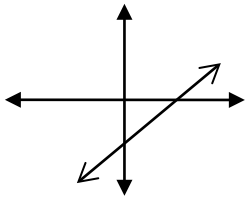
c) 2 d) -2

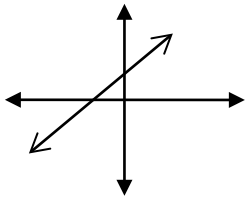
D 10) Find the linear function passing through $(-2,3)$ and $(3,4)$.

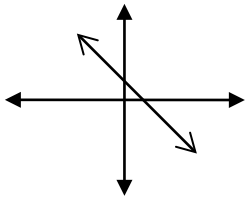
a) $y = 5x - 17$ b) $y = x - 1$

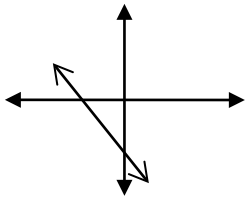
c) $y = \frac{1}{5}x - \frac{19}{5}$ d) $y = \frac{1}{5}x + \frac{17}{5}$

A 11) Which is the graph of $y = x - 1$

a) 

b) 

c) 

d) 

D 12) What is the slope of the linear function passing through $(2,6)$ and $(5,-1)$?

a) $m = \frac{3}{5}$ b) $m = -\frac{3}{5}$

c) $m = \frac{5}{3}$ d) $m = -\frac{5}{3}$

A 13) The ratio of rise over run?

a) slope b) line

c) point d) coordinates

A 14) Which of the following describes the slope of parallel lines?

a) they have the same slope b) the have a slope of zero

c) they have no slope d) none of the above

C 15) Find the value of k for which the line $3x + ky = 7$ passes through the point $(3,2)$.

a) $k = 1$ b) $k = 2$
c) $k = -1$ d) $k = -2$

D 16) Transform $y = x^2 - 2x - 4$ into the form $y = a(x - h)^2 + k$.

a) $y = (x+1)^2 + 5$ b) $y = (x-1)^2 + 5$
c) $y = (x+1)^2 - 5$ d) $y = (x-1)^2 - 5$

B 17) Which graph has the widest opening in the following?

a) $y = 2x^2 - 4$ b) $y = \frac{1}{3}x^2 - 5$
c) $y = 3x^2 - 6$ d) $y = -2x^2 + 1$

B 18) Which graph has the most constricted opening?

a) $y = -\frac{1}{5}x^2 + 6$ b) $y = -5x^2 + 6$
c) $y = x^2 + 6$ d) $y = 3x^2 - 2$

B 19) Line passing through the vertex of a quadratic equation and perpendicular to the x-axis.

a) slope b) axis of symmetry
c) vertex d) coordinates

A 20) What is the vertex of the quadratic equation $y = (x-3)^2 + 2$?

a) $(3,2)$ b) $(-3,-2)$
c) $(-3,2)$ d) $(3,-2)$

C 21) The axis of symmetry of the quadratic equation $y = (x+3)^2 - 2$

a) $x = -2$ b) $x = 2$
c) $x = -3$ d) $x = 3$

C 22) What is the minimum or maximum point of $y = (x-5)^2$?

a) $(0,5)$ b) $(0,-5)$
c) $(5,0)$ d) $(-5,0)$

D 23) Find the maximum value of the function described by the equation $y = 36x - 3x^2 - 100$.

a) 5 b) 6
c) 7 d) 8

B 24) Find the zeros of the function $f(x) = x^2 - 4$.

a) 2 and 3 b) 2 and -2
c) 1 and -1 d) 4 and -4

C 25) Find the root of the function described by the equation $y = x^2 + 6x + 5$.

a) 6 and 5 b) 1 and 5
c) -5 and -1 d) 5 and -1

A 26) Which of the following is a polynomial in one variable?

a) $4x^5 - 3x^2 + x - 1$ b) $4x^2y - 4xy^2 - 3$
c) $2x + \frac{3}{x} + 1$ d) $m^{-3} + 3m - 2$

C 27) What is the degree of the polynomial $6x^3 + 2x - 3$?

a) 1 b) 2
c) 3 d) 6

A 28) The quotient of $(x^2 - 5x + 6) \div (x - 2)$ is

a) $x - 3$ b) $x + 3$
c) $x - 4$ d) $x + 2$

C 29) What would be the remainder if $4x^2 + 7x - 5$ is divided by $x - 1$?

a) -11 b) 11
c) 6 d) -6

A 30) Which is the correct synthetic division for $(2x^2 + 11x + 12) \div (x + 4)$?

a) -4 | 2 11 12 / -8 -12 / 2 3 0

b) -4 | -2 -11 -12 / 8 -12 / -2 -3 -24

c) 4 | 2 11 12 / 8 76 / 2 19 88

d) 4 | -2 -11 -12 / -8 -76 / -2 -19 -88

B 31) What are the zeros of the polynomial function $f(x)=2x^2+5x-3$?

a) $-\frac{1}{2},3$ b) $\frac{1}{2},-3$

c) $-\frac{1}{2},-3$ d) $\frac{1}{2},3$

A 32) Find the polynomial with the sets of zeros $\{1,-1,2\}$.

a) x^3-x^2-x+2 b) x^3+x^2-x-2

c) x^3-x^2+x+2 d) x^3+x^2+x-2

B 33) Which does not belong to the group?

a) $f(x)=x^3-x+3$ b) $f(x)=2x^7-5x^3-8$

c) $f(x)=3x^4-2x+7$ d) $f(x)=2x^5-3x^3+x-2$

B 34) What would be the remainder if $2x^2-x+5$ is divided by $x-2$?

a) -11 b) 11

c) 1 d) -1

A 35) Find the function whose exact zeros are $\{1,1,-1\}$

a) x^3-x^2-x+1 b) x^3-x^2-x-1

c) x^3-2x^2+5x-1 d) x^3-2x^2-1x-1

C 36) Evaluate $f(x)=9^x$ if $x=-\frac{1}{2}$

a) $\sqrt{3}$ b) $-\sqrt{3}$

c) $\frac{1}{\sqrt{3}}$ d) $-\frac{1}{\sqrt{3}}$

B 37) Find the base of the exponential function whose graph contains the points $(2,9)$.

a) 2 b) 3

c) 4 d) 5

C 38) What is the logarithmic form of $8=2^3$?

a) $\log_8 3=2$ b) $\log_3 2=8$

c) $\log_2 8=3$ d) $\log_3 2=8$

B 39) What is the exponential form of $\log_8 2=\frac{1}{3}$?

a) $2^8 = \frac{1}{3}$ b) $8^{1/3} = 2$

c) $2^{1/3} = 8$ d) $8^2 = \frac{1}{3}$

D 40) $\log_4(8)(3)$ is similar to

a) $\log_4 3 - \log_4 8$ b) $\log_4 8 - \log_4 3$

c) $(\log_4 8)(\log_4 3)$ d) $\log_4 8 + \log_4 3$

C 41) $\log_2 4 - \log_2 3$ is similar to

a) $\log_2\left(\frac{3}{4}\right)$ b) $\log_2\left(-\frac{3}{4}\right)$

c) $\log_2\left(\frac{4}{3}\right)$ d) $\log_2\left(-\frac{4}{3}\right)$

A 42) $\log_c(4)^3$ is similar as

a) $3\log_c 4$ b) $4\log_c 3$

c) $c\log(4)^3$ d) $c\log_3 4$

C 43) Given $3^x = 27$, solve for x

a) 1 b) 2

c) 3 d) 4

A 44) Given $\log_3 x = 2$, solve for x

a) 9 b) 4

c) 8 d) 5

B 45) Given $\log_3(3x-4) = 2$, solve for x

a) $\frac{3}{13}$ b) $\frac{13}{3}$

c) 3 d) 13

C 46) Express $\log_b x + \log_b x + \log_b 7$ as a single logarithm

a) $\log_b \frac{x^2}{7}$ b) $\log_b \frac{7}{x^2}$

c) $\log_b 7x^2$ d) $2\log_b 7x$

C 47) Expand $\log_a \frac{x^2}{y}$

a) $\log_a x + \log_a y - \log_a x$ b) $\log_a x + \log_a x + \log_a y$

c) $\log_a x + \log_a x - \log_a y$ d) $\log_a x - \log_a x + \log_a y$

A 48) Which is the exponent in $x = \log_b y$?

a) x b) log

c) b d) y

A 49) The range of $y = \left(\frac{1}{2}\right)^x$ is

a) set of real numbers b) set of positive real numbers

c) set of negative real numbers d) none of these

C 50) It is the line that the curve approaches more and more closely, that is the distance between the line and the curve approaches zero as the graph moves out farther and farther along the line.

a) range b) domain

c) asymptote d) intercept

Note:

Letters placed before the number of each item are the letter of the correct option.

Appendix J

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

The Principal
Sergio Osmeña High School
Quezon City

Sir/Madame:

Warm greetings!

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to ask permission from your kind office to let us administer a 50 item test to at least 50 fourth year high school students of your school for the validation of our test instrument.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. NANETTE CABANTAC

Sgd. JEANNE ROSE MANDIGMA

Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix K

ITEM ANALYSIS OF THE FIRST TRY OUT

Item No.	Upper 27% N=19	Lower 27% N=19	Diffuculty Index		Discrimination Index		Decision
1	19	16	0.92	easy	0.16	LD	REVISE *
2	15	11	0.68	average	0.21	MD	RETAIN
3	10	8	0.47	average	0.11	LD	REVISE
4	12	7	0.50	average	0.26	MD	RETAIN
5	10	10	0.53	average	0.00	LD	REVISE
6	18	16	0.89	easy	0.11	LD	REVISE *
7	12	4	0.42	average	0.42	HD	RETAIN
8	15	5	0.53	average	0.53	HD	RETAIN
9	14	2	0.42	average	0.63	HD	RETAIN
10	15	6	0.55	average	0.47	HD	RETAIN
11	15	4	0.50	average	0.58	HD	RETAIN
12	16	9	0.66	average	0.37	MD	RETAIN
13	19	16	0.92	easy	0.16	LD	REVISE *
14	14	13	0.71	average	0.05	LD	REVISE
15	14	5	0.50	average	0.47	HD	RETAIN
16	15	2	0.45	average	0.68	HD	RETAIN
17	4	1	0.13	difficult	0.16	LD	REVISE *
18	4	2	0.16	difficult	0.11	LD	REVISE *
19	18	14	0.84	easy	0.21	MD	REVISE
20	14	1	0.39	average	0.68	HD	RETAIN
21	9	7	0.42	average	0.11	LD	REVISE
22	11	1	0.32	average	0.53	HD	RETAIN
23	2	0	0.05	very difficult	0.11	LD	REVISE *
24	18	15	0.87	easy	0.16	LD	REVISE
25	9	2	0.29	average	0.37	MD	RETAIN
26	6	6	0.32	average	0.00	LD	REVISE
27	18	13	0.82	easy	0.26	MD	REVISE
28	19	13	0.84	easy	0.32	MD	REVISE
29	18	13	0.82	easy	0.26	MD	REVISE
30	19	18	0.97	easy	0.05	LD	REVISE *
31	15	10	0.66	average	0.26	MD	RETAIN
32	12	6	0.47	average	0.32	MD	RETAIN
33	14	9	0.61	average	0.26	MD	RETAIN
34	18	7	0.66	average	0.58	HD	RETAIN
35	10	7	0.45	average	0.16	LD	REVISE
36	13	5	0.47	average	0.42	HD	RETAIN
37	7	9	0.42	average	-0.11	LD	REVISE

38	15	7	0.58	average	0.42	HD	RETAIN
39	18	8	0.68	average	0.53	HD	RETAIN
40	15	6	0.55	average	0.47	HD	RETAIN
41	18	12	0.79	easy	0.32	MD	REVISE
42	16	10	0.68	average	0.32	MD	RETAIN
43	19	17	0.95	easy	0.11	LD	REVISE *
44	18	9	0.71	average	0.47	HD	RETAIN
45	17	9	0.68	average	0.42	HD	RETAIN
46	18	4	0.58	average	0.74	HD	RETAIN
47	13	9	0.58	average	0.21	MD	RETAIN
48	16	4	0.53	average	0.63	HD	RETAIN
49	13	11	0.63	average	0.11	LD	REVISE
50	6	2	0.21	difficult	0.21	MD	REVISE

Note:

* Originally rejected items but where revised for the second try out.

Appendix L

OPTION ANALYSIS FOR THE FIRST TRY OUT

Item number	A	%	B	%	C	%	D	%	Omitted	%	Total
1	0	0	1	2.63	35	92.11	2	5.26	0	0	38
2	26	68.42	6	15.79	4	10.53	2	5.26	0	0	38
3	4	10.53	18	47.37	10	26.32	6	15.79	0	0	38
4	5	13.16	19	50.00	9	23.68	5	13.16	0	0	38
5	6	15.79	8	21.05	20	52.63	4	10.53	0	0	38
6	0	0	34	89.47	4	10.53	0	0	0	0	38
7	14	36.84	16	42.11	0	0	8	21.05	0	0	38
8	20	52.63	8	21.05	7	18.42	3	7.89	0	0	38
9	16	42.11	6	15.79	6	15.79	10	26.32	0	0	38
10	21	55.26	6	15.79	10	26.32	0	0	1	2.63	38
11	19	50.00	7	18.42	5	13.16	7	18.42	0	0	38
12	4	10.53	4	10.53	6	15.79	24	63.16	0	0	38
13	35	92.11	0	0	1	2.63	2	5.26	0	0	38
14	27	71.05	3	7.89	6	15.79	2	5.26	0	0	38
15	4	10.53	5	13.16	19	50.00	10	26.32	0	0	38
16	2	5.26	13	34.21	6	15.79	17	44.74	0	0	38
17	10	26.32	5	13.16	19	50.00	4	10.53	0	0	38
18	21	55.26	6	15.79	5	13.16	6	15.79	0	0	38
19	0	0	32	84.21	0	0	6	15.79	0	0	38
20	15	39.47	4	10.53	13	34.21	6	15.79	0	0	38
21	13	34.21	3	7.89	16	42.11	6	15.79	0	0	38
22	8	21.05	12	31.58	12	31.58	6	15.79	0	0	38
23	3	7.89	27	71.05	6	15.79	2	5.26	0	0	38
24	1	2.63	33	86.84	1	2.63	3	7.89	0	0	38
25	4	10.53	22	57.89	12	31.58	0	0	0	0	38
26	12	31.58	9	23.68	12	31.58	4	10.53	1	2.63	38
27	0	0	2	5.26	31	81.58	5	13.16	0	0	38
28	32	84.21	5	13.16	0	0	1	2.63	0	0	38
29	3	7.89	2	5.26	31	81.58	2	5.26	0	0	38
30	37	97.37	0	0	1	2.63	0	0	0	0	38
31	3	7.89	25	65.79	9	23.68	1	2.63	0	0	38
32	18	47.37	13	34.21	2	5.26	4	10.53	1	2.63	38
33	2	5.26	7	18.42	6	15.79	23	60.53	0	0	38
34	4	10.53	26	68.42	5	13.16	2	5.26	1	2.63	38
35	18	47.37	16	42.11	3	7.89	1	2.63	0	0	38
36	7	18.42	8	21.05	18	47.37	5	13.16	0	0	38
37	11	28.95	16	42.11	6	15.79	4	10.53	1	2.63	38
38	4	10.53	11	28.95	22	57.89	1	2.63	0	0	38
39	8	21.05	26	68.42	4	10.53	0	0	0	0	38

40	0	0	7	18.42	10	26.32	21	55.26	0	0	38
41	3	7.89	3	7.89	30	78.95	2	5.26	0	0	38
42	26	68.42	4	10.53	5	13.16	3	7.89	0	0	38
43	2	5.26	0	0	36	94.74	0	0	0	0	38
44	27	71.05	0	0	8	21.05	3	7.89	0	0	38
45	4	10.53	26	68.42	7	18.42	1	2.63	0	0	38
46	7	18.42	6	15.79	22	57.89	3	7.89	0	0	38
47	10	26.32	6	15.79	22	57.89	0	0	0	0	38
48	20	52.63	3	7.89	13	34.21	2	5.26	0	0	38
49	24	63.16	6	15.79	6	15.79	2	5.26	0	0	38
50	9	23.68	6	15.79	8	21.05	15	39.47	0	0	38

Note:

- Represents the correct options

Appendix M

MATHEMATICAL PERFORMANCE TEST FOR THE SECOND TRY OUT

Direction: Choose the letter of the correct answer and write it on the space provided before each number.

C 1) Given that $f(x) = -3x - 1$, find $f(2x - 2)$

a) $6x + 5$ b) $6x - 5$

c) $5 - 6x$ d) $5 + 6x$

A 2) A special type of relation such that for every value of x there corresponds a unique value of y?

a) function b) domain

c) range d) intercept

B 3) Given $f(x) = x - 2$; $g(x) = 4 - x^2$, find $(f - g)(x)$.

a) $x^2 + x + 6$ b) $x^2 + x - 6$

c) $x^2 - x + 2$ d) $x^2 - x - 2$

B 4) If $f(x) = -2x$ and $g(x) = x - 2$ find $(f \circ g)(2)$.

a) -1 b) 0

c) 1 d) 2

C 5) If $f(x) = x^2 - 1$ and $g(x) = x - 2$ find $(f \cdot g)(3)$

a) 4 b) -4

c) 8 d) -8

B 6) It is the standard equation of a linear function.

a) $y + x = mb$ b) $y = mx + b$

c) $x = my + b$ d) $my + mx = b$

B 7) Rewrite $2x + 5y = 4$ in the form of $y = mx + b$.

a) $5y = -2x + 4$ b) $y = -\frac{2}{5}x + \frac{4}{5}$

c) $y = \frac{2}{5}x + \frac{4}{5}$ d) $y = -\frac{2}{5}x - \frac{4}{5}$

A 8) Find the linear function passing through $(2,-3)$ and has a slope of 1.

a) $y = x - 5$ b) $y = x + 5$

c) $y = x - 3$ d) $y = x + 3$

A 9) What is the slope of $2x - 2y + 11 = 0$

a) 1 b) -1

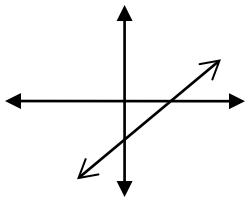
c) 2 d) -2

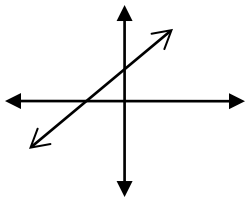
D 10) Find the linear function passing through $(-2,3)$ and $(3,4)$.

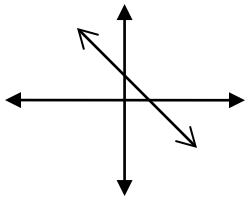
a) $y = 5x - 17$ b) $y = x - 1$

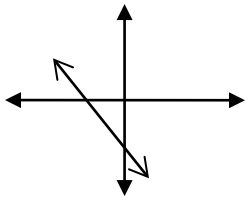
c) $y = \frac{1}{5}x - \frac{19}{5}$ d) $y = \frac{1}{5}x + \frac{17}{5}$

A 11) Which is the graph of $y = x - 1$

a) 

b) 

c) 

d) 

D 12) What is the slope of the linear function passing through $(2,6)$ and $(5,1)$?

a) $m = \frac{3}{5}$ b) $m = -\frac{3}{5}$

c) $m = \frac{5}{3}$ d) $m = -\frac{5}{3}$

A 13) It is defined as $m = \frac{\Delta y}{\Delta x}$

a) slope b) line

c) point d) coordinates

A 14) Which of the following describes the slope of $y = x + 2$ and $2y - 2x = 1$?

a) they have the same slope b) the have a slope of zero

c) they have no slope d) they have negative slopes

C 15) Find the value of k for which the line $3x + ky = 7$ passes through the point $(3,2)$.

a) $k = 1$ b) $k = 2$
c) $k = -1$ d) $k = -2$

D 16) Transform $y = x^2 - 2x - 4$ into the form $y = a(x - h)^2 + k$.

a) $y = (x + 1)^2 + 5$ b) $y = (x - 1)^2 + 5$
c) $y = (x + 1)^2 - 5$ d) $y = (x - 1)^2 - 5$

B 17) Which graph has the widest opening in the following?

a) $y = \frac{1}{3}x^2 - 4$ b) $y = \frac{1}{4}x^2 - 5$
c) $y = -\frac{1}{2}x^2 - 6$ d) $y = \frac{1}{2}x^2 + 1$

B 18) Which graph has the most constricted opening?

a) $y = 2x^2 + 6$ b) $y = -5x^2 + 6$
c) $y = 4x^2 + 6$ d) $y = 3x^2 - 2$

B 19) Line passing through the vertex of a quadratic equation and perpendicular to the x-axis.

a) transversal b) axis of symmetry
c) parallel line d) perpendicular line

A 20) What is the vertex of the quadratic equation $y = (x - 3)^2 + 2$?

a) $(3,2)$ b) $(-3,-2)$
c) $(-3,2)$ d) $(3,-2)$

C 21) The axis of symmetry of the quadratic equation $y = (x + 3)^2 - 2$

a) $x = -2$ b) $x = 2$
c) $x = -3$ d) $x = 3$

C 22) What is the minimum or maximum point of $y = (x - 5)^2$?

a) $(0,5)$ b) $(0,-5)$
c) $(5,0)$ d) $(-5,0)$

D 23) If $y = 36x - 3x^2 - 100$ will be transformed into the form $y = a(x-h)^2 + k$ what would be the value of k.

a) 5 b) 6
c) 7 d) 8

B 24) Find the zeros of the function $f(x) = x^2 - x - 6$.

a) 2 and 3 b) -2 and 3
c) 2 and -3 d) -2 and -3

C 25) Find the root of the function described by the equation $y = x^2 + 6x + 5$.

a) 6 and 5 b) 1 and 5
c) -5 and -1 d) 5 and -1

A 26) Which of the following is a polynomial in one variable?

a) $4x^5 - 3x^2 + x - 1$ b) $4x^2y - 4xy^2 - 3$
c) $2xy + x + y$ d) $sm + m + 6$

C 27) What is the degree of the polynomial $2x^2 + 6x^3 + 5x + 2$?

a) 1 b) 2
c) 3 d) 6

A 28) The quotient of $(-x^2 + 5x - 6) \div (2 - x)$ is

a) $x - 3$ b) $x + 3$
c) $x - 6$ d) $x + 6$

C 29) What would be the remainder if $4x^2 + 7x - 5$ is divided by $x - 2$?

a) -35 b) 35
c) 25 d) -25

D 30) Which is the correct synthetic division for $(2x^2 + 11x + 12) \div (x + 4)$?

a)
$$\begin{array}{r|ccc} -4 & 2 & 11 & 12 \\ & & 8 & 12 \\ \hline & 2 & 3 & 0 \end{array}$$

b)
$$\begin{array}{r|ccc} 4 & -2 & -11 & -12 \\ & & 8 & -12 \\ \hline & -2 & -3 & 0 \end{array}$$

c)
$$\begin{array}{r|ccc} 4 & 2 & 11 & 12 \\ & & 8 & 76 \\ \hline & 2 & 19 & 88 \end{array}$$

d)
$$\begin{array}{r|ccc} -4 & 2 & 11 & 12 \\ & & -8 & -12 \\ \hline & 2 & 3 & 0 \end{array}$$

B 31) What are the zeros of the polynomial function $f(x)=2x^2+5x-3$?

a) $-\frac{1}{2},3$ b) $\frac{1}{2},-3$

c) $-\frac{1}{2},-3$ d) $\frac{1}{2},3$

A 32) Find the polynomial with the sets of zeros $\{1,-1,2\}$.

a) x^3-2x^2-x+2 b) x^3+2x^2-x-2

c) x^3-2x^2+x+2 d) x^3+2x^2+x-2

D 33) Which does not belong to the group?

a) $f(x)=x^3-x+3$ b) $f(x)=2x^6-5x^3-8$

c) $f(x)=3x^4-2x+7$ d) $f(x)=2x^5-3x^3+x-2$

B 34) What would be the remainder if $2x^2-x+5$ is divided by $x-2$?

a) -11 b) 11

c) 1 d) -1

A 35) Find the function whose exact zeros are $\{1,1,-1\}$

a) x^3-x^2-x+1 b) x^3+3x^2+3x+1

c) x^3-x^2-x-1 d) x^3-2x^2-1x-1

C 36) Evaluate $f(x)=9^x$ if $x=-\frac{1}{2}$

a) 3 b) -3

c) $\frac{1}{3}$ d) $-\frac{1}{3}$

B 37) Find the base of the exponential function whose graph contains the points $(3,8)$.

a) 4 b) 2

c) 3 d) 8

C 38) What is the logarithmic form of $8=2^3$?

a) $\log_8 3=2$ b) $\log_3 2=8$

c) $\log_2 8=3$ d) $\log_3 2=8$

B 39) What is the exponential form of $\log_8 2 = \frac{1}{3}$?

a) $2^8 = \frac{1}{3}$ b) $8^{1/3} = 2$

c) $2^{1/3} = 8$ d) $8^2 = \frac{1}{3}$

D 40) $\log_4(8)(3)$ is similar to

a) $\log_4 3 - \log_4 8$ b) $\log_4 8 - \log_4 3$

c) $(\log_4 8)(\log_4 3)$ d) $\log_4 8 + \log_4 3$

C 41) $\log_2 4 - \log_2(-3)$ is similar to

a) $\log_2\left(\frac{3}{4}\right)$ b) $\log_2\left(-\frac{3}{4}\right)$

c) $\log_2\left(-\frac{4}{3}\right)$ d) $\log_2\left(\frac{4}{3}\right)$

A 42) $\log_c(4)^3$ is similar to

a) $3\log_c 4$ b) $4\log_c 3$

c) $c\log(4)^3$ d) $c\log_3 4$

C 43) Given $2^{2x} = 16$, solve for x

a) 4 b) 3

c) 2 d) 1

A 44) Given $\log_3 x = 2$, solve for x

a) 9 b) 4

c) 8 d) 5

B 45) Given $\log_3(3x-4) = 2$, solve for x

a) $\frac{3}{13}$ b) $\frac{13}{3}$

c) 3 d) 13

C 46) Express $\log_b x + \log_b x + \log_b 7$ as a single logarithm

a) $\log_b \frac{x^2}{7}$ b) $\log_b \frac{7}{x^2}$

c) $\log_b 7x^2$ d) $2\log_b 7x$

C 47) Expand $\log_a \frac{x^2}{y}$

a) $\log_a x + \log_a y - \log_a x$ b) $\log_a x + \log_a x + \log_a y$

c) $\log_a x + \log_a x - \log_a y$ d) $\log_a x - \log_a x + \log_a y$

A 48) Which is the exponent in $x = \log_b y$?

a) x b) log

c) b d) y

D 49) The range of $y = \left(\frac{1}{2}\right)^x$ is

a) set of positive integers b) set of positive real numbers

c) set of negative real numbers d) set of real numbers

C 50) It is the term used to define all the possible values of x in a given function.

a) asymptote b) range

c) domain d) intercept

Note:

Letters placed before the number of each item are the letter of the correct option.

Appendix N

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

The Principal
Bacoor National High School
Bacoor Cavite

Sir/Madame:

Warm greetings!

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to ask permission from your kind office to let us administer a 50 item test to at least 50 fourth year high school students of your school for the validation of our test instrument.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. NANETTE CABANTAC

Sgd. JEANNE ROSE MANDIGMA

Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix O

ITEM ANALYSIS OF THE SECOND TRY OUT

Item No.	Upper 27% N=19	Lower 27% N=19	Diffuculty Index		Discrimination Index		Decision
1	9	8	0.45	average	0.05	LD	REVISE
2	17	10	0.71	average	0.37	MD	RETAIN
3	13	9	0.58	average	0.21	MD	RETAIN
4	9	6	0.39	average	0.16	LD	REVISE
5	18	9	0.71	average	0.47	HD	RETAIN
6	19	8	0.71	average	0.58	HD	RETAIN
7	14	10	0.63	average	0.21	MD	RETAIN
8	16	7	0.61	average	0.47	HD	RETAIN
9	14	5	0.50	average	0.47	HD	RETAIN
10	16	5	0.55	average	0.58	HD	RETAIN
11	14	6	0.53	average	0.42	HD	RETAIN
12	18	7	0.66	average	0.58	HD	RETAIN
13	19	14	0.87	easy	0.26	MD	REVISE
14	17	10	0.71	average	0.37	MD	RETAIN
15	13	9	0.58	average	0.21	MD	RETAIN
16	15	8	0.61	average	0.37	MD	RETAIN
17	10	6	0.42	average	0.21	MD	RETAIN
18	11	10	0.55	average	0.05	LD	REVISE
19	19	12	0.82	easy	0.37	MD	REVISE
20	10	3	0.34	average	0.37	MD	RETAIN
21	18	5	0.61	average	0.68	HD	RETAIN
22	14	4	0.47	average	0.53	HD	RETAIN
23	8	2	0.26	average	0.32	MD	RETAIN
24	9	6	0.39	average	0.16	LD	REVISE
25	10	6	0.42	average	0.21	MD	RETAIN
26	13	12	0.66	average	0.05	LD	REVISE
27	19	9	0.74	average	0.53	HD	RETAIN
28	10	15	0.66	average	-0.26	LD	REVISE
29	17	9	0.68	average	0.42	HD	RETAIN
30	18	9	0.71	average	0.47	HD	RETAIN
31	9	10	0.50	average	-0.05	LD	REVISE
32	15	8	0.61	average	0.37	MD	RETAIN
33	2	2	0.11	very difficult	0.00	LD	REVISE*
34	19	8	0.71	average	0.58	HD	RETAIN
35	14	10	0.63	average	0.21	MD	RETAIN
36	19	5	0.63	average	0.74	HD	RETAIN
37	9	2	0.29	average	0.37	MD	RETAIN

38	19	16	0.92	easy	0.16	LD	REVISE*
39	19	13	0.84	easy	0.32	MD	REVISE
40	19	19	1.00	easy	0.00	LD	REVISE*
41	18	10	0.74	average	0.42	HD	RETAIN
42	19	17	0.95	easy	0.11	LD	REVISE*
43	19	19	1.00	easy	0.00	LD	REVISE*
44	14	12	0.68	average	0.11	LD	RETAIN
45	18	12	0.79	easy	0.32	MD	REVISE
46	16	12	0.74	average	0.21	MD	RETAIN
47	19	13	0.84	easy	0.32	MD	REVISE
48	18	10	0.74	average	0.42	HD	RETAIN
49	10	3	0.34	average	0.37	MD	RETAIN
50	13	13	0.68	average	0.00	LD	REVISE

Note:

* Originally rejected items but where revised for the final Mathematical ability test.

Appendix P

OPTION ANALYSIS FOR THE SECOND TRY OUT

Item number	A	%	B	%	C	%	D	%	Omitted	%	Total
1	10	26.32	11	28.95	17	44.74	0	0	0	0	38
2	27	71.05	2	5.26	0	0	8	21.05	1	2.63	38
3	1	2.63	22	57.89	12	31.58	3	7.89	0	0	38
4	8	21.05	15	39.47	5	13.16	10	26.32	0	0	38
5	4	10.53	4	10.53	27	71.05	3	7.89	0	0	38
6	0	0	27	71.05	0	0	11	28.95	0	0	38
7	12	31.58	24	63.16	1	2.63	1	2.63	0	0	38
8	24	63.16	4	10.53	9	23.68	1	2.63	0	0	38
9	19	50.00	5	13.16	11	28.95	2	5.26	1	2.63	38
10	6	15.79	9	23.68	1	2.63	21	55.26	1	2.63	38
11	20	52.63	7	18.42	2	5.26	9	23.68	0	0	38
12	3	7.89	4	10.53	6	15.79	25	65.79	0	0	38
13	33	86.84	5	13.16	0	0	0	0	0	0	38
14	27	71.05	6	15.79	2	5.26	3	7.89	0	0	38
15	1	2.63	12	31.58	22	57.89	3	7.89	0	0	38
16	4	10.53	7	18.42	3	7.89	23	60.53	1	2.63	38
17	6	15.79	16	42.11	4	10.53	12	31.58	0	0	38
18	2	5.26	21	55.26	9	23.68	6	15.79	0	0	38
19	1	2.63	31	81.58	3	7.89	3	7.89	0	0	38
20	13	34.21	1	2.63	19	50.00	5	13.16	0	0	38
21	5	13.16	0	0	23	60.53	10	26.32	0	0	38
22	3	7.89	16	42.11	18	47.37	1	2.63	0	0	38
23	18	47.37	10	26.32	0	0	10	26.32	0	0	38
24	0	0	15	39.47	17	44.74	6	15.79	0	0	38
25	9	23.68	11	28.95	17	44.74	1	2.63	0	0	38
26	26	68.42	2	5.26	5	13.16	5	13.16	0	0	38
27	1	2.63	8	21.05	28	73.68	1	2.63	0	0	38
28	26	68.42	12	31.58	0	0	0	0	0	0	38
29	5	13.16	1	2.63	26	68.42	5	13.16	1	2.63	38
30	4	10.53	0	0	7	18.42	27	71.05	0	0	38
31	13	34.21	19	50.00	3	7.89	3	7.89	0	0	38
32	25	65.79	8	21.05	3	7.89	2	5.26	0	0	38
33	13	34.21	8	21.05	12	31.58	4	10.53	1	2.63	38
34	1	2.63	27	71.05	3	7.89	7	18.42	0	0	38
35	24	63.16	4	10.53	6	15.79	3	7.89	1	2.63	38
36	4	10.53	4	10.53	25	65.79	5	13.16	0	0	38
37	3	7.89	12	31.58	22	57.89	1	2.63	0	0	38
38	1	2.63	2	5.26	35	92.11	0	0	0	0	38
39	0	0	32	84.21	6	15.79	0	0	0	0	38

40	0	0	0	0	0	0	38	100.00	0	0	38
41	4	10.53	1	2.63	29	76.32	4	10.53	0	0	38
42	36	94.74	0	0	1	2.63	1	2.63	0	0	38
43	0	0	0	0	38	100.00	0	0	0	0	38
44	26	68.42	2	5.26	10	26.32	0	0	0	0	38
45	4	10.53	30	78.95	3	7.89	1	2.63	0	0	38
46	5	13.16	0	0	28	73.68	5	13.16	0	0	38
47	0	0	2	5.26	36	94.74	0	0	0	0	38
48	28	73.68	1	2.63	2	5.26	7	18.42	0	0	38
49	2	5.26	20	52.63	3	7.89	12	31.58	1	2.63	38
50	4	10.53	6	15.79	26	68.42	2	5.26	0	0	38

Note:

- Represents the correct options

Appendix Q

MATHEMATICAL PERFORMANCE TEST THAT WAS ADMINISTERED TO THE SELECTED NATIONAL HIGH SCHOOL

C 1) Given that $f(x) = 3x - 1$, find $f(2x - 2)$

a) $6x - 5$ b) $6x + 5$
c) $6x - 7$ d) $6x + 7$

A 2) A special type of relation such that for every value of x there corresponds a unique value of y?

a) function b) domain
c) range d) intercept

B 3) Given $f(x) = x - 2$; $g(x) = 4 - x^2$, find $(f - g)(x)$.

a) $x^2 + x + 6$ b) $x^2 + x - 6$
c) $x^2 - x + 2$ d) $x^2 - x - 2$

B 4) If $f(x) = 2x + x$ and $g(x) = x - 2$ find $(f \square g)(3)$.

a) 15 b) 3
c) -3 d) -6

C 5) If $f(x) = x^2 - 1$ and $g(x) = x - 2$ find $(f \cdot g)(3)$

a) 4 b) -4
c) 8 d) -8

B 6) It is the standard equation of a linear function.

a) $y + x = mb$ b) $y = mx + b$
c) $x = my + b$ d) $my + mx = b$

B 7) Rewrite $2x + 5y = 4$ in the form of $y = mx + b$.

a) $5y = -2x + 4$ b) $y = -\frac{2}{5}x + \frac{4}{5}$
c) $y = \frac{2}{5}x + \frac{4}{5}$ d) $y = -\frac{2}{5}x - \frac{4}{5}$

A 8) Find the linear function passing through $(2,-3)$ and has a slope of 1.

a) $y = x - 5$ b) $y = x + 5$
c) $y = x - 3$ d) $y = x + 3$

A 9) What is the slope of $2x-2y+11=0$

a) 1 b) -1

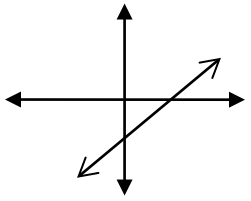
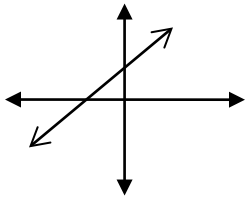
c) 2 d) -2

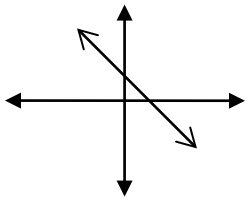
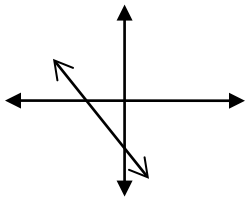
D 10) Find the linear function passing through $(-2,3)$ and $(3,4)$.

a) $y=5x-17$ b) $y=x-1$

c) $y=\frac{1}{5}x-\frac{19}{5}$ d) $y=\frac{1}{5}x+\frac{17}{5}$

A 11) Which is the graph of $y=x-1$

a)  b) 

c)  d) 

D 12) What is the slope of the linear function passing through $(2,6)$ and $(5,1)$?

a) $m=\frac{3}{5}$ b) $m=-\frac{3}{5}$

c) $m=\frac{5}{3}$ d) $m=-\frac{5}{3}$

A 13) It is defined as the ratio of the change in y and the change in x

a) slope b) line

c) point d) coordinates

A 14) Which of the following describes the slope of $y=x+2$ and $2y-2x=1$?

a) they have the same slope b) the have a slope of zero

c) they have no slope d) they have negative slopes

C 15) Find the value of k for which the line $3x+ky=7$ passes through the point $(3,2)$.

a) $k=1$ b) $k=2$

c) $k=-1$ d) $k=-2$

D 16) Transform $y = x^2 - 2x - 4$ into the form $y = a(x-h)^2 + k$.

a) $y = (x+1)^2 + 5$ b) $y = (x-1)^2 + 5$

c) $y = (x+1)^2 - 5$ d) $y = (x-1)^2 - 5$

B 17) Which graph has the widest opening in the following?

a) $y = \frac{1}{3}x^2 - 4$ b) $y = \frac{1}{4}x^2 - 5$

c) $y = -\frac{1}{2}x^2 - 6$ d) $y = \frac{1}{2}x^2 + 1$

B 18) Which graph has the most constricted opening?

a) $y = -2x^2 + 6$ b) $y = -5x^2 + 6$

c) $y = -4x^2 + 6$ d) $y = 3x^2 + 2$

B 19) A line perpendicular to the x-axis and divides the graph of a quadratic equation into two equal parts.

a) transversal b) axis of symmetry

c) parallel line d) perpendicular line

A 20) What is the vertex of the quadratic equation $y = (x-3)^2 + 2$?

a) $(3,2)$ b) $(-3,-2)$

c) $(-3,2)$ d) $(3,-2)$

C 21) The axis of symmetry of the quadratic equation $y = (x+3)^2 - 2$

a) $x = -2$ b) $x = 2$

c) $x = -3$ d) $x = 3$

C 22) What is the minimum or maximum point of $y = (x-5)^2$?

a) $(0,5)$ b) $(0,-5)$

c) $(5,0)$ d) $(-5,0)$

D 23) If $y = 36x - 3x^2 - 100$ will be transformed into the form $y = a(x-h)^2 + k$ what would be the value of k.

a) 5 b) 6

c) 7 d) 8

B 24) Find the zeros of the function $f(x) = x^2 + 5x + 6$.

a) 2 and 3 b) -2 and -3
c) 2 and -3 d) -2 and 3

C 25) Find the root of the function described by the equation $y = x^2 + 6x + 5$.

a) 6 and 5 b) 1 and 5
c) -5 and -1 d) 5 and -1

A 26) Which of the following is a polynomial in one variable?

a) $4g^5 - 3g^2 + g - 1$ b) $4x^2y - 4xy^2 - 3$
c) $2xy + x + y$ d) $sm + ml + 6h$

C 27) What is the degree of the polynomial $2x^2 + 6x^3 + 5x + 2$?

a) 1 b) 2
c) 3 d) 6

A 28) The quotient of $(-x^2 + 5x - 6) \div (2 - x)$ is

a) $x - 3$ b) $-x + 3$
c) $-x - 6$ d) $x + 6$

C 29) What would be the remainder if $4x^2 + 7x - 5$ is divided by $x - 2$?

a) -35 b) 35
c) 25 d) -25

D 30) Which is the correct synthetic division for $(2x^2 + 11x + 12) \div (x + 4)$?

a)
$$\begin{array}{r|rrr} -4 & 2 & -11 & 12 \\ & & 8 & -12 \\ \hline & 2 & 3 & 0 \end{array}$$

b)
$$\begin{array}{r|rrr} 4 & -2 & -11 & -12 \\ & & 8 & -12 \\ \hline & -2 & -3 & 0 \end{array}$$

c)
$$\begin{array}{r|rrr} 4 & 2 & 11 & 12 \\ & & -8 & 76 \\ \hline & 2 & 19 & 0 \end{array}$$

d)
$$\begin{array}{r|rrr} -4 & 2 & 11 & 12 \\ & & -8 & -12 \\ \hline & 2 & 3 & 0 \end{array}$$

B 31) What are the zeros of the polynomial function $f(x) = 2x^2 + 5x - 3$?

a) $\frac{1}{2}, 3$ b) $\frac{1}{2}, -3$
c) $-\frac{1}{2}, 3$ d) $-\frac{1}{2}, -3$

A 32) Find the polynomial with the sets of zeros $\{1,-1,2\}$.

a) $x^3 - 2x^2 - x + 2$ b) $x^3 + 2x^2 - x - 2$

c) $x^3 - 2x^2 + x + 2$ d) $x^3 + 2x^2 + x - 2$

D 33) Which does not belong to the group?

a) $f(x) = 2x^3 - 2x + 3$ b) $f(x) = 2x^6 - 5x^3 - 8$

c) $f(x) = 3x^4 - 2x + 7$ d) $f(x) = 2x^5 - 3x^3 + x - 2$

B 34) What would be the remainder if $2x^2 - x + 5$ is divided by $x - 2$?

a) -11 b) 11

c) 1 d) -1

A 35) Find the function whose exact zeros are $\{1,1,-1\}$

a) $x^3 - x^2 - x + 1$ b) $x^3 + 3x^2 + 3x + 1$

c) $x^3 - x^2 - x - 1$ d) $x^3 - 2x^2 - 1x - 1$

C 36) Evaluate $f(x) = 9^x$ if $x = -\frac{1}{2}$

a) 3 b) -3

c) $\frac{1}{3}$ d) $-\frac{1}{3}$

B 37) Find the base of the exponential function whose graph contains the points $(3,8)$.

a) 4 b) 2

c) 3 d) 8

C 38) What is the logarithmic form of $8 = 2^3$?

a) $\log_2 3 = 8$ b) $\log_3 2 = 8$

c) $\log_2 8 = 3$ d) $\log_8 2 = 3$

B 39) What is the exponential form of $\log_8 2 = \frac{1}{3}x$?

a) $2^8 = \frac{1}{3}x$ b) $8^{1x/3} = 2$

c) $2^{1/3(x)} = 8$ d) $8^2 = \frac{1}{3}x$

D 40) $\log_4(8)(3)$ is similar to

a) $\log_4 8 - \log_4 3$ b) $\log_4 3 \div \log_4 8$

c) $(\log_4 8)(\log_4 3)$ d) $\log_4 3 + \log_4 8$

C 41) $\log_2(-4) - \log_2(-3)$ is similar to

a) $\log_2\left(\frac{3}{4}\right)$ b) $\log_2\left(-\frac{3}{4}\right)$

c) $\log_2\left(\frac{4}{3}\right)$ d) $\log_2\left(-\frac{4}{3}\right)$

D 42) $\log_c(4)^{-3}$ is similar to

a) $3\log_c 4$ b) $4\log_c 3$

c) $c\log(4)^3$ d) $-3\log_c 4$

C 43) Given $2^{2x} = 16^{(x+2)}$, solve for x

a) $\frac{4}{3}$ b) -1

c) $-\frac{4}{3}$ d) $\frac{3}{4}$

A 44) Given $\log_3 x = 2$, solve for x

a) 9 b) 4

c) 8 d) 5

B 45) Given $\log_3(3x-4) = 2$, solve for x

a) $-\frac{13}{3}$ b) $\frac{13}{3}$

c) $\frac{3}{5}$ d) $-\frac{3}{5}$

C 46) Express $\log_b x + \log_b x + \log_b 7$ as a single logarithm

a) $\log_b \frac{x^2}{7}$ b) $\log_b \frac{7}{x^2}$

c) $\log_b 7x^2$ d) $2\log_b 7x$

C 47) Expand $\log_a \frac{x^2}{y}$

a) $\log_a x + \log_a y - \log_a x$ b) $\log_a x + \log_a x + \log_a y$

c) $\log_a x - \log_a y + \log_a x$ d) $\log_a x - \log_a x + \log_a y$

A 48) Which is the exponent in $x = \log_b y$?

a) x b) log

c) b d) y

D 49) The range of $y = \left(\frac{1}{2}\right)^x$ is

a) set of positive integers b) set of positive real numbers

c) set of negative real numbers d) set of real numbers

C 50) It is the base in the expression $a = \log_c b$

a) a b) b

c) c d) log

Note:

Letters placed before the number of each item are the letter of the correct option.

Appendix R

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. Rowena A. Cacanindin
Principal, Batasan Hills National High School
Batasan Hills, Quezon City

Sir/Madame:

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to ask permission from your kind office to allow us to administer the questionnaires to 4th year high school students and mathematics teachers of your school who will serve as the respondents in our research.

The kind action that your office will extend on the above request will contribute much to the completion of our research endeavor.

Thank you very much.

Very truly yours,

Sgd. Nanette CABANTAC
Sgd. JEANNE ROSE MANDIGMA
Sgd. CHRISTINE DATOR
Sgd. CELINA SARMIENTO
Sgd. ELAINE KRIS LEE
Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix S

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. David Atas
Principal IV, Dasmariñas National High School
Dasmariñas, Cavite

Sir/Madame:

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

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Thank you very much.

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Sgd. NANETTE CABANTAC

Sgd. JEANNE ROSE MANDIGMA

Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser

Appendix T

Philippine Normal University
College of Science
DEPARTMENT OF MATHEMATICS
Taft Ave. Manila

(Date)

Dr. Margarito B. Materum
Principal III, Valenzuela National High School
Valenzuela City

Sir/Madame:

We, junior students of Philippine Normal University, taking up Bachelor of Science major in Mathematics for Teachers, are conducting a research entitled "*Mathematical Ability of 4th Year High School Students of Selected National High School (S.Y. 2005-2006)*".

In this regard, we would like to ask permission from your kind office to allow us to administer the questionnaires to 4th year high school students and mathematics teachers of your school who will serve as the respondents in our research.

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Sgd. CHRISTINE DATOR

Sgd. CELINA SARMIENTO

Sgd. ELAINE KRIS LEE

Sgd. CHRISTIAN VALDEZ

Noted:

Sgd. Dr. LOLITA O. PUNZALAN
Course Adviser