SIMON FRASER UNIVERSITY

MEMORANDUM

S.76-189

To: SENATE

FOR INFORMATION

Subject: ALGEBRA 11 AND 12: INFORMATION Re MATH CHANGES

From: SENATE UNDERGRADUATE ADMISSIONS BOARD

Date: 15TH DECEMBER, 1976

The Senate Undergraduate Admissions Board wishes to inform Senate of the Department of Education revisions to the Mathematics Curriculum, such that Algebra 11 and Algebra 12 will replace Mathematics 11 and Mathematics 12.

As a result of this revision, and the fact that we currently require Math 11 for admission purposes, it will be necessary to accept either Algebra 11 OR Math 11, until the new curriculum is fully implemented by all secondary schools.

Appendix B contains extracts from the Department of Education Mathematics Curriculum Guide (1976).

Lorita Wilson

Attach.
ACM:bc

Registrar's Note: The intent is to accept either of Math 11 or Alg 11, and to accept either of Math 12 or Alg 12 as a recognized "12 level" subject for ad mission purposes.

APPENDIX B

I. GENERAL STATEMENT

Mathematics as one of the "three R's" in the traditional curriculum consisted largely of computational arithmetic. This aspect of mathematics has played, and will continue to play, an important part in the education of our children. During the late 1950's and through the 1960's reform was largely in the hands of pure mathematicians. Many gains have resulted from such reform. In a highly rigorous approach, however, there has developed a lack of relevance, for a large segment of the school population. Mathematics programmes are now being prepared which focus upon developing in youngsters a freedom to explore, to look at new problems in the light of past experience and knowledge, and to reach out for novel approaches or solutions.

Before any formal mathematics can be understood there must be a wealth of manipulative experiences through which concepts and relations are understood at an intuitive level. Mathematics as a discipline, as a formal structure, must be built upon a sound foundation of concrete experiences. Formal study of mathematics as a structured discipline is the function of post-elementary education.

The intuitive understanding of mathematical concepts and relations is not sufficient. A child must be able to perform, that is, "do mathematics". At the elementary level this means that, although mathematics is more than facts, computation and processes, it is certainly nothing less.

A mathematics programme must teach children to solve problems. Problems start in the physical world, are translated into mathematical language for ease of handling, and then brought back into the physical world where the solutions are given meaning.

Wherever possible, as new topics, concepts or processes are introduced, the student should be presented with real problems from and in the concrete world.

Fundamental to the programme is the dealing with these problems through the following sequence of activities:

a) manipulative, exploratory activities with real objects;

b) simulative activities with non-representational 3-D materials;

c) simulative activities with pictorial representational materials;

d) simulative activities with pictorial non-representational materials;

e) graphical representation or model building activities;

f) construction of a mathematical model;

g) application of appropriate algorithms or mathematical processes;

h) development of a generalized mathematical model for future use.

As pupils progress through the programme and as topics, concepts and processes reach the upper levels of development, the time devoted to concrete and semi-concrete activities decreases in relation to the time spent in more abstract activities.

It may not be necessary or possible in every case to begin at the concrete level. If the material is of such a nature that first hand experience is impractical or if previous experiences have developed the underlying concepts, then initial activities may be at the semi-concrete or abstract level.

On occasion insight into the structure of the mathematics of the situation may allow certain pupils to go quickly through or skip altogether some steps in the process.

SEQUENCE OF ACTIVITIES

The following is a simple illustration of a sequence of activities.

CONCRETE

ABSTRACT

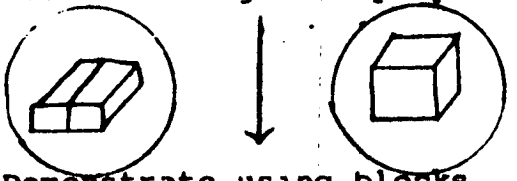
Two people are in a room. One person comes into the room. How many people are now in the room?

↓

A problem is perceived.

↓

Act out using real people.

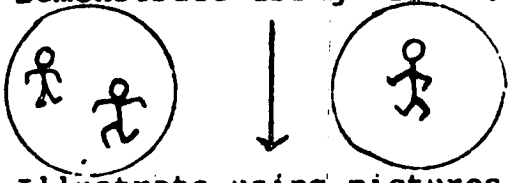


↓

Real objects are manipulated to arrive at solutions.

↓

Demonstrate using blocks.

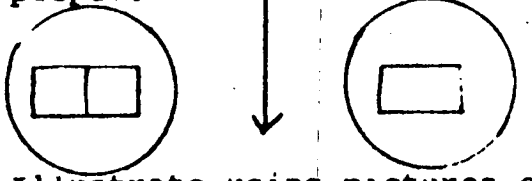


↓

Nonreprentational concrete objects are manipulated to arrive at solutions.

↓

Illustrate using pictures of people.



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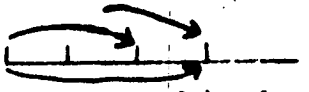
Pictures of real objects are used in arriving at solutions.

↓

Illustrate using pictures of blocks.



↓

Drawings of nonrepresentational objects are used in arriving at solutions.

↓

Construct a graphical model.

↓

A graphical model is constructed.

↓

$2 + 1 = n$

Write the number sentence.

↓

A mathematical model is constructed to represent the structure of the relationship.

↓

$$\begin{array}{r} 2 \\ +1 \\ \hline 3 \end{array}$$

Solve by addition.

↓

Algorithms and mathematical processes are applied.

↓

$a + b = \square$

$a + b = n$

Write a generalized statement.

↓

A generalized mathematical model is developed for future use.

II. NOTES RE IMPLEMENTATION (Prescribed and Permissive Courses)

1. Prescribed Courses: As of September, 1976, courses outlined in this document from years 1 - 8 inclusive are prescribed courses.

2. Permissive Courses:

Junior Secondary School Mathematics

To enable a smooth transition to the new courses at the Senior Secondary School level, the Department would encourage schools which have not yet implemented the revised Mathematics 9 and 10 courses to do so in the 1976-77 school year.

Senior Secondary School Mathematics

At the present time (April, 1976) the proposed new courses at the Senior Secondary School level have been finalized, except for selection of a supporting text for Computing Science 11.

For the 1976-77 school year, schools will have the option of introducing the new courses Algebra 11, (and Algebra 12 in the second semester), Consumer Mathematics 11, and Trades Mathematics 11 or continuing to offer the prescribed courses Mathematics 11, Mathematics 12, and General Mathematics 11.

The additional mathematics courses outlined for the 11, 12 level are planned for implementation when textbook references are available in the near future. These include Computing Science 11, Probability and Statistics 12 (Finite Mathematics), and Geometry 12.

* See Instructional Services Circular (23.2.76 - 843) for additional information regarding implementation of the Senior Secondary Mathematics programme.

3. Course Outlines, Years 9-10, 11-12: In each of the levels indicated preliminary drafts of the Course Outlin were included in the Curriculum Guide for one year prior to preparing the final draft. Many comments and constru tive criticisms were received from individual teachers and/or groups of teachers from throughout the Province. These comments and criticisms were given careful consideration in the preparation of the fianl drafts.

4. Prescribed Materials: Materials prescribed to support mathematic courses are listed in the Prescribed Textbook List, published annually by the Curriculum Development Branch and available from the Publication Services Branch.

The revised programme recognizes that there is a body of mathematical knowledge and skills that must be provided for all pupils. In addition, provision must be made for pupils with specific requirements. As a consequence, a two part mathematics programme has been planned. The first part, essentially the same for all pupils, includes the elementary programme and extends into the secondary. The second part consists of elective courses selected by the pupil because of

(a) post-secondary goals
(b) secondary school programme requirements
and (c) pupil interest and ability

Provision has also been made through a multiple-text authorization for alternative sub-programmes for groups of pupils. These alternatives allow for differences in approach, depth and rate of learning. The extent to which the inherent benefits are achieved, however, depends in large measure on the resourcefulness of the teacher and the organization of the school.

It cannot be too strongly emphasized that no single text should be regarded as the sole instrument for meeting the objectives of the programme as outlined in this curriculum guide.

If the programme is to be relevant to present needs of pupils while also providing the foundations for future learning, then mathematics should be integrated with the other subjects. A meaningful integration will go far towards achieving a deep and continuing interest in mathematics and an appreciation for its power and usefulness. The nature and the means of integration will be determined at the school level by the specific programmes being offered to the pupils.

III. STATEMENT OF METRICATION

The Federal Government has committed Canada to the change to the Metric System. This change will take place over a ten year period and is to be completed by 1981. Commencing in September, 1973, all primary pupils began to use the metric system as a standard of measurement. It has been agreed by the Council of Ministers, Canada, that all instruction in elementary and secondary schools be predominently metric by 1978. Mathematics for years K-12 will be completely metric by that date.

It is the intent of the Metric Commission to establish the practice of using spaces rather than commas in the writing of larger numbers (e.g. 746 321 988 rather than 746, 321, 988). However, you will find both forms used in present editions of the prescribed texts. Spaces are not used in computation.

IV. OBJECTIVES

A. General

Stated on the pages following are the cognitive objectives generally thought desirable at this time. The specific objectives listed for each year are meant to be more than merely illustrative but are not exhaustive. Teachers are encouraged to formulate specific objectives for their own situation consistent with those in this guide.

No mention is made here of objectives in the affective domain, not because they are less important, but because there is no consensus among educators of what they should be or how they might be achieved. Again, teachers are encouraged to develop their own specific objectives in this area.

In identifying the major objectives of a mathematics programme, one must consider that the broad goals of mathematics are derived from the needs of individuals and of society. The practical usefulness of mathematics in our scientific and technological society is increasingly apparent.

With few exceptions, the content of the revised courses in years 1-10 does not differ significantly from the content of previous courses. The emphasis in years 1-10 remains on the operations with natural, whole and rational numbers and the study of their properties. One major exception is an expanded study of geometry. The treatment is largely intuitive though somewhat more formal at the secondary level. Two other exceptions are an introduction to the concept of function and the employment of flow charting.

The courses are organized around 9 "themes" or strands:

I	sets and set operation
II	number and number operations
III	geometry
IV	measurement
V	problem solving
VI	graphs and functions
VII	applications of mathematics
VIII	logical thinking
IX	probability and statistics

The development of a course, however, does not follow a single strand exclusively but must draw on several strands at once.