SECTION ONE

INTRODUCTION

Purpose of the Teachers' Guide

The major aim of this Teachers' Guide is to provide users' of the OECS Primary Mathematics Curriculum with a clear understanding of how to achieve the intended outcomes of the curriculum. More specifically, the Guide is aimed at:

- Helping teachers and principals to effectively implement the emphases embedded in this curriculum.
- Providing a variety of suggested activities and materials to achieve the outcomes.
- Providing suggestions on how to organize the curriculum to suit students' needs.
- Clarifying terms that are used in the curriculum.
- Encouraging collaboration among teachers, principals, education officers, curriculum officers, teacher educators and other stakeholders regarding the teaching and learning of mathematics.

Given the focus on these aims, the Guide contains guidelines related to several areas of the teaching and learning process, namely, teaching methods, teaching/learning activities, resources and materials, and assessment methods. General suggestions as well as ideas related to specific outcomes have been included. It is important to note that the Guide is not a prescription. You should supplement the suggestions with appropriate ideas of your own.

Effective implementation of a curriculum depends to a large extent on the users' understanding of the principles that undergird the curriculum. The next section therefore outlines the principles on which the curriculum is based.

Major Features of the Curriculum

Conceptualisation of Mathematics

The OECS Primary School Mathematics Curriculum is based on two ways of describing mathematics:

- Perceptions of mathematics, and
- The components of mathematics.

Perceptions of mathematics often focus on its general characteristics. Mathematics has been perceived as:

- ***A way of thinking***: It provides us with ways of organising, analysing, and synthesising information
- ***A language***: It has a precise vocabulary consisting of clearly defined terms and symbols that enable communication in mathematics, other subjects, and real life situations.
- ***A study of patterns and relationships***: Mathematical ideas are interrelated.
- ***An art***: The interrelationships that exist among mathematical ideas provide it with a sense of order that is aesthetically pleasing.
- ***A tool***: Mathematics is used by people in their personal and professional lives.

These general perceptions are abstractions of the observable aspects of mathematics, that is, its specific components.

Mathematics consists of several facts, skills, concepts, and general procedures (Department of Science [DES], 1987; National Council of Teachers of Mathematics [NCTM], 1989, 2000). The outcomes of the OECS Primary Mathematics Curriculum, therefore, focus on the following components:

- ***Concepts*** – The generalisations that denote the essential characteristics of objects.
- ***Mathematical facts*** –The terms (such as names for numbers and shapes), notations/symbols, rules, formulae, and conventions that form the basis of mathematics.
- ***Skills*** – the cognitive and/or psychomotor abilities that enable students to perform operations such as calculating, estimating, measuring, representing, classifying, hypothesising, pattern searching, and communicating.

- ***General procedures*** – The processes that guide the choice of knowledge and skills that are to be used in a given mathematical situation (DES, 1987). Examples of these processes are problem solving and logical reasoning.
- ***Personal qualities*** –The desirable work habits and positive attitudes that assist the learning of mathematics.

Organisation of the Curriculum

Content Strands. The Curriculum is divided into five (5) main content strands.

- ***Statistics*** – The collection, representation, and interpretation of data.
- ***Geometry*** – The study of three-dimensional objects and plane shapes.
- ***Measurement*** - The assignment of a number to the attributes of objects. These attributes include length, mass, capacity, temperature, time, area, and perimeter.
- ***Number Concepts*** – The analysis of the characteristics of various types of numbers and the interrelationships that exist among numbers.
- ***Computation***— The use of the four basic operations with whole numbers, fractions, decimals, and calculations involving percentages and ratio.

For each grade level (Grade 5 - 6), the content has been organised into specific topics with their corresponding learning outcomes. These learning outcomes are based on the main components of mathematics.

Curricular Emphases. The learning outcomes incorporate an emphasis on four major mathematical processes. These are:

- ***Problem Solving***
  - Teaching/learning mathematics through problem solving
  - Teaching/learning about problem solving
  - Teaching/learning mathematics to solve problems

§ ***Logical Reasoning***

- Analysing the 'what', 'how', and 'why' of mathematics
- Generating and testing hypotheses
- Making inferences
- Validating and justifying conclusions

§ ***Communicating mathematical ideas***

- Reading about mathematics
- Writing about mathematics
- Representing mathematics
- Discussing mathematics

§ ***Making connections in mathematics***

- Relating mathematics to real life situations
- Relating mathematics to other subjects
- Building up relationships among mathematical topics, concepts, and procedures.

These emphases are to be developed through teaching/learning strategies that focus on active engagement of students in the learning process. The curriculum also emphasises the use of a variety of assessment methods such as:

§ ***Journal writing***: Assessment of students through periodic review of their journal entries related to their learning of, and feelings about, mathematics.

§ ***Observation***: The process of looking at, listening to, and recording the presence or absence of selected elements of a performance or product.

§ ***Oral Assessment***: The use of questioning, think alouds, conferences or interviews to collect information about students.

§ ***Peer assessment***: The involvement of students in reviewing and evaluating each other's work using a set of selected criteria.

§ ***Pencil and paper tests/exercises***: The use of a set of written items which instruct students to carry out specified tasks.

§ ***Portfolio Assessment***: The assessment of student achievement/progress that is based on a well-defined collection of student products and/or

performances over time.

- ***Practical Assessment***: The assessment of students' abilities and skills related to handling and using mathematical instruments or performing psychomotor tasks.
- ***Projects and Investigations***: The assessment of students' achievement through requiring them to complete tasks that involve the use of several mathematical ideas.
- ***Student self-assessment***: The involvement of students in making decisions about their own achievement/progress based on evidence and reflection.

To summarise, the outcomes for each content strand are related to the basic components of mathematics and embody processes associated with the four major curricular emphases. The suggested teaching/learning strategies and assessment strategies also support the focus on the four curricular emphases.

Each of the preceding content strands and emphases will be discussed in more detail in subsequent sections of the Teachers' Guide.

Guidelines for Using the Curriculum and Teachers' Guide

Although the content of the curriculum has been organised sequentially into five main content strands, it does not necessarily mean that it should be taught in that order. The object is not to complete one content strand before moving on to the next. Rather, you should use a combination of the spiral and network approaches to organising content and outcomes.

With the spiral approach, each content strand would be touched on frequently and the content would be taken a stage further with each revisit. The network approach involves a movement among the content strands, but there is no set pattern for this movement. The movement is influenced by various factors, for example, the students' characteristics and the relationships that exist among mathematical topics. With both approaches, each revisit to a content strand would allow students to review and

consolidate work that was previously covered, further develop associated concepts, skills, or procedures, and learn new content.

The use of these approaches requires that you have a basis for selecting and organising outcomes for teaching purposes. In planning for a term, unit, or lesson you could use the following steps.

Selecting and organising outcomes for teaching

1. Select related learning outcomes from various content strands.
2. Arrange these outcomes in an appropriate sequence. For example, the outcomes could be sequenced on the basis of the following criteria:
   - § The relationships that exist among the outcomes. Prerequisites for a given topic should be placed before the topic in the sequence.
   - § The relationships that exist among activities associated with the outcomes.

     If the results of an activity related to an outcome can be used to initiate work related to another outcome, then that relationship could be used to arrange the outcomes in a logical order in the sequence.
3. You may need to move back and forth between 1 and 2, as necessary, to obtain a set of interrelated outcomes.

Figures 1, 2, 5 and 6 illustrate a selection of outcomes at the Grade 5 level that have been arranged according to relationships among the outcomes, while Figures 3 and 4 outline some activity-related arrangements that are based on outcomes at the Grade 6 level.

Figure 1. An example of a sequence of outcomes that is based on prerequisites

Number Concepts

Explain the concept of percent.
Represent a given percent using pictures/diagrams and symbols.
Explain the meaning of a given percent.

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Measurement

Explain the concepts of cost price, selling price, profit, loss, and discount.
Use the concepts of cost price, selling price, profit, loss, and discount in descriptions of situations involving buying and selling.

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Number Concepts
Describe and analyse situations in real life that involve percents.

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Computation
Multiply a proper fraction by a whole number.
Multiply a whole number by a proper fraction.

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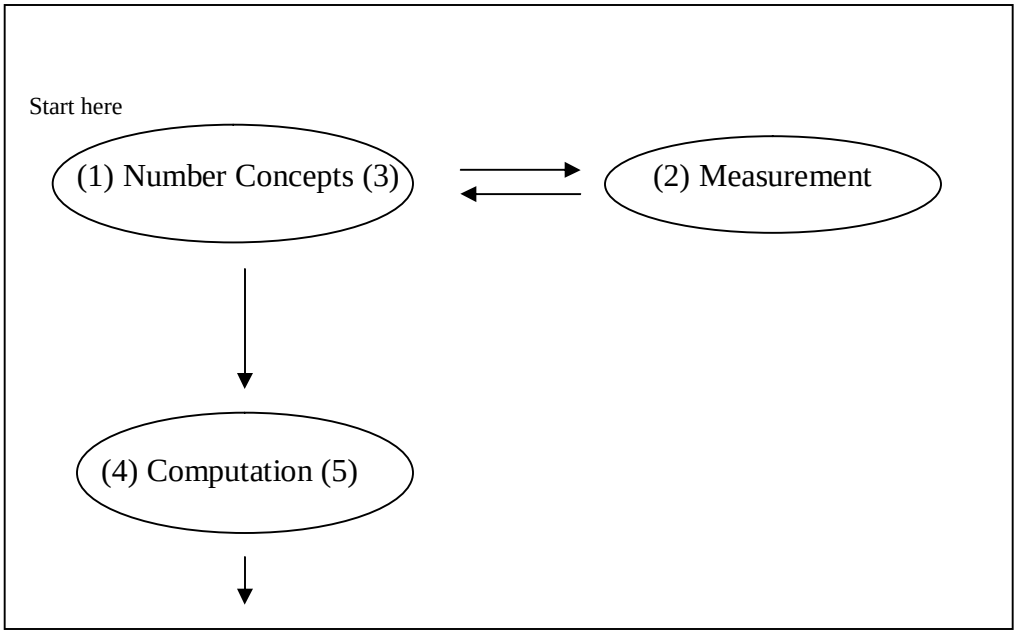
Computation
Calculate a percent of a number.
Calculate profit or loss as a percent of the cost price of an article.

This sequence may be summarised as follows.

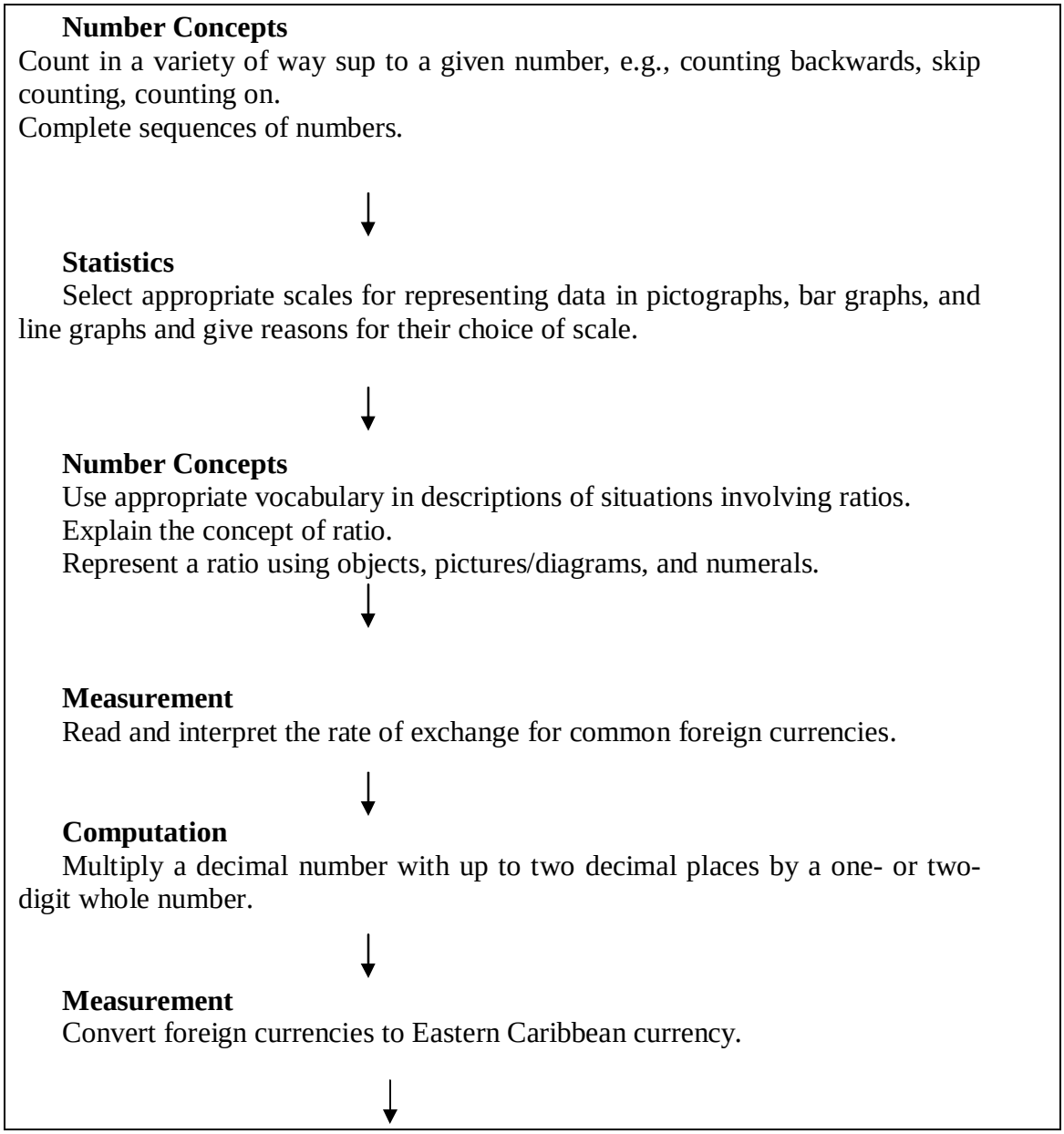
Figure 2. Summary of the prerequisite-based spiral



In Figure 1, the selection of outcomes within Number Concepts and Computation define a spiral in which the content of cost price, selling price and percents are revisited over time. In Figure 2, note how the arrows define a net-worked movement among the three content strands. The arrow after computation indicates that the spiral continues. The work on calculating profit or loss as a percent could lead to a focus on other related outcomes in any of the five content strands. For example, it could lead back into measurement and work on preparing up bills.

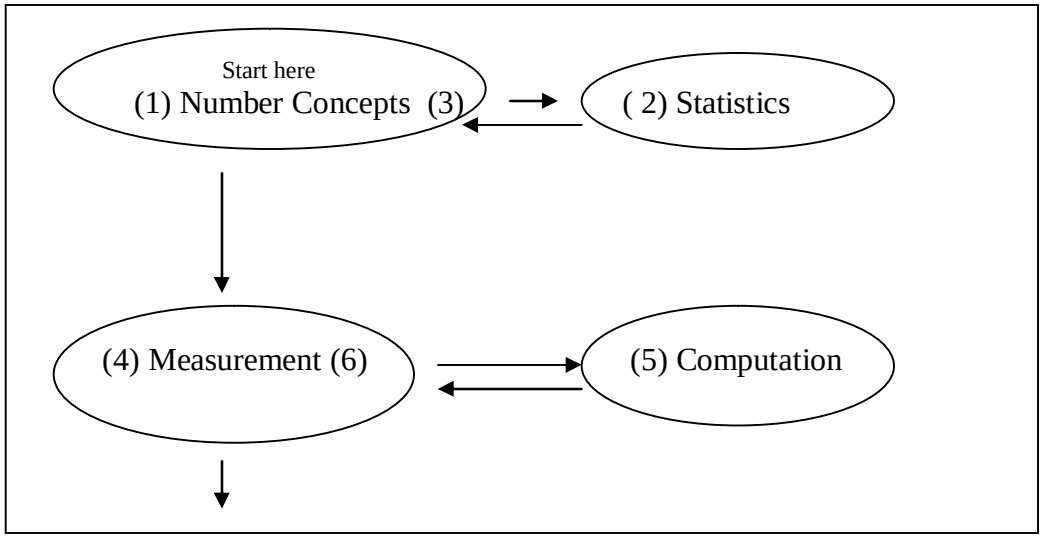
Figures 3 and 4 illustrate sequences of outcomes that are based on activities associated with the outcomes.

Figure 3. An example of a sequence of outcomes that is based on activities



This sequence may be summarised as follows.

Figure 4. Summary of the example of the activity-related sequence (Fig. 3)



Analysis of Figure 3 shows that the selected outcomes focus on activities involving ratios. The results of activities related to any one of the outcomes could be used to introduce the mathematical ideas associated with the subsequent outcome. Figure 4 illustrates a network that involves four of the five content strands.

Note that there is no one way of sequencing a set of outcomes. For example in Figure 1, the starting point could have been Number Concepts - the concept of percent- followed by computations involving proper fractions and whole numbers. Figures 5 and 6 provide details on this alternative organisation of the outcomes. The illustrations, therefore, are just examples of one way in which the selected outcomes could be sequenced.

Figure 5. An alternative to the prerequisite-related sequence of Figure 1

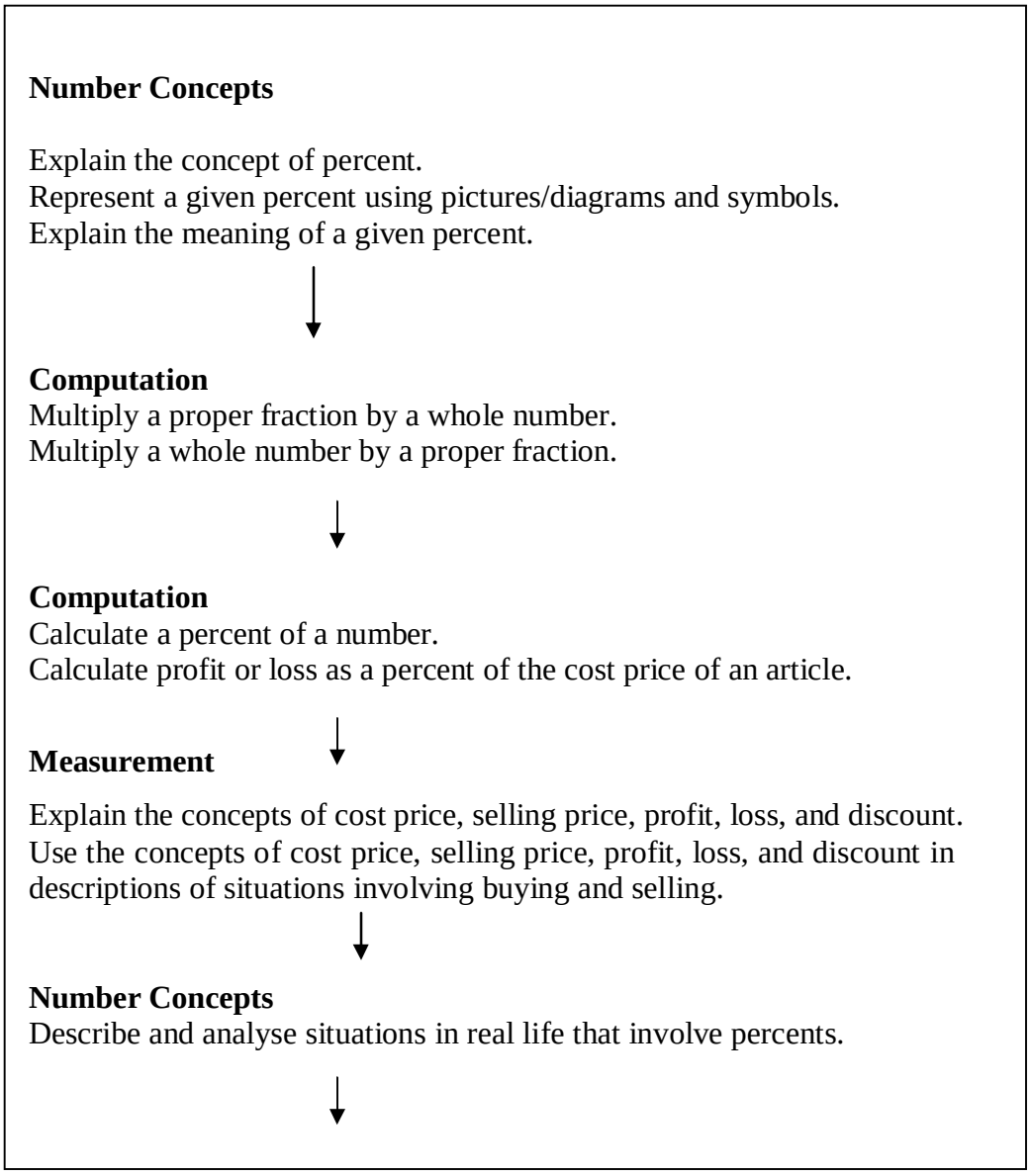
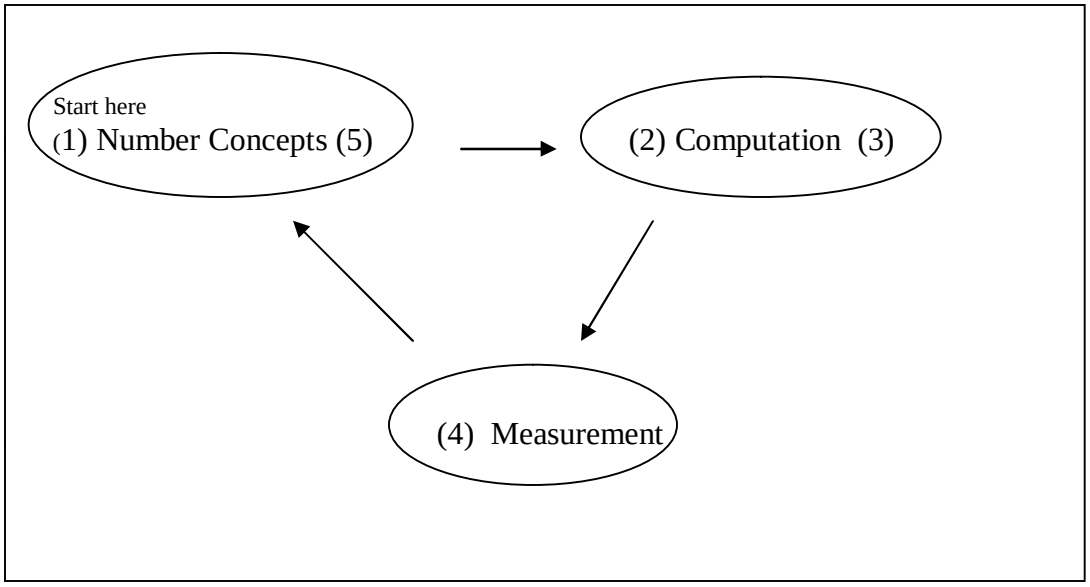


Figure 6 is a summary of this sequence.

Figure 6. Summary of alternative organisation of the selected Gr. 5 outcomes



Decisions about the selection and organisation of the outcomes should be guided by the characteristics of your students, e.g., their levels of readiness, their interests, their rates of progress and levels of achievement. The decisions may also be based on the mathematical needs that arise during the course of activities. For example, while students are engaging in problem solving activities related to measurement of mass, it may become apparent that they need to review the concept of place value. Given the flexibility of the spiral and network approaches, you may decide to provide appropriate teaching/learning experiences related to place value then return to the activities on measurement of mass. This means that you would need to constantly assess your students' learning using appropriate methods.

The Teachers' Guide contains several ideas about the teaching and learning of mathematics and activities related to the outcomes. These ideas and activities are by no means exhaustive. They are merely suggestions. *You should use your initiative to develop, use, document, and share your ideas and activities with other teachers. Thus you can build up a set of effective activities or strategies that you and your colleagues have used to enhance students' learning.*

The following is a summary of how you can use the curriculum and teachers' guide.

Guidelines for using the mathematics curriculum and Teachers' Guide

1. Familiarise yourself with the curriculum and Teachers' Guide by reading them thoroughly.

2. As you go through the curriculum, note those areas that you need to have clarified.

3. Check the relevant sections in the Teachers' Guide for such clarification.

4. Discuss the ideas and activities included in the curriculum and guide with other teachers at your school.

5. Use the curriculum and Teachers' Guide to plan and develop suitable experiences to teach your students mathematics.

Suggestions for Professional Development

As you interact with and implement the OECS Mathematics curriculum, you should use this experience as an opportunity for professional development. The teaching of mathematics can be both a challenging and rewarding process. By sharing your successes and discussing strategies that did not work well with at least another teacher, you can begin to build up a network of teachers who could help you deal with your challenges and improve your teaching of mathematics.

Here are some activities that you can engage in as part of your professional development. As you carry out the activities, share the results with a colleague. Ask for his/her opinion on what you did. Encourage other teachers to join you in the activities.

For Your Professional Development

Try out these activities. Start with those that interest you. Share the results with a colleague.

- Talk to students. Find out what they like and dislike about Mathematics. Use this information to plan positive experiences for your students.
- Read books, magazines, journals and government documents that contain information about mathematics or the teaching and learning of mathematics.
- Make teaching aids and collect resource material.
- Try out your teaching aids and resources. Keep a record of the aids and resources that enabled student learning. Also make notes on why you think the aids and resources were effective or ineffective.
- Reflect on your practice. Keep a journal.
- Attend mathematics workshops, whenever possible.
- Improve your knowledge of mathematics. Join a mathematics class, if possible.
- Start a mathematics club in your school.
- Form mathematics support groups in your educational district or community.
- Join your National Mathematics Teachers' Association, if one exists.
- Identify someone in your school who could be your mentor for mathematics. Find out if that person would be willing to be your mentor. If so, arrange to meet with this person periodically to discuss issues related to the teaching and learning of mathematics.
- Contact your Curriculum Officer for Mathematics and the mathematics tutors at your Teachers' College to discuss your ideas for teaching mathematics.

In implementing the OECS mathematics curriculum, you should keep in mind two important factors. This curriculum is ultimately aimed at developing mathematically

powerful students who engage in mathematical tasks with confidence. *Your role is to engage in those tasks with your students as well as guide and encourage them.* Secondly, you are part of a network of teachers who are engaged in the same endeavours. *You can draw support from this group of teachers through the OERU's local counterpart in your territory or the curriculum officer at the OERU's main office.*

The Mathematically powerful child

The mathematically powerful child

is

a critical thinker and problem solver.

He/ she readily pursues solutions to a variety of problems.

He/she understands and can confidently use

mathematical concepts and principles

across disciplines and in everyday life.

(OERU, 1999)