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BASIC MATHEMATICAL SKILLS AND CONCEPTS FOR EFFECTIVE PARTICIPATION IN AUSTRALIAN SOCIETY

AUSTRALIAN MATHEMATICS EDUCATION PROJECT*

Given the nature and development of Australian society, it is important that we reassess the place of mathematics in the school curriculum, and particularly its place as one of the basic shared student experiences.

It is in the national interest that school programs promote adequate levels of competence within good mathematics programs, and that as many people as possible achieve at those levels. It is also in the interests of Australia and its people that individuals reach as high a level as possible in the subject. Mathematics is important chiefly because it can help in understanding and interpreting many aspects of the world. It can help a person make a significant contribution to a technological society.

So when we address basic skills in mathematics, it is important that we address them within the context of a total mathematics program. Basic skills involve more than arithmetic skills, and understanding of mathematical concepts and processes is more important than knowledge of isolated facts and skills. The following should not be read or interpreted as a list of differentiated topics but as a list of different facets from which the mathematics curriculum may be examined.

This is the first national statement of basic mathematical skills and concepts for effective participation in Australian society. It has been prepared for and endorsed by the Standing Committee of the Australian Mathematics Education Program and is offered as a statement of informed professional opinion.

As computer literacy does not pertain solely to mathematics but encompasses the whole school curriculum, it has not been included in this document.

* A.M.E.P. is a Curriculum Development Centre project based in the University of Queensland.

1. NUMBER SKILLS AND COMPUTATIONAL SKILLS

Because communication of information is frequently in quantitative form, to be effective citizens, students need basic skills in number and computation, including the capacity to use a calculator appropriately.

Students should gain facility with and understanding of our base ten numeration system.

Students should gain knowledge of single-digit number facts to the point of automatic recall for the four operations of addition, subtraction, multiplication and division. They should have the ability to perform any of the four operations with both whole numbers and decimals using at least one of either a mental, written, or calculator algorithm. They should develop confidence to select and apply an appropriate operation to solve a particular problem.

Fractions are widely used to describe parts of discrete or continuous quantities and as numbers, and students need the facility to use simple fractions in each of these situations. Understanding the concept of a fraction involves the generation of equivalent fractions and the ordering of fractions. The ability to add and subtract pairs of simple fractions is also important.

The concepts of ratio and proportion underlie many of the applications of mathematics in society. Students should be familiar with these concepts and be able to recognise and apply them in everyday situations. In particular, percentage is a concept students need to recognise and apply in a consumer world.

All the skills discussed above must be used in context in related areas of the mathematics curriculum and not taught as particular strands or topics. Computational skills must be applied and practised in real situations so that students are able to select and carry out the appropriate mathematical operations. This does not preclude maintenance through formal practice situations.

2. GEOMETRY

Students need geometric concepts and terminology to function effectively in a three-dimensional world. They should be able to interpret two-dimensional representations of three-dimensional shapes and be able to visualise three-dimensional objects; to name common shapes and three-dimensional objects and know their properties; to interpret simple maps, plans and models and be able to construct and draw models; to identify similarities and differences among

objects; and to apply ratio and proportion to maps and scaling of geometric figures.

3. MEASUREMENT

Students should acquire some simple techniques for measuring length, weight, time, temperature, angle, area and volume. The speed, distance, time relationship should be understood. They should be able to measure in appropriate S.I. units, and also be sufficiently familiar with commonly-used units so that they can make reasonably accurate estimates of physical quantities.

Measurement involves a choice about precision. Students should be able to decide how precise a measurement needs to be and either estimate or use an appropriate instrument.

4. ESTIMATION AND APPROXIMATION

Often in everyday mathematical situations it is not possible or desirable to make precise measurements, nor is it necessary to calculate accurately. Students should develop some simple techniques for both estimating quantities and approximating calculations.

5. ALERTNESS TO THE REASONABLENESS OF RESULTS

Due to arithmetic errors, or to inappropriate interpretations, results of mathematical work are sometimes wrong. Students should learn to inspect all results and to check for reasonableness in terms of the original problem. With the increase in the use of calculating devices in our society, this skill is essential.

6. READING, INTERPRETING AND CONSTRUCTING TABLES AND GRAPHS

It is important that students be able to read, interpret and construct simple tables and graphs. They should acquire the notion of a graph as a picture of a relationship, and be able to condense numerical information into more manageable or meaningful terms by setting up simple tables and graphs, or by calculating the average (arithmetic mean).

7. USING MATHEMATICS TO PREDICT

Students should understand how the likelihood of chance events occurring is measured in real life. They should learn how elementary notions of probability are used to determine the likelihood of future events occurring, and be able to identify situations where immediate past experience does not affect the likelihood of future events. They

should be familiar with how mathematics is used to make decisions where a number of possible outcomes is likely, e.g. lotteries, weather forecasting, insurance, superannuation, census. Students should be able to extrapolate and interpolate from data by making predictions based on trends.

8. PROBLEM SOLVING

Problem solving is the process of applying previously acquired knowledge in new and unfamiliar situations. Being able to use mathematics to solve problems is a major reason for studying mathematics at school. Students should have adequate practice in developing a variety of problem solving strategies so they have confidence in their use.

9. APPLYING MATHEMATICS TO EVERYDAY SITUATIONS

The mathematics which students learn should rarely be divorced from everyday situations. Students should be confident in applying the mathematics they have learned and in the interpretation of their conclusions.

10. LANGUAGE

Students should be able to read and comprehend, write and speak mathematics. The basic skills of oracy and literacy are equally important in mathematics as in other areas of the curriculum. Students should be able to read, write and interpret basic mathematical symbols and prose with confidence. Words in mathematics that have specific meanings that are different from their meanings in everyday language often confuse students. Where words have mathematical and non-mathematical meanings, students should know both and be able to interpret the meaning correctly in the appropriate context.

Students should be familiar with the use of symbols to express mathematical relationships in simple formulae based on practical situations. They should have the ability to use a given formula to evaluate an unknown quantity, given values for the others.

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