National Unit Specification: General Information

SCOTTISH QUALIFICATIONS AUTHORITY

UNIT Numeracy (Higher)

NUMBER D01C 12

COURSE

SUMMARY
This unit seeks to develop a wide range of graphical skills in everyday and generalised contexts and apply in combination a wide range of numerical and statistical skills in generalised contexts.

OUTCOMES
1 Analyse and interpret graphical information.
2 Select and use appropriate graphical forms to communicate information.
3 Apply in combination a wide range of numerical and statistical skills.

RECOMMENDED ENTRY
While entry is at the discretion of the centre, candidates would normally be expected to have attained Numeracy (Intermediate 2).

CREDIT VALUE
1 Credit at Higher.

CORE SKILLS
Information on the automatic certification of core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

The attainment of this unit will lead to the automatic award of:

- Numeracy at Higher

Administrative Information

Superclass: RB

Publication date: December 1998

Source: Scottish Qualifications Authority

Version: 01

National unit specification: statement of standards

UNIT Numeracy (Higher)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1
Analyse and interpret graphical information.

Performance Criteria
a) Extract information accurately from complex diagrams.
b) Give full and correct interpretations of significant features.

Note on range for the outcome
Graphical information: may include statistical data in graphical forms.

Significant features: may include patterns; discontinuities; rates of change; turning values; relationship of variables in, for example, socio-economic data, population growth curves, predator-prey relationships; graphs of distance/speed/acceleration; sales and stock movements; weather maps.

Evidence Requirements
Oral, written and/or performance evidence that the candidate can analyse and interpret significant features of at least two pieces of graphical information.

OUTCOME 2
Select and use appropriate graphical forms to communicate information.

Performance Criteria
a) Select an appropriate form.
b) Use the selected form of communication to present information clearly.

Note on range for the outcome
Communicate information: information communicated in the form of tables; line graphs; bar charts; pie charts; stem and leaf charts; histograms; diagrams or qualitative forms as appropriate to the context.

Qualitative form: candidate should be able to recognise relationships in a graph with no scale on axes, eg. graph of predator – prey relationship.

Evidence Requirements
Evidence that the candidate can select an appropriate form and use the selected form of communication to present information clearly. At least two pieces of evidence are required.

National unit specification: statement of standards (cont)

UNIT Numeracy (Higher)

OUTCOME 3
Apply in combination a wide range of numerical and statistical skills.

Performance Criteria
a) Work with a mathematical concept.
b) Decide the steps to be carried out.
c) Carry out a number of sustained complex calculations.

Note on range for the outcome
Mathematical concept: such as relationship in symbolic forms; or negative numbers (eg. in the context of a number line or as temperatures below zero); or the concept of different types of data (eg. qualitative, quantitative, discrete, continuous); or statistical concepts (eg. standard deviation, confidence limits).

Complex calculations: some examples of complex calculations are: use of formulae in symbolic form; calculations involving indices (scientific notation); calculation of standard deviation; manipulation of symbols; addition, subtraction, multiplication and division of fractions.

Evidence Requirements
Oral, written and/or performance evidence that the candidate can:

- solve problems in generalised contexts involving one mathematical concept
- carry out four calculations involving complex sustained calculations in generalised contexts.

At least half the calculations should involve five steps.

National unit specification: support notes

UNIT Numeracy (Higher)

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

GUIDANCE ON CONTENT AND CONTEXT
The content and context for this core skills unit should be appropriate to the personal and/or vocational needs of the candidate and set in everyday and unfamiliar, generalised contexts.

Core skills units are stated at five levels of attainment, with activities becoming progressively more demanding in breadth and depth, and in the extent of individual autonomy required. The appendix to this unit shows the relationship between the levels in Numeracy.

This unit is designed to develop numeracy skills at a level which is helpful for advanced posts in business, administration, care and technician occupations and for entry into higher education.

Outcome 1

At this level, information may involve complex concepts/relationships which the candidate may have encountered through personal experience, in an area of study or in the work setting. It may also involve situations where the candidate deals with a problem in a more generalised way eg. statistical correlation of experimental data. The candidate should be able to analyse and interpret significant features of graphical information eg. a graph of photoelectric current against frequency showing the threshold frequency. Candidates should also be able to interpret graphs which have discontinuities eg. the speed-time graph of a bouncing ball. Other suitable areas of study would be growth and decay curves such as population growth graphs and/or predator-prey relationships where a graph of numbers in population against time gives a self-regulating series of interdependent fluctuations with the predator curve following the shape of the prey curve but showing a time lag. Socio-economic data and complicated weather maps would also be suitable areas of study.

Outcome 2

At this level, the candidate should be familiar with tables, line graphs, bar charts, stem and leaf charts, histograms, diagrams and qualitative forms commonly used in the area of study, eg. in physics, qualitative form could be used to show the threshold frequency in the photo-electric effect, or in biology, qualitative form could be used to show the main points of predator-prey relationships. However, evidence of all forms is not required. The candidate should select the form which best communicates the information.

Candidates should be familiar with the use of advanced calculators and computer spreadsheets that can manipulate and present data in a variety of graphical formats.

National unit specification: support notes (cont)

UNIT Numeracy (Higher)

Outcome 3

At this level, the candidate should be able to:

- add and subtract
- multiply and divide
- use whole numbers and decimals
- work with percentages, fractions and ratios.

However, evidence of each of these is not required.

The mathematical concept to be applied will depend on the area of study. It could be positive and negative numbers. For example, in business, the concepts of positive and negative numbers could arise in profit and loss returns; in science, temperature differences may be positive or negative. At this level, the candidate should be able to demonstrate a range of numerical, statistical and other mathematical skills. At a theoretical level, candidates should be able to create and test a model of a situation such as in income tax or APR calculations; or kinetic energy = $\frac{1}{2}mv^2$ calculations. Complex calculations may use formulae and symbols in scientific contexts such as energy, momentum and projectiles. One possible approach would be to integrate part of outcome 3 with outcome 2 and analyse data calculating statistical terms such as range, standard deviation or confidence limits as appropriate. At this level, the candidate should be able to work with indices such as squares and square roots and work with numbers expressed in scientific notation. Solutions to real problems should be carefully considered – rejecting answers which are mathematically correct but invalid in context. Calculations should be checked against estimates or by using the inverse algorithm. Evidence of checking procedures is not required. Answers should be expressed to an appropriate level of accuracy, particularly when interpreting calculator displays.

The use of calculators

The sensible use of appropriate technologies (numeric/scientific/graphic or programmable calculators or computers) should be encouraged. Due account should be taken of estimating and rounding errors introduced into calculations. Tables, graphs, charts and diagrams may be drawn using IT tools provided the candidate understands the underlying concepts. Spreadsheets could be used to test models of situations.

National unit specification: support notes (cont)

UNIT Numeracy (Higher)

GUIDANCE ON TEACHING AND LEARNING APPROACHES

The learning and teaching approaches should encourage candidates to identify evidence of their attainment and to transfer the skills acquired to other contexts.

Where appropriate, numeracy topics should be taught and skills developed in real-life contexts. Candidates should be encouraged throughout the unit to make use of skills in mental and written calculations, to make efficient use of calculators and to apply the strategy of checking. The outcomes should be demonstrated in unfamiliar situations and in generalised contexts where the relevant facts and their importance need to be identified and clarified. Problems could be dealt with at a theoretical level where the candidate creates and tests a model of the situation.

Where the Numeracy unit is being combined with another unit to create an enhanced learning and teaching programme, care must be taken to ensure that all aspects of each unit are covered and adequate time must be allowed for the coverage of both units. Such a programme would create opportunities to consolidate the skills gained in this unit.

GUIDANCE ON APPROACHES TO ASSESSMENT

The statement of satisfactory performance for each outcome indicates the minimum required for the purpose of summative assessment. However, the number of activities undertaken by the candidate in the course of the unit should not be limited to those specified for assessment purposes. In awarding the candidate Numeracy at Higher the teacher/lecturer must be confident that the candidate will be able to demonstrate these skills in any appropriate context and set of circumstances.

Teachers/lecturers must remember to distinguish between their differing roles in formative and summative assessment. In the former, as much help and support as is required by the candidate may legitimately be given by the teacher/lecturer. Tasks which are used to provide evidence for summative assessment must be completed by the candidate unaided.

Evidence of attainment should be gathered, wherever possible, from integrated activities whether this unit is being studied as a stand alone unit or in combination with other units in the candidate's programme. Where an integrated approach to assessment is adopted, teachers/lecturers should provide a matrix of evidence which shows clearly where each PC is covered. This will be necessary for internal and external verification.

National unit specification: support notes (cont)

UNIT Numeracy (Higher)

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements* (SQA, 1998).

Numeracy core skills units **Appendix**

Progression chart

Skill	Access 2	Access 3	Intermediate 1	Intermediate 2	Higher
Use graphical information	Read and use a basic scale. Identify basic graphical information. Communicate basic graphical information with teacher/lecturer support.	Read and use a simple scale. Extract simple graphical information. Communicate simple graphical information.	Read and use a straightforward scale. Interpret straightforward graphical information. Communicate straightforward graphical information.	Interpret graphical information when presented as a number of related but straightforward forms or in a complex form. Select and use appropriate forms of table, graph, chart or diagram to communicate information.	Analyse and interpret graphical information. Select and use appropriate graphical forms to communicate information.
Apply numerical skills	Apply a range of basic numerical skills in familiar everyday contexts.	Apply a range of basic numerical skills in everyday contexts.	Apply a range of basic numerical skills in everyday contexts.	Apply a wide range of numerical skills.	Apply in combination a wide range of numerical and statistical skills.