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ABSTRACT

This information sheet describes Numeracy and Mathematics, one of four streams or subject areas offered in the Certificates in General Education for Adults (CGEA) in Australia. The learning outcomes are organized into four different categories or domains according to different purposes and functions of using mathematics: numeracy for practical purposes, for interpreting society, for personal organization, and for knowledge. In most cases, these functions or purposes (domains) are divided into more than one learning outcome at each level. A diagram illustrates the learning outcomes of the stream and direct and possible links among the four levels. The assessment criteria give the detailed criteria for satisfying the learning outcome. The assessment criteria are grouped under three categories: mathematical knowledge and techniques, mathematical language, and interpretation. Information is provided on reading the learning outcome details, including assessment criteria, performance range, conditions of assessment, and assessment tasks. (YLB)

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Numeracy and Mathematics Stream

The view of numeracy and mathematics embedded within the new Certificates in General Education for Adults (CGEA) is one that sees numeracy as making meaning of mathematics and sees mathematics as an important tool to be used efficiently and critically. Mathematical knowledge and skills need to be applied and used for a range of purposes and in a variety of contexts.

Purposes and functions of mathematics: the new learning outcomes

Presenting maths in relevant and meaningful contexts was vital to the emerging idea of numeracy as distinct from mathematics. So much so that the purpose and use of mathematics within meaningful contexts was made the focus of the new learning outcomes for this version of the CGEA. As well there was an effort to parallel the four domains of the Reading and Writing Stream of the CGEA: Self Expression, Practical Purposes, Public Debate and Knowledge. These approaches formed the basis to the rewriting and naming of the different learning outcomes of the Numeracy and Mathematics Stream of the CGEA.

Rather than the learning outcomes having the maths strands (number; space and shape; data; measurement; and algebra) as their focus, the purposes or functions to which the maths is put, are given prominence. The learning outcomes still ensure that the skills and knowledge of the maths strands are included but they are arranged under a different organisational structure.

The learning outcomes are organised into four different categories or, as they are called in the CGEA Reading and Writing stream, domains, according to different purposes and functions of using mathematics.

❑ Numeracy for Practical Purposes

Numeracy for Practical Purposes addresses mathematical aspects of the physical world to do with designing, making and measuring. It incorporates maths related to the appreciation and application of shape and measurement.

❑ Numeracy for Interpreting Society

Numeracy for Interpreting Society corresponds to the Reading and Writing domain of Public Debate. It relates to interpreting and reflecting on numerical, statistical and graphical information of relevance to self, work or community.

❑ Numeracy for Personal Organisation

Numeracy for Personal Organisation has as its focus the numeracy and mathematical requirements for personal organisational matters involving money, time and travel.

❑ Numeracy for Knowledge

Numeracy for Knowledge is introduced at level 3 and parallels the Reading and Writing domain of Knowledge. It deals with mathematical skills needed for further study in mathematics, or other subjects with mathematical underpinnings and/or assumptions. It is introduced in order to provide learners with knowledge about the conventions and techniques of formal study in mathematics.

In most cases these functions or purposes (the domains) are divided into more than one learning outcome at each level. (See diagram on next page.)

The four levels

❑ Level 1

The initial level of the CGEA in numeracy and mathematics aims to enable students to develop the confidence to perform simple and familiar numeracy tasks and to develop the ability to make sense of maths in their daily personal lives. The maths involved includes measurement, shape, numbers, and graphs that are part of the learners' normal routines to do with shopping, travelling, cooking, interpreting public information, telling the time etc.

At the end of the level learners will be able to perform mathematical tasks which involve a single mathematical step or process. Their communication about mathematical ideas would mainly be oral.

❑ Level 2

The next level not only looks at maths applied to tasks which are part of the learners' normal routine but also extends the maths of level 1 to applications outside their immediate personal environment such as the workplace and the community, whether first hand or portrayed by the media. The purpose is to enable students to develop everyday numeracy to make sense of their daily personal and public lives.

At exit level 2, learners would be able to attempt a series of operations or tasks with some confidence, be able to

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select the appropriate method or approach required, and would be able to communicate their ideas both verbally and in written form. They would be at ease with straightforward calculations either manually and/or using a calculator.

❑ Level 3

Level 3 aims to enable learners to explore mathematics beyond its familiar and everyday use to its application in wider, less personal contexts such as newspapers and other media reports, workplace documents and procedures, and specific projects at home or in the community. The mathematics covered is extended beyond that introduced at levels 1 and 2 and would include measurement, graphs and simple statistics, use of maps and directions and an introductory understanding of the use of formulae and problem solving strategies.

Learners are expected to have the capacity to interpret and analyse how mathematics is represented and used, and to recognise and use some of the conventions and symbolism of formal mathematics.

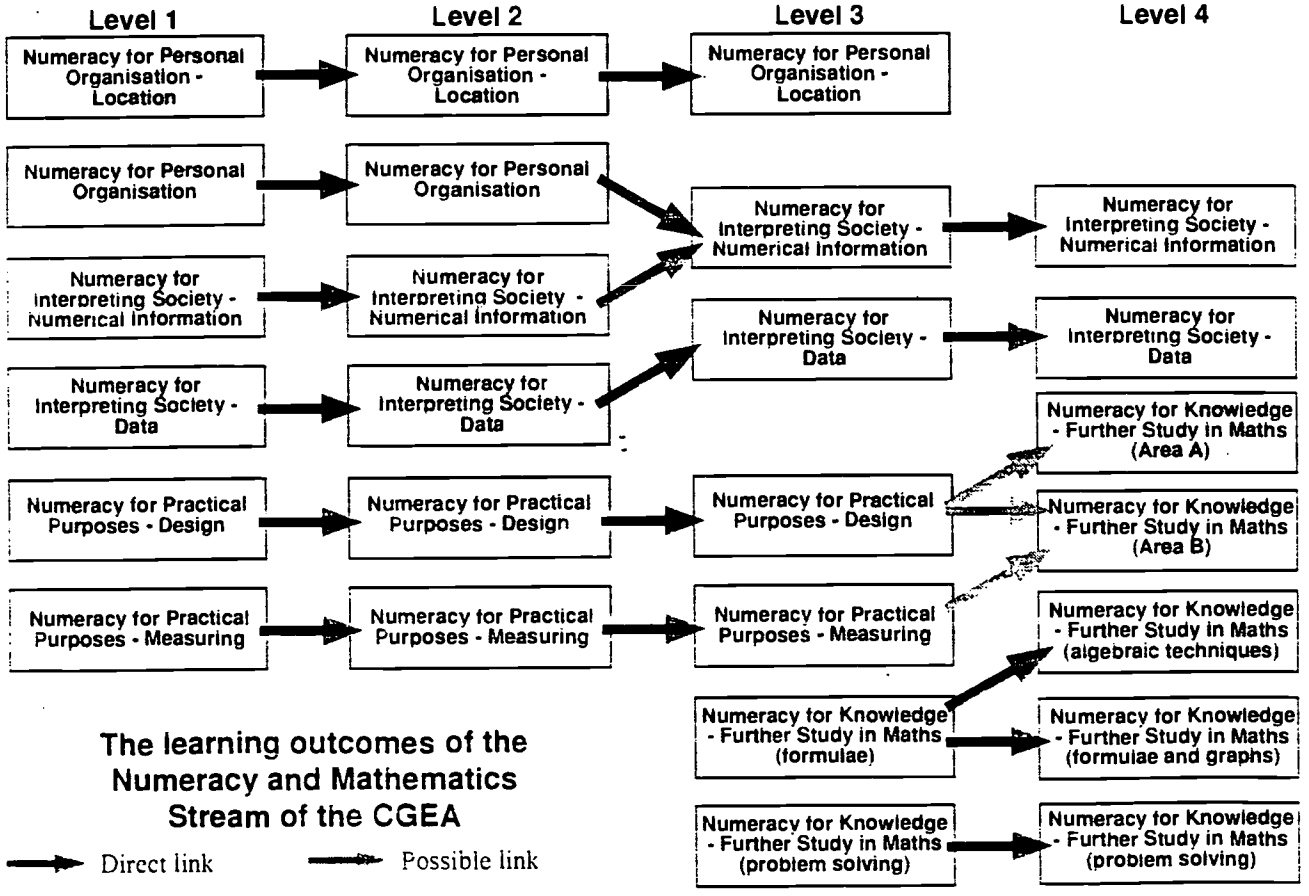
❑ Level 4

This level of the CGEA with its focus on learning mathematics for further study includes the early stages of knowledge and skills belonging to several formal areas of mathematics. The mathematics involved will include: numerical calculations and analysis of graphical data required for interpreting information about society; the use of formulae and their graphs, algebraic techniques and problem solving strategies; and familiarity with fundamental processes of at least two selected specialist mathematical areas.

At the end of this level learners will be able to confidently perform calculations using a variety of methods. They will be able to interpret and use the formal symbols and conventions of the chosen fields of mathematics in order to solve simple problems, and to communicate their problem solving processes in writing using a variety of informal and formal language.

Number of learning outcomes

At levels 1 and 2 it is only necessary to demonstrate competence in five of the six learning outcomes, and at levels 3 and 4 only six of the seven learning outcomes. However, it is expected that in most teaching contexts all the learning outcomes would be taught. These options have been included in order to offer both learners and teachers more flexibility in assessment and, in some specific contexts such as workplaces, one of the learning outcomes could be left out if it was not seen to be relevant.



The learning outcomes of the Numeracy and Mathematics Stream of the CGEA

→ Direct link ⇢ Possible link

For further information about the CGEA please contact Jan, Louise or Dave at the Adult Education Resource and Information Service, ARIS, Language Australia, Level 9, 300 Flinders St., Melbourne on (03) 9614 0255.

Numeracy for Knowledge - Further Study in Maths

Numeracy for Knowledge is a new learning outcome that is introduced at Level 3 and extended at Level 4. Exit level 3 is seen as the end of the general education focus of the CGEA and level 4 is seen as the stage where learners are initiated into formal areas of study - hence the title of the level 4 certificate - Further Study.

Therefore in the numeracy and mathematics stream, it is expected that learners at level 3 can recognise and use some of the conventions and symbolism of formal mathematics, while this is extended at level 4 to incorporate the early stages of knowledge and skills belonging to several formal areas of mathematics. This study of formal areas of mathematics becomes a major focus of the Numeracy and Mathematics stream at level 4.

At level 3 learners should have an introductory understanding of the use of formulae and problem solving strategies, whereas at level 4 this is strengthened to incorporate the use of formulae and their graphs, algebraic techniques and problem solving strategies; and familiarity with fundamental processes of at least two selected specialist mathematical areas. These two areas of study could be chosen from areas such as trigonometry, business maths, statistics, probability and formal geometry.

If, for example, learners were aiming to study drafting, then trigonometry and geometry may well be the two chosen areas. Statistics and probability would, for example, be possible choices for students wishing to enter University courses in Social Science disciplines. Whatever the on-going study, formulae and graphs, algebraic techniques and problem solving are seen as core areas.

The assessment criteria

The assessment criteria give the detailed criteria for satisfying the learning outcome. The learning outcome is achieved when the learner can demonstrate competence in all the assessment criteria.

However, in the Numeracy and Mathematics stream it is **not** expected that one assessment task or activity can or should cover all the assessment criteria.

The assessment criteria are grouped under three categories.

Mathematical knowledge and techniques

The specific mathematical skills, knowledge and techniques required for each learning outcome are specified within this category of the assessment criteria.

Mathematical language

The important aspect of communicating mathematically, and therefore understanding and developing mathematical language, is specified within the assessment criteria under this category.

Interpretation

Two important aspects of numeracy and mathematics are addressed under the **Interpretation** category of the assessment criteria. The first is checking results against initial estimates, and the second aspect relates to the issue of using mathematics critically. Learners are expected to relate the meaning of mathematical tasks or activities to personal experience, implications, beliefs, and social consequences.

Assessment

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical application over a period of time. It will require a combination of evidence collected mainly through teacher observations and some collection of written records of students' attempts at tasks. A folio of evidence could be collected through a combination of:

- records of teacher observations of students' activities, oral presentations, practical tasks, etc.
- samples of students' written work
- written reports of investigations or problem solving activities
- student self assessment sheets, reflections, or journal entries
- pictures, diagrams, models created by students.

It is not expected that all assessment criteria for an outcome can be assessed within one single task e.g. it would be unlikely that both the money and time aspects of the personal organisation learning outcome (1.3) could be demonstrated within one task. Therefore it might require a number of observations or tasks to completely assess any given outcome.

On the other hand, it will often be possible to assess aspects of more than one learning outcome within one assessment task e.g. a task which involves the practical application of measurement knowledge and skills (practical purposes - measurement) may also allow demonstration of ability to calculate with money (personal organisation).

Where assessment criteria include a list of items of mathematical knowledge (e.g. in 1.2 Numeracy for Practical Purposes - Measuring "uses appropriately common units of measurement such as centimetres, metres, kilograms, litres, degrees Celsius etc.") it is assumed that these will be included as part of the teaching/learning program. It is not envisaged that all the listed items be assessed individually - competence in one or two as part of an assessment activity being sufficient evidence that the criterion can be met.

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Reading the Learning Outcome details

Assessment criteria: These do not all have to be met in the one assessment task/activity but all have to be met before the student is said to have competence of the learning outcome. The assessment criteria are grouped according to three categories: Mathematical knowledge and techniques; Mathematical language; and Interpretation

Learning outcomes: Each module has six or seven learning outcomes - at Levels 1 and 2 students need to cover five out of the six, whilst at level 3 and 4 students need to cover six out of the seven

Conditions of assessment: These vary for the different levels. They describe the conditions under which assessment should take place and give some general guidelines regarding types of texts and materials to use; the degree of support available from teachers; the types of calculations - in the head, pen and paper and calculator - to be used; and the degree of use of oral and/or written language.

Learning outcome 2.5 Numeracy for Interpreting Society - Data

Can use and create everyday graphs and charts to represent and interpret public information which is of interest or relevance.

Assessment criteria

Not all assessment criteria need to be met in the one assessment task or activity

Mathematical Knowledge & Techniques

(a) interpret the key features, conventions and vocabulary of everyday graphs or charts, including the concept of scale
(b) use whole numbers, percentages, decimals and simple ratios found on charts and graphs
(c) collect, sort and record data in a table using simple techniques
(d) interpret and discuss meaning of text that incorporates graphs or charts
(e) mark scales and axes appropriately
(f) represent data in simple bar or line graphs

Language

(g) use the descriptive language of graphs and charts such as maximum, minimum, increasing, decreasing, going up, constant, changing, slope, etc.

Interpretation

(h) relate meaning/information of graph or chart in terms of personal implications and/or social consequences
(I) decide on the fairness or bias of the data in response to teacher prompting.

Performance range

- The types of graphs or charts could include simple pie charts, bar graphs, line graphs, pictograms, etc. of the kind found in newspapers, on household bills, information leaflets, etc.
- Scales created should count in 1's, 2's, 5's or 10's.
- Scales interpreted from public information not limited to the above simple scales - can interpret from more complex scales available on public information.

Conditions of assessment

The conditions of assessment apply to all learning outcomes in the module. They are:

- concrete, relevant, familiar contexts and materials where the maths content is predictable and easily accessible
- relies on context, prior knowledge and personal experience to derive meaning and check reasonableness
- performs where access to mentor/ teacher and advice/modelling is available and recourse to first/other language is acceptable.
- uses a blend of personal "in the head" methods, pen and paper and calculator procedures
- uses a combination of oral and written general, and some mathematical, language, symbols and abbreviations.

Performance range: The information in this section is **not prescriptive** nor comprehensive. This section has been used to illustrate possible contexts; appropriate instruments, materials and/or texts that are suitable for use at that level; and is also used to clarify and refine specific mathematical content and language appropriate to the level.

Assessment tasks: Examples of assessment tasks are given for each module. In most cases these tasks are integrated with learning outcomes from the other Streams.

For information & advice about the CGEA contact:
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LANGUAGE AUSTRALIA
The National Languages and Literacy Institute of Australia

Adult Education in the Community

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