A DESCRIPTION AND EVALUATION OF A CONTINUOUS PROGRESS PROGRAM FOR INTRODUCTORY ALGEBRA

by

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ABSTRACT

Since about the end of the Second World War there has been mounting pressure for change in our approach to formal education. During this time, support has grown for the development of instructional techniques that replace the group approach of the traditional classroom with those more concerned with the individual. Many educational theorists and practitioners favour abandoning the graded structure and developing instead the type of program which permits learning to be conducted on some form of continuum for each individual learner. The purpose of this project was to develop a continuous progress program in introductory algebra for a junior secondary school in a large urban school district (Greater Victoria). A second purpose was to describe the structure and operation of the program. Thirdly, this study investigated the possible relationships between the success of a student in the continuous progress program and certain personality traits. Lastly, the study proposed to evaluate the continuous progress program from the point of view of the teachers and the students who were involved.

The eight personality traits examined in the study were those of the Gordon Personal Profile and the Gordon

Personal Inventory; viz., Ascendancy, Responsibility, Emotional Stability, Sociability, Cautiousness, Original Thinking, Personal Relations and Vigor. The Chi square test was used to determine if significant relationships existed between success in continuous progress and the above personality traits.

Student evaluation of the program was obtained from a questionnaire prepared for the purpose. The Chi square test was again used, to determine if significant relationships existed between success in continuous progress and responses to the questionnaire. In addition, a general appraisal of response patterns was made.

Teacher evaluation was based on responses to a prepared set of questions presented to each teacher during a tape-recorded interview.

Analysis of the data indicated that there probably are relationships between a student's successful performance in a continuous progress program and each of the personality traits of Vigor, Responsibility and Emotional Stability. Students who earned high scores on these traits tended to do well in continuous progress. Success in continuous progress also appears to be related to certain responses in the questionnaire pertaining to:

a) general preference for mathematics and reaction to working in the continuous progress environment,
b) effort, rate of learning and perception of the amount learned,
c) willingness to seek teacher help,
d) ability to concentrate.

Both teachers and students were generally favourable to the continuous progress program. The investigation did reveal, however, that several aspects of the program need refinement. Moreover, there was a strong indication that continuous progress was not suitable for all students.

Examiners: [redacted]

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CHAPTER I

INTRODUCTION

Public education continues to be one of society's most enduring concerns, and in recent years the creation of a relaxed, democratic climate for learning has been a popular goal. Students need to acquire knowledge and to develop skills. They have the capacity to learn and a variety of materials and facilities to assist them. One might expect to find our schools filled with well-adjusted, highly motivated students, but it is the writer's contention that in a general sense this is not the case.

Before about 1850 most public education in North America was performed in small schools of few rooms and limited facilities. Out of necessity children were often grouped into levels of achievement rather than grades, and as a child proved his ability in one level he was advanced to the next. Thus the individual pupil could work his way through the entire educational offering of a school largely on his own initiative and at his own rate of speed.

By 1850 society had become quite complex and the demands for formal education were more urgent. The small ungraded school gave way to one of very different structure. This was the graded school which is still common today. It is characterized by a careful and quite rigidly structured framework of grades which each student is required to take, each grade being associated with a specific body of work presented in an annual increment of time. Budde (1967) attributes certain advantages to the system when he writes that the graded school:

a)defines a body of work,
b)permits an efficient counting of pupils,
c)can reveal what a pupil knows at any time,
d)aids in test writing and selecting,
e)uses letter grades for pupil standings,
f)is easily understood by most people.

Almost from the outset of the graded organization there have been attempts to modify it. Some suggested changes have been successfully accommodated within the graded structure while others have failed to get established. Still others have been absorbed by the existing system without having substantially affected it. Goodlad (1967) writes that "any establishment, threatened by heresy, seeks first to crush and then, failing this, to absorb the leaders of dissent." (p.3) He goes on to say that if the absorption is done without fundamental adaptations, then the process is self-defeating.

Since the end of the Second World War, as the number of students vastly increased and the rate of knowledge accumulation and discovery accelerated sharply, the pressure to educate more students better has been constant. Once again the search for efficiency and sophistication has been going on. Under catch phrases such as 'enlightened administration' and 'student involvement', and responding to a growing permissiveness in our society, many schools have begun to relax their traditional controls. The result may be a working environment in which efficient learning is not taking place, with a general deterioration in order and discipline, and a decline in student motivation to learn.

In attempting to establish how children learn, Bloom (1968) and other educators have generally agreed that individuals learn in ways, and at rates and times that are unique. Educational systems that do not allow for these characteristic differences have little chance for success, and the traditional framework of many of our schools prevents effective adaptation to the needs of the individual. "All too often," writes Clausen (1960), "we begin with an organization which is convenient for the teacher to administer, and the talk then becomes one of fitting children into the organization." (p.353)

Bahner (1960) is one of a growing number of educational theorists and practitioners who feel that our present problems will not be solved until we are prepared to take one basic step; viz., to organize our educational system on a foundation of continuous progress for each individual. Many advantages for the nongraded approach are forecast including the promoting of social and emotional growth, mental health and maximum academic achievement.

Relaxation of controls is not a helpful step unless it is accompanied by an educational offering that pupils are able to accept. Effective self-discipline can replace external control if the student perceives a course as being worthy of his attention. Student acceptance of a course depends on its organization and presentation as well as its inherent usefulness.

The continuous progress program described in this report was an attempt to organize a course in a form that would encourage a student to apply himself voluntarily to the work. To accomplish this goal, five essential features were incorporated:

a)a minimum or core program,
b)a set of behaviourally defined objectives,
c)a specified level of mastery,
d)a choice of learning modes,
e)individualized progress.

This document is a report of a project extending over a three-year period which entailed:

a)the preparation of a continuous progress package for the Mathematics 9 course prescribed in the curriculum guide Secondary School Mathematics, 1966, for the Province of British Columbia,

b)the study of relationships between certain personality traits and success in continuous progress,

c)the evaluation of pupil and teacher reactions to the continuous progress program.

CHAPTER II

REVIEW OF THE LITERATURE

CONTINUOUS PROGRESS DEFINED

The terms continuous progress and nongrading are often used in the literature to refer to essentially the same concept, and the practice will be sustained in this report. Although differing in detail, all continuous progress programs attempt to offer each student a continuum of learning experiences to enable him to progress towards an educational goal at a rate which is best suited to his individual abilities and needs.

Goodlad (1967) describes nongrading as learner-centered and establishes its function as the development of the learner as an individual and as a member of society. He indicates that means of fulfilling this function should emphasize ways of knowing and thinking. The organizational structure that he envisages will ignore grades or replace them with a nongraded plan, and provide for individual differences through such things as flexible groupings, individualized programs, and different rates of progress.

Anderson (1967) has written that nongrading involves two clear dimensions of the school environment; the philosophy that guides the school staff towards the pupil, and the administrative machinery that regulates teacher and pupil activity. He says that:

> ...it is in short both an operational mechanism and a theoretical proposition. It is not a new staffing pattern as in team teaching. It is not a technological innovation as in educational television. It is not, as such, a component of the curriculum reform movement, though it may very well be the chief inspiration behind curriculum reform. Rather it is a concept of what is right and a plan for implementation of that concept. (p.4)

He distinguishes four consistent features of most nongraded programs:

(1) Instructional emphasis on individualization.
(2) Educational emphasis on the individual.
(3) Provision for different learning rates.
(4) Provision for different learning programs.

He lists seven objectives of a continuous progress plan:

(1) Suitable provision for each unique child, through flexible grouping, adaptable curriculum, and a great range of materials and instruction.

(2) Successive learning experiences for each individual, pertinent and appropriate to his present needs.

(3) Optimum and constant pressure for each learner.

(4) Assured success and appropriate rewards for reasonable diligence and effort.

(5) Absence of grade levels and the machinery of promotion and failure.

(6) Abolishment of the letter-grade report and adoption of a system of reporting each child as an individual.

(7) More sophisticated curriculum planning, evaluation, and record-keeping by the teacher.

EVOLUTION OF THE CONTINUOUS PROGRESS PROGRAM

Many writers, including Glaser (1967) and Phillips (1968), stress the importance of evaluation in education, but a review of the literature reveals considerable criticism of letter-grade evaluation. Bloom (1968) refers to the well-known evaluation model that implies a certain range of letter grades as:

> ...the most wasteful and destructive aspect of the present educational system. It reduces the aspirations of both teachers and students; it reduces motivation for learning in students; and it systematically destroys the ego and self-concept of a sizeable group of students who are legally required to attend school ... under conditions which are frustrating and humiliating year after year. (p.1)

He suggests that many teachers have a preconceived pattern of grade expectations at the beginning of the school year and "the final sorting of students through the grading process becomes approximately equivalent to the original expectation." (p.1)

He warns that:

> ...the cost of this system in reducing opportunities for further learning and in alienating youth from both school and society is so great that no society can tolerate it for long. (p.1)

Palmer (1962) refers to the "explosive evaluation system" common in our schools, and maintains that it is "folly and scandalous that teachers remain in ignorance of progressive methods of marking and of achieved new standards of evaluation." He adds that "when the letter grade becomes more important than the learning itself, education itself is subverted." (p.467)

Lohnes (1967) shows similar concern, contending that:

> ...the measurement record attached to the students in most of our secondary schools today is inadequate and harmful, that it involves errors of commission by sponsoring invidious comparisons, burdening teachers, and erecting a barrier between the teacher and the student; that it involves errors of omission by ignoring important traits of individual differences in adolescents and providing inadequate interpretations of traits it does report. (pp.102-103)

To get away from the detrimental aspects of letter-grade evaluation, some educators would abandon the traditional graded structure and replace it with a continuous progress organization. Goodlad (1967) perceives four types of schools, ranging from the traditional graded schools which he scorns as the "unenlightened unfortunates", through two transitional kinds, to the pure nongraded schools which he describes as the "enlightened minority", practicing or genuinely making plans to practice the philosophy of individual development.

Encouraging a change in the direction of nongrading, Frazier (1968) believes that we know more clearly today what is learnable, we are more sophisticated in our teaching techniques and instructional materials, and we are once more accepting mastery of the objective as a practical and respectable goal. He feels that the one-to-one relationship between student and teacher is not an impractical dream.

The continuous progress program of this report was founded on the three major areas of educational need cited by Bolvin (1968): high quality evaluation techniques, variety in teaching materials and methods, and behavioural objectives.

REFERENCE MODELS

Carswell (1967) writes that the most important phase of establishing a continuous progress program is planning, and should include extensive work in four areas:

(1)Reading for philosophical orientation.
(2)Seeing nongrading interpreted in action.
(3)Identifying nongraded practices now functioning.
(4)Planning a strategy for change. (p.12)

In the same vein, Shearron and Wait (1967) warn that one should not attempt nongrading within a graded school, and that nominal nongrading is worse than no attempt at all. They stress the necessity "for at least a year of study and careful planning in preparation for changing to the nongraded structure." (p.42) They go on to say that the understanding and acceptance of the nongraded philosophy and concepts by parents, teachers, administrators and children are important factors for success.

Five instructional models discovered in the literature had significant influence on the development of the continuous progress program of this study. An outline of each of them follows.

Model I. Frazier (1968) suggests a redevelopment of the curriculum into two types of learnings in order to better accommodate the needs of the individual. The lesser learnings, consisting of basic skills and knowledge, would be required study for all students and would be taught for mastery. The larger learnings, extending more into the affective domain, would be designed for the individual, and would have a broad goal of pupil progress and growth.

The model suggests the direction in which education should go, but contains no operational details. The system would be designed for feedback, and letter grades and report cards as we know them would be replaced by some sort of individual student appraisal.

Model II. Laidlaw (1965) seems to be trying to satisfy the troublesome dichotomy of a simple pass-fail rating based on a recognized standard of achievement on the one hand and a grading of students against their peers on the other. Believing that certain objectives of a curriculum are basic while others are beyond the minimum responsibility, he offers two distinct levels of study, a common core and selected enrichment.

The core, consisting of a stated set of objectives, would emphasize diagnosis and feedback. Students would earn a pass when they could demonstrate mastery of these basic objectives. The enrichment units would be used to establish relative performance and competence within a group, indicated by letter grades.

Model III. Glaser (1967) gives further support to the cause of individualization with a coordinated objectives-teaching-evaluation approach designed to crystallize and clarify our educational efforts. This model organizes a course into a hierarchy of behaviourally defined objectives which each student completes, to prescribed standards, at his own rate.

There are no letter-grade evaluations and no school grades as we know them. A minimum of emphasis is placed on time and a maximum on subject matter. There is an approach to a one-to-one relationship between the teacher and each student.

Model IV. The ASCD Yearbook (1967) tells of a model from the junior secondary level which was based on a clearly defined set of objectives and individualized student progress. The organization of the program was such that the teacher played a greatly reduced role in evaluation for the formal student record and could devote more of his time to working with his students to reach the educational goals. At the same time, the students were oriented toward goal achievement rather than competition to measure up to their peers.

The plan called for two types of testing, serving quite exclusive functions.

(1) The teacher-constructed classroom test, used as a diagnostic feedback instrument to aid a pupil and his teacher to master a particular objective.

(2) The formal examination, constructed by an evaluation committee, used for the official records of a student's achievement.

Model V. Bloom (1968) offers a model founded on the following eleven propositions:

(1) The great majority of students have the ability to master the major objectives of a curriculum.

(2) Time is the key to mastery.

(3) Aptitude to master a particular learning task is directly related to time.

(4) Mastery time will vary with the individual and the task.

(5) Perseverence affects success.

(6) Ability to understand instruction affects ability to learn.

(7) Mastery is related to quality and variety of instruction and materials.

(8) Objectives and standards of mastery must be clearly predefined.

(9) Evaluation must be for mastery only.

(10) Collection of necessary evidence of progress must be possible.

(11) Recognition of achievement of mastery must be possible.

The general plan of the model was to develop teaching techniques and materials that would permit individual students to reach mastery in less time than it presently took them, and at the same time permit each student to proceed at a pace which was more in tune with his own learning aptitude.

The Bloom model called for a course to be broken into small, well-defined instructional units, by content or time. Each learning unit was objectively categorized into a hierarchy of behaviourally defined learning tasks. All students were made clearly aware of the learning objectives and the standards of mastery.

REACTION TO CONTINUOUS PROGRESS

Advantages of Nongrading. There are many expressions of favourable reaction to continuous progress in the literature. Anderson (1962) writes of the great variety of practices and viewpoints in those schools operating so-called nongraded programs, as well as the common spirit and ideal which permeates their thinking, and the enthusiasm with which they work. He adds that although teachers working on nongrading are "confronted with many a raised eyebrow" from more traditionally oriented teachers, "the available data offer them much encouragement." (pp.267-268)

Bahner (1960) quotes another reporting school as being "pleased to join the company of other groups who are seriously questioning long-established practices of grouping children within a school." (p.355)

Lohnes (1967) becomes even more eloquent when he looks forward to school as a "community of scholars", "permeated with respect for individual personality" and in which "teachers and students learn in reciprocity" with the teacher helping the learner to "believe in his own individuality and his capacity to learn." (p.104)

The chief advantages of nongrading, according to Shearron and Wait (1967) are:

a)improved mental health of teachers and pupils,
b)continuous progress according to an individual's needs and abilities,
c)better programs of instruction,
d)increased instructional efficiency,
e)improved teacher relations and staff morale,
f)stimulated professional growth,

g)healthy atmosphere of experimentation,
h)improved student mastery of basic learnings,
i)improved progress reporting and evaluation,
j)improved emotional and social adjustment.

Problems In Implementation. Statistical evidence of the effects of nongrading is scarce, and many educators are not willing to support the process on the basis of largely subjective analyses. Shearron and Wait (1967) have listed the main handicaps to nongrading as:

a)lack of understanding by teachers, principals and parents,
b)persistent use of the "graded" vocabulary,
c)continuous need for orientation of new teachers and new parents.

The ASCD Yearbook (1967) suggests several other reasons for the apparent resistance to what many educators feel is needed change. Firstly there is often a sort of 'comfortable inertia' which makes any known evil more attractive than unknown ones. Also cited is the shallowness of many educators and the almost automatic human tendency to try to justify what one is presently doing. Then too, education is such a complicated field, and our present grading system seems so simple and neat and satisfying, with few of the time and emotional pressures that would seem to accompany a more detailed method.

The yearbook points also to the many winners under the present system, including some students, parents, teachers and administrators. They suggest that perhaps the strongest change resistor of all is the continuing inability of educators to agree on attractive substitutes for the present techniques.

SUMMARY

To sum up, a review of the literature reveals considerable support for continuous progress by well-known educational writers. Reistance to nongrading seems to arise more from practical difficulties than from theoretical opposition. The project described in this report was undertaken primarily to discover how well continuous progress worked in a particular situation.

The program was designed to include the features which Carbone (1961) considered essential for the successful introduction of a nongraded plan into a school system, viz.;

(1)A clear set of educational objectives, presented in a realistic sequence over the whole program.

(2)A wide variety of instructional materials of different levels of sophistication.

(3)A real move toward greater individualization of learning.

(4)Flexible student groupings and easy movement through the groups.

(5)Good evaluation devices.

(6)A committal to individual difference.

CHAPTER III

DESCRIPTION
of the
CONTINUOUS PROGRESS PROGRAM

PURPOSE AND SCOPE

The continuous progress program described in this study was essentially a minimum course in introductory algebra, based upon a set of behavioural objectives. Its major purpose was to give the students specific goals to work toward, by the achievement of which they would "pass" the course. The program made it possible for each pupil to apply a personalized style to his studies. The learning objectives and the mastery level were the same for every student, but pupils advanced independently of one another, at rates that were controlled by individual effort and ability.

Since a variety of factors influence learning, a choice of learning modes was offered in the continuous progress program. Students could adapt their study habits to the demands of the objective as well as to their own attitudes. The program could accommodate individual study, small group work, and class-sized lessons. Fast-moving students were not held back since they could proceed directly into the work of the grade ten course as soon as they completed the objectives of Mathematics 9. Instead of failing, students who progressed slowly would simply begin their next school year's work at the objective they last mastered.

The program operated in a 1000-student junior secondary school in a middle-class urban municipality. Of the 330 pupils in grade nine, some 250 took mathematics by continuous progress, 30 elected a traditional class, and 50 were on the non-academic program. Five teachers, working in groups of either three or four, made up the instructional staff for the program. One part-time teacher aide provided clerical help for about three hours each week. Three one-hour mathematics classes allotted on the regular weekly timetable were augmented by optional classes held before and after school each day.

Although the school was fundamentally traditional in its educational approach, the principal encouraged originality and experimentation from his teaching staff, and actively supported the continuous progress program in mathematics. It was, however, the only subject being presented in that way.

STRUCTURE

In the continuous progress program the grade nine academic mathematics course was divided into eight broad units of work. Two to five learning objectives were identified for each unit, making a total of 29 behavioural objectives in the program. Students progressed by reaching a 75 per cent mastery level on a test of each objective. Modern Elementary Algebra by Nichols, Collins and MacPherson (1963) was used as the textbook and the British Columbia Department of Education Curriculum Bulletin (1966) as the guide for program content.

Classes were held in the school cafeteria, whose 3600 square feet of floor space provided for two classroom areas and a large open area. Each classroom could accommodate 40 pupils, while the open area could easily seat 100. Adjoining the cafeteria was a small kitchen which served as the test bank and supply room.

Figure (1) is a floor plan of the cafeteria showing the major stations used in the program.

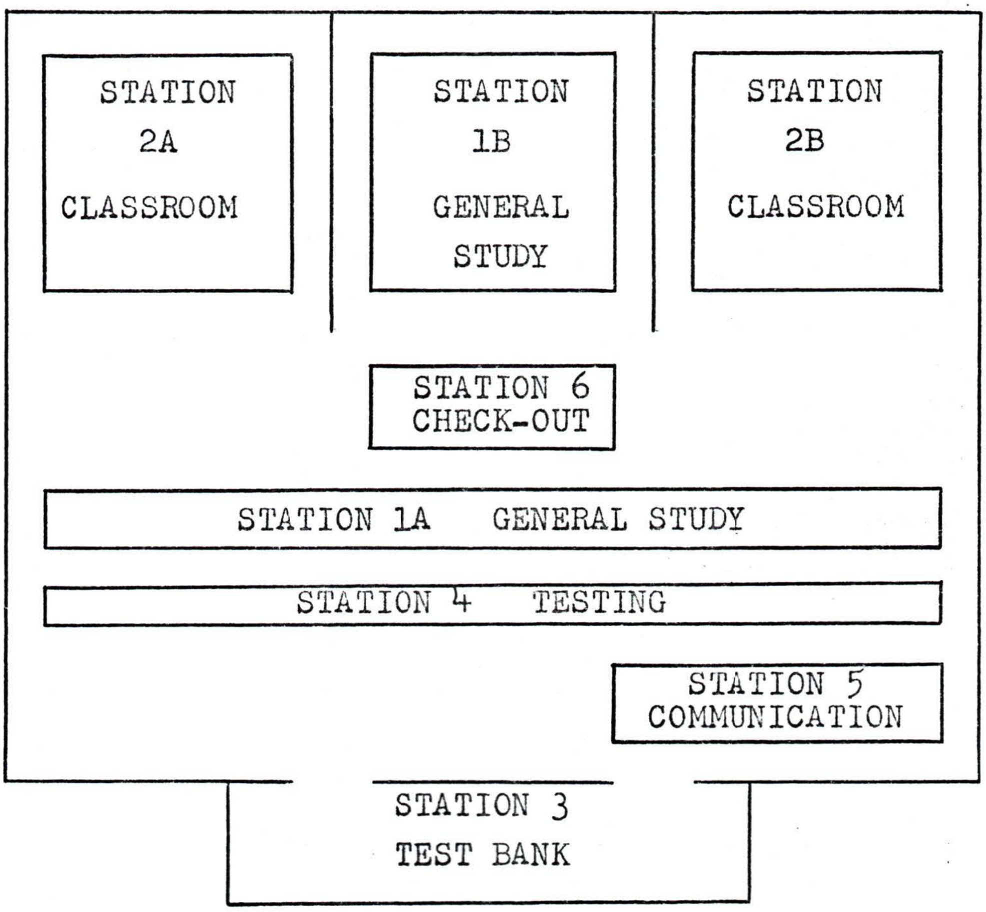

FIGURE 1: DIAGRAM OF THE SCHOOL CAFETERIA, SHOWING THE MAJOR STATIONS USED IN THE CONTINUOUS PROGRESS PROGRAM

Station 1 - General Study. Individual study and informal pupil-teacher and pupil-pupil work was performed in the general study area. A pupil could move freely from here to the other stations in the cafeteria.

Station 2 - Classrooms. Formal lessons conducted by a teacher were held in these sections. Although they were not self-contained, they were the classrooms of the cafeteria.

Station 3 - Test Bank. Students who wished to write tests received them from the test bank. The bank opened at the beginning of each period and closed as soon as all students who came to class to write a test had been served.

Station 4 - Testing. Part of the cafeteria was reserved for students who were writing tests.

Station 5 - Communication. Three services were provided at this station. Firstly, all tests were deposited here after they were written. Secondly, answer keys to practice exercises were available here. And lastly, general announcements were made over a public address system from this station.

Station 6 - Check-out. Students who did not achieve 75% on a mastery test were required to write retests until they did so. The check-out procedure, mandatory for each retest, began with the student placing himself and his work before a teacher for evaluation. A signature of approval for retesting was given if the teacher was satisfied with the quality of the student's work and his apparent knowledge of the subject matter of the objective.

Five sections of the total program can be identified:

(1) Program Introduction.
(2) Unit Outlines.
(3) Tests.
(4) Progress Records.
(5) Progress Reporting.

Program Introduction. The introduction was designed to inform parents and students of the organization and requirements of continuous progress. Its purpose was to prepare each student in such a way that he would not only want to work efficiently, but also would know how to.

A Parent Form Letter (Form A), intended to create an understanding and encouraging home atmosphere for the student, was sent to each parent (Appendix I)[1]. It reminded them of the emphasis on individual progress and pupil responsibility, and of the mastery requirement for progress. It provided information on progress rates and sources of help available to students, as well as ways in which parents could keep informed of their child's progress. At his first mathematics class the student received an Information Bulletin (Form B), describing the organization of the continuous progress program and his responsibilities within it, and a Progress Thermometer (Form C), on which to record his successes.

For the first class period, and in subsequent periods if necessary, the teacher strove to orient each of his pupils to the routines of continuous progress. Form B was read to the class and mechanical details such as registering in class, receiving lessons, writing tests, and getting "checked out" were explained and reviewed until each student seemed to understand the structure within which he had to work.

The first unit of the course was essentially an orientation section. The learning objectives were straightforward, so the student not only could progress at a reasonable rate but also could adapt to the continuous progress routine.

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[1]Forms A to K are included in the Appendix I

Unlike all subsequent units, the first unit was closed on a prearranged day. All students who had not completed it by that time were given a final test and moved on to the first objective of the second unit.

Unit Outlines. The core of the continuous progress structure was the set of learning objectives which were distributed to the students in the form of Unit Outline Sheets (Appendix V). Each of the eight unit outlines attempted to describe, in behavioural terms, the objectives that the student had to master in order to receive credit for the unit. As well as the objectives, the unit outlines contained information on directed readings and practice exercises that the student was expected to do in preparing himself for testing.

The unit outline had two primary functions. Firstly, it informed the student of what he was expected to know. Secondly, it indicated by its behavioural expression the type of question to be anticipated on the mastery test.

Tests. There was but one way to advance in the continuous progress program - through the testing procedure. Progress through mastery was the keynote, and the development of a well-stocked test bank was a direct consequence of this.

Two types of tests were found in the test bank; the objective mastery test and the unit test.

Associated with each of the 29 objectives of the program was a set of mastery tests (Appendix V). Theoretically the test bank required a large number of equivalent tests for each objective. In practice, however, five for each objective were usually found to be sufficient. Each test was coded numerically for identification of unit, objective and trial. A score of not less than 75 per cent gave the student credit for the objective and approval to progress.

For every unit of the continuous progress program the test bank contained one unit test (Appendix V). In contrast to the mastery test, the unit test was not designed as a measure of mastery for progress. Before writing a unit test, a student was required to have passed a mastery test for each objective of the unit. The unit test was a cumulative or final test of the major concepts of a unit. It also provided the letter grades that were still required by the school.

Progress Records. Two types of progress records were built into the continuous progress structure, one for the student and one for the teacher. Although each produced a picture of individual progress, they served quite distinct functions.

The student progress record is the progress thermometer which was kept in the student's daily workbook and maintained by him. This record was primarily a motivational device for the student. On it he could indicate such things as his short and long range goals, the average class progress, and his own progress.

The progress thermometer was also used as part of the parent reporting procedure. It appeared as the first page of the pupil workbook and, when properly kept, it could help the parent to evaluate his child's success.

The Student Progress Record (Form D) kept by the teacher was the official file on the activities of each student. A dated entry was made for every attempt of a mastery test, and for the completion of each unit of the program. The record contained evidence of all formal communications from the mathematics department to the parent, including letter grades for the school report card. As the entries accumulated the student record functioned as a profile of individual pupil success.

Progress Reporting. Reporting in continuous progress occurred at frequent intervals. The traditional report card was issued three times in the year by the school, and a letter grade and progress point assessment for each pupil was submitted at these times. In addition to this there were two other formal reports in the program.

The first of these was associated with rates of progress which were considered to be slow. Two form letters were used in this reporting procedure. Form E was designed as the first notification to the parents that their child was falling behind, as well as a reminder of the sources of help that were available. Form F was a follow-up communication which compared the progress point of the child in question with that considered to be more normal. Slow progress letters were mailed every two weeks.

At the conclusion of each unit of work the student had to write a unit test. The score and letter grade for this test, along with the teacher's comments, were forwarded to the parent on Form G. Because each student controlled his own schedule of progress, Form G's were being sent to parents via the students almost every day.

OPERATION

The continuous progress program was designed to individualize learning and to establish a one-to-one relationship between a teacher and a pupil. The minimum goals of the course were set by the teaching staff but the rate of progress and the learning mode were controlled by each student according to his own needs. There was an unmistakable atmosphere of teamwork in the operation of the program. Teachers worked as a cooperative unit, both in front of their classes and behind the scenes. Pupils worked individually and in small informal groups. Teachers and students worked together in instructional situations involving as many pupils as were interested in attending.

Students and teachers of course played separate roles. In effect, the operation for each student was a flexible interrelationship between himself, his teachers, and his classmates and in most cases he was able to manipulate these factors to reach his educational goal.

The Role of the Teacher. The duties of the teacher in continuous progress were basically the same as those of a traditional classroom teacher, with some notable changes in emphasis.

There were occasional behaviour problems and at times the general noise level had to be controlled, but in the area of order and discipline there was usually little to do other than guide the students in the routines of the program.

Maintenance of supplies was, on the other hand, a large and important task. Over 130 different forms were included in the continuous progress package and these had to be readily available. The student was conditioned to expect no delays in his progress that could be blamed on operational breakdown.

Processing tests was one of the most time-consuming and persistent responsibilities of the continuous progress teacher. Not a school day would pass without some students writing tests and these tests were expected to be returned to the pupils within 24 hours. About 8,200 tests were written within the one year period of this report, precipitating an equal number of entries in the student records and about 1,500 progress letters to parents.

The teaching role in continuous progress was especially important. It was often performed in an atmosphere not regularly found in the traditional classroom setting. One-to-one, one-to-few and one-to-many instructional groups were all common and it was not unusual to find more than one of them going on at the same time in a continuous progress class. Teaching was a cooperative endeavor, with each teacher on the team equally responsible to every student.

Perhaps the most significant feature of continuous progress teaching was related to the initiation of the lesson. The teacher tried to encourage self-learning through effort and meaningful study, and it was only when it seemed obvious that a large number of students were experiencing difficulties with the same concept that he would give an unsolicited lesson. The impetus for most lessons in the program came from the student, who chose the topic, the time of the lesson, and sometimes even the teacher. The teacher came to the cafeteria prepared to teach, but the content and format of his lessons were not known to him until a pupil indicated his need.

<u>The Role of the Student</u>. The single task of the pupil in continuous progress was to master the prescribed objectives. Its importance was such that the vitality of the entire program depended upon it. In a traditional classroom situation the teacher leads his class through the work at a pace which will "cover the course" by the end of the school year, giving the illusion that the whole class is proceeding at a pace set by the teacher. In continuous progress each student advanced through the work at his own pace, and there would have been no meaningful operation without the active involvement of the students. No amount of planning or

material development, no theoretical justification or teacher support would have been sufficient to maintain anything but the framework of continuous progress.

The Operational Procedure. Six fundamental steps led to the mastery of one objective of the program. Repetition of them produced mastery of other objectives, completion of a unit of work, and eventually the entire course. Figure (2) illustrates how a student proceeded with his development of an objective.

The most direct route from the introduction of an objective to its completion was as follows. The student studied the materials, in his text or elsewhere, that were related to the stated objective. He worked the practice exercises indicated on the unit outline sheet, marked his work, and made corrections to his errors. He then wrote and passed the objective mastery test and upon its return, made all corrections to it and filed it in his workbook.

A more normal route included some external assistance, and to describe this more clearly one hypothetical student will be followed through a complete unit cycle.

With the unit outline sheet as his guide, a pupil began work on an objective. When satisfied of his general understanding, he turned to the assigned practice exercises, did at least the minimum number indicated on the outline, and marked them at the communication desk. Returning to his seat, he corrected any errors and went on with new work.

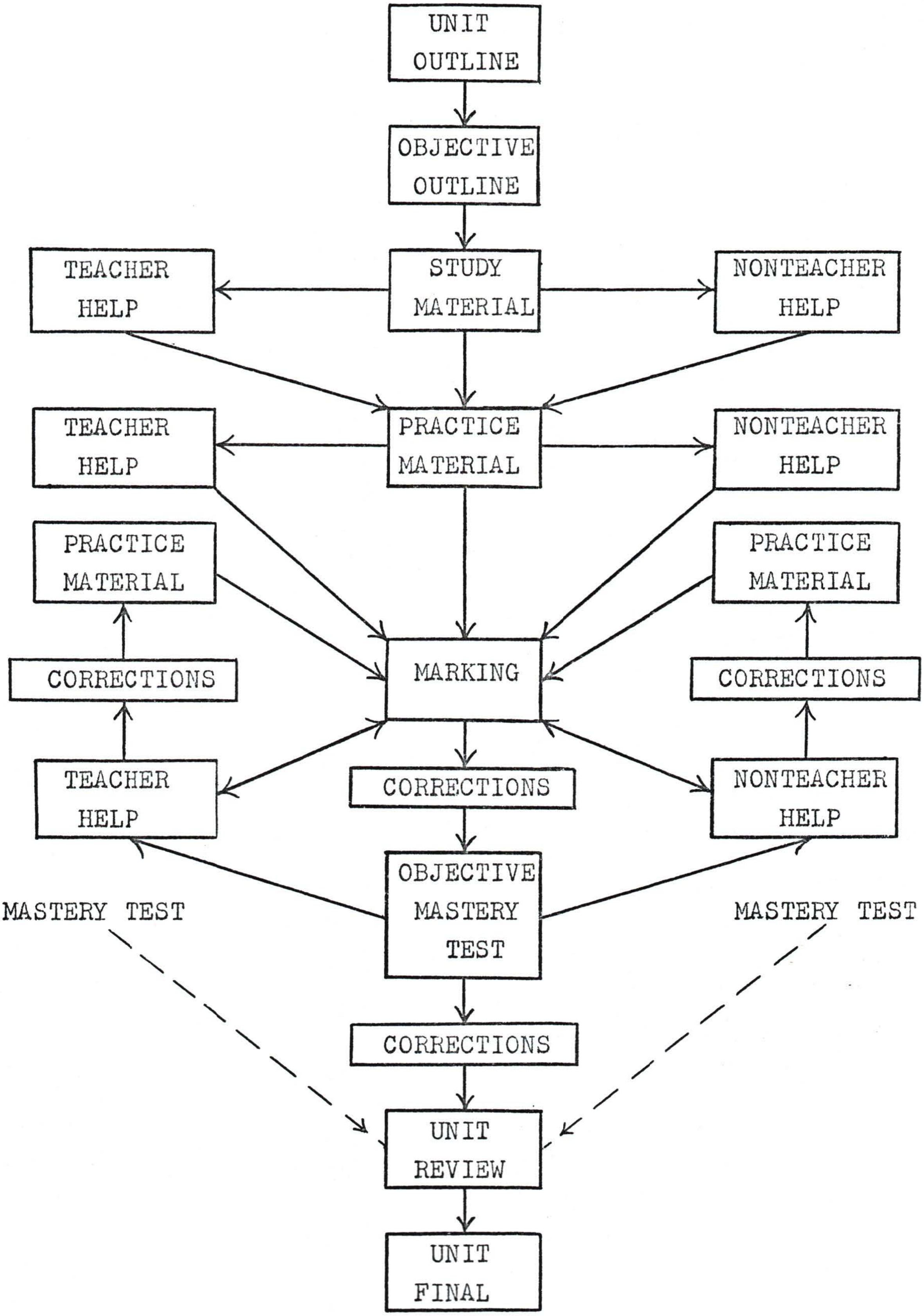

FIGURE 2: FLOW CHART - STUDENT PROCEDURE IN CONTINUOUS PROGRESS

At indeterminate intervals throughout this study routine, the student sought help. He moved about the cafeteria freely to consult other pupils, or he carried on with his work and raised his hand to get teacher assistance. If he wanted still further help, the early morning and after school extra classes were available.

In this way the student prepared himself for demonstrating his mastery of the objective. At any time after the minimum assigned work had been completed he could write an objective mastery test.

Tests were available at the beginning of any class period and in the after school extra classes. With few exceptions they were designed to be written in about 45 minutes. Typically then, a student who was properly prepared would ask for a test at the beginning of his hour class and complete it before he left. If for any legitimate reason a test was not finished within the period, the student simply wrote 'incomplete' on the test paper and handed it in. It would be returned to him for completion in his next class period.

Mastery tests were returned at the beginning of the next period. At that time the student proceeded in one of two ways. If the test mark was up to the mastery standard, he made careful written corrections of all errors, seeking help where needed, then filed his test paper in his workbook and continued to the next objective. If the test mark indicated "non-mastery", he corrected the errors and filed his paper as before and then performed such review and practice of the materials and concepts of the objective as he deemed necessary.

When a student felt prepared for retesting, he went to the check-out station and carried on with his studies. A signature of approval for retesting was given by the check-out teacher if both the following conditions were fulfilled:

(1) The student's workbook showed that the study requirements of continuous progress were being met.

(2) The student could display his understanding of the objective under a brief oral examination.

If approval was not given, the student was instructed as to how he could overcome the deficiencies.

Two advantages of the check-out process could be cited. Firstly, it was mandatory that any student not meeting with success contact a teacher during the period of his difficulties. Secondly, the rather rigorous inspection at the time of check-out motivated students to do a good job on their studies.

In this way, all the objectives of a unit would eventually be mastered, some at the first attempt, many at the second, and some not until the non-mastered - review - check-out process had been performed several times. When all objectives of a unit were mastered, the student wrote the unit final test. It was marked, but instead of being evaluated for mastery, it was assigned a letter grade. The unit test was retained by the teacher and the student received a Form G for his parents indicating the test result and the completion of the unit.

CHAPTER IV

FACTORS AFFECTING SUCCESS IN A CONTINUOUS PROGRESS PROGRAM

INTRODUCTION

In the school year on which this report is based, i.e. the second year of operation, students who chose the continuous progress program outnumbered the traditional classroom students by a ratio of about eight to one. Although this indicates the initial popularity of the program, it does not measure student success, and there was a wide range of pupil achievement.

Learning is essentially an individual act, with the factors that combine to produce a successful learning experience subtle and varied. It is considered worthwhile to investigate some factors that might affect success in a continuous progress program.

SUBJECTS

About 250 students were in the continuous progress program for grade nine mathematics in the 1970-71 school year. These formed the population from which data were collected. Analyses were based on all available and usable data.

FACTORS FOR SUCCESS

The present study investigated two factors that may affect success in a continuous progress program:

(1)Sex of the learner.
(2)Personality of the learner.

The factor of personality was studied under eight traits which have been accepted by some authors to be reasonably discrete.

It was also proposed to investigate the factor of aptitude for mathematics, but a recent ruling of the local school board made this impossible.

INSTRUMENTATION

The Gordon Personal Profile and the Gordon Personal Inventory, each designed to measure four personality traits, were administered to the student population by the school's counselling staff (Appendix II). These particular instruments were chosen because they seemed to lend themselves to the proposed study. Moreover, Buros (1965) contains reviews supporting their use and describing them as short, convenient measures of personality traits that are as good as any available.

STATEMENTS OF HYPOTHESES

The following hypotheses were tested in this study:

H.1 There is no significant relationship between success in continuous progress and the sex of the student.

H.2 There is no significant relationship between success in continuous progress and any personality trait of the Gordon Personal Profile or of the Gordon Personal Inventory; viz.,

a)Ascendancy.
b)Responsibility.
c)Emotional Stability.
d)Sociability.
e)Cautiousness.
f)Original Thinking.
g)Personal Relations.
h)Vigor.

RAW SCORE DATA

Of the 244 students who participated in the study, 115 were male and 129 were female.

The classification of success in the continuous progress program was based on the number of units completed by the end of the school year. Of the eight units in the total program, six were the minimum requirement to obtain credit for the course. Units seven and eight were enrichment, and were mandatory for commencing the grade ten program or any free choice program in the current school year.

Five levels of success were established:

Classification		Number of Units Completed
Excellent	(E)	More than 6 units
Good	(G)	6 units
Fair	(F)	5 units
Poor	(P)	4 units
Very Poor	(V)	Fewer than 4 units

Table (1) shows the distribution of the population over success in continuous progress.

TABLE 1

DISTRIBUTION OF CONTINUOUS PROGRESS STUDENTS OVER SUCCESS

Excellent (E)	Good (G)	Fair (F)	Poor (P)	Very Poor (V)	Total
26	72	70	61	15	244

The manual which accompanies the Gordon personality instruments suggests that the 31st and the 69th percentiles may serve as cutting points for determining whether an individual's true score is below or above the average on the given trait. A three cell classification of each personality trait was made by applying these bounds to the raw data of this study, using Gordon's norm tables for Percentile Ranks for High School Students.

Table (2) shows the distribution of the population over the personality traits.

TABLE 2

DISTRIBUTION OF CONTINUOUS PROGRESS STUDENTS OVER PERSONALITY TRAITS

Trait	Below Average	Average	Above Average	Total
Ascendancy	55	76	76	207
Responsibility	60	87	60	207
Emotional Stability	53	82	72	207
Sociability	77	82	48	207
Cautiousness	70	90	45	205
Original Thinking	63	68	74	205
Personal Relations	79	74	52	205
Vigor	66	81	58	205

Table (3) shows the girls' raw scores on the eight traits of the Gordon personality tests and their continuous progress success categories.

TABLE 3

GIRLS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
1	13	9	16	17	10	26	12	12	G
2	22	17	10	33	6	23	14	21	F
3	20	23	26	23	10	20	28	22	F
4									F
5	20	26	20	26	22	12	18	12	F
6	29	19	19	31	20	25	24	19	G
7	31	18	16	25	23	30	21	24	F
8									P
9	9	22	20	13	31	23	22	18	F
10	20	14	12	22	9	17	20	14	F
11	14	27	26	21	25	22	24	19	G
12									G
13	25	21	24	22	19	29	28	24	G
14	24	16	19	27	26	31	32	25	F
15									G
16	16	24	21	25	15	15	27	19	P
17	8	23	22	9	21	25	11	18	E
18	21	23	29	27	13	28	29	16	V
19									F
20	9	12	9	18	13	15	25	13	G
21	18	26	19	24	19	33	22	25	G
22	26	17	19	26	22	28	29	22	F
23									F
24	23	25	20	27	26	28	29	21	G
25	24	18	10	32	26	25	23	32	P
26	21	32	32	17	17	23	25	25	G
27	16	27	21	10	27	29	16	18	F
28	26	14	21	27	19	19	29	25	F
29	31	18	23	32	21	34	25	34	F
30	20	22	19	11	26	27	15	24	G
31	19	11	6	22	6	21	25	14	V
32	19	16	19	21	19	22	21	20	P
33	25	19	20	34					P
34	24	21	23	21	24	23	35	22	P
35	11	20	20	19	29	17	33	19	P
36	29	14	16	34	16	23	30	24	V
37	16	15	17	18	10	16	8	18	V
38	30	18	18	28	14	19	15	14	P
39	18	17	20	25	26	23	30	19	V
40	19	13	20	22	15	20	16	23	P
41									V
42	24	20	15	31	19	23	27	27	P
43	22	26	20	26	20	20	21	23	P

TABLE 3

GIRLS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
44	30	12	16	28	27	26	24	29	P
45									V
46	26	21	31	18	19	20	26	21	P
47	28	22	23	35	21	32	33	22	P
48	23	24	23	30	29	24	25	19	P
49	16	12	13	23	8	14	27	13	P
50	24	12	15	27	11	22	18	15	P
51	11	17	18	12	26	15	22	12	P
52	26	20	16	26	24	32	21	29	V
53	13	9	19	17	22	9	15	12	P
54									V
55	11	21	16	20	17	21	24	18	V
56	13	27	26	20	25	18	24	19	G
57	19	30	33	14	38	21	23	22	E
58	15	24	22	21	27	18	22	13	P
59	12	14	13	27	22	20	17	19	G
60	21	21	28	26	16	16	26	24	P
61	17	10	19	18	8	21	21	8	P
62	17	24	17	24	28	22	17	25	E
63	21	24	22	29	28	23	32	25	F
64	30	21	19	26	18	21	23	18	F
65	7	23	26	14	34	28	29	23	F
66	22	23	21	24	23	23	20	20	G
67	13	9	10	18	16	28	18	14	P
68	8	20	25	9	26	27	28	15	F
69	24	24	25	27	17	27	24	34	G
70	9	22	22	19	27	34	24	27	G
71	9	13	9	11	14	13	4	21	F
72	24	28	26	26	23	28	26	25	G
73	20	27	21	18	20	21	27	26	G
74	29	21	24	32	19	17	18	26	G
75									G
76	17	20	9	18	14	19	15	22	G
77	9	11	10	18	6	20	6	18	F
78	24	25	29	26	23	29	31	27	F
79	15	11	16	12	20	16	21	11	G
80									F
81	17	20	24	17	23	19	19	29	G
82	18	19	22	17	27	13	21	21	F
83	20	28	23	29	25	21	20	26	F
84	17	26	25	12	23	21	18	28	E
85	18	16	17	21	17	20	23	20	F
86	24	22	19	17	29	31	24	22	F

TABLE 3

GIRLS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
87	30	22	21	24	19	27	16	26	G
88	21	22	19	34	13	15	16	24	E
89	25	21	17	31	9	19	16	21	F
90	25	22	26	25	18	25	18	29	E
91	19	20	23	24	33	26	33	18	P
92	28	21	20	31	24	23	33	22	G
93	28	25	28	25	19	26	28	35	F
94									P
95	21	32	32	15	29	24	26	13	G
96	28	19	23	26	15	26	15	30	E
97	32	23	21	26	15	25	18	24	G
98	20	26	28	26	23	14	31	18	G
99									F
100	17	18	23	16	28	14	17	19	G
101	20	19	17	26	17	18	23	14	F
102	14	16	15	23	18	29	23	18	G
103	21	18	18	17	23	14	21	16	F
104	24	27	22	25	16	22	31	23	F
105	26	23	28	29	8	25	17	24	G
106	24	15	24	21	14	30	20	22	F
107									P
108									E
109	16	24	17	23	21	20	20	27	G
110	22	25	30	27	24	26	24	24	G
111	21	20	25	26	19	9	19	17	G
112	21	25	27	15	25	22	27	26	F
113	26	20	20	28	22	20	28	24	F
114	9	24	12	17	25	17	17	23	F
115	28	23	25	18	21	30	17	30	F
116	24	26	22	24	20	34	25	23	F
117	21	28	32	25	27	27	28	30	G
118	23	23	13	27	21	30	25	26	G
119	9	21	21	15	14	13	18	9	G
120	21	23	26	22	14	24	13	25	G
121	17	19	19	25	23	13	23	23	F
122	30	20	23	31	10	28	19	29	G
123	24	16	12	24	22	28	22	24	G
124	18	26	30	12	28	32	27	31	E
125	19	27	24	8	27	28	14	31	E
126									E
127									F
128									G
129									P

Table (4) shows the boys' raw scores on the eight traits of the Gordon personality tests and their continuous progress success categories.

TABLE 4

BOYS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
1	11	23	23	9	23	27	13	23	F
2									G
3	26	11	21	20	3	23	21	25	G
4									G
5	16	23	24	19	21	25	27	29	P
6									P
7	11	21	14	18	21	28	22	25	F
8	18	25	26	13	27	19	24	26	E
9	14	25	24	19	23	20	18	15	F
10	23	22	27	18	15	17	16	26	E
11	17	24	25	14	19	17	15	29	E
12	18	22	27	14	18	19	20	19	G
13	21	22	25	16	23	25	18	16	F
14									P
15	20	20	28	10	31	28	28	23	F
16									F
17	28	23	26	29	22	30	29	31	G
18	29	17	16	30	11	21	20	14	P
19	17	26	30	13	22	34	28	30	E
20									G
21									V
22	18	22	26	11	24	29	18	21	P
23									P
24									P
25	20	15	27	18	20	23	22	15	V
26	15	11	15	19	13	16	9	16	P
27	26	26	30	26	23	28	27	32	P
28	20	27	33	20	24	17	22	19	P
29	32	17	24	27	14	32	24	18	P
30	9	18	17	6	27	30	24	19	P
31	25	20	26	23	8	14	21	17	P
32	20	19	31	16	18	27	18	25	P
33	29	22	29	26	29	22	29	30	P
34	23	11	23	21	13	26	19	14	V
35	18	20	27	19	23	22	27	20	P
36									V

TABLE 4

BOYS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
37	5	20	17	8	28	30	26	20	P
38	27	31	25	25	27	31	23	35	P
39	19	21	29	25	24	19	26	17	P
40	20	27	29	24	22	23	21	33	P
41	16	24	31	15	22	14	17	29	P
42									P
43	24	14	18	26	8	31	22	23	P
44	19	20	31	14	16	19	20	13	V
45	23	14	9	28	22	21	19	22	P
46	18	24	26	16	27	16	17	22	P
47	21	29	24	28	22	26	21	29	G
48	26	20	29	27	28	21	26	29	G
49	12	16	13	11	18	12	18	18	F
50	28	27	26	21	29	30	27	24	F
51									F
52	26	21	24	21	20	31	22	31	P
53	18	26	26	14	27	30	30	22	G
54									E
55									F
56	22	9	19	24	2	15	17	16	P
57	25	17	24	24	22	29	20	27	E
58	15	10	9	24	15	20	13	14	P
59	23	23	22	24	13	28	24	29	E
60	16	26	29	17	22	24	25	25	E
61	20	18	23	25	23	25	26	18	F
62	20	26	26	18	22	30	30	28	G
63	28	15	27	22	15	27	26	26	E
64	16	15	14	29	20	14	22	14	F
65	13	26	31	16	29	19	26	24	G
66	17	27	28	16	27	28	28	22	F
67	16	24	26	22	20	20	21	21	G
68	17	22	17	20	24	15	17	22	G
69	11	20	17	10	22	23	22	9	G
70	23	28	33	18	33	20	22	27	F
71									G
72	19	14	21	24	12	15	20	19	F
73	6	9	9	14	14	10	16	8	P
74	18	19	25	24	24	21	19	30	P
75	31	21	21	33	14	21	15	24	F
76	20	20	15	25	14	12	6	20	G
77	24	20	29	19	17	13	21	15	P
78	22	22	26	26	23	16	14	23	G
79	32	24	27	23	23	30	24	33	G

TABLE 4

BOYS' RAW SCORES ON THE EIGHT TRAITS OF THE GORDON PERSONALITY TESTS AND THEIR CONTINUOUS PROGRESS SUCCESS CATEGORIES

Student No.	Gordon Personal Profile Subtest				Gordon Personal Inventory Subtest				Progress Success Category
	A	R	E	S	C	O	P	V	
80	15	18	23	10	18	15	16	21	F
81	24	22	29	27	21	25	26	20	G
82	20	22	25	25	21	24	19	22	F
83	20	23	27	14	16	29	16	27	G
84	22	23	24	19	13	18	6	21	F
85	25	13	22	28	14	25	21	20	G
86	29	24	27	26	21	22	23	20	F
87	29	25	30	22	14	24	21	21	G
88									F
89	19	25	33	17	27	29	29	29	G
90	17	30	34	21	28	30	23	29	E
91	19	30	26	23	27	26	20	23	G
92	22	28	23	23	23	34	28	27	E
93	15	26	27	16	14	17	18	25	G
94	24	20	26	20	18	18	22	22	P
95	22	29	31	26					F
96	20	13	17	24	15	17	5	23	P
97	22	25	21	26	25	25	21	25	F
98	20	20	27	23	22	13	18	21	G
99	26	21	21	26	13	21	18	26	G
100	13	20	23	18	10	8	18	11	G
101	23	26	23	16	21	19	9	27	G
102									F
103	17	31	26	14	19	19	11	35	F
104	23	17	16	20	14	13	16	11	F
105	35	15	22	28	25	33	29	27	F
106	20	17	23	18	15	20	14	27	E
107	24	27	27	26	23	24	23	30	E
108	30	15	23	24	18	30	21	25	F
109	29	19	19	32	15	16	21	22	P
110	18	11	6	17	11	25	13	28	E
111	10	20	16	18	21	22	11	24	G
112									F
113	22	28	24	21	17	19	14	30	E
114	10	23	28	11	22	24	17	15	F
115	21	25	25	13	32	28	33	23	G

ANALYSIS OF DATA

The Chi square test was used to determine the significance of the relationships between Success in the continuous progress program and each of Sex and the eight Gordon Personality Traits.

Sex and Success in the Continuous Progress Program.

There was no significant relationship between Sex and the degree of Success in the continuous progress program. The contingency table for this test is shown in Table (5). In the two extreme success categories, however, the boys showed some superiority over the girls. Twenty-five per cent more boys ranked Excellent than expected, and forty-three per cent fewer boys ranked Very Poor.

TABLE 5

CONTINGENCY TABLE FOR CHI SQUARE TEST OF RELATIONSHIP BETWEEN SUCCESS IN CONTINUOUS PROGRESS AND SEX (H.1)

	Observed Frequencies Continuous Progress Success Category					
Sex	E	G	F	P	V	Totals
Male	15	28	29	34	4	110
Female	10	39	40	26	10	125
Totals	25	67	69	60	14	235

df = 4

Table Chi square = 9.49

Significance level = .05

Obtained Chi square = 7.27

Personality and Success in the Continuous Progress Program.

The personality traits of Responsibility, Emotional Stability and Vigor showed significant relationships to Success in continuous progress. The contingency table for these tests is shown in Table (6).

Responsibility. According to Gordon, individuals who are able to stick to any job assigned them, who are persevering and determined, and who can be relied on, score high on the scale of Responsibility. On the other hand, those who are unable to stick to tasks that do not interest them, and who tend to be flighty and irresponsible, usually make low scores.

There was evidence of a relationship between the trait of Responsibility and Success in the program. High scorers on the responsibility scale tended to succeed in continuous progress.

Emotional Stability. "High scores on this scale," writes Gordon, "are generally made by individuals who are well-balanced, emotionally stable, and relatively free from anxieties and nervous tension. Low scores are associated with excessive anxiety, hypersensitivity, nervousness, and low frustration tolerance." (p.3)

At the p=.05 level, the relationship between Emotional Stability and continuous progress Success is marginally significant. The strongest relationship is revealed between below average stability and low success. Above average stability seems to be related to success, but not consistently so.

Vigor. Gordon describes high scorers on this scale as those who are vigorous and energetic, who like to work and move rapidly, and who are able to accomplish more than the average person. He associates low scores with low vitality or energy level, a preference for setting a slow pace, and a tendency to tire easily and be below average in terms of sheer output or productivity.

The Chi square test indicates that it is highly improbable that there is no relationship between Vigor and continuous progress Success. Students who earned high scores on the vigor scale tended to do well in continuous progress.

TABLE 6

CONTINGENCY TABLE FOR CHI SQUARE TEST OF RELATIONSHIPS BETWEEN SUCCESS IN CONTINUOUS PROGRESS AND THE PERSONALITY TRAITS OF RESPONSIBILITY (H.2b), EMOTIONAL STABILITY (H.2c) & VIGOR (H.2h)

Personality Trait	Trait Class	Observed Frequencies Continuous Progress Success					Category
		E	G	F	P	V	Totals
RESPONSIBILITY	Above Av.	12	23	17	8	0	60
	Average	7	32	21	23	4	87
	Below Av.	4	9	20	21	6	60
EMOTIONAL STABILITY	Above Av.	11	28	15	15	3	72
	Average	10	23	29	18	2	82
	Below Av.	2	13	14	19	5	53
VIGOR	Above Av.	18	19	9	11	1	58
	Average	4	28	31	17	1	81
	Below Av.	1	17	17	23	8	66

df = <u>8</u> Significance level = <u>.05</u> Table Chi square = <u>15.51</u>

Obtained Chi square:

for Responsibility = <u>26.03</u>

for Emotional Stability = <u>15.78</u>

for Vigor = <u>50.52</u>

Five personality traits displayed no significant relationship to success in the continuous progress program, although some trends were suggested.

Ascendancy. Success in continuous progress does not seem to be related to the personality trait of Ascendancy.

Sociability. Sociability, which Gordon ascribes to individuals who "like to be with and work with people, and who are gregarious and sociable," seems to be a handicap to success in continuous progress, particularly in the Excellent and Poor success categories.

Cautiousness. This trait shows no consistent trend with continuous progress success, but seventy per cent of those who had Very Poor success in the continuous progress program rated Below Average for Cautiousness.

Original Thinking. The Chi square test does not indicate rejection of the hypothesis of no relationship between the trait of Original Thinking and continuous progress success.

Personal Relations. Success in continuous progress does not seem to be related to the trait of Personal Relations.

CHAPTER V

APPRAISAL OF THE CONTINUOUS PROGRESS PROGRAM

INTRODUCTION

One of the purposes of this study is to report on the strengths and weaknesses of the continuous progress program from the point of view of the participating students and teachers. A student questionnaire (Appendix III) was administered at the time of the Gordon personality battery, and the teachers responded to a prepared set of questions (Appendix IV) presented to them by the author in a tape-recorded interview. As both these instruments were essentially introspective in form, it should be noted that throughout this chapter it is the opinions and perceptions of students and teachers that are being reported.

RAW SCORE DATA

Due to the excessive volume of raw score data generated from the student questionnaire, it has not been included in this report in its entirety. It is, however, available at the Oak Bay Junior Secondary School, 2101 Cadboro Bay Road, Victoria, British Columbia.

ANALYSIS OF DATA

Data from the questionnaires were analyzed in three ways.

(1) The Chi square test was used to determine whether there was a significant relationship between:

a) sex and student questionnaire response,
b) success and student questionnaire response.

(2) The data of the student questionnaire were examined to identify trends.

(3) Summaries of the responses to the teacher interviews were prepared.

Sex and Student Questionnaire Response. Three items from the student questionnaire showed a significant relationship to the sex of the student, in each case favouring the girls. The contingency table for these tests is shown in Table (7). Of these three items, only number (2) indicated a relationship to success in continuous progress as well.

TABLE 7

CONTINGENCY TABLE FOR CHI SQUARE TEST OF RELATIONSHIPS BETWEEN SEX OF THE STUDENT AND STUDENT QUESTIONNAIRE ITEM NUMBERS 2, 17 AND 18

Questionnaire Item Number	Response	Observed Frequencies - Student Sex Male	Female	Totals
2	A	26	35	61
General	B	41	59	100
Effort	C	31	18	49
17	A	13	32	45
Effort in	B	76	75	151
Class	C	9	5	14
18	A	21	31	52
Type of	B	50	68	118
Work Plan	C	27	13	40

df = 2 Significance level = .05 Table Chi square = 5.99

Obtained Chi square: for Item 2 = 7.12
for Item 17 = 8.28
for Item 18 = 8.67

Success and Student Questionnaire Response. Ten items from the student questionnaire showed a significant relationship to success in the continuous progress program. The contingency table for these tests is shown in Table (8). With the exception of Item (6) pertaining to the amount of homework required to 'keep up', these items indicated positive relationships to success.

Discussion of Data Obtained from the Student Questionnaire[2]. Continuous progress seemed to result in a slight increase in the popularity of mathematics for both sexes. General interest in the subject and a favourable reaction to continuous progress appeared to be related to success. (1, 25)

The girls felt that they made more effort in the continuous progress system than they usually did in a traditional system, while the boys felt that they made less. In general, greater effort resulted in greater success. (2)

Both sexes indicated a decline in their rate of learning, but an increase in the amount learned. Success in continuous progress was shown to improve with an increase in either of these factors. (3, 4)

The statistic on retention of learning indicated an advantage in continuous progress for the boys, and a slight disadvantage for the girls. Success did not relate to retention. (5)

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[2]In this section, the numbers in parentheses correspond to item numbers on the Student Questionnaire

Girls indicated an increase in the amount of homework required, whereas boys were exactly balanced between more and less. Success in continuous progress showed an inverse relationship to the amount of homework needed in order to keep up. (6)

Both male and female students generally chose to work with friends and to seek a teacher when help was needed. Although working associates did not appear to be related to success, those who reported that they usually sought help from a teacher had greater success. (7, 8)

Seventy-three per cent of the pupils believed that there was some problem in obtaining help from a teacher during class. However, they seemed well satisfied with teacher availability outside of class. Success was not significantly related to perception of difficulty of obtaining assistance from a teacher. (9, 11)

Over ninety per cent of all students rejected large group lessons as the most useful type of teacher help. The boys showed a slight preference for individual help from a teacher, while the girls claimed to favour small group discussion with a teacher. Success in continuous progress did not show a relationship to the type of teacher help preferred. (10)

Boys and girls generally agreed that some of the teachers were helpful and that continuous progress was suited to some teachers. Both were indecisive in their conclusion regarding how hard the teachers were working in the program, although they leaned marginally to more work than usual. (15, 16)

Although the majority of both sexes described themselves as coming to class to do some work and with a general work plan, the girls indicated a greater tendency to work hard and have a work plan that was clear and definite. Success was not related to these perceptions. (17, 18)

Thirty-one per cent of the girls and forty-two per cent of the boys felt that they wasted a lot of class time, but it did not appear to affect success. (19)

There was general agreement that the unit outlines were very helpful, but the signs, notices and charts were not. (20, 21)

Concentration was somewhat difficult for both boys and girls in the continuous progress class areas. Success was significantly related to the students' perception of their ability to concentrate. (22, 23)

Both sexes agreed that the 75% mastery standard was about right. Success in continuous progress was related to students' perception of the appropriateness of the mastery level. Pupils who indicated that the mastery level was too low or about right tended to have greater success than those who felt it was too high. (24)

TABLE 8

CONTINGENCY TABLE FOR CHI SQUARE TEST OF RELATIONSHIPS BETWEEN SUCCESS IN CONTINUOUS PROGRESS AND STUDENT QUESTIONNAIRE ITEM NUMBERS 1, 2, 3, 4, 6, 8, 22, 23, 24, AND 25

Questionnaire Item No.	Response	Observed Frequencies Continuous Progress Success Category E	G	F	P	V	Totals
1	A	14	21	11	6	0	52
Interest in	B	7	31	24	23	2	87
Mathematics	C	3	13	21	24	10	71
2	A	17	17	17	9	1	61
General	B	7	37	32	17	7	100
Effort	C	0	11	7	27	4	49
3	A	19	31	10	4	0	64
Rate of	B	5	23	21	10	4	63
Learning	C	0	11	25	39	8	83
4	A	11	25	20	11	1	68
Amount	B	9	29	24	20	7	89
Learned	C	4	11	12	22	4	53
6	A	11	40	11	9	1	72
Homework	B	7	15	10	14	4	50
Needed	C	6	10	35	30	7	88
8	A	22	43	36	28	3	132
Teacher	B	1	18	16	19	4	58
Contact	C	1	4	4	6	5	20
22	A	15	35	11	9	2	72
Ability to	B	8	23	32	25	5	93
Concentrate	C	1	7	13	19	5	45
23	A	13	36	17	19	3	88
Noise	B	10	23	24	21	4	82
Distraction	C	1	6	15	13	5	40
24	A	2	3	2	3	3	13
Mastery	B	22	58	43	36	3	162
Standard	C	0	4	11	14	6	35
25	A	15	23	13	9	1	61
Opinion of	B	6	33	24	21	3	87
Program	C	3	9	19	23	8	62

df = 8 Significance level = .05 Table Chi square = 15.51

Obtained Chi square for:

Item 1 = 41.07	Item 8 = 28.15
Item 2 = 53.41	Item 22 = 40.37
Item 3 = 81.35	Item 23 = 19.22
Item 4 = 16.51	Item 24 = 34.27
Item 6 = 48.97	Item 25 = 36.21

Evaluation of the Teacher Opinionnaire - Continuous Progress and the Student. Teachers saw many advantages in the continuous progress program for students with a sense of personal responsibility for their own success and sufficient maturity to assume the management of their own work load. The system gave each student the opportunity to:

a)function as an individual,
b)plan a careful work schedule,
c)concentrate on areas of personal weakness,
d)receive help in specific areas of study,
e)select the teaching method,
f)choose the source of assistance,
g)control the duration of study,
h)plan a testing program,
i)work with efficiency.

Mastery learning was believed to foster good work habits and to give students the satisfaction of achieving at a high level. In addition, the relationships between teachers and individual pupils prevented a student from losing himself in the group. He quickly realized that his progress was as familiar and important to his teacher as that of any of his peers. The student was encouraged to approach his teachers as members of a team whose main interest was helping him to succeed.

The opportunity to proceed as an individual was cited by teachers as not only the greatest advantage of the continuous progress program, but also its only major disadvantage. For students who lacked self-motivation there appeared to be no place in continuous progress. Pupils who did not work well without constant supervision and external pressure frustrated themselves by not making good use of the available learning facilities and not progressing at a satisfactory rate. Moreover, they undermined the tone of organization and cooperative industry that teachers perceived to be so important to maintaining the momentum of the program.

Evaluation of the Teacher Opinionnaire - Continuous Progress and the Teacher. The teachers generally agreed with the philosophy of individualization and commented favourably on the program in which they were involved. They liked the clear direction of effort permitted by the behavioural objectives and the satisfaction in tailoring their teaching to the expressed needs of the students. They were pleased by the knowledge that each pupil had a job to do and did not have to wait for directions from the teacher. They felt that there was stronger motivation to learn and a general improvement in student attitude.

Teachers saw no factors in the continuous progress situation that caused a handicap to their particular style of teaching. On the contrary, they felt that there was a need for the special talents that they as individuals could bring to the system. They also thought that the emphasis on the individual permitted them to know more students in a meaningful way.

Frustration was offered by the teachers as the main disadvantage to teaching in continuous progress. They felt that the true potential of the program was not being realized. They spoke of students in the program who made practically no effort to learn despite the services and facilities at and the teachers in the continuous progress program were asked to provide a summary of the general performance of each of these students.

A compilation of the data for the six students is contained in Table (9). It is preceded by a brief description of the salient features of their performances in the continuous progress program.

Student I quickly gained a reputation as an ideal pupil. She followed the procedures of the continuous progress program meticulously, usually worked alone, set goals to aid her progress and turned to a teacher when help was needed. She indicated a preference for individual assistance and found no difficulty contacting teachers either in or out of class. Showing no unusual desire to progress rapidly, this student advanced steadily, failing to master only one objective test while completing the entire eight units of the program.

Student II revealed a strong desire to progress rapidly and he was eminently successful. His business-like approach consisted of following the unit outline faithfully, making good use of his class time, setting a time goal for completion of each objective and planning a careful work schedule to achieve the goal. He usually worked alone, but found individual help from a teacher useful and easily available both in and out of class. Displaying a very positive attitude, this pupil had no apparent difficulty completing the eight units of the program and felt his retention was better than usual.

Student III achieved only fair success in continuous progress, completing 5 units of the program. The teachers remember her rather vaguely, which would suggest that she was well-behaved but not actively involved in the learning process. Although this girl agreed that teachers were usually available and indicated a preference for individual help, she chose to work mostly with her friends. Contrary to advice, she claimed not to have planned her work and felt that she wasted a great deal of class time.

Student IV completed only 5 units of the program but felt that he remembered more than he usually did. He preferred to work alone, and when in need of a teacher, chose a small group situation. This boy tried to master each objective in the recommended 2-test limit, but he did not set a time goal for his work as he was advised to do. The teachers felt that they did not know this student well enough to contribute any meaningful comment, as it was not his nature to work closely with them, either in or out of class.

Student V completed the first three units of the program in about three months, and no further units in the remaining six months of the school year. Although she claimed to have set the recommended goals for completion of the objectives and to have used her class time profitably, her overall progress record was very poor. This student indicated a rather negative attitude to certain features of the program, expressing the opinion that teachers did not work as hard as usual and that help in class was not readily available. The teachers did not know this pupil too well, as she seldom asked for help or attended extra classes. Her class conduct was generally satisfactory, but she did not take an active part in the learning activities.

Student VI was well-known to his teachers, who described him as very poorly motivated, disorganized, ill-prepared and a frequent source of disappointment to them and himself. Although expressing a preference for large group lessons, he rarely sought help, usually worked alone, set no clear goals and indicated much wasting of his time. This pupil was generally critical of the continuous progress program, finding class help seldom available and perceiving teachers doing less work than usual. Seeming to lack the will to work cooperatively with his teachers, he progressed very slowly, with many objective tests not mastered along the way.

TABLE 9

SUMMARY OF DATA FOR STUDENT CASE STUDIES

Item	Student I girl	II boy	III girl	IV boy	V girl	VI boy
Units completed	8	8	5	5	3	3
Objective tests written	30	32	28	31	20	26
Objective tests mastered	29	29	22	22	12	12
Form G's received	8	8	4	4	2	3
Forms E and F received	0	0	6	8	4	9
Responsibility	High	High	Av.	High	Av.	Low
Emotional Stability	Low	Av.	Av.	Av.	Low	Av.
Vigor	Av.	High	Low	Low	Low	Low
1 Interest in Math.	A	A	B	B	C	C
2 General effort	A	A	C	C	B	B
3 Rate of learning	A	A	C	A	B	C
4 Amount learned	B	A	B	B	B	A
6 Homework needed	B	B	C	A	C	B
8 Teacher contact	A	A	B	B	B	C
17 Effort in class	A	A	B	B	B	B
18 Type of work plan	B	A	B	B	B	C
22 Ability to concentrate	A	A	B	A	A	B
23 Noise distraction	A	B	B	A	A	B
24 Mastery standard	B	B	B	B	B	C
25 Opinion of program	A	A	B	B	B	C

CHAPTER VI

SUMMARY AND CONCLUSIONS

SUMMARY

<u>Hypotheses Tested</u>. The main hypotheses tested in this study were:

H.1 There is no significant relationship between success in continuous progress and the sex of the student.

H.2 There is no significant relationship between success in continuous progress and any personality trait of the Gordon Personal Profile or of the Gordon Personal Inventory; viz.,

a) Ascendancy.
b) Responsibility.
c) Emotional Stability.
d) Sociability.
e) Cautiousness.
f) Original Thinking.
g) Personal Relations.
h) Vigor.

In addition, the Chi square test was used to determine whether there was a significant relationship between any of the 25 items of the student questionnaire and success in the continuous progress program, or between any item and sex.

Furthermore, the information obtained from the student questionnaire and the teacher opinionnaire were discussed.

<u>Test Results</u>. Three personality traits were found to be positively related to success:

i. Responsibility.
ii. Emotional Stability.
iii. Vigor.

Ten items from the student questionnaire showed a relationship to success:

1 As a rule I find mathematics more interesting than most subjects.

2 I would describe my effort in continuous progress mathematics as better than usual for a mathematics course.

3 Compared to a regular class, in continuous progress mathematics I learned more quickly.

4 Compared to a regular class, in continuous progress mathematics I learned more than usual.

6 The amount of homework I needed in order to keep up in continuous progress mathematics was less than usual for a mathematics course.

8 When I needed help in mathematics class I usually tried to contact a teacher.

22 Concentration on my work in the open area of continuous progress was not difficult.

23 The noise made in continuous progress classes was not distracting.

24 For continuous progress learning I think the mastery standard of 75 per cent is too low.

25 Of the courses I took last year I found mathematics more interesting than most.

Three items from the student questionnaire showed a relationship to sex, in each case favouring the female:

2 I would describe my effort in continuous progress mathematics as better than usual for a mathematics course.

17 Most days I came to mathematics class to work hard.

18 Usually I came to mathematics class with a work plan that was clear and definite.

CONCLUSIONS

The data accumulated by this study have led to the conclusion that the continuous progress program was fundamentally sound and worthwhile. The teachers generally agreed that it should continue, and accepted the existing program as meeting the essentials on which to build for the future. Student reaction was not considered to be unfavourable.

Almost all of the planning, preparation of material, and promotion of the program was done by one person. The other teachers involved had not actively campaigned for a change from traditional classroom procedures, nor did they object to a request to participate in the continuous progress program. The students likewise were not known to be anxious for a change, but they were given the choice of taking their mathematics by either continuous progress or by a traditional method.

Factors for Success in the Continuous Progress Program.

The results of this study provide an insight into the personality and characteristics that appear to be associated with a successful student performance in a continuous progress program such as the one described. It is likely that the student who succeeds will have a determined nature and can be relied upon to persevere at his assignments. He will be emotionally stable and relatively free from tensions and anxieties. His vigor and energy will be evident in the quickness of his movement and the rate at which he works.

The successful pupil will have the ability to concentrate under conditions of unusual noise and movement. Moreover, he will be prepared to make the effort necessary to learn. He will probably like mathematics and will not hesitate to seek teacher help when it is required.

Strengths and Weaknesses of the Continuous Progress Program. The teachers gave qualified support to the continuous progress program, believing that it offered some significant benefits both to the students and to themselves. The program was thought to encourage good work habits and develop maturity and responsibility. It was perceived to have raised the standard of learning and the level of understanding of the students. The teachers felt that pupils who followed the procedures of the program, as they were laid down for them, generally progressed favourably and derived genuine satisfaction from their success. In addition, it was the opinion of the teachers that the program encouraged a more meaningful teacher-pupil relationship. The teachers, for their part, felt that they had more opportunity to use their particular teaching skills in continuous progress, and usually took greater satisfaction from their work.

One serious weakness of the continuous progress program described by the teachers was created by trying to operate a nongraded system in a graded school, situated in a local school district that was conditioned to a graded structure. Despite the genuine support of the school administration, local circumstances were such that the continuous progress program was expected to accommodate itself to the pass-fail standards of the graded system at the end of the school year. Knowledge of this created a worrisome and frustrating conflict in the minds of the teachers. On the one hand they had no desire to bring trouble onto themselves with too many "failures", but on the other, continuous progress students were supposed to have the time they needed individually to complete a body of work. The result was an over-emphasis on rate of progress, which the teachers felt weakened the program.

Permitting students who were not working to stay in the continuous progress program was a related weakness seen by the teachers. There were no known benefits to remaining, and the longer they were there, the more of a handicap they became to themselves, their peers, the teachers and the program.

A third handicap suggested by the teachers was the large clerical load. Although the tests, records and reporting forms used in the program were considered valuable, the additional work that they created was found to be a heavy burden.

Certain student perceptions of the continuous progress program have been interpreted as support for the system. Pupils generally indicated that they liked mathematics better in continuous progress and also thought they learned more. The girls felt they made a better effort than they usually did in mathematics, and the boys claimed to remember more. Both sexes revealed a strong preference for small group help or individual help over the more traditional classroom type of teaching, and in continuous progress, pupils usually had the opportunity to choose.

Although no specific pupil antagonism to continuous progress was revealed by the study, certain perceptions have been interpreted as weaknesses of the program. Students felt that they learned more slowly than usual. They claimed to have wasted much class time and were too often distracted from their studies in the large open classroom. In addition, students suggested that they could not always get help from a teacher in class when they needed it.

IMPLICATIONS FOR FURTHER DEVELOPMENT

Although this study has revealed weaknesses as well as strengths in the continuous progress program, there seems little doubt that it should be continued. The basic program appears to be well conceived and prepared, but much benefit could be gained from a careful review of the materials and procedures in the light of the findings of this study.

Staff Selection for Continuous Progress. It is important to the successful operation of continuous progress that the teachers be prepared to work cooperatively. No unusual qualifications seem necessary, but the teacher must be outgoing, serious-minded, knowledgeable of his subject and genuinely interested in the progress of the students in his charge.

Pupil Selection for Continuous Progress. Individual pupil success and, to a considerable extent, the success of the continuous progress class as a whole, are sensitive to the characteristics and personality traits displayed by the members of the class. Consequently, entry into the program should be restricted to those pupils who appear to possess the desired qualities. Moreover, continued membership in the class should be dependent upon the maintenance of these features.

Program Operation for Continuous Progress. Two factors are critical to the successful operation of a continuous progress plan:

(1)The organization of the program.
(2)The conduct of the teaching staff.

The structure of the continuous progress program must be well-defined and clearly understood by everyone concerned. It must include only those items that are perceived to be the essentials, and there must be agreement among the teachers that the procedures will be followed.

Little learning will occur if the student is not motivated to learn. Similarly, effective learning will not take place unless the teacher is aware of the needs of his students. Under the continuous progress system, the teacher can easily become so heavily involved in the act of teaching that he may lose sight of these two important factors. In addition, he has been conditioned to believe that each student will be motivated to learn, knows what he must learn, and will request teacher help when he requires it. In reality it is apparent that pupils are not always motivated to learn, are sometimes not aware of the learning requirements, and do not necessarily seek teacher assistance even if they feel they could benefit from it.

A shift in emphasis is in order. The teacher must develop his sensitivity to the needs of the individual student and become highly skilled at dealing with individual motivational problems. He must be available to students who seek him, but he must also actively seek out those pupils who do need him and want him, but who cannot bring themselves to initiate the teacher contact. In continuous progress formal instruction should become the ultimate learning mode, to be preceded by a continuing effort to discover and meet the needs of the individual pupil.

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APPENDIX I

Oak Bay Junior Secondary School

RE: MATHEMATICS GRADE 9 (CONTINUOUS PROGRESS)

To the Parent:

We would like to draw your attention to a few features of the mathematics 9 program which should help you to keep abreast of your son or daughter's progress, and to be clearly aware of the work that is his responsibility this year. It is our hope as teachers that with us working on the student's behalf in the classroom, and with you, the interested parent, overseeing and encouraging at home, the student will be motivated to succeed at a rate and standard of which he may be justly proud.

Here are some facts for your information:

1) Your son or daughter has been instructed to maintain a neat and orderly exercise book, in which he willkeep all his daily work, test papers, corrections, and so forth. In this exercise book you will always find UNIT OUTLINE SHEETS which clearly state the minimum requirements of each unit. This will enable you to follow his progress. As a rough time guide, you should encourage him to complete a unit in about four weeks.
2) Each student will be permitted to progress at his own rate, within certain limits. If he wishes to work hard, he need not wait for his classmates, if he does not work hard, his class will move ahead of him. His responsibility is to master the work specified in the unit outline, one objective at a time in sequential order. He must achieve 75% mastery before he is permitted to go on. To advance he must write and master a brief test, covering only the material described for the one objective. He may write any test any time he is qualified. For letter grade purposes he must write a "Unit Final" test at the completion of the objectives of each unit.
3) Extra classes, held before and after official school hours, will operate on a regular basis to help those who are experiencing unusual problems with the work
4) Teachers are available for help every class period. With the objectives of the course in his possession and teacher help available, we expect no student to distract others or be himself distracted from his studies.

We sincerely hope this brief outline will give you some idea of the continuous progress mathematics program. We, of course, trust that you will take a real interest in your son or daughter's progress, and if he is keeping his book properly, you should be able to check his progress at any time. If he cannot produce an orderly book, to your satisfaction, please contact us immediately.

You will also be receiving, from time to time, form letters from the mathematics department indicating either successful achievement or slow progress. These are simply intended to assist in keeping you informed.

Please feel free to contact the school (592-1205) if you desire more clarification and, of course, your presence at our annual "Meet the Teachers Night", to be held on will be most welcome.

Yours very truly,

F. G. Partridge, Mathematics Department Head

P. A. Boldt, Principal

OAK BAY JUNIOR SECONDARY SCHOOL

MATHEMATICS

INFORMATION BULLETIN

SUMMARY OF GENERAL INSTRUCTIONS FOR CONTINUOUS PROGRESS

The following instructions apply to ALL STUDENTS. Generally speaking, your Mathematics teacher should not and probably will not approve any of your work which is not up to standards set out below.

A. The Process of Continuous Progress

Step One — Carefully read the objective as it is stated on your Unit Outline Sheet, so that you know exactly what goals have been set for you.

Step Two — Carefully read and study the pages in your text that have been assigned for the objective you are working on. Make contact with teachers or fellow students to assist you with anything you don't feel you understand.

Step Three — Carefully do at least the minimum exercises assigned for the objectives, usually showing the question and always showing your workings. Mark your work and make your corrections. Make contact with teachers or fellow students to assist you with anything you cannot understand.

Step Four — When you really think you understand the requirements of the objective, write the first test in the objective series (with or without a teacher's approval, as you see fit.)

Step Five — Carry on with the work for the next objective in the same way as outlined above.

Step Six — When your objective test is returned to you, do all test corrections showing the question and your workings to arrive at a correct answer.

Step Seven — You should have earned a mastery on your objective test. If you did, carry on with the next objective. If you did not, make whatever moves you feel are necessary to overcome the misunderstandings. Help is available.

Step Eight — When you really feel that now you understand the objective, as a teacher to approve you for the writing of the next test in the objective. Be prepared to show your exercise book, containing a complete written record of your work in the objective.

Step Nine — Repeat steps Five to Eight as necessary to advance through the objectives of the course.

- 2 -

B. The Keeping of Records

All records in Mathematics 9 are to be kept in a Duo-tang Folder or any other convenient three-ring binder.

Every student is required to keep a neat, complete, and up-to-date record book, containing the following items, in the order listed:

Item One — A "thermometer", kept up to date with suitable colouring to show (i) your point of progress, and (ii) the point at which your teacher would prefer the class to be.

Item Two — The Unit Outline Sheet

Item Three — The work you have done to prepare for Objective One. Titles, page references, and marked and corrected exercises must always form a part of this work. Do Not Show Answers Only.

Item Four — Your Objective One Test paper.

Item Five — A page headed " Objective One Test Corrections", containing all your test corrections for the objective test. This work is to be done, by every student , for every test, whether the test was mastered or not. All corrections must be done in such a way that the question and technique of answering can be clearly understood by anyone reading your work.

Item Six — (i) If the objective test shows mastery, proceed as in Items Three to Five, for each of the next objectives.

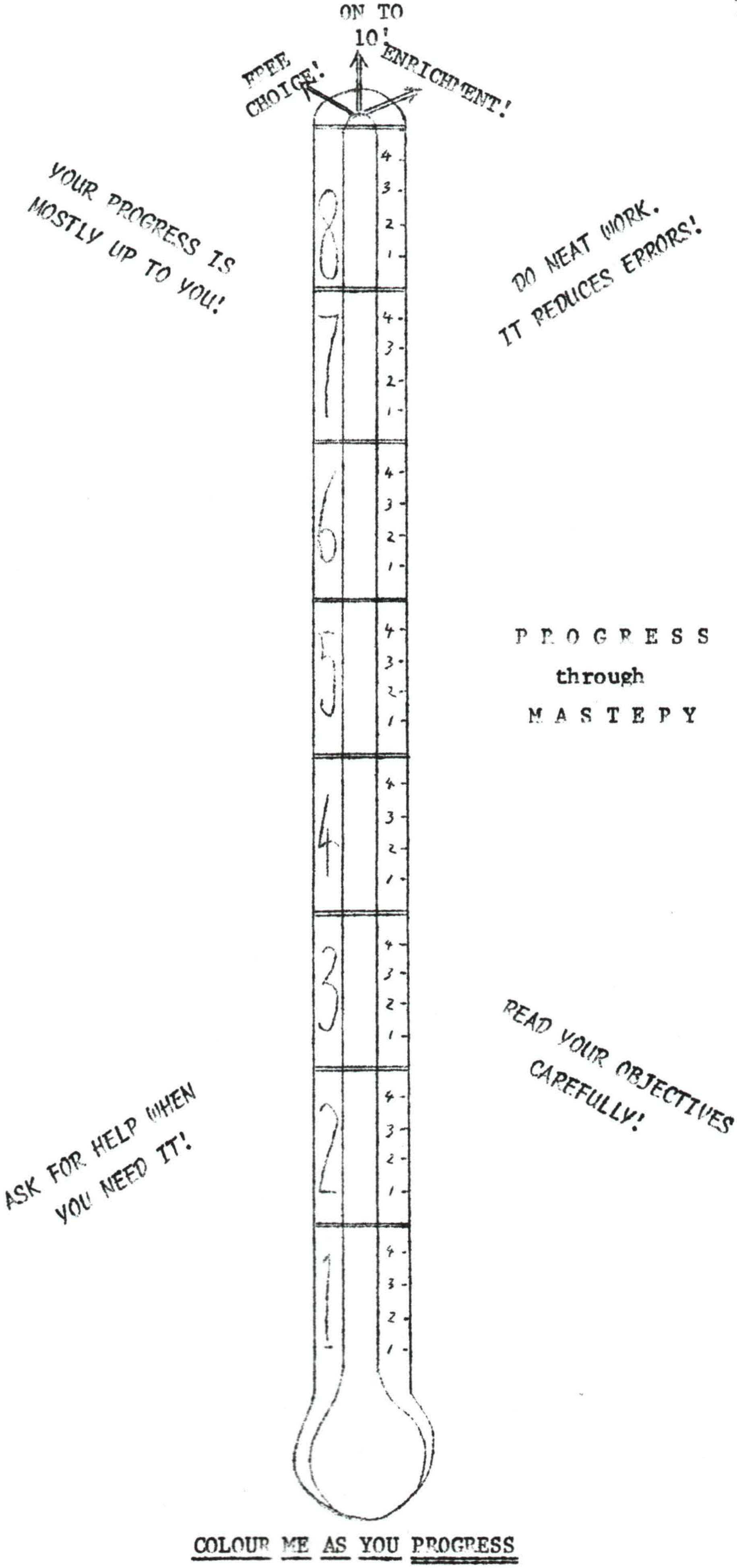
(ii) If the objective test does not show mastery, show all the work you do to overcome the misunderstandings you still have. This will include more notes, more exercises, copies of examples from teachers, and so forth.

Item Seven — The initials of a teacher and the test number for which you have been approved. The initials must be at the end of the work you have done to overcome your problems.

Item Eight — Your next objective test paper.

Item Nine — Proceed as in Items Five to Eight until the objective has been mastered. Then proceed through the rest of the objectives of the course.

FORM C



COLOUR ME AS YOU PROGRESS

FORM D

STUDENT RECORD OF ______________________ male ____ NO

female ____

SUBJECT ________ YEAR ______ BLOCK ______ DIV. ______

NAME OF PARENT/GUARDIAN ______________________

ADDRESS ______________________ PHONE ________

UNIT	O B J E C T I V E					UNIT TEST	
	1	2	3	4	5	SCORE	GRADE
1							
2							
3							
4							
5							
6							
7							
8							

Oak Bay Junior Secondary School

Date ____________________

MATH PROGRESS REPORT FOR ______________________________

Dear Parent:

As part of our policy of keeping parents informed of student progress, you should know that   is not progressing at a rate that will lead to completion of the grade 9 mathematics work by the end of next June.

It is worth noting that daily homework is always provided. Also, extra help classes are operating every morning from 8:00 to 8:30, a.m. and   from 3:30. p.m. Moreover, at least five teachers are available either in or out of class, to provide assistance to students who desire it.

With these facilities, we feel that any student who has the desire to learn, has an excellent chance of succeeding. It should be clearly emphasized, however, that the amount of effort that is put into the work is largely in the hands of the student. Our teachers are eager to assist the learning process, and students should be encouraged to contact them, in or out of class, when and as often as they wish.

If you desire any further information, please feel free to contact me or any other member of the Mathematics department, at 592-1205.

Yours very truly,

Oak Bay Junior Secondary School

MATH PROGRESS REPORT FOR ________________________

Dear Parent:

Following our communication of   this is a reminder that   is still not progressing at a rate that will lead to completion of grade   mathematics work by the end of this coming June.

In order to do so a student should by now have completed Unit _______ Objective _________. Our records indicate that your son/daughter has only completed to Unit ______ Objective ______

If we can be of any further assistance, or if you desire any further information, please feel free to contact us at the school, 592-1205.

Yours very truly,

FORM G

Oak Bay Junior Secondary School

Date ____________________

MATH PROGRESS REPORT FOR ________________________________

Dear Parent:

As part of our policy of keeping parents informed of student progress, we are pleased to be able to tell you that has successfully mastered all the objectives of Unit in Mathematics and has earned a very satisfactory grade on the unit test.

Yours very truly,

If further information is desired please contact us at 592-1205

APPENDIX II

***Start with this page. Mark your answers in column* A** ⟶

a good mixer socially........................
lacking in self-confidence....................
thorough in any work undertaken..............
tends to be somewhat emotional...............

not interested in being with other people........
free from anxieties or tensions.................
quite an unreliable person.....................
takes the lead in group discussion..............

acts somewhat jumpy and nervous.............
a strong influence on others...................
does not like social gatherings.................
a very persistent and steady worker...........

finds it easy to make new acquaintances........
cannot stick to the same task for long...........
easily managed by other people...............
maintains self-control even when frustrated......

able to make important decisions without help..
does not mix easily with new people............
inclined to be tense or high-strung.............
sees a job through despite difficulties...........

not too interested in mixing socially with people..
doesn't take responsibilities seriously..........
steady and composed at all times..............
takes the lead in group activities ....

a person who can be relied upon...............
easily upset when things go wrong............
not too sure of own opinions..................
prefers to be around other people.............

finds it easy to influence other people...........
gets the job done in the face of any obstacle.....
limits social relations to a select few............
tends to be a rather nervous person...........

doesn't make friends very readily..............
takes an active part in group affairs............
keeps at routine duties until completed.........
not too well-balanced emotionally ....

Turn the page and go on.

Mark your answers in column **B** →

	B		A	
	M	L	M	L
assured in relationships with others				
feelings are rather easily hurt				
follows well-developed work habits				
would rather keep to a small group of friends				
	M	L	M	L
becomes irritated somewhat readily				
capable of handling any situation				
does not like to converse with strangers				
thorough in any work performed				
	M	L	M	L
prefers not to argue with other people				
unable to keep to a fixed schedule				
a calm and unexcitable person				
inclined to be highly sociable				
	M	L	M	L
free from worry or care				
lacks a sense of responsibility				
not interested in mixing with the opposite sex				
skillful in handling other people				
	M	L	M	L
finds it easy to be friendly with others				
prefers to let others take the lead in group activity				
seems to have a worrying nature				
sticks to a job despite any difficulty				
	M	L	M	L
able to sway other people's opinions				
lacks interest in joining group activities				
quite a nervous person				
very persistent in any task undertaken				
	M	L	M	L
calm and easygoing in manner				
cannot stick to the task at hand				
enjoys having lots of people around				
not too confident of own abilities				
	M	L	M	L
can be relied upon entirely				
doesn't care for the company of most people				
finds it rather difficult to relax				
takes an active part in group discussion				
	M	L	M	L
doesn't give up easily on a problem				
inclined to be somewhat nervous in manner				
lacking in self-assurance				
prefers to pass the time in the company of others				

A	R	E	S

***Start with this page. Mark your answers in column* A** ⟶

a very original thinker . . . .
a somewhat slow and leisurely person . . . .
tends to be critical of others . . . .
makes decisions only after a great deal of thought . . .

believes that everyone is essentially honest . . . .
likes to take it relatively easy at work or play . . . .
has a very inquiring attitude . . . .
tends to act on impulse . . . .

a very energetic person . . . .
doesn't get angry at other people . . . .
dislikes working on complex and difficult problems . .
prefers gay parties to quiet gatherings . . . .

enjoys philosophical discussions . . . .
gets tired somewhat easily . . . .
considers matters very carefully before acting . . . . . .
does not have a great deal of confidence in people . . .

likes to work primarily with ideas . . . .
does things at a rather slow pace . . . .
very careful when making a decision . . . .
finds a number of people hard to get along with . . . . .

a great person for taking chances . . . .
becomes irritated at other people quite readily . . . . . .
can get a great deal done in a short time . . . .
spends considerable time thinking of new ideas . . . . .

a very patient person . . . .
seeks thrills and excitement . . . .
able to keep working for long stretches . . . .
would rather carry out a project than plan it . . . .

feels very tired and weary at the end of the day . . . . .
inclined to make hurried or snap judgments . . . .
doesn't get resentful toward other people . . . .
has a great thirst for knowledge . . . .

does not act on the spur of the moment . . . .
becomes irritated by faults in others . . . .
lacks interest in doing critical thinking . . . .
prefers to work rapidly . . . .

inclined to become very annoyed at people . . . .
likes to keep "on the go" all the time . . . .
would rather not take chances or run risks . . . .
prefers work requiring little or no original thought . .

Turn the page and go on.

Mark your answers in column **B** → **B** **A**

	B M	B L	A M	A L
a very cautious person				
prefers to work rather slowly				
very tactful and diplomatic				
would rather not occupy the mind with deep thoughts				
loses patience readily with people				
has somewhat less endurance than most people				
tends to be creative and original				
doesn't care much for excitement				
tends to act on hunches				
has a great deal of vigor and drive				
doesn't trust people until they prove themselves				
enjoys questions involving considerable thought				
doesn't like to work at a fast pace				
has great faith in people				
tends to give in to the wishes of the moment				
enjoys working out complicated problems				
a very energetic worker				
accepts criticism with very good grace				
dislikes problems requiring a great deal of reasoning				
inclined to act first and think afterward				
speaks nothing but the best about other people				
very cautious before proceeding				
not interested in thought-provoking discussions				
does not hurry in going from place to place				
doesn't have an inquiring mind				
doesn't act on impulse				
generally bursting with energy				
becomes irritated by weaknesses in other people				
able to get more things done than other people				
enjoys taking chances just for the excitement				
takes offense when subjected to criticism				
would rather work with ideas than things				
very trustful of other people				
prefers work that is routine and simple				
does things on the spur of the moment				
full of vigor and vitality				
makes decisions much too quickly				
has a great liking for everybody				
maintains a lively pace at work or play				
does not have a great interest in acquiring knowledge				

C
O
P
V

A

APPENDIX III

This questionnaire is part of a study being carried out to evaluate the continuous progress mathematics program that you were in last year. Your cooperation in completing the 25 items will be of great assistance.

Your responses will be kept strictly confidential and will not be entered in your school records.

USE YOUR OWN EXPERIENCE IN CONTINUOUS PROGRESS MATHEMATICS TO SELECT THE BEST COMPLETION FOR EACH STATEMENT. Do not ponder any question too long and leave no questions out.

Blacken the space on the answer sheet that corresponds to THE LETTER of your completion choice. Make your mark as long as the pair of lines, and completely fill the area between the pair of lines.

1. As a rule I find mathematics

   A. more interesting than most subjects.

   B. about average in interest.

   C. less interesting than most subjects.

2. I would describe my effort in continuous progress mathematics as

   A. better than usual for a mathematics course.

   B. about the same as usual.

   C. worse than usual.

3. Compared to a regular class, in continuous progress mathematics I learned

   A. more quickly.

   B. at about the same rate.

   C. more slowly.

4. Compared to a regular class, in continuous progress mathematics I learned

   A. more than usual.

   B. about the same amount.

   C. less than usual.

5. Compared to a regular class, from continuous progress mathematics I remember

   A. more than usual.

   B. about the same amount.

   C. less than usual.

6. The amount of homework I needed in order to keep up in continuous progress mathematics was

   A. less than usual for a mathematics course.

   B. about the same as usual.

   C. more than usual.

7. In the continuous progress mathematics class

   A. I usually worked alone.

   B. I usually worked with friends.

   C. I usually worked with people who could help me.

8. When I needed help in mathematics class

   A. I usually tried to contact a teacher.

   B. I occasionally tried to contact a teacher.

   C. I rarely tried to contact a teacher.

9. When I wanted teacher help during mathematics class I found that it was

   A. almost always available.

   B. sometimes available.

   C. rarely available.

10. The type of teacher help that I found most useful was

    A. individual help from a teacher.

    B. small group discussions with a teacher.

    C. large group lessons from a teacher.

11. When I wanted teacher help outside of class I found that it was

    A. almost always available.

    B. sometimes available.

    C. rarely available.

12. In the continuous progress mathematics program I found

    A. all of the teachers helpful.

    B. some of the teachers helpful.

    C. few of the teachers helpful.

13. I think that a continuous progress method of instruction is suited to

    A. most teachers.

    B. some teachers.

    C. very few teachers.

14. Compared to a regular class, I think that in continuous progress teachers do

    A. more work than usual.

    B. about the same amount of work.

    C. less work than usual.

15. When working on an objective

    A. I usually set a time goal of not more than one week.

    B. I usually set a time goal of more than one week.

    C. I usually set no time goal.

16. When preparing for an objective test

    A. I usually set a goal of not more than two tests.

    B. I usually set a goal of more than two tests.

    C. I usually set no goal for number of tests.

17. Most days I came to mathematics class to

    A. work hard.

    B. do some work.

    C. do as little work as possible.

18. Usually I came to mathematics class with a work plan that was

    A. clear and definite.

    B. only general.

    C. vague or non-existent.

19. In most mathematics classes

    A. I used my time profitably.

    B. I did some constructive work.

    C. I wasted a lot of time.

20. As a guide to the content of an objective I found the unit outline

    A. very helpful.

    B. somewhat helpful.

    C. of little help.

21. The signs, notices and charts posted in the teaching areas were

    A. very helpful.

    B. somewhat helpful.

    C. of little help.

22. Concentration on my work in the open area of continuous progress was

    A. not difficult.

    B. somewhat difficult.

    C. very difficult.

23. The noise made in continuous progress classes was

    A. not distracting.

    B. somewhat distracting.

    C. very distracting.

24. For continuous progress learning I think the mastery standard of 75 per cent is

    A. too low.

    B. about right.

    C. too high.

25. Of the courses I took last year I found mathematics

    A. more interesting than most.

    B. about average in interest.

    C. less interesting than most.

APPENDIX IV

TEACHER OPINIONNAIRE

... A tape-recorded interview with each of the teachers involved in the continuous progress program will be conducted in order to obtain responses to the following questions.

1 What would you consider to be the main advantages of continuous progress over a more traditional program ...
   a)for the student?
   b)for the teacher?

2 What would you consider to be the main disadvantages of continuous progress over a more traditional program ...
   a)for the student?
   b)for the teacher?

3 What is your assessment of the value of:
   a)stating behavioural objectives?
   b)learning for mastery?

4 Do you prefer to be a traditional classroom teacher or a member of a continuous progress teaching team? ... why?

CHECK-LIST TO ACCOMPANY THE TEACHER OPINIONNAIRE

... A check-list will be carried by the interviewer to ensure teacher responses to:

1 Were you able to teach effectively in the continuous progress program?
2 Was your work load in continuous progress unusual? ... explain.
3 Does a teacher need any special characteristics in order to operate well in continuous progress? ... explain.
4 How extensive was pupil-teacher contact and interaction?
5 Generally speaking, how well did pupils use their class time?
6 Do you believe that junior secondary students are old enough to assume the responsibilities of continuous progress?
7 Does a pupil need any special characteristics in order to succeed in continuous progress? ... explain.
8 Do you think that continuous progress tends to increase a student's motivation to learn?
9 What is your opinion of 75% as the mastery level?
10 Name up to four factors of the continuous progress program that you feel seriously handicap students.
11 Name up to four factors of the continuous progress program that you feel significantly benefit students.
12 Do you think the continuous progress program itself was well conceived and produced?

APPENDIX V

OAK BAY JUNIOR SECONDARY SCHOOL

MATHEMATICS 9

UNIT 1: SETS

OBJECTIVE 1

The student will be able to identify or define each of the following:

1) set
2) subset
3) proper subset
4) finite set
5) infinite set
6) empty set
7) null set
8) matching sets
9) disjoint sets
10) the universal set
11) the universe
12) element
13) member
14) a one-to-one correspondence
15) Venn Diagram
16) Fuler Circles

OBJECTIVE 2-----

The student will be able to perform certain specified operations and calculations.

1. The student will be able to correctly calculate, by formula, the total number of possible subsets from a given set.

2. The student will be able to correctly perform operation UNION.

3. The student will be able to correctly perform operation INTERSECTION.

4. The student will be able to correctly calculate THE COMPLEMENT of a set.

OBJECTIVE 3

The student will be able to determine or display the relationship between sets by the use of VENN DIAGRAMS.

1. Given certain specific sets, the student will be able to create Venn Diagrams to illustrate set UNION.

2. Given certain specific sets, the student will be able to create Venn Diagrams to illustrate set INTERSECTION.

3. Given certain specific sets, the student will be able to create Venn Distrams to illustrate the COMPLEMENT of a set or sets.

4. Given a Venn Diagram, the student will be able to determine a UNION of sets.

5. Given a Venn Diagram, the student will be able to determine an INTERSECTION of sets.

6. Given a Venn Diagram, the student will be able to determine a COMPLEMENT of a set or sets.

OBJECTIVE 4

The student will be able to interpret the following common SYMBOLS:

1) $\subseteq$ 3) $\supseteq$ 5) U 7) $\longleftrightarrow$ 9) ϕ 11) $\cup$

2) $\subset$ 4) $\overline{M}$ 6) $\in$ 8) { } 10) $\cap$

OAK BAY JUNIOR SECONDARY SCHOOL
MATHEMATICS 9

UNIT 2: ORDER OF OPERATIONS, INVERSE OPERATIONS, and BASIC PRINCIPLES.

OBJECTIVE 1

The student will be able to make accurate calculations in all combinations of addition, subtraction, multiplication, and division. (ORDER OF OPERATIONS) Minimum responsibility: Read p. 26, 27 and do half of exercises from p. 28 (1-26) and p.45 (1)

OBJECTIVE 2

The student will be able to correctly apply INVERSE OPERATIONS.

1) The student will be able to accurately change an addition question to a subtraction one (or the reverse), and solve it.

2) The student will be able to accurately change a multiplication question to a division one (or the reverse), and solve it.

Minimum responsibility: Read p. 42-43 and do half of exercises from p. 43-45 (1-46)

OBJECTIVE 3

The student will be able to demonstrate his understanding of certain BASIC PRINCIPLES of addition and multiplication.

1) The student will be able to write a generalized statement, using frames or variables, for:
   a) The Commutative Principle of Addition
   b) The Commutative Principle of Multiplication
   c) The Associative Principle of Addition
   d) The Associative Principle of Multiplication
   e) The Distributive Principle of Multiplication over Addition
   f) The Principle of Multiplication by One.
   g) The Principle of Multiplication by Zero
   h) The Principle of Addition of Zero

2) Given the generalized statement, the student will be able to NAME the appropriate BASIC PRINCIPLE. (see a to h above)

3) Given numerical examples, the student will be able to accurately name the basic principles being applied. (see #1, a to h above)

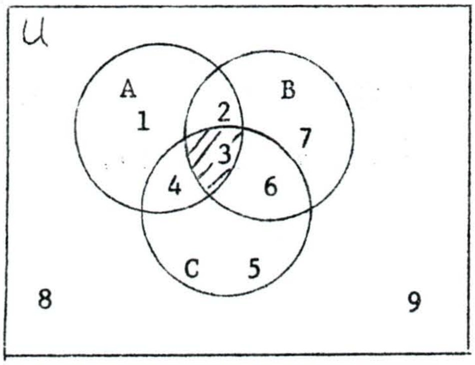
4) Given mathematical statements of principles, containing numerals and frames or variables, the student will be able to identify the principle and replace the frames or variables with numerals to obtain true statements.

Minimum responsibility: Read p. 29, 30, 31, 35, 36, 37, 39, 40
p. 98, 99, 100
and do half of exercises from: p. 32 (1-10), P. 35 (1 and 2)
p. 38 (1 - 27)
p. 40 (a - m)
P. 45 (2, 3, 4)
p. 47 (2, 3, 4, 5, 6,)

e) What is illustrated by the hatching in the diagram? ______________________

3) Study the ac ompanying Venn Diagram and determine:

a) $A \cup B$ ______________________



b) $B \cap C$ ______________________

c) $\overline{C}$ ______________________

d) $\overline{(A \cap B)} \cap C$ ______________________

e) What set operation is illustrated by the hatching? ______________________

4) Use a Venn Diagram to illustrate each of the following set-ups:

a) a Universe "U", and three disjoint subsets, A, B, and C.

b) a Universal Set :"U" and two subsets, A and B, such that A is a Proper Subset of B.

c) a Universe "U", and two subsets A and B, such that $A \neq B$, $A \cup B \neq A$, $A \cup B \neq B$ but $A \cup B \neq \emptyset$.

x

SCORE	M	NM

OBJECTIVE MASTERY TEST

Mathematics 9 - O.B.J.S.

Date ____________________

Unit 1 - Objective 3 - Test 1

Student No. ____________

Student Name ____ Teacher ____________________

Take your Time -- Answer Carefully -- Put In Teacher's Box For Marking.

1) In the space provided, draw a careful Venn Diagram to illustrate, as clearly as possible, each of the following.
GENERAL INSTRUCTIONS: 1) Use capital letters to indicate your sets.
2) Show the elements of your sets in the diagrams.
3) If you wish to emphasize any part of a diagram, use shading or hatching.

a) Given: Universe M: $\{0,1,2,3,\ldots,9\}$; Set A: $\{2,3,4,5\}$; Set B: $\{2,4,6,8\}$

Illustrate: $A \cup B$

b) Given: Universe R: $\{1,3,5,\ldots,13,15\}$; C: $\{3,5,7,9\}$; D: $\{5,9,11,13,15\}$

Illustrate: $C \cap D$

c) Given: Universe U: $\{a,b,c,d,e,f,g,h\}$; R: $\{b,c,d\}$; S: $\{g,h\}$

Illustrate: $\overline{R \cup S}$

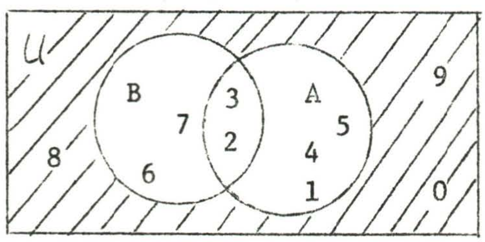
2) Study the accompanying Venn Diagram and determine:

a) $A \cup B$ ____________________

b) B ____________________

c) $\overline{A}$ ____________________

d) $\overline{A \cap B}$ ____________________



OBJECTIVE MASTERY TEST

SCORE	M	NM

Mathematics 9 - O.B.J.S. Date: ________

Unit 1 - Objective 2 - Test 1 Student No. ________

Student Name ________________ Teacher ________

Take Your Time -- Answer Carefully -- Put In Teacher's Box For Marking.

1. Write the FORMULA for finding the total number of possible subsets (N) from a given set which contains exactly "e" elements.

   FORMULA: ________

2. Using the formula of question 1, calculate the total number of possible subsets of the following sets:

   a. Set A: $\{a,b,c,d\}$

   Formula: ________ Substitution: ________ No. ____

   b. Set B: $\{3\}$

   Formula: ________ Substitution: ________ No. ____

   c. Set C: $\emptyset$

   Formula: ________ Substitution: ________ No. ____

3. Find: $A \cup B$, given,

   a. A: $\{2,4,6,\}$; B: $\{4,6,8\}$ Ans. ________

   b. A: $\{a,b,c,d,e\}$; B: $\{b,c,d\}$ Ans. ________

   c. A: $\{\frac{1}{4}, \frac{1}{2}, 1\}$; B: $\{2,4\}$ Ans. ________

   d. A: $\{0,1,2,3,\ldots\}$; B: $\{0,2,4,6, \ldots\}$ Ans. ________

4. Find: $A \cap B$, given:

   a. A: $\{0,3,6\}$; B: $\{6,9, 12,15\}$ Ans. ________

   b. A: $\{a,, c, d\}$; B: $\{a,b,c,d\}$ Ans. ________

   c. A: $\{2,3,5\}$; B: $\{11,13,17,19\}$ Ans. ________

   d. A: $\{1,3,5,7,9\}$; B: $\{2,4,6, \ldots\}$ Ans. ________

5. Given: Universe: $\{0,1,2,3,\ldots 9\}$; Set A: $\{0,2,4,6,8\}$ Set B: $\{3,6,9\}$

   Find:

   a. $A \cup B$ ________ b. $\overline{A}$ ________

   c. $\overline{B}$ ________ d. $\overline{A} \cap \overline{B}$ ________

   e. $(\overline{A \cap B}) \cup B$ ________

   f. $(A \cup B) \cup A$ ________

   g. $(B \cap \overline{B}) \cap B$ ________

3. Fill in the blanks: "Sets R and S will be in one-to-one (a) if, for every element in R there is exactly one element in (b), (c) for every element in (d) there is exactly (e) element in (f).

a.______________________ b. ______________________

c. ______________________ d. ______________________

e. ______________________ f. ______________________

C. Answer "True" or "False".

1. Every set is a subset of itself. 1.______________

2. The Empty Set is a subset of every set. 2.______________

3. Infinite sets always contain more elements than finite sets. 3.______________

4. The Empty Set is a finite set. 4.______________

5. All proper subsets are finite. 5.______________

OBJECTIVE MASTERY TEST

MATHEMATICS 9 - O.B.J.S.

SCORE M NM

Date ______________

Unit 1 - Objective 1 - Test 1.

Student No. ______________

Student Name ______________________

Teacher ______________

READ THE FOLLOWING GENERAL INSTRUCTIONS CAREFULLY:

1. Do all the work you wish to be considered right on this paper.
2. Take your time and answer carefully and fully.
3. When finished the test, hand paper in to teacher named above.
4. If unfinished at the end of period, put a large "U" in top [illegible]t corner and hand in to teacher named above. The paper will be returned to you for completion next day.

A. Each of the following definitions should remind you of a particular word or expression related to your studies of sets. In each case write this word or expression.

1. A diagrammatic representation of the relationship between a group of sets. 1. ______________
2. One of the objects of a set. 2. ______________
3. The main set, from which other sets and elements are selected. 3. ______________
4. Two or more sets with no common elements. 4. ______________
5. Any set containing no elements. 5. ______________
6. A set which has a limit to its size. 6. ______________
7. A set "B" such that every element of B is an element of set "A", but not every element of A is an element of B. 7. ______________
8. Two or more sets with the same number of elements. 8. ______________

B. Answer the following:

1. Write a synonym for:
   a) Empty Set ______________
   b) Universal Set ______________
   c) Element ______________
   d) Venn Diagram ______________

2. What kind of set is {1,3,5,7,9,11,...}? ______________

Continued over

OBJECTIVE 2 Multiplication and Division of Radicals.

1) The student will study and work with radicals of Real numbers, and be able to demonstrate his ability to:
   a) identify the "exponent" of the radical.
   b) identify the "radicand" of the radical.
   c) identify the "principal root" of any Real number.

Minimum responsibility: Read pp. 303-304.

2) The student will memorize and be able to state the general rule for:
   a) expressing a root of any Real number as a power, or the converse.
   b) expressing a root of any Real number raised to a power as a power.
   c) the multiplication of Roots of Real numbers whose exponents are the same.
   d) the division of Roots of Real numbers whose exponents are the same.

Minimum responsibility: Read pp. 303-307; pp. 308-309; pp. 310.

3) The student will be able to correctly simplify any Real number expression involving fractional exponents.

4) The student will be able to correctly simplify any Real number expression involving roots.

5) The student will be able to correctly rewrite any radical as a power, or any power as a radical.

Minimum responsibility: Read pp. 310; Do ax. pp. 307-308 # 1-6 (at least $\frac{1}{2}$ of each); p. 309 # 1-30 (at least $\frac{1}{2}$); pp. 310 # 1-16 (at least $\frac{1}{2}$) pp. 311-312 # 1-6 (at least $\frac{1}{2}$ of each)

NOTE: In all of the above questions make use of the rules (See part 2 above) as much as possible and SHOW YOUR WORKINGS.

OAK BAY JUNIOR SECONDARY SCHOOL

MATHEMATICS 9

UNIT 8: EXPONENTS AND RADICALS

OBJECTIVE 1 - Multiplication and Division of Powers.

1) The student will study and work with Real numbers raised to Natural number powers, and be able to demonstrate his ability to:
   a) indentify the "base" of the power.
   b) identify the "exponent" of the power.
   c) evaluate any Natural number power of a Real number

Minimum responsibility: Read pp 297-298; do ex. p. 299 #1, 3 (all).

2) The student will memorize and be able to state the general rule for:
   a) the multiplication of Real numbers with the same base raised to powers
   b) a product of Real numbers raised to a power.
   c) raising a power of a Real number to a power.
   d) a Rational number raised to a power.
   e) the division of Real numbers with the same base raised to powers

Minimum responsibility: Read pp. 297-298; pp. 300-302

3) The student will be able to write the simplest form of any Real number raised to the ZERO power.

4) The student will be able to write a non-negative equivalent form for any Real number with a negative exponent.

5) The student will be able to use the above rules to write simplest equivalent expressions for expressions containing various combinations of powers of Real numbers.

Minimum responsibility: Do ex. p. 299 # 2 (at least $\frac{1}{2}$ of), p. 302 (all), p. 311 # 2

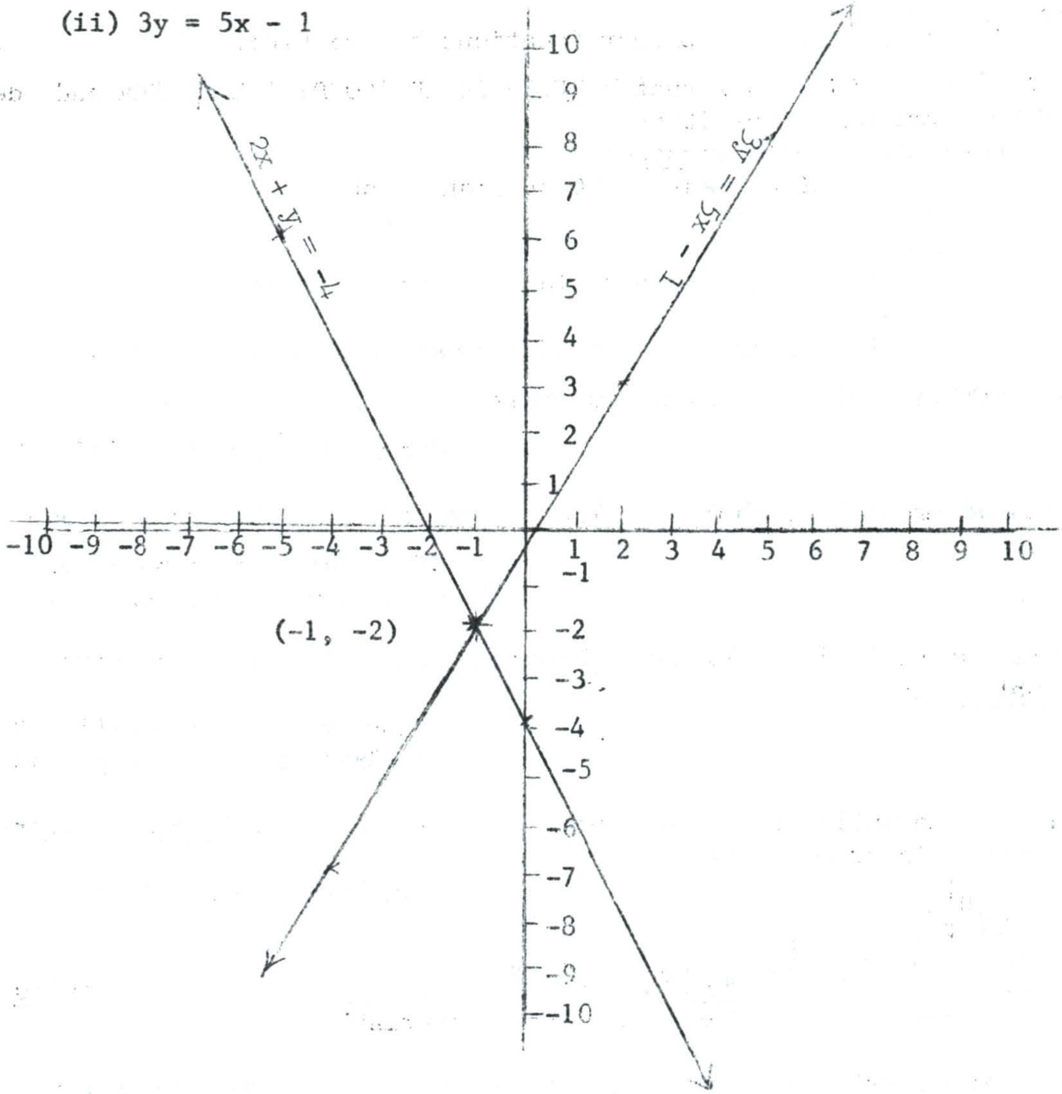
NOTE. In all the above questions, make use of the Rules for powers (See part 2, 3, 4 above) as much as possible and SHOW YOUR WORKINGS.

The following is an example of a suggested arrangement for your graphing of linear equations. You need not follow it slavishly, but in any event all your work should be very neat and orderly and readily understandable.

Ex. Graph the following pair of linear equations and read the solution set of the system from the graph.

(i) $2x + y = -4$

(ii) $3y = 5x - 1$



for $2x + y = -4$

x	0	-2	-5	1
y	-4	0	6	-6

for $3y = 5x - 1$

x	2	-4	5	-1
y	3	-7	8	-2

The Solution Set = $\{(-1, -2)\}$

Check: for $2x + y = -4$

$2(-1) + (-2) = -4$

$-4 = -4$ True

for $3y = 5x - 1$

$3(-2) = 5(-1) -1$

$-6 = -6$ True

OAK BAY JUNIOR SECONDARY SCHOOL

MATHEMATICS 9

UNIT 7: GRAPHING LINEAR EQUATIONS

NOTE: All work in this unit is to be done in a GRAPH BOOK. Be prepared to hand it in for marking when you have completed the unit.

OBJECTIVE 1

Solving Systems of Linear Equations by Graphing.

1) The student will construct a RECTANGULAR COORDINATE SYSTEM and demonstrate his understanding of it by:
   i) indicating on the system:
      a) The Coordinate or Cartesian Plane
      b) The X-axis
      c) The Y-axis
      d) The First, Second, Third and Fourth Quadrants
      e) The Origin
      f) The graphs of any points whose coordinates are known
   ii) Answering all questions on pages 237 to 239 of your text.

Reading Reference: pp 235-239

2) The student will be able to plot the graph of any linear equation.

Reading Reference: pp 239-240
Do at least half of ex. p 241, #1-12

3) The student will be able to solve any system of linear equations graphically.

Reading Reference: pp 241-243
Do at least half of ex. p 243-244 #1-13

4) The student will be able to define and determine the X and Y Intercepts for any linear equation.

Reading Reference: p 242

OBJECTIVE 2

A study of Independent (Simultaneous), Dependent, and Inconsistent Systems of Linear Equations in two variables.

1) The student will be able to plot the graphs of any system of Linear Equations in two variables and:
   i) Tell whether the system is dependent, independent, or inconsistent.
   ii) If the system is independent, determine its solution set from the graph and check the solution set.
   iii) If the system is dependent or inconsistent, use Equation Principles to support this conclusion.

Reading Reference: pp 245-247
Do at least half of ex. p 247-250 #1-10

OBJECTIVE 3

Vocabulary: The student will be able to define, describe, give an example of, or otherwise show his understanding of all of the words in the Vocabulary List on page 259 of your text.

PLEASE TURN OVER

PROBLEM: A man is 27 years older than his son, and in 10 years time he will be twice as old as his son. How old is each now?

Solution A. (using one variable)

Let m be the age of the man

Then the age of the son = $m - 27$

The age of the man in 10 years time = $m + 10$

And the age of the son in 10 years time = $m - 27 + 10$

But the age of the son in 10 years time $\frac{m + 10}{2}$

$$\therefore m - 27 + 10 = \frac{m + 10}{2}$$

$$(m - 27 + 10)2 = \left(\frac{m + 10}{2}\right)2$$

$$2m - 34 = m + 10$$

$$2m + {}^{-}m = m + 10 + {}^{-}m + 34$$

$$\therefore m = 44$$

Thus the age of the man = m = 44 years

And the age of the son = m - 27 = 44 - 27 = 17 years

Solution B. (Using two variables)

Let m and s be the present age of the man and his son respectively

The difference in their present age = 27

The age of the man in 10 years time = $m + 10$

And the age of the son in 10 years time = $s + 10$

$\therefore$ (i) $m - s = 27$

(ii) $m + 10 = 2(s + 10)$

from (i) $m = 27 + s$

substitute in (ii)

$$27 + s + 10 = 2(s + 10)$$

$$s + 37 = 2s + 20$$

$$37 - 20 = 2s - s$$

$$\therefore s = 17$$

Now substitute 17 for s in (i)

$$m - 17 = 27$$

$$\therefore m = 27 + 17 = 44$$

Thus the age of the man = m = 44 years

And the age of his son = s = 17 years

NOTE:

There are work sheets available on request in several different areas of problem solving. (See posted answer keys)

OAK BAY JUNIOR SECONDARY

MATHEMATICS 9

UNIT 6: PROBLEM SOLVING

OBJECTIVE 1 - The Solution of Problems using only one variable.

1) The student will be able to solve a given problem, using only one variable and the following procedure:
   * i) read and understand the problem.
   ii) assign a letter name to some unknown quantity in the problem. (usually that which you are required to find).
   iii) make some algebraic expressions that involve the variable and relate to the solution of the problem.
   iv) make an algebraic equation.
   v) solve the equation.
   vi) make a clear concluding statement to the problem.

Minimum responsibility: Read p. 185, 189, 190; carefully study the solution of problems on pp. 191-199. Do at least half of example from p. 186-189: and at least half of example from p. 199 (#1-48).

OBJECTIVE 2 - The Solution of Problems using two or more variables.

1) The student will be able to solve a given problem, using two or more variables and the following procedure:
   * i) read and understand the problem.
   ii) assign letternames to two or more unknowns in the problem (often those things which you are required to find).
   iii) make some algebraic expressions that involve the variables and relate to the solution of the problem.
   iv) make algebraic equations.
   v) solve the equations.
   vi) make a clear concluding statement of the problem.

Minimum responsibility: Read pp. 276-277. Do all examples from pp. 277-278, and some from p.286

* Note: The following problem has been solved twice, firstly using one variable, and then using two variables.

READ IT AND STUDY THE SOLUTIONS.

Use the examples on the following page as a guide to your approach and setting-up of problem solutions.

UNIT 5: PART B

OBJECTIVE 4 - Solution of Linear Equations in Two Variables.

1) Given a Linear Equation in two variables, the student will be able to determine ordered number pairs which will satisfy the equation.
Minumum responsiblity: Read pp. 216-217; do all exercise p. 217 #(1-12)

2) Given a Linear Equation in two variables, the student will be able to to write an equivalent equation in the Standard Form of a Linear Equation in Two Variables.
Minimum responsibility: Read pp. 230-231; do all exercises p. 231-23 #(1-10)

3) The student will be able to solve Systems of Two Linear Equations in two unknowns by each of three methods:

a) Comparison Method.
b) Substitution Method.
c) Addition Method.

Minimum responsibility: Read pp. 269-271; pp. 272-273; pp. 274-276; do at least $\frac{1}{2}$ of exercise from p. 271 (#1-8), p. 273, #(1-10), p. 276 #(1&2).

OBJECTIVE 5 - Vocabulary

The student will be able to define, describe, or otherwise demonstrate his ability to recognize each of the following:

a) (to) solve (an equation).
b) Solution set (of an equation).
c) root(s)(of an equation).
d) (to) satisfy (an equation).
e) If and only if.
f) ordered pair (of numbers).
g) system of equations.

Minimum responsibility: use your vocabulary lists at the ends of each chapter and the index of your text to handle this objective.

OAK BAY JUNIOR SECONDARY

MATHEMATICS 9

UNIT 5: PART A THE SOLUTION OF ALGEBRAIC EQUATIONS.

OBJECTIVE 1 - Algebraic Expressions - continued.

1) The student will be able to define, classify, or otherwise distinguish Monomial, Binomial, Trinomial, and Polynomial Expressions.
Minimum responsibility: Read pp. 176-179; do exercise p. 179 #1 (all)

2) The student will be able to reduce a given algebraic expression to its simplest form.
Minimum responsibility: Read pp. 171-174; pp. 176-179; do exercise p. 175, ($\frac{1}{2}$ of #1-36), p. 179-180 ($\frac{1}{2}$ of #2 a to z).

OBJECTIVE 2 - Solution of Linear Equations in one variable.

1) The student will be able to solve certain simple equations by any method of his choice.
Minimum responsibility: Read pp. 157-158. Do at least $\frac{1}{2}$ of exercise from p. 158-160 (# 1 & 2).

2) The student will learn the EQUATION PRINCIPLE FOR ADDITION, and be able t to use it in solving equations.
Minimum responsibility: Read pp. 160-162. Do at least $\frac{1}{2}$ of exercise P. 163 (#1-47)

3) The student will learn the EQUATION PRINCIPLE FOR MULTIPLICATION, and be able to use it in solving equations.
Minimum responsibility: Read pp. 164-165. Do at least $\frac{1}{2}$ of exercise p. 166 #(6-42)

OBJECTIVE 3 - Solution of Linear Equations in one variable.

1) The student will be able to solve equations involving ABSOLUTE VALUE.
Minimum responsibility: Read pp. 169-170; Do at least $\frac{1}{2}$ of exercise p. 170 #(1-26)

2) The student will be able to solve miscellaneous equations by the use of the Equation Principles for Addition and Multiplication, and other Basic Principles and Theorems.
Minimum responsibility: Read pp. 167-168 & pp. 180-182) Do at least $\frac{1}{2}$ of exercise p. 168-169 #(43-80); and at least $\frac{1}{2}$ of exercise pp. 182-185 #(1-66)

OBJECTIVE 3: Proving Expressions Equivalent

NOTE: This particular objective has given many students a gread deal of trouble in the past. You would be wise to work carefully and methodically through the work, building your ability as you progress. If you want to challenge yourself beyond the "core", work in pages 128 to 143 as well as those listed below.

1) The student will be able to find the value of algebraic expressions for designated replacements for the variables.

Minimum responsibility: Read pp 117 & 118; do exercises from pp 118-120, #1 & 2; P 147 #7.

2) The student will be able to develop a complete and documented proof of the equivalence of two given algebraic expressions.

Minimum responsibility: Read pp 121-124; do all of exercises pp 124 - 127, #1, 3, 5(p), 6, 7(k); p 145, #8

OBJECTIVE 4: Simplifying Equivalent Expressions.

1) Given a statement of equivalence between two algebraic expressions, the stude[nt] will be able to tell whether or not it is true for all replacements of the variables.

Minimum responsibility: Do exercises from p 126, #5; p 127, #7; p 144, #3

2) The student will be able to correctly reduce a given algebraic expression into a simpler equivalent expression.

Minimum responsibility: Do exercises from p 124, #2; p 126, #4; p 146 #9.

OBJECTIVE 5: Vocabulary

The student will be able to define, describe, or otherwise demonstrate his ability to recognize and use each of the following:

a) additive identity
b) multiplicative identity
c) additive inverse
d) multiplicative inverse
e) algebraic term
f) algebraic expression
g) equivalent expression
h) replacement set
i) variable
j) equation
k) principle of reciprocals
l) principle of opposites

Minimum responsibility: Use your vocabulary lists at the ends of each chapte[r] and the index of your text to handle this objective.

OAK BAY JUNIOR SECONDARY

MATHEMATICS 9

UNIT 4: MATHEMATICAL SENTENCES AND EQUIVALENT EXPRESSIONS

OBJECTIVE 1: True Sentences, False Sentences, Open Sentences.

1) The student will be able to describe, recognize, or otherwise distinguish between:

   a) True Sentences
   b) False Sentences
   c) Open Sentences
      i) Open Sentences which are always true, regardless of the replacement for the variable
      ii) Open Sentences which are never true, regardless of the replacement for the variable.
      iii) Open Sentences which are sometimes true, depending on the replacement for the variable.

Minimum responsibility: Read pp 92-95, pp 98-100, pp 154-155, do exercieses from p 93, #1 & 2; p 144, #1; p 147, #1; p 101, #1; p 149, #6; pp 155-157, #1-22.

2) The student will be able to correctly replace the variables in an open sentence with numerals to:
   a) make a true statement
   b) make a false statement

Minimum responsibility: Read pp 114-115; do exercises from p 95, #1 & 2; p 105, #3; p 144, #2 & 3; p 148, #2; p 115, #1-48.

OBJECTIVE 2: Number Fields and Finite Number Systems.

1) The student will be able to list or name the eleven basic properties of a NUMBER FIELD, using either the proper name or a generalization of each property

   Minimum responsibility: Read pp 106-108

2) The student will be able to:
   a) correctly add in modular numbers
   b) correctly multiply in modular numbers

   Minimum responsibility: /read pp 109-111

3) The student will be able to inspect a number system and correctly decide:

   a) which Field Properties are present
   b) which Field Properties are absent.
   c) whether or not the number system in question is a NUMBER FIELD

   Minimum responsibility: Read pp 109-113; do exercises from pp 109, 113, 114

OAK BAY JUNIOR SECONDARY SCHOOL

MATHEMATICS 9

UNIT 3 REAL NUMBERS AND FUNDAMENTAL OPERATIONS

OBJECTIVE 1

The student will be able to demonstrate his understanding of certain number systems.

1) The student will be able to recognize or describe, and distinguish between Natural Numbers, Whole Numbers, Integers, Rational Numbers, Irrational Numbers, and Real Numbers.
2) The student will be able to arrange the Natural Numbers, Whole Numbers, Integers, Rational Numbers, Irrational Numbers, and Real Numbers into an order of increasing complexity, and show or tell how each is related to the others.
3) The student will be able to construct a Number line and indicate on it the Real Number System.

Minimum responsibility: Read pages 50-54, 60-63, and 64-68

OBJECTIVE 2

The student will be able to correctly perform certain specified manipulations and calculations.

1) The student will be able to accurately change any Rational Number from "fraction" form to "decimal" form.
   Minimum responsibility: Read p. 62, do ½ exercise from p. 63 (#1, a-p)
2) The student will be able to accurately change any Rational Number from "decimal" form to "fraction" form.
   Minimum responsibility: Read p. 62, do ½ ex. from p.63 (#2, a-a')
3) The student will be able to approximate the positive square root of any Rational Number to a specified accuracy.
   Minimum responsibility: Read pp.64-66, do 1/3 ex. from p. 68 (2, a-e)

OBJECTIVE 3

Fundamental Operations and Rational Numbers.

1) The student will be able to accurately add Rational Numbers.
   Minimum responsibility: Read pp. 56-58, do ½ ex. from p. 59 (#1-3)
2) The student will be able to accurately subtract Rational Numbers.
   Minimum responsibility: Read pp 69-73, do ½ ex. from p.70 (#1-50), p.72 (#1-10'), p.74 (#4).
3) The student will be able to accurately multiply Rational Numbers.
   Minimum responsibility: Read pp.75-78, do ½ ex. from p.78 (#1-2).
4) The student will be able to accurately divide Rational Numbers.
   Minimum responsibility: Read pp. 81-82, do ½ ex. from p. 83 (#1).
   Additional Responsibility: P.85 and 88, ½ ex. #1

OBJECTIVE 4

The student will be able to demonstrate his understanding of the concepts of ORDER, ABSOLUTE VALUE, CLOSURE, OPPOSITE, and RECIPROCAL.

1) The student will be able to correctly interpret mathematical statements of ORDER, involving <, > = ,≤, ≥, and their negatives.
   Minimum Responsibility: pp. 52-54, do p.54 (#1-4), P.60 (#4), (all at least ½ of)
2) The student will be able to write the ABSOLUTE VALUE of any Real No. and simplify absolute value expressions.
   Minimum Responsibility: Read pp. 55-56, do p.56 (#1,2), P.60 (#), p.74 (#5), P.79 (#3,4), p.85 (#2). (all at least ½ of)
3) The student will be able to predict the existence or absence of CLOSURE for specific sets under specific operations.
   Minimum Responsibility: Read p. 33, do p.34 (#1-15), (½ of)
4) The student will be able to write or recognize the OPPOSITE of any Real Number.
   Minimum Responsibility: Read pp. 71-73, do p.73 (#1-3) (½ of)
5) The student will be able to write or recognize the RECIPROCAL of any Real Number.
   Minimum Responsibility: Read pp. 81-82, do p. 84 (#4-9)
6) The student will learn the Principle of Subtraction, and be able to reconize its use, its generalized statement, and be able to make use of it in performing operation Subtraction.
   Minimum Responsibility: Read pp. 71-73, do p. 74 (#6 - all parts)
7) The student will learn the Principle of Division, and be able to recognize its use, its generalized statement, and be able to make use of it in performing operation Division.
   Minimum Responsibility: Read pp. 81-82, do p.83 (#2 - all parts), (#3 - ½ of)

OBJECTIVE 5

The student will be able to identify or define each of the following:

1) Binary Operation
2) Dense Set
3) Reciprocal of a number
4) Repeating Decimal
5) Terminating Decimal
6) Counter-Example
7) Order Relations
8) the Opposite of a number
9) Directed Numbers
10) Origin
11) Number Line

(see text please for vocabulary list - p. 85)

OBJECTIVE MASTERY TEST	SCORE	M	NM

Mathematics 9 - OB.J.S.

Date ____________

UNIT 1 - OBJECTIVE 4 - Test 1

Student No. ____________

Student Name ____________ Teacher ____________

TAKE YOUR TIME - ANSWER CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

1) GIVEN: Universe M: $\{0,1,2,3,...,9\}$; A; $\{2,4,6,8\}$; B; $\{3,5,7\}$

Some of the following statements are true and some are false. Indicate which is which.

a) $A \subseteq M$ ____________ b) $A \cap B = \emptyset$ ____________

c) $\overline{B} = \{1,9\}$ ____________ d) $2 \in M$ ____________

e) $B \subset A$ ____________ f) $\{\emptyset\} = \emptyset$ ____________

g) $\supseteq \neq \subseteq$ ____________ h) $\overline{A \cup B} = \{1,9\}$ ____________

i) $B \cap A \cap M = A$ ____________ j) If $B \subseteq A$, then $A \supseteq B$ ____________

2) How should one read:

a) $\in$ ____________

b) $\cap$ ____________

c) $\overline{R \cup S}$ ____________

d) $\mathcal{U}$ ____________

e) $\subset$ ____________

3) Use suitable symbols to write the relationship, given R: $\{5,6,7\}$; S: $\{6\}$

...that S is to R

...that R is to S

...that 5 is to R

4) Use a symbol to show the matching of Set A($\{4,8,12\}$) and Set B($\{2,3,4\}$)

ans. ____________

5) Write the following in symbols:

"The Null Set is a Proper Subset of Set P."

Ans. ____________

UNIT TEST

MATHEMATICS 9 - O.B.J.S.

SCORE GRADE

UNIT 1

Date ______________

Student No ______________

Student Name ______________________________ Teacher ______________

Take your time - Answer carefully - You have the entire period if needed.

A) Complete each of the following with a word or phrase from Unit One.

1) A group or collection of objects is called (1). 1) ______________

2) Every non-empty set contains one or more (2) or (3). 2) ______________

3) ______________

3) Two or more sets which exhibit one-to-one (4) 4) ______________

are said to be (5) sets. 5) ______________

4) Although every set is a (6) of itself, we do not 6) ______________

accept the set as being a (7). 7) ______________

5) To represent set relationships in pictorial form, one 8) ______________

would use (8) circles to construct what is known as(9) 9) ______________

6) Although sets vary in size from the tiny (10) on the 10) ______________

one extreme to the largest (11) on the other, the set 11) ______________

with which one is working at any particular time may correctly be referred to as the (12). 12) ______________

7) The "remainders" or "leftovers" from some particular operation on sets is called the (13). 13) ______________

B) Respond to each of the following with "True" or "False".

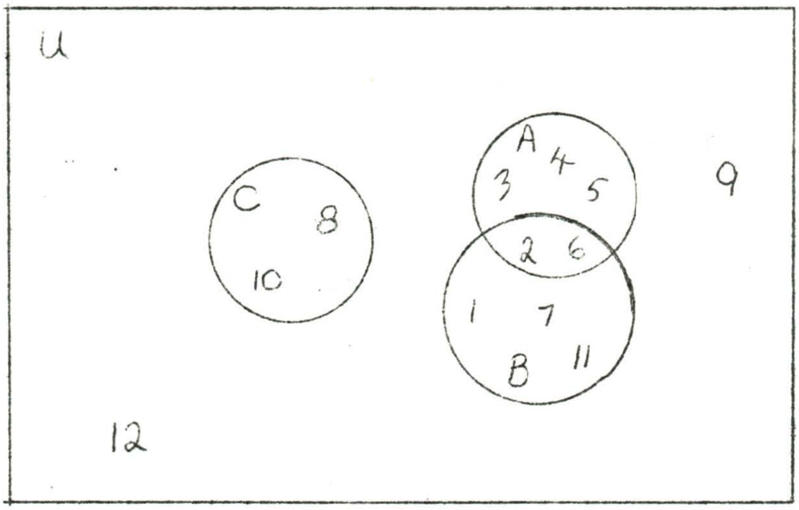
1) the Null Set, having no elements, has no subsets. 1) ________

2) If Set A $\supseteq$ Set B, then it follows that Set B $\subseteq$ Set A. 2) ________

3) Every subset is proper, except the universe itself. 3) ________

4) It is impossible to form the union of sets that are disjoint. 4) ________

For #5 to #14 use this diagram.



5) $A \subset U$ 5)______________ 6) $A \cap B = \{2,6\}$ 6)____________

7) $B \cup C = \emptyset$ 7)______________ 8) $6 \in B$ 8)____________

9) $A = \{3,4,5\}$ 9)______________ 10) $\overline{B} \cap \overline{C} = \{3,4,5,9,12\}$ 10)____________

11) $\overline{A \cup B} = C$ 11)______________ 12) A & C are disjoint. 12)____________

13) $A \cap B \cap C = \emptyset$ 13)______________ 14) A & B are Matching Sets. 14)____________

15) Write a formula for finding total number of subsets. ____________________

16) Use this formula to calculate no. of subsets for A in the diagram. ______________

C) Use Symbols to indicate:

1) 8 is a member of the set M. 1)__________

2) The union of sets A and B is the set C. 2)__________

3) Sets X and Y are disjoint. 3)__________

4) Set R is a proper subset of Set T. 4)__________

5) The Universe contains the subset W. 5)__________

6) The Complement of the union of sets R and S contains no elements. 6)__________

7) 13 belongs to the set P. 7)__________

D) Follow instructions.

1) Given universe U: {all Natural Nos. from 1 to 9 inclusive} and set R: {1,3,5,7,9}; and set S: {3,5,7}:

i) Draw a neat and complete Venn Diagram illustrating the relationsiip between these sets. (display the elements on the diagram) (2 marks)

ii) Use SHADING on your diagram to illustrate $\overline{R \cup S}$.

iii) Use HATCHING on the same diagram to illustrate $R \cap S$.

2) Given universe U: {0,1,2,3,4,...}; A: {3,6,9}; B: {2,4,8} and C: {3,5,7,9};

i) Use the space provided to draw a neat and careful Venn Diagram showing the relationship between these sets. (display the elements) (2 marks)

ii) Refer to the given information and the diagram and use the most suitable SYMBOL to complete:

a) A ________ U

b) A ___B___ B = ∅

c) U ________ B

d) 4 ________ B

iii) Find:

a) $A \cup B$ ______________ b) $B \cup C$ ______________

c) $A \cap C$ ______________ d) $A \cap \overline{B}$ ______________

e) $\overline{A} \cup \overline{C}$ ______________ f) $\overline{B \cap C}$ ______________

g) $(\overline{A} \cap \overline{C}) \cap B$ ______________

iv) On the diagram, shade or hatch $A \cup (B \cup C)$.

v) Name a pair of matching sets. ______________________

of disjoint sets. ______________________

OBJECTIVE MASTERY TEST

SCORE	M	NM

Division__________ Mathematics 9 - O.B.J.S. Date__________

Unit 2 - OBJECTIVE 1 - Test 1 Student No.__________

Student Name__________ Teacher__________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

WRITE EACH OF THE FOLLOWING IN SIMPLEST FORM:

1. $.34 \times 5 + 5$ 1.__________
2. $124 - 3 \times \frac{1}{2} \times \frac{1}{2}$ 2.__________
3. $(18 - 4) + 2 \div 8$ 3.__________
4. $3 + (61 - 11)(4 + 3)$ 4.__________
5. $9 + 2 \times [7 - (\frac{1}{2} \times \frac{1}{2})]$ 5.__________
6. $\frac{7 \times 2 - 1 \times 3 + 5}{2 \times 5 \times 3}$ 6.__________
7. $14.3 - 4.4 \times \frac{1}{4} \times 4$ 7.__________
8. $(7 \times 0 + 2) \times 5 + 3 - \frac{1}{2}$ 8.__________
9. $(63 + 4 \div 16) + 3/4 \times 12$ 9.__________
10. $3/4 \times (3/4 + 3/4) - 3/4$ 10.__________
11. $(6 + 44 \times 3 - 3) + 6$ 11.__________
12. $(5 \div 5 - \frac{1}{4})\frac{1}{4}$ 12.__________
13. $4\frac{1}{2} \div 4\frac{1}{2} + \frac{1}{2}$ 13.__________
14. $2 + 2 \times 2(2)2-2$ 14.__________
15. $5 \times 5 - 5 + 5 \times 5$ 15.__________
16. $\frac{3 + 2 \div \frac{1}{2}}{1 + 2 \times 3}$ 16.__________
17. $3 \times 4 - 2 + 2 - 1$ 17.__________
18. $3(20.5 + .55) + 6$ 18.__________
19. $.2 \times .22(3 - \frac{1}{2})$ 19.__________
20. $36 \div 9 \times 4$ 20.__________

SCORE	M	NM

OBJECTIVE MASTERY TEST

DIVISION ______ Mathematics 9 - O.B.J.S.

DATE ______________

Unit 2 - Objective 2 - Test 1 Student No. ______________

Student Name ______________________ Teacher ______________________

Take Your Time - Work Carefully - Put in Teacher's Box for Marking

A) Write each of the following in Inverse Form and then Solve the Unknown.

1) $17 + x = 28$ Inverse Form: ______________ $x =$ ______________

2) $438 - \Delta = 19$ ______________ $\Delta =$ ______________

3) $m - 12 = 0$ ______________ $m =$ ______________

4) $a \div 60 = 2\frac{3}{4}$ ______________ $a =$ ______________

5) $m \div 1.1 = 2.8$ ______________ $m =$ ______________

6) $0 \times 9 = a$ ______________ $a =$ ______________

7) $\frac{1}{8} + b = \frac{3}{4}$ ______________ $b =$ ______________

8) $21 - 8.5 = k$ ______________ $k =$ ______________

9) $17.9 + p = 81.1$ ______________ $p =$ ______________

10) $\frac{35}{0} = m$ ______________ $m =$ ______________

11) $r \times 0 = 31$ ______________ $r =$ ______________

12) $x - \frac{1}{4} = \frac{1}{2}$ ______________ $x =$ ______________

13) $7.4 \div 3.7 = e$ ______________ $e =$ ______________

14) $1 - \frac{1}{2} = z$ ______________ $z =$ ______________

15) $\frac{0}{122} = a$ ______________ $a =$ ______________

16) $t + 9.29 = 10.1$ ______________ $t =$ ______________

B) Complete the following to show your understanding of Inverse Operations:

Given that $\oplus$ and $\odot$ are symbols for two inverse operations, then:

a) $a \oplus b = c$ if and only if ______________________

b) $2 \oplus 2 = 8$ if and only if ______________________

c) $18 \odot 6 = 1.5$ if and only if ______________________

d) $10 \odot 10 = \frac{1}{2}$ if and only if ______________________

e) $12 \oplus 3 = 72$ if and only if ______________________

f) $8 \oplus 1 = 16$ if and only if ______________________

c) In terms of the fundamental operations of arithmetic, what is operation

$\oplus$? ______________________. operation $\odot$? ______________________

MATHEMATICS 9 O.B.J.S.

SCORE	M	NM

Division ________

UNIT 2 - OBJECTIVE 3 - TEST 1

Date ____________

Student No. ____________

Student Name ____________________ Teacher ____________________

Take Your Time   Answer Carefully   Put in teacher's box for marking.

I. Use frames or variables to write a generalized statement of:

(a) Distributive principle of Multiplication over addition: ____________________

(b) Commutative principle of addition ____________________

(c) Principle of Multiplication by zero ____________________

(d) Associative principle of addition ____________________

II. Give the full and proper name of each of the basic principles illustrated
D_ NOT ABBREVIATE - watch the spelling

(a) For every a,b,c; a x(b x c) = (a x b) x c ____________________

(b) For every a,b,; a + b = b + a ____________________

(c) For every a,b,c; a(b + c) = ab + ac ____________________

III. Use suitable abbreviations to name the principles involved in going from one step to the next.

(a) 5 x [8 + (3 + 2)] = 5 x[(3 + 2) + 8] ____________________

= 5(3 + 2) + 5(8) ____________________

= 5 x 3 + 5 x 2 + 5 x 8 ____________________

(b) (7 x 9) [(8 + 6) + (5 + 9)] = (7 x 9) [(6 + 8) + (9 + 5)] ____________________

= (7 x 9) [14 + 14] Arith Fact.

= (7 x 9) 14 + (7 x 9) 14 ____________________

= 14 (7 x 9) + 14(7 x 9) ____________________

= 14 [(7 x 9) + (7 x 9)] ____________________

= 14 [63 + 63] Arith Fact.

= 14 [63 x 1 + 63 x 1] ____________________

= 14 [63 (1 + 1)] ____________________

= 14 [63 x 2] ____________________

Continued over

(c) $8 \times 9 + 8 \times (5 + 7) = 8\ [9 + (5 + 7)]$ ________________

$= 8\ [9 + 12]$ Arith Fact

$= 8 \times 9 + 8 \times 12$ ________________

$= 9 \times 8 + 12 \times 8$ ________________

$= 72 + 96$ ________________

IV. Making use of your knowledge of basic principles tell what principle is being illustrated by each example (DO NOT ABBREVIATEO and <u>replace the frames or vauables with numbers that will make each statement true</u>.

(a) $\frac{5}{6} + D = \frac{2}{3} + \frac{5}{6}$ Principle ________________

D = ________________

(b) $8\ (\square + \triangle) = \diamond \times 9 + \diamond \times 12$ Principle ________________

$\square$ = __________ $\triangle$ = __________

$\diamond$ = __________

(c) $(5 + \square) \times 7$ Principle ________________

$= 5 \times 7 + \square \times 7$ Principle ________________

$= 5 \times 7$ $\square$ = ________________

SCORE	L/G

UNIT TEST

Division ____ Mathematics 9 - O.B.J.S. Date ____

Unit 2 Student No. ____

Student Name ____ Teacher ____

Take Your Time - Answer Carefully - Put In Teacher's Box For Marking.

A) Give Brief Answers to the following: (do Not abbreviate important words)

1. Is Multiplication distributive with respect to subtraction? 1) ____
2. What basic principle involves a change in arrangement but no change in order? 2) ____
3. What operation could be said to "undo" division? 3) ____
4. Is division an associative operation? 4) ____
5. Is subtraction distributive over division? 5) ____
6. Is division distributive over subtraction? 6) ____
7. What basic principle permits a change in order? 7) ____
8. What number affects addition as the number one affects multiplication? 8) ____
9. Complete the inverse statement: "if a ÷ b = c; then 9) ____
10. What is the result of division by zero? 10) ____
11. Name the principle being used: (a+b) +c = c + (a+b)? 11) ____
12. Say "true" or "false" to the following:
    a) If ⊖ and ⊙ are inverse operations, then a ⊖ b = c if c ⊙ a =b. a) ____
    b) If x ÷ y = z; then y=xXz b) ____
    c) By agreement, we say that zero divided by zero is zero. c) ____

B) Solve Each of the following:

a) $\frac{1}{2}+\frac{1}{2}$X14-4 a) ____ b) 3/4 [10 (7+5)] - 20 b) ____

c) (4.3-1.6)(.7+.29) c) ____ d) (12÷ 2/3+1/3)X 3+7 d) ____

e) $\frac{8-0.6 \text{ X}10\div2}{8\text{X }(11-.5)+2}$ e) ____ f) 0 X (15½- 3/4X28) f) ____

C) Using Frames or Variables, write a generalized statement of:

a) The Commutative Principle of Multiplication.

____

b) The Principle of Multiplication by One.

____

c) The Principle of Addition by Zero.

____

over

D. Write in Inverse Form and then Solve:

		Inverse:	Solve:
a)	$t + 4/5 = 9$	______	$t =$ ______
b)	$51 \div \triangle = 17$	______	$\triangle =$ ______
c)	$m/5 = 0$	______	$m =$ ______
d)	$y - 1/3 = 3/4$	______	$y =$ ______
e)	$\square \times 13 = 156$	______	$\square =$ ______
f)	$10/b = 0$	______	$b =$ ______

E. Tell what basic principle is being illustrated (or write NONE) and replace the variables with numerals to obtain True Statements. If more than one replacement will do, name or describe them all. (do NOT abbreviate)

		Principle:	Solve:
a.	$4 \times c =$ zero	______	$c =$ ______
b.	$7(6 + b) = 7\ (6) + 7\ (13)$	______	$b =$ ______
c.	$a + (3 + b) = (a + 3) + 5$	______	$a =$ ______
			$b =$ ______
d.	$(4 \times 5) + 9 = 9 + (4 \times m)$	______	$m =$ ______
e.	$\frac{1}{7}x = x(\frac{1}{7})$	______	$x =$ ______
f.	$a/o = 6$	______	$a =$ ______

F. Use suitable abbreviations to name the principles used in going from one step to the next:

a. $1 \times (5 \times 9 + 5 \times 8) = (5 \times 9 + 5 \times 8) \times 1$ 1. ______

$= (5 \times 9 + 5 \times 8)$ 2. ______

$= 5\ (9 + 8)$ 3. ______

b. $[3(4 + 6) + 2 \times 0] \times 7 = [3(4 + 6) + 0] \times 7$ 1. ______

$= [3(4 + 6)] \times 7$ 2. ______

$= 7\ [3(4 + 6)]$ 3. ______

$= (7 \times 3)\ (4 + 6)$ 4. ______

c. $[4 + (3 + 6)] + 7 = [4 + (6 + 3)] + 7$ 1. ______

$= [(4 + 6) + 3] + 7$ 2. ______

$= [3 + (4 + 6)] + 7$ 3. ______

$= 7 + [3 + (4 + 6)]$ 4. ______

G. Give the Full Name of the basic principle being illustrated:

a. $\square \times \triangle + \square \times 0 = \square(\triangle + 0)$ ______

b. $a + (b + c) = (a + b) + c$ ______

c. $(r \times s) \times t = t \times (r \times s)$ ______

OBJECTIVE MASTERY TEST

SCORE M NM

DIVISION ___________ MATHEMATICS 9 - O.B.J.S. ___________________

UNIT 3 - OBJECTIVE 1 - TEST 1

DATE. ___________________

STUDENT NO. ________________

Take Your Time - Work Carefully - Put in Teacher's Box for Marking

STUDENT NAME _______________ _______________ TEACHER ___________________

A. In the following questions, let N stand for Natural Nos. W for Whole Nos. I for Integers, R for Rational Nos., IR for Irrational Nos., and Real for Real Nos.

Find: 1. $R \cup IR$ ______________ 2. $N \cap W$ ______________

3. $W \cup N$ ______________ 4. $I \cap N$ ______________

5. $IR \cap R$ ______________ 6. $N \cup W \cup I$ ______________

7. $R \cap I$ ______________ 8. $\overline{R}$ ______________

9. $\overline{IR}$ ______________ 10. $\overline{R \cup IR}$ ______________

B. Give the proper name of 5 Proper Subsets of the Real No. System in a logical order, and state the most significant single feature of each.

The Number System	Most Significant Feature
1. ______________	______________
2. ______________	______________
3. ______________	______________
4. ______________	______________
5. ______________	______________

C. Answer

1. Is (-7) rational? ______ 2. Is $\frac{-141}{-3}$ an integer? ______

3. Is $\sqrt{125}$ whole? ______ 4. Is 0.010110111... real? ______

5. Is $\frac{8}{8}$ natural? ______ 6. Is 1.4142 irrational? ______

7. Is 0 real? ______ 8. Is $\frac{5}{0}$ whole? ______

9. Is $-\sqrt{25}$ rational? ______ 10. Is 23.464646... rational? ______

SCORE	M	NM

OBJECTIVE MASTERY TEST

Division__________ Mathematics 9 - O.B.J.S Date____________________

UNIT 3 - OBJECTIVE 2 - TEST 1 Student No.____________

STUDENT NAME____________________________ TEACHER____________________________

A) Change to decimal form:

1) $\frac{17}{25}$ 2) $3\frac{11}{20}$ 3) $\frac{7}{8}$ 4) $\frac{20}{33}$

Ans.__________ Ans.__________ Ans.__________ Ans.__________

5) $\frac{7}{9}$ 6) $\frac{5}{7}$ 7) $3\frac{47}{99}$ 8) $\frac{124}{990}$

Ans.__________ Ans.__________ Ans.__________ Ans.__________

B) Change to Ratio or fraction form:

1) .35 2) $12.7\dot{7}$ 3) $0.8787\overline{87}$ 4) 9.401

Ans.__________ Ans.__________ Ans.__________ Ans.__________

5) 0.001 6) $.283\overline{83}$ 7) .666 8) $.138\overline{138}$

Ans__________ Ans__________ Ans__________ Ans__________

C) Use the reverse side to calculate to the nearest 2 places of decimals

1) $\sqrt{15}$ 2). $\sqrt{20}$

Use the APPROXIMATION METHOD SHOWN IN YOUR TEXT.

SCORE	M	NM

OBJECTIVE MASTERY TEST

Date ____________

Division ________ Mathematics 9 - O.B.J.S. Student No. ____________

UNIT 3 - OBJECTIVE 3 - TEST 1

STUDENT NAME ______________________________ TEACHER ____________________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

A) SOLVE for the frame or variable in the following:

1) $28 + a = -9$ a= ________

2) $m \times (-\frac{3}{4}) = 24$ m= ________

3) $1.68 - 11.99 = p$ p= ________

4) $\triangle - (-45) = 10$ $\triangle$= ________

5) $-3\frac{1}{2} \times b = 0$ b= ________

6) $t + (-6) = 654$ t= ________

7) $-12.18 + (-6.4) = a$ a= ________

8) $41 \div r = -1$ r= ________

9) $\square + (-8\frac{1}{4}) = 6$ $\square$= ________

10) $(-10) \times x = -35$ x= ________

11) $-9 - (-21) = y$ y= ________

12) $\frac{7}{8}$ of $m = -35$ m= ________

13) $(-2.8)(-.8) = r$ r= ________

14) $a + (-\frac{5}{6}) = -3\frac{2}{3}$ a= ________

B) SOLVE the following directed number problems:

1) $(-6.1) + (-4\frac{1}{2})$ ________

2) $4 \times (-13)$ ________

3) $18 - (-13.2)$ ________

4) $(-16) \div (-8)$ ________

5) $45 \times (-\frac{1}{2})$ ________

6) -2.34×0 ________

7) $.5 \div (-.5)$ ________

8) $16\frac{1}{4} - (-\frac{3}{4})$ ________

9) $7 + (-8) - 3$ ________

10) $74.3 - 50$ ________

11) $6 - (-6) - 6$ ________

12) $485 \div 0$ ________

13) $7\frac{1}{2} \times (-60)$ ________

14) $4\frac{1}{4} + (-4\frac{1}{4})$ ________

15) $47.5 + 32.9$ ________

16. $(-84) - (7.5)$ ________

17) $(-246) \div \frac{3}{4}$ ________

18) $.6 \times (-100)$ ________

19) $6.04 - (-.04)$ ________

20) $(-\frac{1}{4}) \div (-12)$ ________

OBJECTIVE MASTERY TEST

SCORE	M	NM

Division _____ Mathematics 9 - O.B, J. S. Date __________

Unit 3 - Objective 4 - Test 1 Student No. __________

Student Name __________ Teacher __________

Take Your Time - Work Carefully - Put in Teacher's Box for Marking

A) Give a generalization of:
i) The Principle of Subtraction: for every __________
ii) The Principle of Division : for every __________

B) Using the Subtraction or Division Principle;
i) rewrite each of the following,
ii) calculate the answer:

	rewrite					
1) 42 - 34	______	= ______	2) -26 - - 8	______	= ______
3) -28 ÷ -7	______	= ______	4) -80 ÷ 30	______	= ______
5) 24 - -8	______	= ______	6) 29 - -74	______	= ______
7) $-\frac{4}{5} \div \frac{2}{7}$	______	= ______	8) -.52 ÷ -.4	______	= ______
9) $-\frac{3}{5} - -\frac{17}{5}$	______	= ______	10) -32 - 8	______	= ______
11) $\frac{4}{9} \div -\frac{4}{9}$	______	= ______	12) 17.305 ÷ -½	______	= ______
13) 67.54 - -67.54	______	= ______			

C) Give the opposite and the reciprocal of each of the following:

	the opposite	the reciprocal
1) $2\frac{1}{4}$	______	______
2) .303	______	______
3) $-\frac{22}{7}$	______	______
4) $\sqrt{2}$	______	______
5) □	______	______

D) Calculate:

1) $|-4 - - 7|$ ______ 2) $|-7| - |-4|$ ______

3) $|8 + -15|$ ______ 4) $|-71| + -6$ ______

5) $|\triangle|$ if $\triangle < 0$ ______

E) Say "closed" or "not closed" for each set under the given operation:

1) The Set: Natural Nos.; the operation: divide by 2. ______

2) The set: Integers; the operation: subtraction. ______

3) The set: Odd whole nos.; the operation: double. ______

4) The set: Rational Nos.; the operation: all Fundamental Operations. ______

OVER

E) Label the following as true or false:

1) $|-3| + |2| < -3 + 2$ ________

2) $-8 + 4 \neq -4$ ________

3) $6 + |-5| \not> 11$ ________

4) $|-8| + -8 \leq 0$ ________

5) $3 = 4$ or $12 < 18$ ________

6) $7 \neq 5$ and $-3 > -17$ ________

7) $|7| \geq |-3| - (-3)$ ________

8) $(3\frac{1}{2}) \times (-3\frac{1}{2}) = 1$ ________

SCORE	M	NM

OBJECTIVE MASTERY TEST

Division________ Mathematics 9 - O.B.J.S. Date________________

UNIT 3 - OBJECTIVE 5 - TEST 1 Student No.____________

STUDENT NAME________________________ TEACHER________________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

A) Complete:

1. Mathematical operations which deal with exactly two elements at a time are said to be 1.____________
2. Name one set operation which is like this. 2.____________
3. Name one arithmetic operation like this. 3.____________
4. If the product of two numbers is one, what word describes the numbers, relative to each other? 4.____________
5. Terminating decimals are actually repeaters--of what? 5.____________
6. If "a" and "b" are Real Numbers, then, according to a certain property of order, either 6. a______ b
   or 7. a______ b
   or 8. a______ b
9. The numbers that show movement as well as quantity are sometimes called 9.____________
10. Given two numbers a and b, if their sum is zero, then "a" is said to be (10) of "b". 10.____________
11. A set of numbers, for which between any two there exists at least one more, is said to be 11.____________
12. A subset of the Real Numbers that has this characteristic is the (12) number system. 12.____________
13. What is the name of the point on the number line that corresponds to the number zero? 13.____________
14. The exception that is used to prove a particular mathematical statement false is called 14.____________
15. What Real Number is its own reciprocal? 15.____________

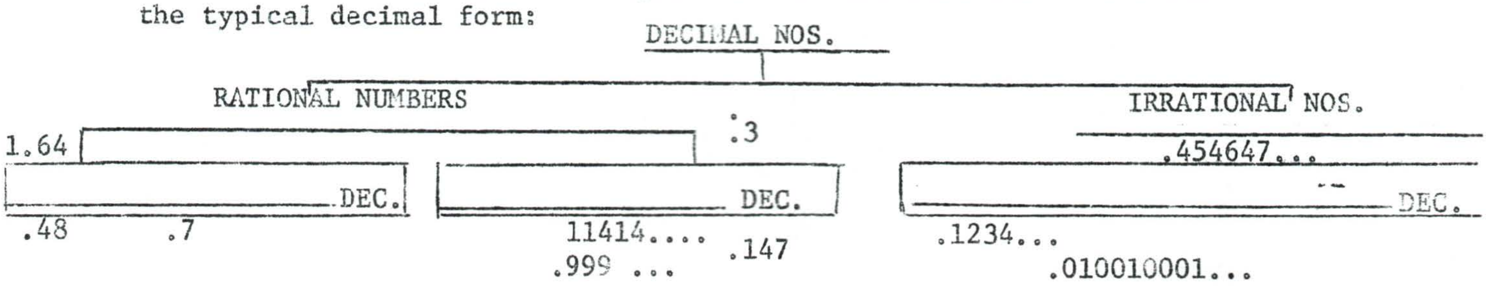
    has no reciprocal? 16.____________

    is its own opposite? 17.____________

    has no opposite? 18.____________
19. Using as the number example, in what form would you expect those: i) its reciprocal? 19.____________

    ii) its opposite? 20.____________

B) Fill in the 3 blanks in the diagram with a word selected to describe the typical decimal form:



SCORE	

UNIT TEST

DIVISION __________ MATHEMATICS 9 - O.B.J.S. DATE __________

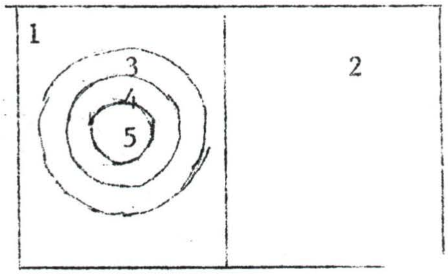
UNIT 3 STUDENT NO. __________

STUD' E __________ TEACHER __________

Take Your Time - Answer Carefully - Put in Teacher's Box for Marking

A. The accompanying diagram is supposed to illustrate the set of all Real Numbers. What proper subsets of the Real Number System are illustrated .

1. __________
2. __________
3. __________
4. __________
5. __________



B. Name the number system that:

1. Fills the number line. 1. __________
2. Can be displayed in non-terminating, non-repeating decimal form. 2. __________
3. Does not contain a zero element. 3. __________
4. Is not closed under operation subtraction. 4. __________
5. Is, in fact, a ratio of Integers. 5. __________

C. Say "Rational" or "Irrational" for:

1. 0.135135... __________
2. -.261261126 __________
3. -.1414 __________
4. $\sqrt{3}$ __________
5. -3.1497813 __________
6. $-2\frac{11}{127}$ __________

D. Write as decimal f ctions:

1. $\frac{329}{100}$ __________
2. $\frac{3}{11}$ __________
3. $4\frac{5}{99}$ __________
4. $\frac{914}{999}$ __________

Continued over

E. Write as ratios of whole numbers: (lowest terms please)

1. 0.3065 ______ 2. 0.2727... ______

3. $0.\overline{025}$ ______ 4. 0.193636... ______

F. Say "True or "False" to the following:

1. $|-17| < |-137|$ ______ 2. $|-45| \leq -45$ ______

3. $|x| \geq x$ ______ 4. $|-4 + {}^{+}16| \not< |-4| + |{}^{+}16|$ ______

5. ${}^{+}6 > {}^{+}2$ and $-6 < {}^{+}3$ ______

6. $-9 > {}^{+}3$ or $-7 \neq -6$ ______

G. Calculate:

1. $-7 + 4$ ______ 2. $-36 + (-112)$ ______

3. $-7 - (-7)$ ______ 4. $3.2 \times (-4)$ ______

5. $(\frac{-4}{7} \times (-35)$ ______ 6. $0 \div (-119)$ ______

7. $(-\frac{1}{2}) \times (-\frac{4}{5})$ ______ 8. $-9.7 - 8.5$ ______

9. $6.66 + (-3.3)$ ______ 10. $(-\frac{1}{3}) \div (-\frac{2}{3})$ ______

11. $(-4.8) - (-2.2)$ ______ 12. $[(-6) \times (-5)] \times (-\frac{1}{2})$ ______

H. Say "Closed" or "Not Closed" for:

1. All even Natural Nos. under operation multiplication. ______

2. All multiples of 3 under operation addition. ______

3. {1,4,9,16,25,36,49,64...} under "multiply the no. by itself." ______

4. All Integers under operation division. ______

Continued

I. Complete:

1. An operation that always deals with 2 elements at a time is said to be ________________.

2. If a X b = 1, then "a" and "b" are called ________________

3. If a + b = 0, then "b" is (3) of "a". ________________

4. Any example used to show the falsity of a mathematical statement is called ________________

5. What is the opposite of -9? ________

of $\frac{13}{2}$? ________

6. What is the reciprocal of 1? ________

of zero? ________

of $\frac{5}{7}$? ________

J. Say "True" or "False" to the following?

1. Although $\frac{12}{0}$ will simplify to 12, it would be proper to call it a Rational Number. 1.________

2. The opposite of the opposite of the opposite of (-14) is 14. 2.________

3. {Rational Nos.} $\cap$ {Irrational Nos.} = {Real Nos.} 3.________

4. {Integers} $\subset$ {Rational Nos.} 4.________

5. The Natural No. set and the Whole No. set are disjoint. 5.________

6. Zero and the Empty Set do not mean the same thing. 6.________

7. $-\sqrt{17} \in$ {Real Nos.} 7.________

8. If $\square$ is a negative no. then $|\square| = \square$ 8.________

9. Irrational Nos. are not really Real Nos. 9.________

OBJECTIVE MASTERY TEST

SCORE	M	NM

Division ________ Mathematics 9 - O.B.J.S. DATE ______________

Unit 4 - Objective 1 - Test 1 Student No. ______________

STUDENT NAME ______________________ TEACHER ______________

Take Your Time - Work Carefully - Put in Teacher's Box for Marking

A. COMPLETE: Open sentences in algebra are of 3 types:
  i) those which are (a) regardless of the replacement for the (b);
 ii) those that are (c); and
iii) those that are (d), depending on (e).

a) ______________ b) ______________

c) ______________ d) ______________

e) ______________

B. CLASSIFY the sentences as TRUE, FALSE, or OPEN.

1) $251\% > 251$ __________ 2) $-\frac{14}{33} = -0.4242\ldots$ __________

3) $3x \times 2 = 2 \times 3x$ __________ 4) $|-6| - |-4|$ [illegible] $|{}^{-}6 - {}^{-}4|$ __________

5) $\frac{11}{7} - \frac{4}{7} \times (-5) = -5$ __________ 6) $24a = \frac{1}{2}$ __________

7) $1.7 < \frac{170}{100}$ __________ 8) $\sqrt{\frac{144}{49}} = 1\frac{5}{7}$ __________

9) 3% of $100 = .03$ __________ 10) $|m| \geq m$ __________

C. LABEL the statements as Always (A), Sometimes (S), or Never (N), true when considering replacements for the variables.

1) $5a - 17 = 24$ ____ 2) $(6r + 4) + 11 = 6r + (4 + 11)$ ____

3) $.75x + ($[illegible]$) = .75x$ ____ 4) $2.4b - b = 0$ ____

5) 12% of $m + 0 = .12m$ ____ 6) $|a| \geq a$ ____

7) $4x\ (a + 5) = 4a + 20$ ____ 8) $(-s)^2 = -25$ ____

9) $16m \div 8m = 2$; $(m \neq o)$ ____ 10) $3a^2 = 3a^3$ ____

D. REPLACE the variable to form (i) a TRUE SENTENCE; (ii) a FALSE SENTENCE

1) $-2.5 \times a = 1$ for TRUE a = __________ for FALSE a = __________

2) $-\frac{1}{2} \div -\frac{1}{4} = x$ x = __________ x = __________

3) $n + n + n = 1$ n = __________ n = __________

4) $-5(6 +$ [illegible]$) = -30 + b$ b = __________ b = __________

5) $o - p = 12$ p = __________ p = __________

SCORE	M	NM

OBJECTIVE MASTERY TEST

Division__________ Mathematics 9 - O.B.J.S Date__________________________

UNIT 4 - OBJECTIVE 2 - TEST 1 Student No.______________

STUDENT NAME________________________________TEACHER__________________________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

A) 1. Construct a neat and complete addition, and a neat and complete multiplication table for a Module 5 number system. (4 marks each: 1 for structure, and deduct 1 for each error to a maximum of 3)

2. List the 11 basic properties of a Number Field; write a generalization for each; and say "YES" or "NO" to each property for the Module 5 system under consideration.

BASIC PROPERTY	GENERALIZATION	YES/NO
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		
11)		

3. Using the above information and tables, answer the following questions.

1) What is the Additive Identity in Module 5?____________________

2. What is the opposite of 3 in Module 5?____________________

3. What is the reciprocal of 4 in Module 5?____________________

4. Is the set of whole number, Mod. 5, a Number Field?
If so, how do you know this? If not, specifically why?

____

SCORE	M	NM

OBJECTIVE MASTERY TEST

UNIT 4 - OBJECTIVE 3 - Test 1 Date__________

Division______ Mathematics 9 - O.B.J.S. Student No.__________

STUDENT NAME____________________ TEACHER__________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

a) Find the value of the expression for the given replacements for the variables.

1. $3x + 3y$ with (-9) for x and 3 for y. 1.__________
2. $a(2b - a)$ with ½ for a, 0 for b. 2.__________
3. $\frac{(a+b)^2}{a-b}$ with -¼ for a, -½ for b. 3.__________
4. $a^2 - 5ab + 3b^2$ with - 4 for a, 2 for b. 4.__________
5. $|2m| - |-7r|$ with 0.3 for m, 0.4 for r. 5.__________

b) Provide a complete proof (including reasons for each step) for each statement of equivalence. (4 marks each)

1. $10a + 4a = 14a$

PROOF:

2. $b + b = 2b$

PROOF:

3. $-(x)(-y) = xy$

PROOF:

4. $5t - 9t = -4t$

PROOF:

c) Use suitable abbreviations to provide the best authority or reasons for each step in the following proof.

1) $x + y - (-x + y) = x + y + [-(-x + y)]$ a)__________

$= x + y + [-\{y + (-x)\}]$ b)__________

$= x + y + [(-1)(y + (-x)]$ c)__________

$= x + y + [(-1)y + (-1)(-x)]$ d)__________

$= x + y + [-y + x]$ e)__________

$= x + [y + (-y)] + x$ f)__________

Continued over

c) continued (1)

$= x + 0 + x$ g)________________

$= x + x$ h)________________

$= 1x + 1x$ i)________________

$= (1 + 1)x$ j)________________

$= 2x$ k)________________

2) $xy + [-(xy)] = [x + (-x)]\,y$ a)________________

$= y\,[x + (-x)]$ b)________________

$= y(0)$ c)________________

$= 0$ d)________________

SCORE	M	NM

OBJECTIVE MASTERY TEST

Division________ Mathematics 9 - O.B.J.S.

Unit 4 - Objective 4 - Test 1

Date________________________

Student Name______________________________ Student No. ________

Teacher______________________

Take Your Time - Work Carefully - Put in Teacher's Box for Marking.

A) Reduce each expression to its Simplest Equivalent Form. You may feel that you should take several steps to arrive at your final expression, but do not feel compelled to show all reasons for your work.

1) $(3a)(5b)(-2c)$ ______________

2) $3p - 5p + 9p - 7$ ______________

3) $-8am + 4a(2m - 3) - 6a$ ______________

4) $(-3)(-x)(\frac{1}{2})$ ______________

5) $1.8m + 2v + 3.8m - 12v$ ______________

6) $w - w - w$ ______________

7) $(-2a)^3 + 2a$ ______________

8) $7(2x - 3y) + 10y - 10x$ ______________

9) $\frac{3}{4}r - (\frac{3}{4}r)$ ______________

10) $a + 2a = 3a + (-4a)$ ______________

11) $-8.1r - 8r + 2(2r - 4r)$ ______________

12) $\frac{24a - 16b}{8}$ ______________

B) Tell whether or not each of the following statements of equivalence between two algebraic expressions is True for all replacements of the variables. (say "yes" or "no") (the replacement set is Real Nos.)

1) $x^2 + x = x(x + 1)$ __________

2) $(a)(a)(a) = 3a$ __________

3) $2m(p - 3r) = 2mp - 3r$ __________

4) $2x - 12x + 30 = 2(15 - 5x)$ __________

5) $-a - b - a + b = 0$ __________

6) $(a + b)(x - y) = (x - y)(b + a)$ __________

7) $11a - 12t + 2(2s + t) = 5(3s - 2t)$ __________

8) $|2a - 3b| = |2a| - |3b|$ __________

9) $\frac{6}{5}r + \frac{3}{5r} + \frac{1}{5} = 2r$ __________

10) $-[(-a)bc] = (-a)(bc)$ __________

11) $\frac{4p + 12}{4} = p + 12$ __________

12) $12x - 11y - 4(6x - 2y) = -3(4x + y)$ __________

Use the space below this line for any calculations you need, if you wish to do so.

SCORE	M	NM

OBJECTIVE MASTERY TEST

DIVISION__________ Mathematics 9 - O.B.J.S Date __________

UNIT 4 - Objective 5 - Test 1 Student No.__________

STUDENT NAME____________________ TEACHER__________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

A) Use words or numerals to most suitably complete each of the following:

1) The product of a number and its (i) is (ii), which number in (ii) is often called (iii) (2 words) i)__________

ii)__________

iii)__________

2) The sume of a number and its (i) is (ii), which number in (ii) is often referred to as the (iii). (2 words) i)__________

ii)__________

iii)__________

3) The opposite of a number is also called the (i) (2 words) i)__________

4) The reciprocal of a number is also called the (i). (2 words) i)__________

5) A statement of equivalence between two algebraic expressions is called (i). i)__________

6) Algebraic expressions having the same value are said to be (i). i)__________

7) The set from which one may choose replacements for the variables is called (i). i)__________

8) A symbol, usually in the form of a lower case letter, used to stand for number in algebra is known as (i). i)__________

B) Using variables, give a generalization of:

1) The Principle of Opposites: 1.__________

2) The Principal of Reciprocals: 2.__________

C) Name the variable(s) in the following expressions:

1) 4a + 3b - c __________ 2) -2st + 3s + 4 __________

2) 6(2x - 4y) x 0__________

D) Give one example of each of the following to illustrate your understanding of the concept.

1. Algebraic Term:__________

2. Algebraic Expression:__________

3. Algebraic Equation:__________

SCORE	GRADE

UNIT TEST

Division ________ Mathematics 9 - O.B.J.S. Date ____________

Unit 4 Student No. ____________

Student Name ______________________________ Teacher ____________________

Take Your Time - Work Carefully - Put In Teacher's Box For Marking.

A. Give brief answers to the following:

1. What is the Additive Identity in:
   a. the Real Number System? a. ____________
   b. the set of Whole Nos. Modulo 7? b. ____________
   c. the Natural Number System? c. ____________
2. What is the Reciprocal of 4 in:
   a. the set of Whole Numbers? a. ____________
   b. the Rational Number System? b. ____________
   c. the set of Whole Nos. Modulo 5? c. ____________
3. What is the Opposite of 2 in:
   a. the Rational Number System? a. ____________
   b. the Integers? b. ____________
   c. the set of Whole Numbers Modulo 6? c. ____________
4. Give another name for Reciprocal. 4. ____________
5. Two or more expressions with the same value are called what? 5. ____________
6. In Algebra, what are symbols like a, x, m, ... called? 6. ____________
7. What is the name of the Principle being illustrated by:
   a. for every a and b, $a-b=a+(-b)$? a. ____________
   b. for every x and y, ($y \neq$ zero), $x \div y = x \times 1/y$? b. ____________
   c. for every r and s, $r+s=r-(-s)$? c. ____________

B. Classify each of the following sentences as either <u>True</u>, <u>False</u>, or <u>Open</u>:

1. $0.333... = 1/3$ ____________ 2. $13a-2=3a-12$ ____________
3. $4m(4r+5)=16mr+20m$ ____________ 4. $\sqrt{\frac{81}{49}} = 1\frac{2}{7}$ ____________
5. $t+t+t \neq 3t$ ____________ 6. $|-4| - |-9| = |(-4)-(-9)|$ ____________

DO NOT BE AFRAID TO SHOW YOUR WORK .... ON FOOLSCAP IF YOU WANT.

C. Label each Open Sentence below as either Always True, Sometimes True or Never True, when considering Real Number replacements for the variables. (use AT, ST, and NT for your answer form).

1. $a - b - a - b = 0$ ________ 2. $x + (-y) = -[y + (-x)]$ ________

3. $3m + 5m + 7 = 15m$ ________ 4. $-5(3a - 2b) = 10b - 15a$ ________

5. $-[-(-y)] = y$ ________ 6. $2r + 3s - (2r - 4s) = 7s$ ________

D. Use your knowledge of principles to reduce the following algebraic expressions to their SIMPLEST FORM.

1. $3a + (-4a) + 4$ ________ 2. $2ab - 5a - 2ab(4)$ ________

3. $-3(-xy)(-5)$ ________ 4. $7(3t - 6) + 10 - 4t + 7$ ________

5. $(2m - 4p)8 - 7m - 7p$ ________ 6. $3(a - 2b + 3c) - (3a + 2b + c)$ ________

E. In the space provided, make an addition table and a multiplication table for Whole Numbers Modulo 3.
(3 marks each: 1 for structure, and deduct one for each error up to 2).

F. Using suitable abbreviations, list the Field Properties that are present for the set of Whole Numbers Modulo 3. (1 mark for each correct, and deduct 1 for each incorrect property listed) (Maximum Value: 11)

________ ________ ________ ________

________ ________ ________ ________

________ ________ ________ ________

G. Is the set of Whole Nos. Modulo 3 a Number Field? ________

H. Supply a Reason for each step in the following proofs. Abbreviations are acceptable.

1. $a - (b-c) = a + [-(b+(-c))]$ ________
$= a + [(-1)(b+(-c))]$ ________
$= a + (-1)b + (-1)(-c)$ ________
$= a + (-b) + c$ ________
$= a - b + c$ ________

2. $6m-3m-9m = 6m+(-3m)+(-9m)$ ________
$= 6m+(-1)3m+(-1)9m$ ________
$= 6m + [(-1)3]m + [(-1)9]m$ ________
$= 6m+(-3)m+(-9)m$ ________
$= [6+(-3)+(-9)]m$ ________

I. Provide a carefully documented Proof for the following equivalance. (5 marks)

For every Real a and b, prove that: $-(a - b) = b - a$

OBJECTIVE MASTERY TEST

SCORE	M.	NM

MATHEMATICS 9 - OAK BAY JUNIOR SECONDARY   DATE ______________

DIV. ________

UNIT 5 - OBJECTIVE 1 - TEST 1   STUDENT NO. __________

STUDENT NAME ______________________   TEACHER __________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN BOX FOR MARKING

Use your knowledge of basic principles to write each express in its simplest form and then classify the result as a Monomial, Binomial, Trinomial, or Polynomial expression. Show your important workings.

		SIMPLEST FORM	KIND OF EXPRESSION
1.	$-2m + 7m + 5m$	1. ________	1. ________
2.	$9x + 6y - 3x - 4y$	2. ________	2. ________
3.	$(1.4a)\ (-3b)$	3. ________	3. ________
4.	$(-6.3x)\ (-y)\ (5)$	4. ________	4. ________
5.	$9ab - 4ab + 3a - 4b + 2$	5. ________	5. ________
6.	$-u + 3t + 2u - 5 - 3t$	6. ________	6. ________
7.	$3r + 6s - 6 - 7r + 4s + 4$	7. ________	7. ________
8.	$10xy - 5rs - 3xy + 9 + rs$	8. ________	8. ________
9.	$2(a + b) + 4(a - b)$	9. ________	9. ________
10.	$\frac{1}{2}(2m - 4n) + \frac{1}{3}(9m + 12n)$	10. ________	10. ________
11.	$3(a + 2b + 3c) - 2(3a+2b+c)$	11. ________	11. ________
12.	$-3(2x + y) - 4(x - y)$	12. ________	12. ________
13.	$5(9 + 6x + y) - 3(x - y)$	13. ________	13. ________
14.	$(2a + b)\ (3a + 4b)$	14. ________	14. ________
15.	$(2m + 3r)^2$	15. ________	15. ________
16.	$4.3r - 6\ (1.8r - .3)$	16. ________	16. ________

SCORE	M	NM

OBJECTIVE MASTERY TEST

Division_____ MATHEMATICS 9 - O.B.J.D. Student No.__________

UNIT 5 - OBJECTIVE 2 - Test 1

STUDENT NAME__________________________ TEACHER__________________

EPA - EPM - EPA - EPM - EPA - EPM Date__________________

A) Here are some very simple algebraic equations in one variable. You should be able to SOLVE THEM with little or no written calculations. Place ANSWERS ONLY in the spaces provided.

1) $15 - m = 23$ __________

2) $3\frac{1}{2}a = 1$ __________

3) $\frac{-}{12} = 3$ __________

4) $3p - 5 = -26$ __________

5) $-8 = b - (-8)$ __________

6) $-13.3 - m = 5$ __________

7) $a + (-30) = 15$ __________

8) $4 + 6a = 5$ __________

$\frac{5}{3}c = -10$ __________

10) $a + (-6.4) = 11.2$ __________

Here are some algebraic equations in one variable that are a little more complicated and may take some calculation in order to SOLVE. This time you must give some indication as to how you got your answer. ANSWERS ONLY WILL NOT BE ACCEPTED. (Use the space below or on the reverse side.)

1) $17 + 3b = 29$

2. $-3 = -11 + \frac{4}{7}a$

3) $5 + (-2a) = 13$

4. $6\frac{1}{2}m - 26 = 0$

5) $-9 = -(-a) - 14$

6. $2.3b + 8.1 = 15$

7) $\frac{-12.3}{r} = -36.9$

8. $-3 - (-m) = 2m$

C) Write a generalized statement of the :
EQUATION PRINCIPLE FOR MULTIPLICATION

d) Use Equation Principles, and any other principle that is useful to get the job done, to SOLVE the following equations. NO MARKS will be given for answers only. Each t· you use an euqation principle, indicate its use BY WRITING "EPA" or "EPM".

1) $-11 = x + 7$

2) $100a = 5$

3) $-5\frac{2}{3} = b - 7\frac{1}{3}$

4) $-70 = 3.5c$

5) $.64 + (-p) = .8$

6) $\frac{8}{13} a = \frac{-1}{26}$

7) $-7.9 - y = 6$

8) $\frac{1.3}{a} = -5.2$

9) $c + 41 - 9 = 18$

10) $[-14 - (-11)] \times 8 = 6x$

11) $-4.9 + r - 6 = -3.3$

12) $3a + 7a = -200$

SCORE	M	NM

OBJECTIVE MASTERY TEST

Div.______ Mathematics 9 - Oak Bay Junior Secondary

Date______________

Unit 5 - Objective 3 - Test 1

Student No. ____________

Student Name ------------------------------ Teacher ----------------------

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

You should now be ready to takle more complex equations. Each of the following equations involves ABSOLUTE VALUE. Solve them, showing enough of your work to make your method clear, and make use of the equation principles where possible and indicate their use by writing "EPA" and "EPM". (note: answers only will not be accepted.) 2 marks each.

1. $|2x| = 72$

2. $|12 + m| = 8\frac{1}{2}$

3. $|-9b| = 48$

4. $\left|\frac{2m + 13}{11}\right| = 3$

5. $|- .4m| = 2.8$

6. $|-(-8a)| = 2.75$

7. $\left|\frac{12a - a}{33}\right| = \frac{1}{3}$

8. $|0.2d - 14d| = 6.9$

9. $|2t + 1| = 3$

10. $|-3p - 4p| = 35$

Continued over

Now you should be sufficiently practiced in the fundamentals of equation solution to solve these miscellaneous equations. Once again, use the equation principles as much as possible, and indicate their use. (note: no solution will be accepted unless some work is shown, at least part of which shows equation principles being used.) 1 mark each.

1. $3y + 3 = 0$

2. $6a = 6 - 2a + 2$

3. $3x + 2 - x = 12$

4. $\frac{a}{3} - 7 = 12$

5. $\frac{1}{2}m - \frac{1}{4}m - 2 = 3$

6. $\frac{1}{4}r + 2 = 7 - \frac{3}{4}r$

7. $4t = 10t - 3$

8. $4d - (d + 4) = (3d - 14) + d$

9. $17p + 3 - 3(2p - 4) = -1$

10. $13 + \frac{3x - 2}{2} = \frac{5x + 12}{6}$

11. $6(3t - 5) - 4(s + 5) = -40$

12. $-b + 4b - 12 \neq -3$

13. $\frac{r - 4}{2r} = 15$; $(r \neq 0)$

14. $-8s + 3 + 4s = -7 - 6s$

SCORE	M	NM

OBJECTIVE MASTERY TEST

Div.________ Mathematics 9 - D.B.J.S. Date______________________________

UNIT 5 - OBJECTIVE 4 - TEST 1 Student No.____________

STUDENT NAME______________________________ TEACHER______________________________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN TEACHER'S BOX FOR MARKING.

A. Complete each of the following tables of ordered number pairs for the given linear equations.

1) $x-2y = -10$

x	0		
y		0	-1

2) $a = 2b + 5$

a	0		
b		0	-1

3) $3(m+n) = 7$

m	0		-1
n		0	

B. Write each of the following equations in two variables in the Standard Form.

1) $Ax = -By + C$ ______________________

2) $4(m-n) = \frac{m+n+6}{2}$ ______________________

3) $\frac{3a+7}{-6} = b-1$ ______________________

4) $4x=3y$ ______________________

5) $\frac{1}{2}(3p+2q-10)=0$ ______________________

C. You are required to know the three methods for solving any given system of linear equations. Solve each of the given systems by using any method that you wish but use a different method for each system. Indicate which method you are using by writing the method at the beginning of your work, and, please organize your work in such a manner that the reader may follow what you are doing. You will be penali- for your work that is messy, poorly organized and difficult to understand-- BE NEAT AND ORDERLY. (Marks - 5 each)

1) $2x +y=10$
$x-y=5$

2) $2m-3n=1$
$4m+n= 23$

3) $y=3x-2$
$x=2y+4$

OBJECTIVE MASTERY TEST

Mathematics 9 - O.B.J.S.

SCORE	M	NM

Division ______________ Date ____________

Unit 5 - Objective 5 - Test 1 Student No. ____________

Student Name ____________________ Teacher __________________________

TAKE YOUR TIME - WORK CAREFULLY - PUT IN BOX FOR MARKING

Using your best grammatical form, write a careful summary to show your understanding of each of the following concepts. Use examples to complement your work if you think they would be worthwhile. 3 Marks Each.

1) to solve an equation:

2) solution set of an equation:

3) root or roots of an equation:

4) to satisfy an equation:

5) the expression "if and only if":

6) ordered pair of numbers:

7) a system of equations:

TEACHER ____________ UNIT V TEST NAME ____________

BLOCK ________ NUMBER ____________

SCORE	LETTER GRADE
60	

I. Complete the table below. If the expression is in its simplest form fill in the blank with the word "simplest." Classify each simplified expression as a monomial, binomial, trinomial or polynomial.

Given expression	simplified form	type of expression
$3x + 2$		
$5x + 3y + 2x - y$		
$4x - \frac{1}{3}x$		
$x^2 + 2x + 3$		
$5x^2 + 2x + 4x$		
$x^3 + 3x^2y + 3xy^2 + y^3$		

II. Rewrite the expressions below in the standard form of Linear equations in two variables.

STANDARD FORMS

$3x - 2 = 4y$

$2x + y - 4 = 0$

$4y - 3 = 2x$

III. Find the roots of the equation below

Roots

1. $2x + 3 = 5$ ____________
2. $6x - 4 = 2$ ____________
3. $\frac{1}{2}x + 3 = 8$ ____________
4. $8a - 3 = -4$ ____________
5. $|x| = 4$ ____________
6. $-2x = \frac{-5}{6}$ ____________

IV. Using the replacement set shown below find solutions to the open sentences.
$\{(x,y), (3,4), (2,3), (1,1), (3,2), (5,1)\}$

1. $x < y$ ____________
2. $x = 3$ ____________
3. $x + 1 = y$ ____________
4. $2x = 2y$ ____________
5. $2x - 4 = 3y + 3$ ____________

V. (A) use the addition method solve the equation below. Show all work in a neat orderly fashion.

$$x + y = 7$$
$$x - 2y = 7$$

OVER

V. (B) Use the substitution method to solve the equation below.

$$4x + 3y = 20$$
$$3x - 2 = y$$

(C) Use the comparison method to solve the equation below.

$$x + y = 7$$
$$2x + y = 5$$

VI. Identify the principles as they are used.

$3x - 2 - (x - 3) = 7$

$3x + {}^{-}2 + {}^{-}(x + {}^{-}3) = 7$ ______________________

$3x + {}^{-}2 + {}^{-}1\ (x + {}^{-}3) = 7$ ______________________

$3x + {}^{-}2 + {}^{-}1x + 3 = 7$ ______________________

$3x + {}^{-}1x + {}^{-}2 + 3 = 7$ ______________________

$(3 + {}^{-}1)x + 1 = 7$ ______________________

$2x + 1 = 7$ ______________________

(continued.)

$2x + 1 + {}^{-1} = 7 + {}^{-1}$ ______________________

$2x + 0 = 6$ ______________________

$2x = 6$ ______________________

$\frac{1}{2} \cdot 2x = \frac{1}{2} \cdot 6$ ______________________

$1x = 3$ ______________________

$x = 3$ ______________________

VII. Solve the equations below. Show work (2 marks each)

1. $4x - 3 = 2x + 6$

2. $|x - 3| = 7$

3. $\frac{5}{x} = \frac{-2}{3}$

4. $\frac{4}{x} + 2 = {}^{-}3$

5. $(-3x) = {}^{-}2x + ({}^{-}5$ _

OBJECTIVE MASTERY TEST

SCORE	M	NM

Mathematics 9 - O.B.J.S.

Division ______________ Date ____________

Unit 6 - Objective 1 - Test 1 Student No. ___________

Student Name ______________________ Teacher __________________________

TAKE YOUR TIME - FOLLOW INSTRUCTIONS - PUT IN TEACHER'S BOX FOR MARKING

Using ONE VARIABLE and the general layout suggested in you unit outline solve each of these problems. (5 marks each - name variable - expression - equation - solve - final statement.)

1) Find three consecutive integers such that twice the first, plus three times the second, plus four times the third is twenty.

2) In a collection of coins there are six less than twice as many dimes as quarters. If the total value of the collection is $17.40, how many coins of each type were there?

3) Jane is four years older than Howard. David's age is eight less than the sum of the ages of Jane and Howard. If the sum of the three ages is twenty-four, how old is each person?

4) Find two numbers differing by 57, so that one of them is twenty times as large as the other.

5) A merchant brought 800 pounds of tea for $390.00 For part of it he paid 45¢ a pound and for the rest 55¢ a pound. How much did he buy at each price?

SCORE M NM

OBJECTIVE MASTERY TEST

Div.________ Mathematics 9 - O.B.J.S Date________________

UNIT 6 - OBJECTIVE 2 - TEST 1 Student No.____________

STUDENT NAME__________________________TEACHER+____________________

BE CAREFUL - THINK CLEARLY - SET UP YOUR WORK NEATLY - CHECK YOURSELF.

Using two or more variables and the general layout suggested in your Unit Outline solve each of the following problems.

(5 MARKS) - name variables - make expressions - make equations - solve = make final statement.)

1) Find two numbers such that their sum is eighteen, and the difference between three times the larger and four times the smaller is twelve.

2) Mrs. Brown is twenty-seven years older than her daughter. If she will be twice as old as her daughter ten years from now, what is the present age of each person?

3) Find the number of nickels and dimes in a coin bank if there are seven more than four times as many nickels as dimes, and the total value of the collection is $7.55.

4) Grass seed, which normally sold for 35¢ per pound was mixed with another type of seed which normally sold for 55¢ per pound, If 30 pounds of the mix could sell for 45¢ per pound to yield the same income as if the grass seed had been sold separately, how much of each kind of seed went into the mix?

5) Two trains travel towards each other from two cities that are 432 miles apart. If the average speed of one of the trains is two and one-half times the other, and they meet in exactly four hours, calculate the average speed of each of the trains.

SCORE	GRADE
27	

UNIT TEST

MATHEMATICS 9 - OAK BAY JUNIOR SECONDARY

DIV. ______________ DATE: ______________

UNIT 6 STUDENT NO. ______________

STUDENT NAME: ______________________ TEACHER: ______________

TAKE YOUR TIME - WORK CAREFULLY - READ CAREFULLY - THINK.

PART MARKS WILL BE GIVEN FOR ORGANIZATION OF WORK.

A. Using One Variable and the set-up described in your Unit Outline, solve the following problems. (5 Marks each.)

1) Find a number such that $\frac{1}{2}$ of the number is 10 more than 1/3 of it.
2) A quantity of nickels, dimes, and quarters were worth $16.10. Find how many there were of each denomination if there were three times as many dimes as quarters, and four times as many nickels as dimes.

B. Using Two Variables and the set-up described in your Unit Outline, solve the following problems. Tell what method of equation solution you are using. (6 Marks each.)

1) A farm boy kept rabbits and chickens. Altogether they had 33 heads and 100 feet. How many of the animals were rabbits and how many were chickens?
2) Mary is 4 years younger than her brother Tom. Six years ago Tom was twice as old as Mary was then. How old is each now?

C. Solve the following problem using one or more variables, as you please, and the set-up described in your Unit Outline. (5 Marks.)

1) Find three consecutive odd integers such that the sum of three times the first and four times the second exceeds five times the third by 26.

OBJECTIVE MASTERY TEST

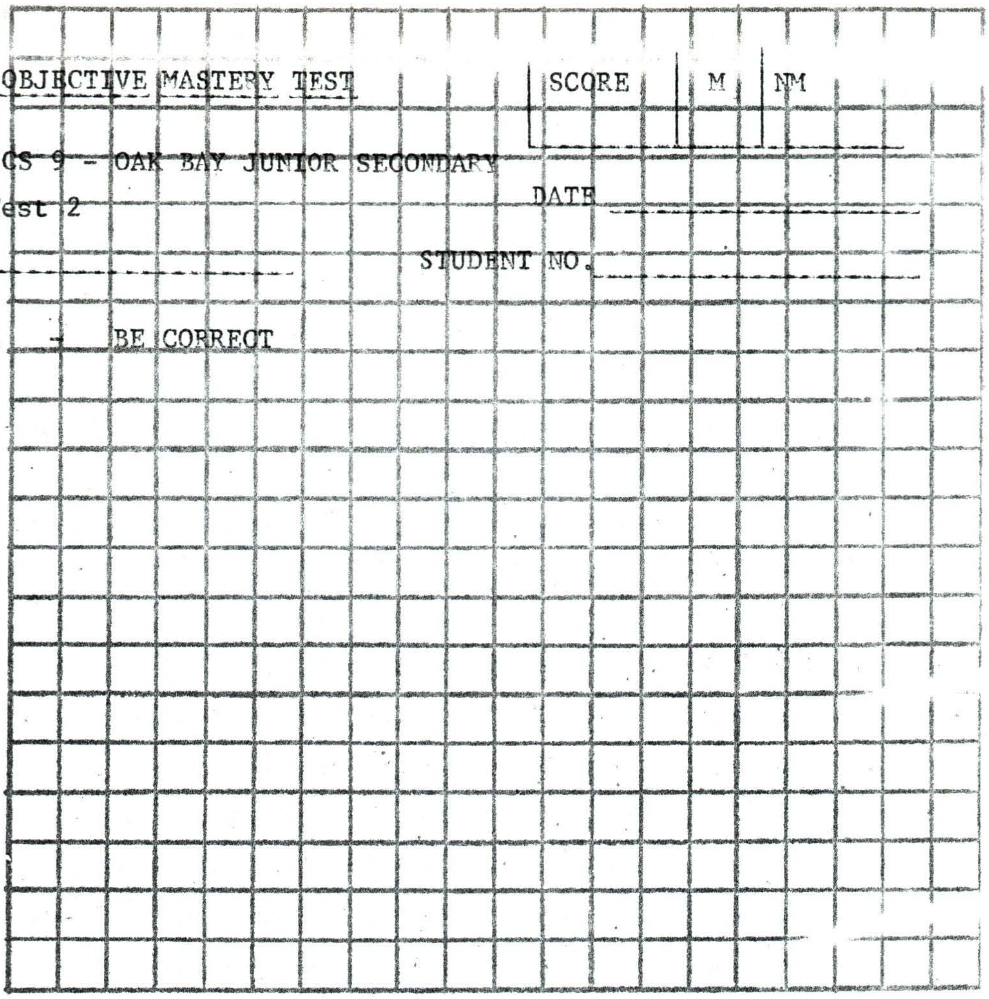
SCORE	M	NM

DIV. ________ MATHEMATICS 9 - OAK BAY JUNIOR SECONDARY

UNIT 7 - Objective 1 - Test 2 DATE ____________

STUDENT NAME ______________________ STUDENT NO. ____________

BE NEAT - BE CAREFUL - BE CORRECT



#1.a) On the first co-ordinate grid, show suitably labelled:

i. The x-axis

ii. The y-axis

iii. The origin

iv. The 4th quadrant

b) Plot the graph of

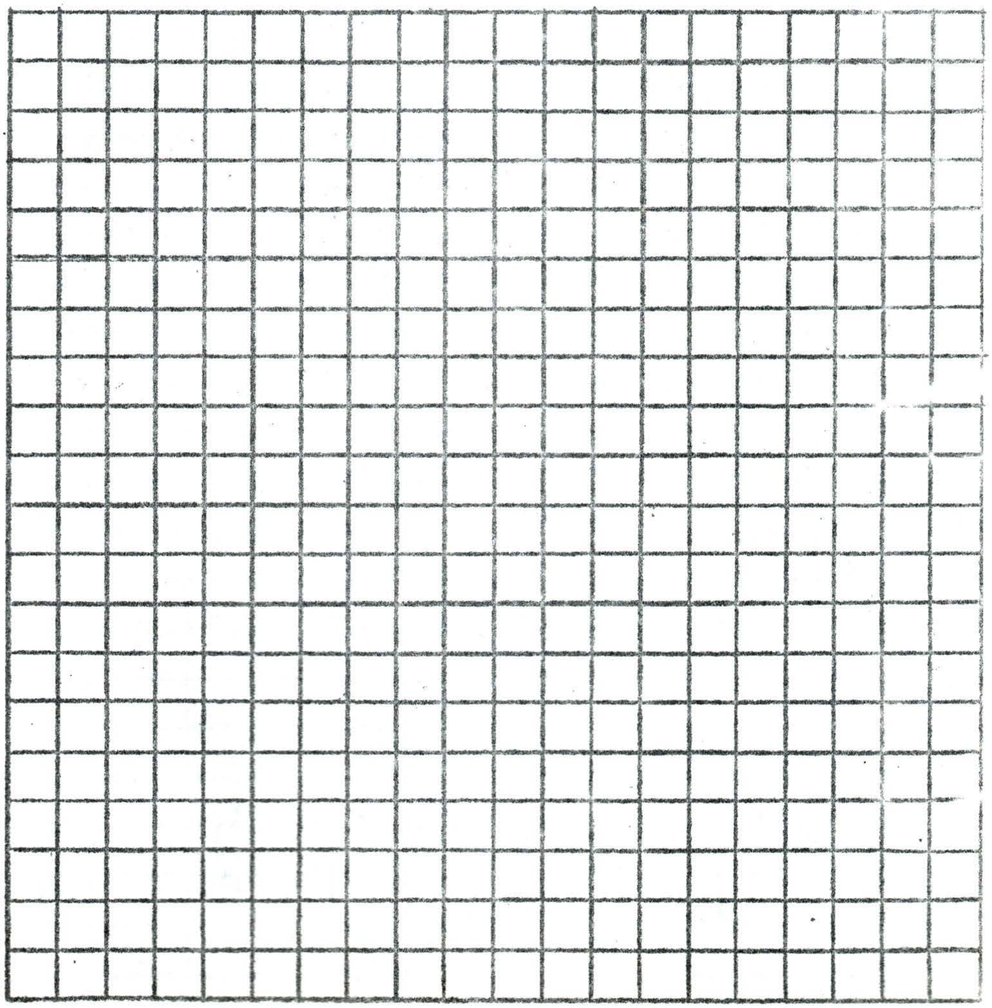
i. point A(-4, -7)

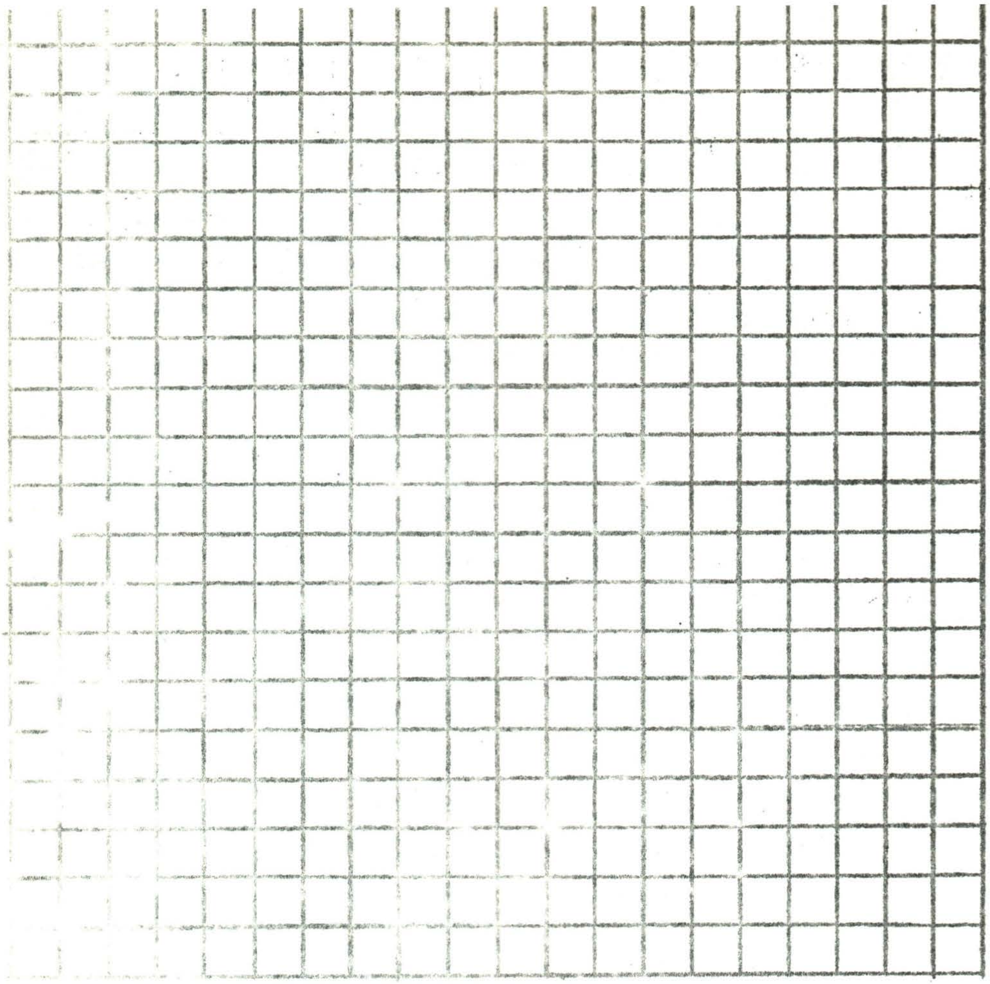
ii. point B(0, -9)

iii. point C(7,6)

iv. point D(-8,5)

(10 MARKS)



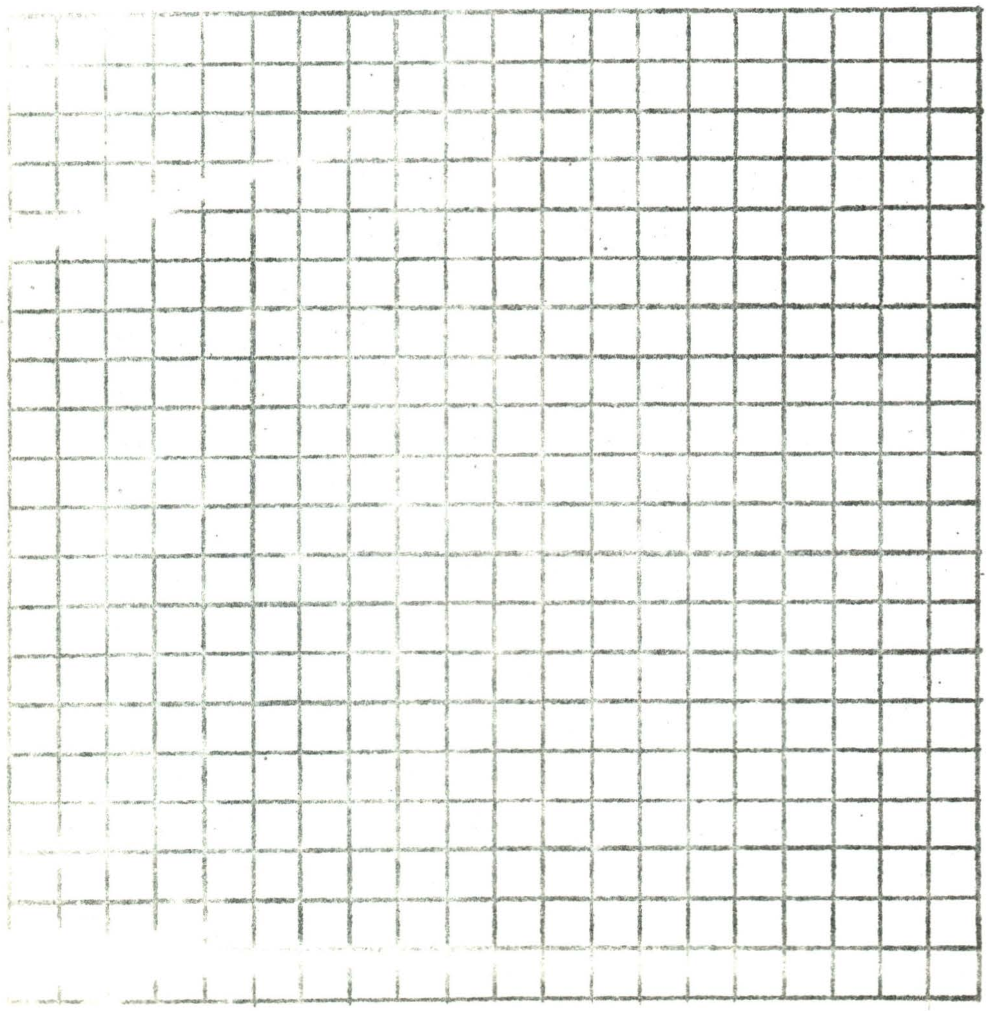


#2. a) On the second co-ordinate grid, neatly plot the graph of the linear equation "$4x - 8y - 30 = 0$". Show your important workings and try to make your completed job as neat and meaningful as possible.

b) Put a circle around the x-intercept and write its ordered number pair.

c) Put a box around the y-intercept and write its ordered number pair.

(8 MARKS)



#3. a) On the third co-ordinate grid, neatly plot the graphs of the following linear equations:

i. $2p - 2r = 6$

ii. $p = 7r + 3$

b) Show all important workings and try to make your completed job neat and meaningful to the reader.

c) On the graph, circle the solution set and write its ordered number pair.

d) On the graph put a circle around each x-intercept and a box around each y-intercept

(10 MARKS)

SCORE	M	NM

BJECTIVE MASTERY TEST

athematics 9 - O.B.J.S.

NIT 7 - OBJECTIVE 2 - TEST 1

ate ____________ Student NO.______

tudent Name ____________________

eacher ____________________

NSTRUCTIONS
1) Using a procedure that will
how your best work, plot the
raphs of the following systems
f Linear Equations.
5 marks per system)

2) From an examination of your
raphs, tell whether each system
s Dependent, Independent, or
nconsistent.
1 mark each)

3) If the system is Independent,
etermine its solution set from
he graph, and check it in the
quations.
3 marks per system)

4) If the system is Dependent
r Inconsistent, use your
rinciples to prove it.
3 marks each)

ystem (1) - on first grid

(i) $3a - 5b = 2a - 3b + 6$

(ii) $2b - 3a = 4b - 2a + 2$

ystem (2) - on second grid

(i) $3x + 2y - 5 = 0$

(ii) $(5/2)x + \frac{5}{3}y = 4\frac{1}{6}$

ystem (3) - on third grid

(i) $2x + 3y = x - (2y - 3)$

(ii) $3x + 15y = 15$

OBJECTIVE MASTERY TEST SCORE M NM

Division ________ MATHEMATICS 9 - O.B.J.S. ________________

UNIT 7 - OBJECTIVE 3 - Test 1 Date________________

Student Name __________________________ Teacher ______________ Student NO.__

Be careful - Be neat - Be Prepared - Think.

Read each of the following definitions and tell what is being defined.
(in some cases more than one response is required.)

1. The plane in which we locate points corresponding to number pairs. i.________________ ii.________________
2. The general name for the horizontal base line of a coordinate system. ________________
3. The point on a graph at which a vertical and a horizontal number line meet. ________________
4. The two axes superimposed on the plane. i.________________ ii.________________
5. The points on a coordinate plane corresponding to ordered number pairs. ________________
6. The four parts into which the two axes divide or separate the plane. ________________
7. The distance from the origin to the point at which the line corresponding to a linear equation cuts an axis. ________________
8. The distance from the origin to the point at which a line crosses the y-axis. ________________
9. A set or group of linear equations in two variables that are considered or taken together. ________________
10. A pair of linear equations in two variables having exactly one number pair satisfying both equations. i.________________ ii.________________
11. A pair of linear equations in two variables which are, in fact, equivalent equations. ________________
12. A pair of linear equations in two variables which have no common solutions. ________________
13. The two numbers of an ordered number pair. ________________
14. The first number in an ordered number pair. (give three different answers) i)________________ ii)________________ iii)________________
15. The second number in an ordered number pair. (give three different answers) i)________________ ii)________________ iii)________________
16. The linear equation form Ax + By = C. ________________

UNIT TEST	SCORE	M	M.I

Div.________ Mathematics 9 - OBJS Date__________

STUDENT NAME____________________ TEACHER____________________

UNIT 7

TAKE YOUR TIME - WORK CAREFULLY - BE NEAT - CHECK YOUR WORK.

A. Give brief answers:

1. The name of the point whose coordinates are (o,o) 1.__________
2. The name of the vertical number line of a coordinate system in x and y. 2.__________
3. The name of the first coordinate in an ordered pair (one word) 3.__________
4. The synonymn for Simultaneous System. 4.__________
5. The ordinate of any x - intercept. 5.__________
6. Quadrant I $\cap$ Quadrant II 6.__________
7. X - axis $\cap$ Y - axis. 7.__________
8. The minimum number of points needed to plot the graph of any Linear Equation. 8.__________
9. The Standard form of a Linear Equation in 2 variables. 9.__________
10. The reason for the name Linear Equation. 10.__________

B. You have been given graph paper to work on.

On the first plane:

1. Prepare a suitably labelled rectangular coordinate system. (Real number range: -10 to 10 inclusive)
2. Shade Quadrant III
3. Draw 2 lines to illustrate an Inconsistent System of Linear Equations.
4. Draw the graph of "x = -7" and write on the graph the equation written in Standard Form.

(6 marks)

On the second plane:

1. On a suitably labelled rectangular coordinate system, plot the graphs of the following linear equations, and find their solution set graphically.
2. Check your solution set by substituting your coordinates into the given equations.

i) $2a + 5 = b$

ii) $23 + b = -5a$

(Show Your work.)

(7 MARKS)

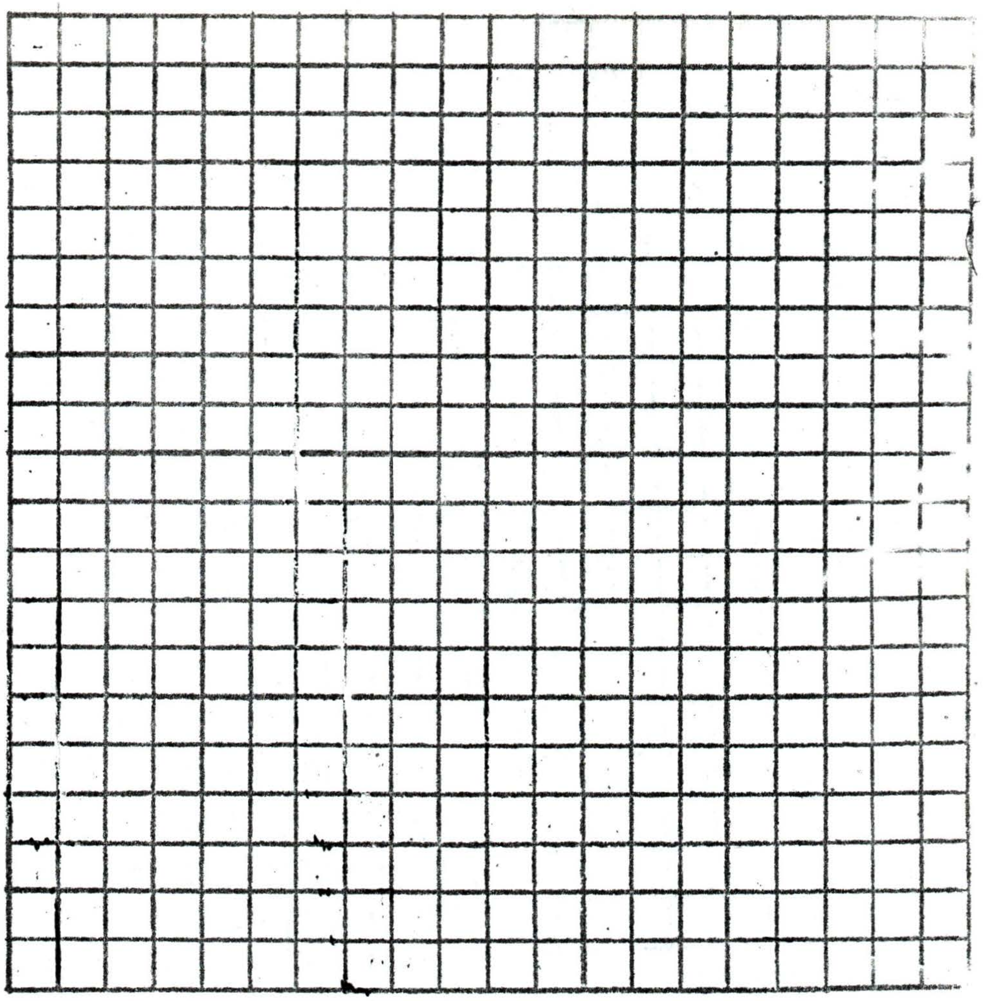
On the third plane

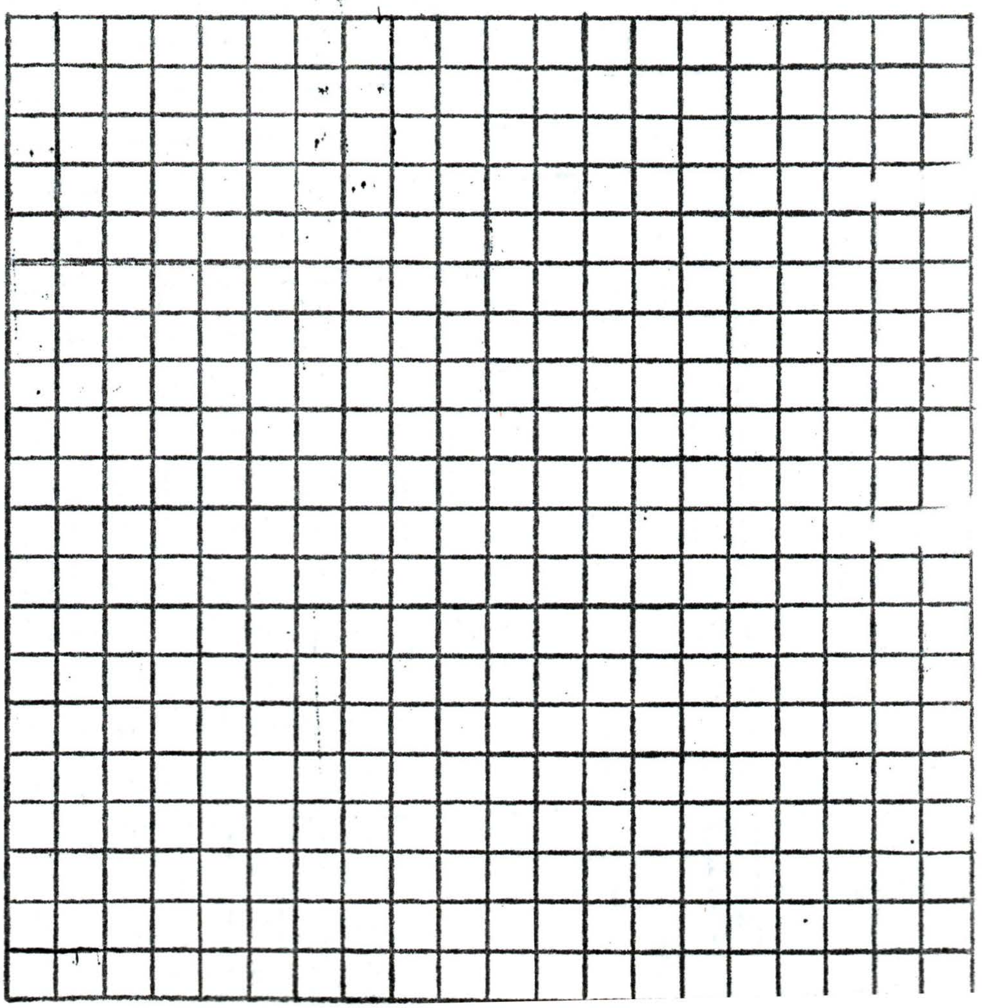
1. On a suitably labell[ed] rectangular coordina[te] system, plot the graphs of the follow[ing] pair of Linear Equations and decide on the basis of the graphs what kind of system it is.
2. Support your decisio[n] with algebraic logic.
3. Put a circle around the x - intercept of the first equation a[nd] estimate its coordinates.
4. Put a box around the y - intercept of the second equation and estimate its coordinates.

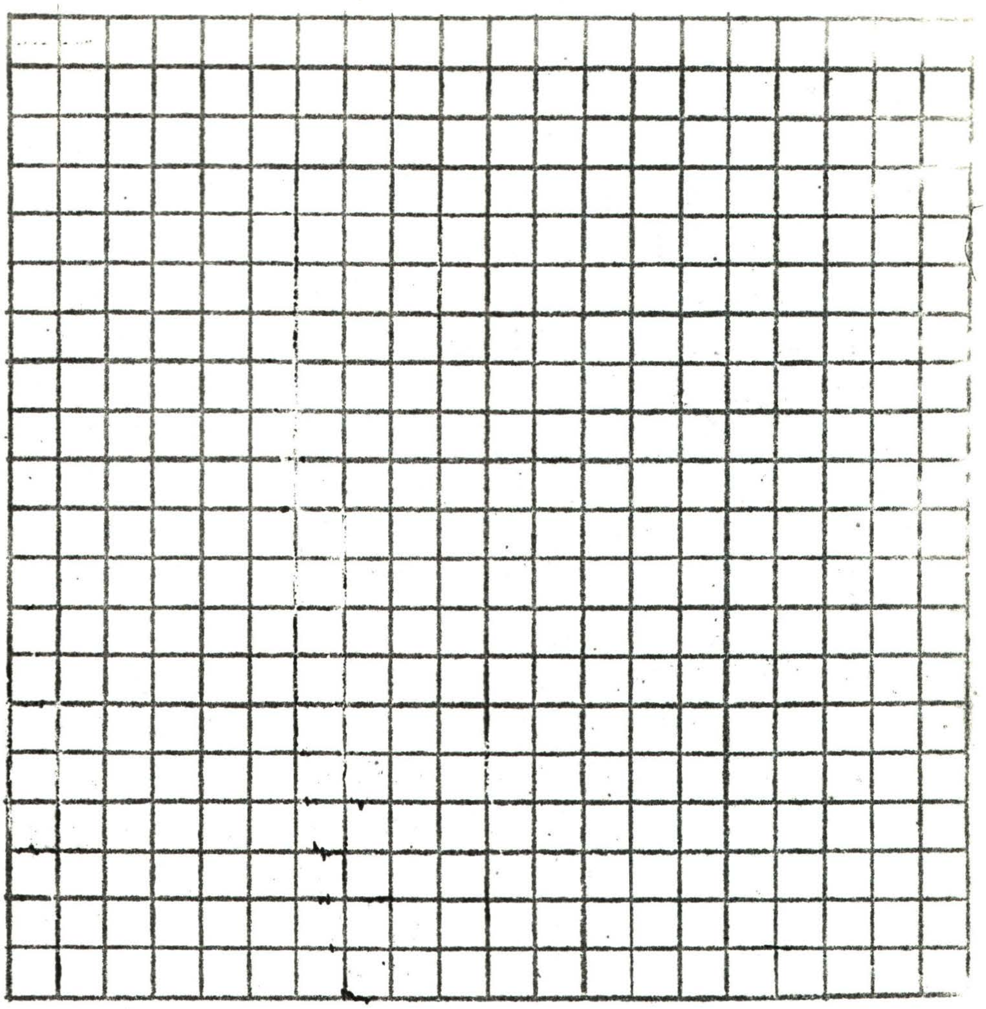
i) $4y + 3x = 7$

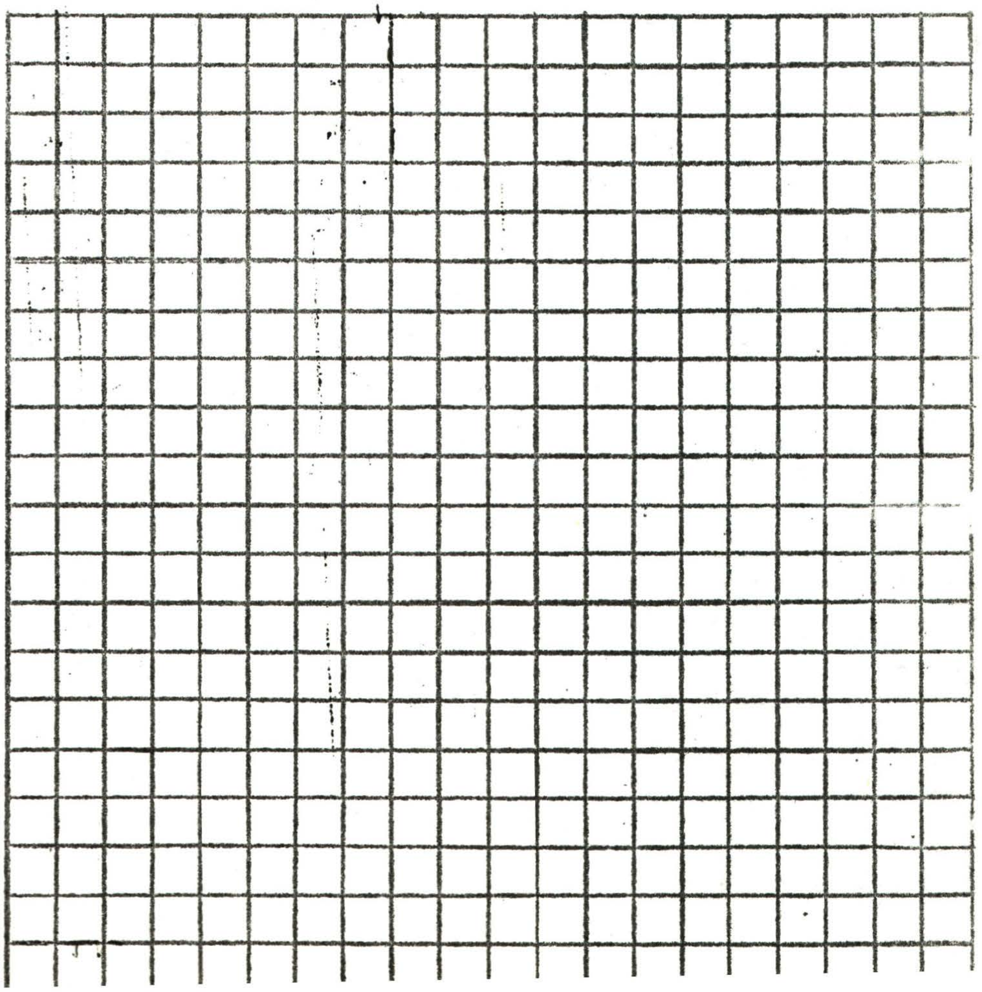
ii) $1\frac{1}{2}x + 2y = 17$

SHOW WORK (12 marks)









SCORE	M	NM

OBJECTIVE MASTERY TEST

Mathematics 9 - O.B.J.S

Div.__________ Date__________

UNIT 8 - OBJECTIVE 1- TEST 1

Student No.__________

STUDENT NAME__________ TEACHER__________

YOUR LAST UNIT - THINK CLEARLY - GOOD LUCK !

A) ANSWER THE FOLLOWING:

1) In the term a^m , what is the base? __________

what is the exponent? __________

2) Use a rule for powers to rewrite:

(a) $a^x \times a^x$ __________

(b) $(a^r)^m$ __________

(c) $(\frac{a}{m})^c$ __________

(d) $\frac{x^a}{x^m}$ __________

(e) $(ab)^x$ __________

3) What is x^0, $\forall$ real x? __________

4) Write with a positive exponent? a^{-c} __________

$\frac{1}{m^{-a}}$ __________

5) Re-express so that no exponents appear, and each is in simplest form. Don't be afraid to show your work.

(a) $(-4)^2$ __________

(b) $(\frac{3}{5})^3$ __________

(c) $2(-5)^3$ __________

(d) $(-\frac{1}{4})^3 \ (-\frac{1}{3})^2$ __________

(e) $(-3)^{-3}(-3)$ __________

(f) $\frac{1}{25}\ (2 \times 5)^4$ __________

(g) $4^3 \times 4^{-5} \times 4^2$ __________

(h) $12^0 \times 2^6$ __________

OVER

(6) We want you to demonstrate your ability to use ~~the rules~~ for manipulating powers, so use the rules as much as possible to reduce each expression to its simplest form, with no negative exponents. SHOW YOUR USE OF RULES.

(2 MARKS EACH)

a) $a^4 \times a^3 \times a^8$ ____________________

b) $(3a)^4$ ____________________

c) $r\ r^2\ r^7$ ____________________

d) $(-6\ a^3)^2$ ____________________

e) $(4a^3s^{-4})^5$ ____________________

f) $(-2c^3d)^2(3c^2d^2)^3$ ____________________

g) $\frac{a^{14}}{a9}$ ____________________

h) $\frac{24\ a^6c^3}{6a^3c}$ ____________________

i) $\frac{3r^3m^7}{21r^5m^{-4}}$ ____________________

j) $\frac{-2r^{-2}s^{-1}}{4r^3}$ ____________________

k) $\frac{x^{-7}y^5}{x^{-9}y}$ ____________________

SCORE	M	NM

OBJECTIVE MASTERY TEST

Div._______ Mathematics 9 - O.B.J.S. Date ____________________

Unit 8 - OBJECTIVE 2 - Test 1 Student No.____________

STUDENT NAME______________________________________ TEACHER______________________

THINK - WORK CAREFULLY - YOUR LAST OBJECTIVE!

Answer the following miscellaneous questions concerning Roots and Radicals, Powers and Exponents. (MAKE AS MUCH USE OF THE RULES FOR RADICALS AND EXPONENTS AS POSSIBLE AND SHOW YOUR WORK.)

1. Simplify: $a^{\frac{1}{2}}a^{\frac{3}{2}}$ ____________________

2. Simplify: $\dfrac{m^{\frac{2}{3}}}{m^{\frac{1}{3}}}$ ____________________

3. Write with no exponent: $4^{-3}4^{-1}4^{4}$ ____________________

4. Write with no exponent: $\dfrac{7}{36^{-\frac{1}{2}}}$ ____________________

5. Write with no exponent: $\left(\dfrac{27}{125}\right)^{-\frac{1}{3}}$ ____________________

6. Simplify: $\sqrt{3^2}\ \sqrt{2^4}$ ____________________

7. Simplify: $\dfrac{\sqrt[5]{64}}{\sqrt[5]{2}}$ ____________________

8. Simplify: $\sqrt{8a^2}\ \sqrt{8a^7}$ ____________________

9. Simplify: $\dfrac{15\sqrt[3]{64}}{5\sqrt[3]{8}}$ ____________________

10. Simplify: $(125y^9)^{\frac{1}{3}}$ ____________________

11. Simplify and no negative exponents:

$$\frac{3^{-4}ab^{-3}c^{-4}}{3^{-6}a^{-1}c}$$

____

12. Simplify: $3\sqrt{4} + 5\sqrt{8}$

13. Simplify: $13\sqrt[3]{5} + 3\sqrt[3]{5}$ ____________________

14. Simplify: $\sqrt[3]{\dfrac{-27}{a^6m^3}}$ ____________________

OVER

Math 9 continued

15. Simplify: $\left(\frac{a^4 b^{\frac{3}{4}}}{a^{\frac{5}{4}}}\right)^4$ ________________

16. Simplify: $\frac{55}{25^{\frac{1}{2}}}$ ________________

17. Use a rule to re-express: $\sqrt[a]{b}\ \sqrt[a]{c}$ ________________

18. Use a rule to re-express: $\sqrt[r]{\frac{a}{c}}$ ________________

19. Re-express as a power: $\sqrt[a]{m^x}$ ________________

20. Simplify: $\left(\sqrt[b]{x}\right)^b$ ________________

21. Simplify: $\sqrt{96} + \sqrt{48}$ ________________

22. Use the distributive principle and simplify:
$(\sqrt{2} - \sqrt{3})(\sqrt{2} + \sqrt{3})$ ________________

23. What is the principal square root of 625? ________________

2 . In $\sqrt[5]{243}$ what is

(a) the radicand? a)________________

(b) the exponent? b)________________

UNIT TEST

SCORE	GRADE

Div._______ Mathematics 9 - OBJS Date____________________

UNIT 8 Student No._______________

STUDENT NAME____________________________________ TEACHER__________________________

Congratulations - Your Last Unit Test in Math 9!

1. Complete the following general rules for manipulation of powers and roots:

1) $a^r \times a^m \times a^c =$ ____________________ 2) $(\frac{a}{x})^m =$ ____________________

3) $\sqrt[r]{x} \cdot \sqrt[r]{y} =$ ____________________ 4) $(a^m b^r)^a =$ ____________________

5) $\dfrac{\sqrt[a]{m}}{\sqrt[a]{p}} =$ ____________________ 6) $\sqrt[x]{a^m} =$ ____________________

7) a = ____________________

SIMPLIFY, showing your work if you wish part marks.

1. $3\sqrt{11} - 6\sqrt{11}$

2. $\sqrt[3]{24} - \sqrt[3]{16}$

3) $\sqrt[5]{-32}$

4. $(32)(2^{-5})$

5. $16^{\frac{1}{2}} \times 4^{-\frac{1}{2}}$

6. $(125a^6)^{1/3}$

7. $(16y^{-4})^{-\frac{1}{2}}$

8. $(-3^2)^{-2}$

9. $\sqrt[4]{81ab^4c^8}$

10. $\dfrac{a^{\frac{1}{2}}}{a^{1/3}}$

11. $(81x^3y^4)^{\frac{1}{2}}$

12. $8^{-3} \times 8^{-1} \times 8^4$

13. $3\sqrt{5} \cdot 3\sqrt{32}$

14. $\sqrt[3]{2a} - \sqrt[3]{4a^2}$

15. $\sqrt[3]{-27m^9}$

16. $\dfrac{\sqrt{98}}{7\sqrt{2}}$

17. $\sqrt[5]{64} - 2^{-1/5}$

18. $\sqrt{9} \cdot \sqrt{12}$

19. $\dfrac{84^{\frac{1}{2}}}{16^{1/3}}$

20. $(5x)^{\frac{1}{2}} \cdot (5x^2)^{\frac{1}{2}}$

OVER

C. Answer "TRUE" or "FALSE".

1. $(2^2)^2 = 8$ ________

2. $\sqrt{45} = 3\sqrt{15}$ ________

3. $(4a^2b)^3 = 12a^6b^3$ ________

4. $\frac{2}{a^{-3}} = 2a^3$ ________

5. $\frac{x^{-3}}{x^2} = \frac{1}{\sqrt[5]{x}}$ ________

6. $\sqrt[3]{-8} = 2$ ________

7. $\sqrt[3]{m^2} = m^{3/2}$ ________

8. $\frac{\sqrt[3]{39}}{\sqrt[3]{3}} = 13^{1/3}$ ________

9. $\frac{5}{\sqrt{5}} = \frac{5\sqrt{5}}{5} = \sqrt{5}$ ________

10. $16\ m^3r^5 \div 2mr^2 = 8m^3r^{5/2}$ ________

11. $a^{3/4} \cdot a^{-\frac{1}{2}} = \sqrt[4]{a}$ ________

12. $(3m^2)^3 = 27\ m^6$ ________

D. Write equivalent expressions(showing important workings.)

a) In Radical form.

1.) $(3ab)^{5/3}$ ________

2.) $\left(\frac{m^2}{n^2}\right)^{\frac{1}{4}}$ ________

b) Containing Fractional exponents.

1. $\sqrt[5]{r^2s^{10}}$ ________

2. $\sqrt[3]{2x^5}$ ________

c.) Containing only Positive exponents.

1. $3a^3(a^{-2/3})$ ________

2. $\frac{3b^3c^{-2}}{12b^7c^{-5}}$ ________

VITA

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University of British Columbia	1960	to	1961
		to	

Degrees, Diplomas, Etc., Awarded, with Dates and Names of Institutions:

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Honours and Awards:

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