

Numeracy

Tutor Guide

[INTERMEDIATE 2]

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Acknowledgement

Grateful thanks are expressed to SQA for permission to use various extracts from Numeracy Intermediate 2 D01C 11 National Unit Specification: General Information

General Information

UNIT Numeracy (Intermediate 2)

NUMBER D01C 11

Course summary

This unit seeks to develop skills of interpretation and communication of graphical information and application of a wide range of numerical skills in everyday and straightforward generalised contexts.

Outcomes

1. Interpret graphical information when presented as a number of related but straightforward forms or in a complex form.
2. Select and use appropriate forms of table, graph, chart or diagram to communicate information.
3. Apply a wide range of numerical skills.

Recommended entry

While entry is at the discretion of the centre, candidates would normally be expected to have attained Numeracy (Intermediate 1).

Credit value

1 Credit at Intermediate 2.

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 Intermediate 2.

Statement of standards

UNIT Numeracy (Intermediate 2)

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

Interpret graphical information when presented as a number of related but straightforward forms or in a complex form.

Performance criteria

- (a) Extract information from tables, graphs, charts, or diagrams when presented as a number of related but straightforward forms or in a complex form.
- (b) Explain extracted information appropriately in terms of the context.

Note on range for the outcome

Graphical information: information may involve concepts/relationships such as cumulative frequency, speed/velocity, complex variables (drops per minute).

Complex form: e.g. a qualitative graph; a graph where part of the axis has been omitted in order to disguise the situation; histograms; stem-and-leaf charts.

Diagrams: e.g. circuit diagrams; flow charts; project plan/timeline diagrams; Ordnance Survey maps.

Evidence requirements

Oral, written and/or performance evidence that the candidate can correctly extract and explain graphical information from three of: tables, graphs, charts and diagrams. At least one extraction should involve interpolation and extrapolation.

Outcome 2

Select and use appropriate forms of table, graph, chart or diagram 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 or diagrams as appropriate to the context.

Evidence requirements

Evidence that the candidate can select appropriate forms of communication and present information clearly. At least three different forms of communication should be used.

Outcome 3

Apply a wide range of numerical skills.

Performance criteria

- (a) Work with a numerical concept.
- (b) Decide the operations to be carried out.
- (c) Carry out complex calculations.
- (d) Carry out sustained calculations.

Note on range for the outcome

Numerical concept: e.g. the concept of negative numbers (in the context of a number line or as temperatures below zero); or the concept of different types of data (e.g. qualitative, quantitative, discrete, continuous); or numbers represented by symbols (e.g. x or y); or statistical concepts, e.g. range).

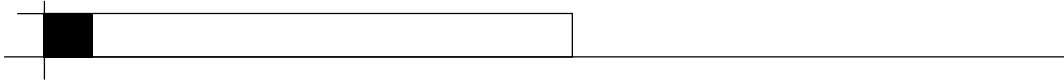
Complex calculations: e.g. use of formulae in symbolic form; calculations involving indices (scientific notation); calculation of standard deviation; manipulation of symbols; addition, subtraction, multiplication and division of fractions.

Evidence requirements

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

- solve problems involving one numerical concept in an everyday, straightforward generalised context
- carry out one complex calculation in an everyday straightforward generalised context
- carry out three different calculations involving sustained calculations in everyday straightforward generalised contexts and involving basic operations on whole numbers, decimals, percentages, fractions or ratios.

At least two of the calculations should involve four or five operations.



What this unit is about

This core skills unit seeks to develop the ability to interpret and also to produce a wide variety of graphs, charts and other methods of illustrating data as part of the process of analysing it. It also develops, or perhaps introduces, a wide variety of numerical concepts or processes which are part of the portfolio of skills required for everyday problem solving at intermediate level posts in business, administration and technician occupations.

Outcomes

1. Interpret graphical forms
2. Select and use graphical forms
3. Apply a wide range of numerical skills

Prior experience

While entry is at the discretion of the centre, candidates would normally be expected to have attained Numeracy (Intermediate 1). However, it is acknowledged that in many situations, especially with mature students, this will not necessarily be the case, and so the teaching level of much of the material starts well below Intermediate 2 level.

Progression

Successful attainment of this unit will allow the candidate to proceed to

- Numeracy (Higher) D01C 12

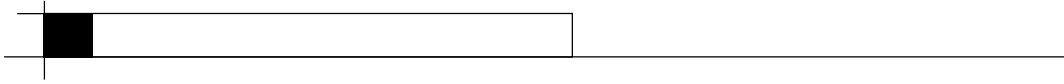
The Learning and Teaching Scotland publication *Numeracy (Higher)* has been written to allow students to progress easily from Intermediate 2 to Higher.

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 Intermediate 2



This open learning pack covers the syllabus requirements for the SQA National Unit, Numeracy (Intermediate 2). In addition to this Tutor Guide, it consists of a Student Introductory Guide and three Study Sections to cover the three outcomes, as indicated below.

Student Introductory Guide

Pages: 14

Study time: 1 hour

Outcome 1: Interpreting Graphical Information

Pages: 84

Study time: 12-15 hours

Outcome 2: Using Graphical Information

Pages: 75

Study time: 12-15 hours

Outcome 3: Numerical Skills

Pages: 123

Study time: 12-15 hours

Unit Study Sections

Each Study Section of this learning pack is structured in exactly the same way:

- Contents page

- An introduction to the section
 - what the section is about
 - the objectives of the section
 - other resources required which are not included in the package

- Assessment information
 - this will have to be communicated by the learning provider

- Subject content, including
 - Self Assessed Questions (SAQs) and Tutor Assignments (TAs)
 - answers to questions
 - comments on Activities

It is as well to point out at this stage that the Study Section for Outcome 3 is slightly different from the other two. There is a General section for all students to look at, and either study or skim, depending on their past experience, and then six optional sections of which they should do four. The reason for this is as follows. The specimen assessment for Outcome 3, as provided in the NABs, contains four questions on different topics. The students attempting this Outcome will come from a wide variety of backgrounds and expertise. The plan is that they choose, or are guided by the tutor to choose, four out of the six sections, and will then do four out of a choice of six questions in the assessment. The introduction to Outcome 3 in the Student Guide contains more information about this.

Approximate study time

The notional design length for the course is 40 hours, but this will depend very much on the academic level and amount of time committed to studying by the student. The study times quoted should be used as a very rough guide.

Symbols used in the pack

In addition to the Introductory Guide there are three distinct Study Sections, each relating to a unit outcome. The Study Sections allow students to work on their own with your support. As they work through the sections, they will encounter two symbols which indicate that something follows that they are expected to do. An explanation of these symbols follows:

Self Assessed Questions



This symbol is used to indicate a numbered Self Assessed Question (SAQ). SAQs are used most commonly to check the students' understanding of the material that has already been covered in the Study Sections.

This type of assessment is self-contained, that is to say that everything is provided within the Study Section to enable students to check their understanding of the materials.

The process is simple:

- The students are set SAQs throughout the Study Section. These will be set as e.g. short-answer questions, etc.
- They respond to these, either by writing in the space provided in the assessment itself, or in their own notebook.

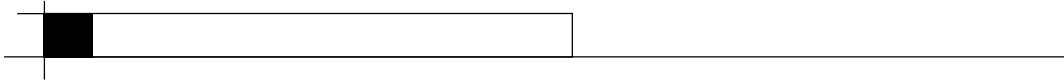
- On completion of the SAQ, they turn to the back of the section to compare the SAQ responses to theirs.
- If they are not satisfied after checking out their responses, they should turn to the appropriate part of the Study Section and go over the topic again.

Remember – the answers to SAQs are contained within the study materials. Students are not expected to ‘guess’ at these answers.

Tutor Assignment



This symbol means that a Tutor Assignment is to follow. These are usually found at the end of each Study Section. The aim of the TA is to cover and/or incorporate the main topics of the Study Section and prepare the student for unit (summative) outcome assessment.



How students will be assessed

Throughout each Study Section of this learning package, a series of Self Assessed Questions (SAQs) have been developed to provide students with 'on-the-spot' feedback about their progress within the relevant Section.

Upon successful completion of all SAQs, students will be asked to attempt a Tutor Assignment (TA). Each Section usually finishes with a TA and each assignment has been devised as a means of assessing the student's progress on the knowledge and understanding required for their SQA unit to date. Generally, the requirements of the TAs closely match the outcomes of the unit.

Important Note: you will notice that the TAs in the study packs are very long. This is because they tend to cover each and every topic mentioned in the study pack. You may well consider giving the student guidance beforehand as to which questions you want answered, perhaps concentrating on those the student has a chance of meeting in the assessment. You will notice also that the students are asked to draw all the graphs by hand. The support notes in the Unit Specification (not mandatory) state 'Tables, graphs, charts and diagrams may be drawn using IT tools provided the candidate understands the underlying concepts.' You may wish to give your students this choice, and this is left to your discretion.

When and where students will be assessed

As a tutor, you should summatively assess each student after successful completion of the appropriate TA, using your own centre's instrument(s) of summative assessment.

Depending on the policy of your school or college, summative assessment may be undertaken at the centre, or at a distance from the centre, under supervision.

Most often assessment is undertaken by the learner at school or college under supervision of a tutor. However, for the student who lives some distance from the school or college, an invigilation system may be set up at a recognised support centre local to the student (community education centre, training centre, etc).

The summative assessments are recorded by you, the tutor, and they form the basis of the student's final results within the unit. The student should be informed that you will complete all the necessary paperwork and notify them of their successful completion of the unit.

What students have to achieve

All outcomes have to be assessed and the objective of this 40-hour unit is that the student will achieve Outcomes 1, 2 and 3 of the SQA unit Numeracy (Intermediate 2) D01C 11.

Opportunities for reassessment

If students don't achieve the required standard for the award of 'pass' within any assessment, they should be informed of this and you should arrange for them to be reassessed on the particular elements of the assessment which needs improving.

Alternative instruments of summative assessment should be available and utilised where necessary.

External assessment

There is no external assessment associated with this unit.

PART 5**Answers to Outcome 1 Tutor Assignments****T 1: Answers**

- (a) Division A down, Division B steady, Division C up
- (b) 1997 - 5,300; 1998 - 5,500; 1999 - 5,800 (± 150 each, but will anyone mention this?)
- (c) 1997 - 34.0%; 1998 - 32.7%; 1999 - 31.0%

T 2: Answers

Armour approx $91 - 28 = 63\%$ of 500 = 315 ha

Blazer approx $95 - 11 = 84\%$ of 750 = 630 ha

Cardigan approx $45 - 12 = 33\%$ of 900 = 297 ha

T 3: Answers

- (a) 20 people
- (b) 20 people
- (c) 55 people

T 4: Answers

less than £5 = $150^\circ \rightarrow 55$ students

£5 - £10 = $120^\circ \rightarrow 44$ students

£15-£20 = $60^\circ \rightarrow 22$ students

>£20 = $30^\circ \rightarrow 11$ students

T 5: Answers

- (a) Heavy traffic A-B and F-G; dual carriageway B-C; motorway D-F; stuck C-D
- (b) Speed on motorway = $30 \text{ miles} \div \frac{1}{2} \text{ hour} = 60 \text{ mph}$
- (c) $50 \text{ miles} \div 1\frac{1}{2} \text{ hours} = 33\frac{1}{3} \text{ mph}$

T 6: Answers

- (a) Approx 92
- (b) Approx 65
- (c) Lowest £125 (more properly £124.99); highest £300 (more properly £299.99)
- (d) Approx 4 (= 92 – 88)
- (e) Approx 45 (= 80 – 35)
- (f) Roughly £215 - £220

T 7: Answers

- (a) Incredibly strong, almost a perfect straight line
- (b) About 2,100 - 2,200 teachers
- (c) About $36 \div 2.9 = 12.4 : 1$

T 8: Answers

- (a) 80 contracts
- (b) £20,000
- (c) Total of the best 8 = £750,000

T 9: Answers

- (a) 31 days
- (b) 142 faulty items
- (c) Daily average 4.58 so management will not be happy

T 10: Answers

- (a) Air trend steadily upwards, rail decreasing a bit (is 1990 a recovery or a blip?)
- (b) $£94.2 \text{ million} \div 57.1 \text{ million journeys} = £1.65 \text{ per journey}$, probably accounted for by a very large number of short commuter journeys in the central belt.
- (c) $8 \text{ million journeys} \div 453,000 \text{ aircraft movements} = 17.7 \text{ passengers per movement}$; movements means *all* planes, even small 2-seaters

T 11: Answer

$$£25,000 \times 1.967 = £49,175$$

T 12: Answer

Basic cost £525, so we have $2 \times £525$ plus 75% of £525 plus 50% of £525 plus $4 \times £19$ (flight supplement) plus $4 \times £35$ (insurance) = £1,922.25

T 13: Answers

- (a) £1,770
- (b) £2,036
- (c) £2,850

Answers to Outcome 2 Tutor Assignments

The graphs to be drawn are not illustrated here for obvious reasons – you just have to look at the student’s efforts to see if they are suitable. The graphs which students have chosen are, I hope, as indicated below.

T1: Answers

- (a) Bar chart
- (b) Compound bar chart
- (c) Pie chart
- (d) Component chart
- (e) Percentage component chart

T2: Answer

Line graph

T3: Answer

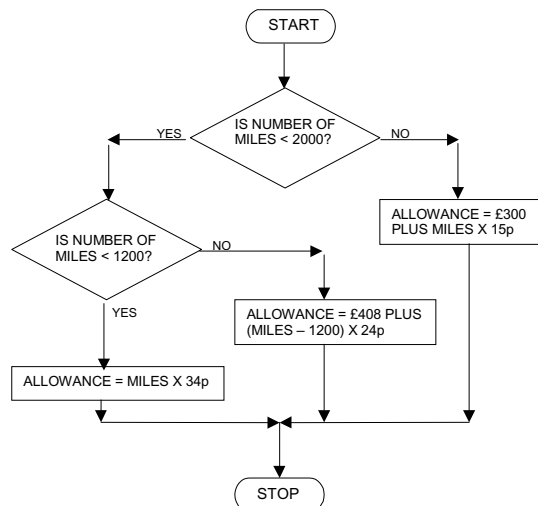
Stem–leaf chart, given here in one possible solution; also frequency table, with intervals 20,000–30,000, 30,000–40,000 and so on. However, different versions are possible, so use the stem–leaf solution alongside to check the student’s work

Stem–Leaf Chart for TA 3

23	1
31	1 4
37	8
38	
39	6
40	
41	
42	3
43	8
44	
45	8 9
46	7 8 9
47	2 8 9
48	1 3 9
49	1 1 2 7
50	1 4 5
51	2 2
52	1 3 4
53	3 4 8
54	9
55	2 3 4
56	0 0 0 3 5
57	4 7
58	2 3 5 7 9
59	
60	2 2 6 9
61	2 7 8 8
62	1 3 5 5 8
63	4
64	1 3 4
65	1 7
66	1
67	2
68	8
78	4
78	4 means 78,400

T4: Answer

The student’s flowchart should look something like this:



Answers to Outcome 3 Tutor Assignments

T₁: Answer

Allowances £7,442; tax £11,915.30; superann £3,192; answer £38,092.70

T₂: Answer

Starts with 7,875 FF and 2,287.50 DM; 1,625 FF convert to 471.77 DM;
left with 69.27 DM convert back to £24.39

T₃: Answers

- (a) Total price £1,087.64 which represents 43.1% interest
(b) First method £43.33 a month, second one £31.11 a month, choose second

T₄: Answer

Worth £7,762.54 after 4 years, just past half way

T₅: Answer

Existing food will last 10 days, bring forward air drop by 4 days

T₆: Answer

$$10 \times \frac{4}{3} \times \frac{450}{500} \times \frac{8}{6} = 16 \text{ hours per day}$$

T₇: Answers

- (a) £189
(b) £41.80
(c) 1998 = 100; 1999 = 110; 2000 = 126.7; 2001 = 133.33

T 8: Answer

$$\frac{\sum p_n q_n}{\sum p_o q_n} = \frac{40,450}{38,088} \times 100 = 106.2$$

T 9: Answer

Using mid-values 16.5, 20.5, 24.5, 28.5 we get
mean = 20.63°C and st dev = 3.65°C

T 10: Answer

Using mid-values 15.2, 15.6, 16.0, 16.4, 16.8 we get
mean = 16.08 mm and st dev = 0.37 mm

T 11: Answers

- (a) (i) 2.803×10^8 km per year
- (a) (ii) 8.889×10^3 m per second
- (b) (i) 9.589×10^8 km per hour
- (b) (ii) 2.664×10^8 m per second
- (c) 8.515×10^8 km
- (d) 9.130×10^{12} atoms, assuming a 210 mm wide page

T 12: Answers

- (a) $32,044 \text{ cm}^2$ or 3.20 m^2
- (b) (i) 623.6
- (b) (ii) 3.17
- (b) (iii) 24.24

PART 6

When students enrol for this course they should either be given a timetable or receive details of their tutor and information on contact details, i.e. the day, time, telephone/e-mail number, where they can make contact. They may retain this information on a Tutor Details Form similar to that shown below.

Tutor Details Form

Tutor's name: _____

Address (for correspondence and assignments):

Telephone number: _____

Fax number: _____

E-mail address: _____

Times available for contact: Day/Evening: _____

Times: _____

Attendance requirement: _____

PART 7

Learning and Teaching Scotland is very interested in the views of tutors who have used these learning materials with students. Your feedback and comments will assist us in evaluating and, where necessary, improving this package for future student and tutor use.

We would be grateful if you would spend a little time completing and returning this form to Learning and Teaching Scotland.

Please answer all of the questions as fully and frankly as possible. Please rate the materials by placing a tick in the appropriate box and adding relevant comments in the space provided.

Thank you for your assistance.

1	The content is pitched at the appropriate level for the target student	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
2	The content is accurate and up-to-date	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
3	The content meets the requirements of the stated outcomes/aims/objectives	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
4	The content is sufficient to allow the student to achieve the stated outcomes/aims/objectives	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
5	The learning approaches are appropriate	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>

contd overleaf

TUTOR EVALUATION FORM

6	The language is suitable for the target student	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
7	Sufficient and significant exercises, SAQs and Tutor Assignments are included	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
8	Appropriate feedback has been included	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
9	The assessment methods are appropriate	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
10	The standards of assessment are acceptable	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
11	The pack is structured in such a way as to allow students to find their way through the materials	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
12	This pack is appropriate for use with a minimum of tutor contact	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>
13	Overall I would rate this pack as	Very Good <input type="checkbox"/>	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	Very Poor <input type="checkbox"/>

Name _____ School/College _____ Date _____

Thank you once again for your assistance. Please send completed forms to: OFDL Project, Learning and Teaching Scotland, Gardyne Road, Dundee DD5 1NY