Quality Improvement Agency

Skills for Life Improvement Programme

Teacher Trainer Pack

Entry assessments for Mathematics (Numeracy) Teacher Training

July 2008

Exemplar entry assessment tasks

The Skills for Life Improvement Programme is delivered on behalf of the Quality Improvement Agency by CfBT Education Trust and partners

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Introduction

The key aim of the QIA Skills for Life Improvement Programme is to improve teaching, learning and achievement in literacy, language and numeracy. The second year of the programme offers opportunities for teachers, trainers and organisations to access the successful, wide-ranging development activities for improving Skills for Life provision and raising achievement for all learners.

In September 2007, new qualifications were introduced for the initial training of teachers in the lifelong learning sector in England. It continues to be a requirement for teachers of Mathematics (Numeracy) and English (Literacy and ESOL) to gain subject specific qualifications.

The nine SVUK endorsed subject specific qualifications are:

Fully integrated (120 credits)
Level 5 Diploma in teaching Mathematics (Numeracy) in the Lifelong Learning Sector
Level 5 Diploma in teaching English (Literacy) in the Lifelong Learning Sector
Level 5 Diploma in teaching English (ESOL) in the Lifelong Learning Sector

Partly integrated (120 credits)
Level 5 Diploma in teaching in the Lifelong Learning Sector (Mathematics Numeracy)
Level 5 Diploma in teaching in the Lifelong Learning Sector (English Literacy)
Level 5 Diploma in teaching in the Lifelong Learning Sector (English ESOL)

Additional Diploma (45 credits)
Level 5 Additional Diploma in teaching Mathematics (Numeracy) in the Lifelong Learning Sector
Level 5 Additional Diploma in teaching English (Literacy) in the Lifelong Learning Sector
Level 5 Additional Diploma in teaching English (ESOL) in the Lifelong Learning Sector

Awarding institutions must now ensure that a potential teacher trainee can evidence the appropriate LLUK entry criteria before admitting them to the qualification programme. Further details can be found in the LLUK document ‘Criteria for entry to Mathematics (Numeracy) and English (Literacy and ESOL) teacher training in the Lifelong Learning Sector’, June 2007.

‘Mathematics entry assessments should cover all the specified elements in the process skills. It is not necessary for all of the extent of these elements to be covered within any one assessment. However, minimal coverage of extent against any one element would be deemed insufficient. There is no requirement for the process elements to be evidenced using all the main mathematical skill areas.

It is expected that the entry assessments for Mathematics will include a significant proportion of recognised Level 3 personal skills in Mathematics, although others more regularly acquired at Level 2 and below may also be used in activities. Potential trainees are required to demonstrate that they hold mathematical skills which go beyond the requirement of study in all existing Level 2 Mathematics qualifications.'

For Mathematics/Numeracy, English skills must be demonstrated at Level 2 of the Qualifications and Credit Framework (QCF).

CRITERIA FOR ENTRY TO MATHEMATICS (NUMERACY) TEACHER TRAINING COURSES IN THE LIFELONG LEARNING SECTOR

Process Skills in Mathematics

1. Making sense of situations and representing them
2. Processing and analysis
3. Interpreting and evaluating results
4. Communicating and reflecting on findings

Process skills	Element	Extent
1. Making sense of situations and representing them	1.1 Situations that can be analysed and explored through numeracy	1.1a Recognise situations can be explored beneficially by using mathematics 1.1b Use interrogation/interpretation by asking questions and considering responses. This is in order to negotiate and hence recognise the mathematics within situations
	1.2 The role of models in representing situations	1.2a Demonstrate understanding of the purpose and benefits of mathematical modelling 1.2b Demonstrate understanding of the stages and iterative nature of mathematical modelling including development, trialling, evaluating, amending, applying and representing/displaying 1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures 1.2d Demonstrate that making conceptual links between different areas of mathematics and differing mathematical procedures can support mathematical modelling
	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures 1.3b Make reasoned selection of tools such as ICT, measuring, calculating and recording equipment

	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information 1.4b Research and analyse context to support the selection of and application of appropriate skills 1.4c Demonstrate understanding of and act on the implications of estimation
2. Processing and analysis	2.1 The importance of using appropriate procedures	2.1a Use efficient procedures in familiar situations and coping strategies in unfamiliar settings accepting that change to efficient procedures is necessary for future development 2.1bRecognise, visualise and represent mathematical equivalences as a mechanism for finding/using an appropriate procedure
	2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2a Identify and justify patterns for summarising mathematical situations 2.2b Identify and justify patterns for prediction of trends/ changes/probabilities 2.2c Compare patterns to find potential simultaneous meeting of conditions
	2.3 The role of changing values and assumptions in investigating a situation	2.3a Identify variables and their characteristics 2.3b Adapt mathematical models to modify/improve the mathematical representation 2.3c Use the analysis of pattern to evaluate particular predicted examples of pattern summaries
	2.4 Use of logic and structure when working towards finding results and solutions	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools 2.4b Collaborate and engage in critical debate as a mechanism for development and testing of logic and structure during processing/ analysis 2.4c Use extended logic and structures when working in multi-step situations
3. Interpreting and evaluating results	3.1 The role of interpretation of results in drawing conclusions	3.1a Apply numerical/mathematical solutions to original context 3.1b Use solutions to inform future mathematical practice 3.1c Use derived knowledge to inform practice in context. For example, work, everyday life and study
	3.2 The effect of accuracy on the reliability of findings	3.2a Demonstrate understanding of the role/application of approximation across processing/analysis and summary 3.2b Demonstrate understanding of the characteristics of error including the effect of compounding in predictive situations 3.2c Evaluate the impact of inaccuracies in the application of mathematical procedures

	3.3 The appropriateness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison 3.3b Recognise errors/misconceptions 3.3c Demonstrate logic in choice of appropriate stage of mathematical interrogation and processing to revisit/revise if results obtained are considered to be inappropriate
4. Communicating and reflecting on findings	4.1 The importance of choosing appropriate language and forms of presentation to communicate results	4.1a Make reasoned selection and use of mathematical language, appropriate to target audience, including interpretation for inclusiveness and accessibility for non mathematicians 4.1b Make reasoned selection and use of communication methodologies including numerical, symbolic, diagrammatic and graphical display 4.1c Use communication techniques that display accurately the development of mathematical processing and analysis, including multi-step processing 4.1d Use oral debate and tactile/kinaesthetic representation appropriately in communicating results
	4.2 The need to reflect on any process to consider whether other approaches would have been more effective	4.2a Evaluate efficient/ rigorous and coping strategies, comparing advantages and disadvantages 4.2b Evaluate the clarity of mathematical arguments to self and audience 4.2c Use self and group reflection as a mechanism to address mathematical efficiency 4.2d Evaluate impact of conclusions on future investigations

Information – suggested process	It is envisaged that the full entry assessment process would consist of 2 **pre-interview tasks (one compulsory – Task 1 and one optional – either Task 2 or Task 3)** sent to candidates 1–2 weeks before the interview and a range of **assessment tasks** completed during an **assessment session** of approximately 3 hours. Prior to the assessment session, trainers should select appropriate assessment tasks from the range of exemplar assessments in the pack, ensuring that they cover the full range of process and personal skills, elements and sufficient extent. It is possible that institutions may wish to set additional tasks, for example, an additional maths test, and it should be made clear to potential trainee teachers that this is not part of the required entry assessment process. A number of candidates should be invited to attend at the same time (ideally 6-8), with two trainers present. The assessment session could include both collaborative and individual tasks, and an individual interview. If this is not possible, the discussion tasks could take place in an interview situation. Some marking guides are included in the pack but it is expected that teacher educators will further develop and amend these activities to suit their context and create new ones for the future. It is also expected that institutions will have their own procedures and systems for administering and marking the assessments. Potential trainees who are able to evidence that they meet the entry criteria can be offered a place on the programme; those not meeting the entry criteria should be given advice and guidance on suitable alternative courses and/or qualifications to enable them to develop the relevant maths skills.
Target Group	1. Potential teacher trainees who have applied for a fully integrated or partly integrated Diploma programme. 2. In-service numeracy teachers who plan to apply for a subject specific qualification.
Rationale	• To enable potential trainees to evidence the LLUK entry criteria for Mathematics/Numeracy teacher training in the lifelong learning sector • To enable participants to demonstrate the skills required to function effectively as users of Maths (Level 3 of the QCF)
Aim	• For teacher-trainers to assess potential trainees for entry to Level 5 Mathematics/Numeracy Diploma programmes in the Lifelong Learning Sector
Exemptions from entry assessment requirement for holders of:	• BA or BSc or BEd or higher degree in Mathematics
Entry Criteria	Level 3 Mathematics and Level 2 English

Example entry assessment process (shaded areas relate to the LLUK Entry Assessment Criteria)	
1. Pre-interview task	Potential trainees are sent two pre-interview tasks 1–2 weeks before the interview/assessment session Research task focusing on research into data on numeracy levels in adults
Interview/ assessment session **2. General information**	Potential trainees are given information about the structure of the session Information on the teacher-training programme: course structure, the units of assessment, teaching practice and the time commitment needed for successful completion of the course Q & A
3. Assessment tasks	Potential trainees undertake a number of assessment tasks (collaborative and individual) mapped to the 'Criteria for entry to Mathematics/Numeracy teacher training in the lifelong learning sector'. Tasks cover process and personal skills. In addition to the two pre-interview tasks, they should do one group task (either Task 04 or Task 05), one personal maths skills test (either Task 06 or Task 07), one error analysis task (either Task 08 or Task 09) and one written test (either Task 10 or Task 11)
4. Individual interview	Assessment of potential trainee's oral communication skills (including presentation and questions on pre-interview tasks) as well as suitability for course
5. Trainers' discussion and decision	Trainers discuss assessment results for individual applicants and decide whether or not to offer a place on the course.

Those unable to evidence the entry criteria	Potential trainees unable to evidence that they can fully meet the entry criteria should be advised of alternative suitable courses and qualifications to enable them to develop the relevant skills.
Trainer experience or qualifications required	Teacher-trainers with several years' experience of delivering teacher-training courses in the lifelong learning sector and with experience of assessing applicants for entry to Level 4 or above Numeracy teacher-training courses in the Skills for Life sector.
Pre-course reading for trainers	Criteria for entry to Mathematics (Numeracy) and English (Literacy and ESOL) teacher training in the lifelong learning sector, June 2007 (draft), LLUK www.lifelonglearninguk.org/documents/nrp/new_entry_guidance.pdf

Resources

Resources needed	Web based material: www.literacytrust.org.uk/Database/basicskillsupdate.html#long www.dcsf.gov.uk/research/data/uploadfiles/RR490.pdf www.dcsf.gov.uk/readwriteplus_skillsforlifesurvey/gors/gor_H.shtml http://neighbourhood.statistics.gov.uk/dissemination/LeadHome.do;jsessionid=ac1f930bce633bec278f81b4defbbeaea4cd0e8e6b7.e38PbNqOa3qRe34Qc3yRc34Obhb0n6jAmljGr5XDqQLvpAe?bhcp=1 www.oecd.org/dataoecd/31/0/39704446.xls Criteria References for each task Mark sheets Answer sheets Group task assessment sheets Interview record sheets Wrapping paper, scissors, rulers, sellotape, atlases, access to Excel, calculators.
Equipment required	Flipchart or whiteboard Computer facilities with spreadsheet software and internet connection Calculators
List of entry assessment tasks	**Pre-session tasks** **Compulsory Task:** 01 Personal use of higher level maths **Optional Tasks:** (select one of task 02 and task 03) 02 National needs and impact survey 03 OECD research task **In-session tasks** 04 Group Task 1: Estimation of births (select one group task from 04 and 05) 05 Group Task 2: Gift wrapping task 06 Personal Maths Skills Task: Maths Test 1 (select one maths test from 06 and 07) 07 Personal Maths Skills Task: Maths Test 2 08 Error Analysis Task: Marking students' work 1 (select one error analysis from 08 and 09) 09 Error Analysis Task: Marking students' work 2 10 Writing Task: Written Task 1 (select one written task from 10 and 11) 11 Writing Task: Written Task 2

Mapping: Process Skills in Mathematics

1. Making sense of situations and representing them

Element	Extent	Assessment Task Reference Number:										
1.1 Situations that can be analysed and explored through numeracy	1.1a	01	02	-	04	05	-	-	-	-	10	11
	1.1b	01	02	-	04	05	-	-	-	-	-	-
1.2 The role of models in representing situations	1.2a	01	-	-	04	05	-	-	-	-	-	-
	1.2b	01	-	-	04	05	-	-	-	-	-	-
	1.2c	01	02	-	04	05	-	-	-	-	-	11
	1.2d	01	-	-	04	05	-	-	-	-	-	11
1.3 Methods, operations and tools that can be used in a situation	1.3a	01	02	03	04	05	06	07	-	-	-	-
	1.3b	-	02	03	04	05	-	-	-	-	-	-
1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a	01	02	03	-	-	06	07	-	-	-	-
	1.4b	01	02	03	-	-	-	-	-	-	-	-
	1.4c	01	02	-	04	-	-	-	-	-	10	-

2. Processing and analysis

Element	Extent	Assessment Task Reference Number										
2.1 The importance of using appropriate procedures	2.1a	01	02	-	04	05	-	-	-	-	-	-
	2.1b	01	02	-	-	-	-	-	08	09	-	-
2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2a	01	-	-	04	05	06	07	-	-	-	-
	2.2b	01	02	-	-	-	06	07	-	-	-	-
	2.2c	01	-	-	-	-	06	07	-	-	-	-
2.3 The role of changing values and assumptions in investigating a situation	2.3a	01	-	-	04	05	06	07	-	-	-	-
	2.3b	01	-	-	04	05	-	-	-	-	-	-
	2.3c	01	-	-	04	05	-	-	-	-	-	-
2.4 Use of logic and structure when working towards finding results and solutions	2.4a	01	02	-	04	05	-	-	-	-	10	-
	2.4b	01	-	-	04	05	-	-	-	-	10	-
	2.4c	01	02	-	04	05	06	07	-	-	10	-

3. Interpreting and evaluating results

Element	Extent	Assessment Task Reference Number										
3.1 The role of interpretation of results in drawing conclusions	3.1a	01	02	-	04	05	-	-	-	-	-	-
	3.1b	01	02	-	04	05	-	-	-	-	-	-
	3.1c	01	02	03	-	-	-	-	-	-	-	-
3.2 The effect of accuracy on the reliability of findings	3.2a	01	02	-	-	-	-	07	-	-	10	-
	3.2b	01	02	-	-	-	-	-	-	-	10	-
	3.2c	-	02	03	-	-	-	-	-	-	10	-
3.3 The appropriateness and accuracy of results and conclusions	3.3a	01			04	05	06	07	08	09	-	-
	3.3b	01	-	-	-	-	-	-	08	09	-	-
	3.3c	01	02	-	04	05	-	-	-	-	-	-

4. Communicating and reflecting on findings

Element	Extent	Assessment Task Reference Number										
4.1 The importance of choosing appropriate language and forms of presentation to communicate results	4.1a	01	02	03	-	-	-	-	-	-	-	-
	4.1b	01	02	03	-	-	-	-	-	-	-	-
	4.1c	01	02	-	04	05	-	-	-	-	-	-
	4.1d	01	02	03	04	05	-	-	-	-	-	-
4.2 The need to reflect on any process to consider whether other approaches would have been more effective	4.2a	01	-	-	04	05	-	-	-	-	-	-
	4.2b	01	02	03	04	05	-	-	-	-	-	-
	4.2c	01	02	-	04	05	-	-	-	-	-	-
	4.2d	01	02	03	04	05	-	-	-	-	-	-

Exemplar Session Plan and Resources for: Entry Assessments for Mathematics (Numeracy) teacher training

Note: this is an example of an interview session based on a selection of the assessment tasks (activities).

Aim

For teacher-trainers to assess potential trainees for entry to Level 5 Mathematics (Numeracy) Diploma programmes in the Lifelong Learning Sector

Time	Content	Resources		
		No.	Style	Title
	Pre-interview tasks and assessment information sent to potential trainees 1–2 weeks before assessment session	01.1 01.2 02.1 02.2	Task Criteria References Task Criteria References	Pre-session Task 1: Personal use of higher level maths Pre-session Task 2: National needs and impact survey
10m (0:10)	**Welcome** Welcome, housekeeping, introductions • Explain format of session • Brief icebreaker task to introduce participants to each other			
10m (0:20)	**Introduce session** **Purpose:** to give information about the course • Talk participants through PowerPoint presentation • Short Q & A		Other	Course information

Time	Content	Resources		
		No.	Style	Title
30m (0:50)	**Group task – Estimation of births** **Purpose:** for potential trainees to start to consider different strategies for problem solving and for trainers to assess their ability to discuss, negotiate and justify choice of mathematical procedures and to reflect and evaluate on choices Introduce task and sort participants into groups (max 3-4 in a group). Emphasise the need for full participation within groups • Give candidates 5 minutes to read through the task • Assign a trainer to each group to observe participation in task • Assess skills using group task assessment sheet • Use targeted questioning to try to fill any gaps in coverage	04.1 04.2 04.3 04.4	Task Criteria References Assess-ment sheet Answer sheet	Group task: Estimation of births Group task: Assessment sheet
70 m (2:00)	**Personal maths skills** **Purpose:** for potential trainees to evidence process skills in mathematics • Explain task and hand out Task instructions and assessment	06.1 06.2 06.3	Written test Criteria References Mark sheet Answer sheet	Maths test Skills checklist
25m (2:25)	**Error analysis** **Purpose:** for potential trainees to evidence ability to diagnose and analyse errors and suggest strategies • Explain task and hand out Task instructions and task sheet	08.1 08.2 08.3	Written task Criteria References Mark sheet Answers	Marking student work Skills checklist

20m (2:45)	**Writing task** **Purpose:** for potential trainees to evidence written communication skills and awareness of key adult numeracy issues • Explain task and hand out Task instructions and task sheet	10.1 10.2	Written task Criteria References Mark sheet	Written task – What is estimation? Skills checklist
30m (3:15) to run concurrently with personal maths skills, error analysis and writing tasks.	**Individual interviews** **Purpose:** for potential trainees to demonstrate commitment and enthusiasm for the course and ask questions; for the trainers to assess oral communication skills • Participants asked to present and discuss work on pre-interview tasks • Optional – use interview as an opportunity to ask questions to fill gaps in coverage of criteria		Other Mark sheet	Interview questions Skills checklist
5m (3:20)	**Close session** Tell potential trainees when they will hear results of assessment.			

Assessor notes – Pre-interview tasks:

There are three pre-interview tasks – Task 01 is compulsory and relates to personal experience with using maths in life, work and/or study. The other two (Tasks 02 and 03) are based around statistical research and use of statistical techniques.

Candidates are asked to complete two pre-interview tasks before they attend for assessment and interview – Task 01 plus either Task 02 or Task 03. They will need to be sent the task information approximately two weeks before the assessment date and asked to bring two copies of the completed tasks to the session, and hand in one copy on arrival. At the session they will need to answer questions on the tasks in interview. On task 01 they will need to be asked how they would use the mathematical knowledge they have gained from their personal experiences with maths to teach numeracy/maths at lower levels (see Criteria References sheets for suggested areas for additional interview questions).

res no.	style	title
01.1	**Compulsory Task**	**Pre-session Task: Personal use of higher level mathematics**

Task:

Identify three examples of where you have used mathematics in your life. The three examples should provide a range of the levels of difficulty of mathematics you have had to use with one example being what you consider to be difficult or higher level maths (see below for some examples of where higher level maths skills might be used), one example of simple maths and one in between these two extremes. You could have used the maths in your work, previous study or in the home or everyday life.

N.B. If you are already working as a numeracy/maths teacher, please **do not** use the topics you teach as examples.

For each example:

a) Briefly outline the situation where you used mathematics, identifying the context clearly.

b) Break down the problem into stages, identifying the maths/numeracy skills that you needed to solve the problem at each stage.

c) Describe how you solved the problem.

Bring your written notes to the interview with any relevant leaflets, documents etc. that relate the situation you are describing. Be prepared to talk about your examples at interview. You will be asked how you might use the mathematical knowledge you have gained in this way to teach maths/numeracy at lower levels.

A model is a representation of a real life situation.
The stages of mathematical modelling are development, trialling, evaluating, amending, applying and representing / displaying.

d) Write short answers to the following questions and bring them to the interview:

- Give an example of when a mathematical model might be useful in real life. What are the benefits of using a mathematical model in this situation?
- In your example, what do you think might be involved in the different stages of the model described in the box above?
- What areas of mathematics would be involved in the mathematical model in your example?

Examples of where you may have used higher level mathematics in your life (not an exhaustive list):

i) Financial mathematics (work, study or home):

Areas of Study	**Sections**	**Examples**
Financial mathematics	Interest	• Compound and Annual Equivalent Rates • Depreciation • Net present values – tables and calculation comparison • Internal rate of return
	Annuities	• Annuities and perpetuities – tables and calculation comparison • Loans and mortgages • Regular payments – with use of geometric progressions
	Time	• Price indices, for example, aggregative and retail price • Time series – additive and multiplicative models, seasonality • Trends and forecasting

ii) Data handling (work or study)

Areas of Study	Sections	Examples
Collection and display of data	Survey design	• Data sources including use primary and secondary data • Populations, samples and sampling methodology • Questionnaire design • Discrete and continuous data characteristics • Large and raw data sets
	Graphical display	• Standard methods of display and their appropriate selection, comparison and use, for example, histograms, ogives, box and whisker diagrams, probability distributions • Inappropriate display as a mechanism of distortion
Summarising data	Measures of location and dispersion	• Mean, median, mode • Graphical and numeric calculation • Range, semi-interquartile range, deciles • Mean absolute deviation and standard deviation • Coefficient of variation • Continuous and discrete data types • Comparison of use

iii) Maths skills in Computing (work or study)

Areas of Study	Sections	Examples
Algebra and its application	Vectors and matrices	• Addition, subtraction and multiplication • Transformations, translations, inverses • Determinants • Simultaneous equations
	Logic circuits	• Boolean algebra – zero/unit rules • Logic design and gates • Commutative, distributive associative laws • Boolean expressions for logic circuits

iv) Use of mathematics in previous career e.g. engineering

Areas of Study	Sections	Examples
Trigonometry	Ratios, measures and techniques	• Sine, cosine, tangent, radian measure • Cartesian and polar coordinates • Solution of triangles, including sine, cosine rules and area of triangle • Vector force systems
	Functions and graphs	• Nature and graphs of oscillatory functions • Periodic times, frequency and amplitude • Phase difference, angle, harmonics
	Applications	• Metrology/precision measurement, alternating currents, voltages and electrical power, structural design

res no.	style	Title
01.2	**Criteria References**	**Pre-session Task: Personal use of higher level mathematics**

Process skills	Element	Extent
1. Making sense of situations and representing them	1.1 Situations that can be analysed and explored through numeracy	1.1a Recognise situations can be explored beneficially by using mathematics[1] 1.1b Use interrogation/interpretation by asking questions and considering responses. This is in order to negotiate and hence recognise the mathematics within situations[1]
	1.2 The role of models in representing situations	1.2a Demonstrate understanding of the purpose and benefits of mathematical modelling[2] 1.2b Demonstrate understanding of the stages and iterative nature of mathematical modelling including development, trialling, evaluating, amending, applying and representing/displaying[2] 1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures[2] 1.2d Demonstrate that making conceptual links between different areas of mathematics and differing mathematical procedures can support mathematical modelling[2]
	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures[1]
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information[3] 1.4b Research and analyse context to support the selection of and application of appropriate skills[3] 1.4c Demonstrate understanding of and act on the implications of estimation[3]
2. Processing and analysis	2.1 The importance of using appropriate procedures	2.1a Use efficient procedures in familiar situations and coping strategies in unfamiliar settings accepting that change to efficient procedures is necessary for future development*[1] 2.1bRecognise, visualise and represent mathematical equivalences as a mechanism for finding/using an appropriate procedure[3]

	2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2a Identify and justify patterns for summarising mathematical situations[3] 2.2b Identify and justify patterns for prediction of trends/changes/probabilities[3] 2.2c Compare patterns to find potential simultaneous meeting of conditions[3]
	2.3 The role of changing values and assumptions in investigating a situation	2.3a Identify variables and their characteristics[1] 2.3b Adapt mathematical models to modify/improve the mathematical representation[3] 2.3c Use the analysis of pattern to evaluate particular predicted examples of pattern summaries[3]
	2.4 Use of logic and structure when working towards finding results and solutions	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools[12] 2.4b Collaborate and engage in critical debate as a mechanism for development and testing of logic and structure during processing/ analysis[3] 2.4c Use extended logic and structures when working in multi-step situations[1]
3. Interpreting and evaluating results	3.1 The role of interpretation of results in drawing conclusion	3.1a Apply numerical/mathematical solutions to original context[1] 3.1b Use solutions to inform future mathematical practice*[1] 3.1c Use derived knowledge to inform practice in context. For example, work, everyday life and study[1]
	3.2 The effect of accuracy on the reliability of findings	3.2a Demonstrate understanding of the role/application of approximation across processing/analysis and summary[1] 3.2b Demonstrate understanding of the characteristics of error including the effect of compounding in predictive situations*[1]
	3.3 The appropriateness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison[3] 3.3b Recognise errors/misconceptions[3] 3.3c Demonstrate logic in choice of appropriate stage of mathematical interrogation and processing to revisit/revise if results obtained are considered to be inappropriate[3]

4. Communicating and reflecting on findings	4.1 The importance of choosing appropriate language and forms of presentation to communicate results	4.1a Make reasoned selection and use of mathematical language, appropriate to target audience, including interpretation for inclusiveness and accessibility for non mathematicians[1] 4.1b Make reasoned selection and use of communication methodologies including numerical, symbolic, diagrammatic and graphical display[3] 4.1c Use communication techniques that display accurately the development of mathematical processing and analysis, including multi-step processing[3] 4.1d Use oral debate and tactile/kinaesthetic representation appropriately in communicating results[3]
	4.2 The need to reflect on any process to consider whether other approaches would have been more effective	4.2a Evaluate efficient/ rigorous and coping strategies, comparing advantages and disadvantages[1] 4.2b Evaluate the clarity of mathematical arguments to self and audience[1] 4.2c Use self and group reflection as a mechanism to address mathematical efficiency[1] 4.2d Evaluate impact of conclusions on future investigations[1]

*Possible areas for interview questions

[1] **should be met by completion of Task 1 a-c**

[2] **should be met by completion of Task 1d**

[3] **may be met by completion of Task 1 a-c**

res no.	style	title
02.1	**Compulsory Task**	**Pre-session Task: National Needs and Impact Survey**

National Needs and Impact Survey of Literacy, Numeracy and ICT Skills, DfES, October 2003

Adult basic skills have a long way to go…

(Excerpt from *The Guardian,* 31 October 2003)

Half the adults in England are so bad at maths they would fail to score even the lowest grade at GCSE, the most authoritative survey of their skills so far reveals. The Government backed research by BMRB International says that 15 million workers struggle to grasp basic calculations and many also have functional literacy problems.

The study forms part of the Government's Skills for Life campaign and was commissioned in response to continuing concern over low standards of reading and writing among British adults who lag behind the rest of Europe.

The study involved more than 8,700 adults in England aged 16 to 65 who were given basic tests by the researchers. These included interpreting a bar chart, calculating a percentage price reduction, or picking a phone number from a list provided.

The survey concluded that 6.8 million (21%) have numeracy skills below Entry Level 3, the standard expected of 11-year-olds, and 15 million (47%) below Level 1 (less than a D-G GCSE).

www.literacytrust.org.uk/Database/basicskillsupdate.html#long

Accessed 29.10.07

The whole report can be downloaded here:

www.dcsf.gov.uk/research/data/uploadfiles/RR490.pdf

Task:

Go to: www.dcsf.gov.uk/readwriteplus_skillsforlifesurvey/gors/gor_H.shtml

Go to: London Central / Southwark. If you click on the map, you will find results by ward.

a) Investigate numeracy levels for Southwark in the different wards.

   Use mathematical techniques to carry out your investigation and present your findings. From your findings, form a conclusion about which ward you think has the highest levels of numeracy and which ward has the lowest levels. Explain why you have come to this conclusion. In your report use language that would make the findings accessible to non-mathematicians.

   (See the table below for a list of mathematical techniques. You should select the most appropriate techniques to use rather than trying to use all of them).

b) Read pages 26 to 39 of the DCSF report

   http://www.dcsf.gov.uk/research/data/uploadfiles/RR490.pdf

   to help form an opinion about what factors may be linked to adult numeracy levels. Identify 3 factors that you think may have a significant effect on numeracy levels.

c) Read pages 13–16 and Appendix 4 (pg. 232–245) to find out how the survey was conducted. Do you think the survey was fair or biased? (Justify your answer.)

d) Go to:

   http://neighbourhood.statistics.gov.uk/dissemination/LeadHome.do;jsessionid=ac1f930bce633bec278f81b4defbbeaea4cd0e8e6b7.e38PbNqOa3qRe34Qc3yRc34Obhb0n6jAmljGr5XDqQLvpAe?bhcp=1

   and research data on the two wards you identified in part a) as having the highest and lowest levels of numeracy. Look up data on the three significant factors you identified in part b) and present your findings in a suitable mathematical form. Form a conclusion about whether there is any relationship between these factors and the different numeracy levels found in the two wards.

e) Write a summary paragraph on your investigation and findings. Include a reference to any possible sources of error in forming your conclusions.

Bring two copies of your completed task to the assessment session and be prepared to answer questions on it in the interview.

Mathematical techniques:

Averages: mean, median, mode

Spread: range, inter-quartile range, variance, standard deviation

Charts, tables and diagrams: bar-chart, pie chart, histogram, frequency table, scatter diagram, box plots

Linear regression

res no.	style	title
02.2	**Criteria References**	**Pre-session Task: National Needs and Impact Survey**

Process skills	Element	Extent
1. Making sense of situations and representing them	1.1 Situations that can be analysed and explored through numeracy	1.1a Recognise situations can be explored beneficially by using mathematics[1] 1.1b Use interrogation/interpretation by asking questions and considering responses. This is in order to negotiate and hence recognise the mathematics within situations[2]
	1.2 The role of models in representing situations	1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures[2]
	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures[1] 1.3b Make reasoned selection of tools such as ICT, measuring, calculating and recording equipment[1]
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information[1] 1.4b Research and analyse context to support the selection of and application of appropriate skills[1] 1.4c Demonstrate understanding of and act on the implications of estimation[1]
2. Processing and analysis	2.1 The importance of using appropriate procedures	2.1a Use efficient procedures in familiar situations and coping strategies in unfamiliar settings accepting that change to efficient procedures is necessary for future development[1] 2.1bRecognise, visualise and represent mathematical equivalences as a mechanism for finding/using an appropriate procedure[1]
	2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2b Identify and justify patterns for prediction of trends/changes/probabilities[1]

	2.4 Use of logic and structure when working towards finding results and solutions	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools[1] 2.4c Use extended logic and structures when working in multi-step situations[1]
3. Interpreting and evaluating results	3.1 The role of interpretation of results in drawing conclusions	3.1a Apply numerical/mathematical solutions to original context[1] 3.1b Use solutions to inform future mathematical practice*[1] 3.1c Use derived knowledge to inform practice in context. For example, work, everyday life and study[1]
	3.2 The effect of accuracy on the reliability of findings	3.2a Demonstrate understanding of the role/application of approximation across processing/analysis and summary[2] 3.2b Demonstrate understanding of the characteristics of error including the effect of compounding in predictive situations[2] 3.2c Evaluate the impact of inaccuracies in the application of mathematical procedures[2]
	3.3 The appropriateness and accuracy of results and conclusions	3.3c Demonstrate logic in choice of appropriate stage of mathematical interrogation and processing to revisit/revise if results obtained are considered to be inappropriate[1]
4. Communicating and reflecting on findings	4.1 The importance of choosing appropriate language and forms of presentation to communicate results	4.1a Make reasoned selection and use of mathematical language, appropriate to target audience, including interpretation for inclusiveness and accessibility for non mathematicians[1] 4.1b Make reasoned selection and use of communication methodologies including numerical, symbolic, diagrammatic and graphical display[1] 4.1c Use communication techniques that display accurately the development of mathematical processing and analysis, including multi-step processing[1] 4.1d Use oral debate and tactile/kinaesthetic representation appropriately in communicating results*[2]
	4.2 The need to reflect on any process to consider whether other approaches would have been more effective	4.2b Evaluate the clarity of mathematical arguments to self and audience* 4.2c Use self and group reflection as a mechanism to address mathematical efficiency[2] 4.2d Evaluate impact of conclusions on future investigations*

*Possible areas for interview questions

[1] **should be met by completion of Task 2**

[2] **may be met by completion of Task 2**

res no.	style	title
03.1	**Task**	**Pre-session Task: OECD research**

Task:

The Organisation for Economic Co-operation and Development (OECD) published the results from their 2006 Programme for International Student Assessment (PISA) on 4 December 2007.
www.oecd.org/dataoecd/31/0/39704446.xls

These indicate how 15-year-olds in the UK have performed in science, mathematics and reading from within a cohort of 57 countries.

Research the findings relating to mathematics. Select the appropriate information to enable you to come to some conclusions about the UK results. Present your findings using language that a layman could follow, without losing any of the meaning. Use appropriate diagrams, charts, tables and or graphs to help get your message across.

How reliable do you think the results are? (Include a discussion about the significance of the standard error data.) Suggest how the results could be used to inform policy in mathematics teaching.

res no. **03.2**

style **Criteria References**

title **Pre-session Task: OECD research**

Process skills	Element	Extent
1. Making sense of situations and representing them	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures 1.3b Make reasoned selection of tools such as ICT, measuring, calculating and recording equipment
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information 1.4b Research and analyse context to support the selection of and application of appropriate skills
3. Interpreting and evaluating results	3.1 The role of interpretation of results in drawing conclusions	3.1c Use derived knowledge to inform practice in context. For example, work, everyday life and study
	3.2 The effect of accuracy on the reliability of findings	3.2c Evaluate the impact of inaccuracies in the application of mathematical procedures
4. Communicating and reflecting on findings	4.1 The importance of choosing appropriate language and forms of presentation to communicate results	4.1a Make reasoned selection and use of mathematical language, appropriate to target audience, including interpretation for inclusiveness and accessibility for non mathematicians 4.1b Make reasoned selection and use of communication methodologies including numerical, symbolic, diagrammatic and graphical display 4.1d Use oral debate and tactile/kinaesthetic representation appropriately in communicating results*
	4.2 The need to reflect on any process to consider whether other approaches would have been more effective	4.2b Evaluate the clarity of mathematical arguments to self and audience* 4.2d Evaluate impact of conclusions on future investigations*

* Possible areas for interview questions

Assessor Notes – Group tasks

There are two group tasks (04 and 05). Task 04 is based on estimation and Task 05 is based on algebra. Groups of candidates will need to take part in one of the two group tasks at the assessment session. Both tasks are designed to enable candidates to meet a similar range of criteria. The group task should take approximately 40 minutes in total.

Relevant elements and the extent that may be met by the group task have been grouped into seven broad areas which are recorded on the assessment sheet. Assessors will need to complete the assessment record sheet for meeting of the relevant criteria by each candidate. Assessors could use suitable interventions such as questions to facilitate assessment of criteria. Candidates will also have to complete a brief reflection on their role in the task which should be collected and assessed for meeting of criteria. Additionally, criteria that have not been fully met may be assessed through questioning at interview.

For further information, please see assessor notes for each task.

res no.	style	title
04.1	**Task**	**Group Task: Estimation of births**

Estimation of births Task – Instructions to assessors:

You will need to provide calculators, access to Excel and atlases.

Candidates should be placed in small groups (ideally no more than four in a group) and be asked to take part in a group task based on estimation.

It is a discussion based task and you will need to emphasise that every group member will need to participate and contribute as they are being assessed against some of the entry criteria.

There will need to be one assessor per group as you will need to assess each group member against the areas on the assessment sheet. You will need to intervene if you feel that one group member is dominating or one member is being reticent about contributing. You may need to prompt them if you feel that their contributions are insufficient to enable you to assess them against the areas on the assessment sheet (alternatively, any gaps could be followed up through questions at interview).

Provide them with the instructions for candidates (see below) and a copy of the assessment sheet and allow them several minutes reading and thinking time. Inform them that no prior knowledge of population or birth rates is required to complete the task.

Give the groups five minutes to work on the task initially, then provide them with the World Statistics table and tell them to use the information in the table to adjust their solution if necessary. Give the groups a further ten minutes to work on the task and then ask them to come up with a solution and to feedback on their solution and their approach to solving the problem.

Provide the candidates with the figure for the actual number of babies born and give them five minutes to write a reflection on their involvement in the task and to evaluate the group's solution, suggesting improvements and reasons for differences from the actual solution. Collect these written reflections in to help you assess each candidate.

Instructions to candidates:

Within your group, estimate how many babies were born in the UK in 2006.

This is a discussion based task and every group member should aim to participate as you will be assessed on your ability to select and justify procedures.

You may use a calculator, an atlas and/or an Excel spreadsheet to help you perform the task but you must not access the internet.

- You should identify the different areas of mathematics that are involved in the task.
- It is important to discuss and negotiate which mathematical procedures you are going to use to perform this task. You should consider the advantages and disadvantages of each method proposed by group members. Also consider testing various different procedures and adapting / rejecting them as appropriate.
- Each group member should be prepared to be involved in feeding back on justifying their group's choice of methods and solution.
- After the feedback you will be given an answer to the estimation task. You will then be asked to reflect on your involvement in the task and evaluate your group's solution, identifying any reasons for differences between that and the actual answer and suggesting how the approach could have been improved in order to arrive at a similar solution.

World statistics

Country	Population (July 2007 est.)	Birth rate (/1,000)
Afghanistan	31,889,923	46.21
Barbados	280,946	12.61
Canada	33,390,141	10.75
China	1,321,851,888	13.45
Japan	127,433,494	8.10
Nigeria	135,031,164	40.20
Sweden	9,031,088	10.20

Taken from https://www.cia.gov/library/publications/the-world-factbook/ (accessed 11/04/08)

res no. style title

04.2 Criteria References Group Task: Estimation of births

Process skills	Extent
A. **Purpose**: Engage in the solution to a problem using mathematical means	1.1a Recognise situations can be explored beneficially by using mathematics
	1.2a Demonstrate understanding of the purpose and benefits of mathematical modelling
	1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures
	1.2d Demonstrate that making conceptual links between different areas of mathematics and differing mathematical procedures can support mathematical modelling
	1.4c Demonstrate understanding of and act on the implications of estimation
B. **Reflecting**: With others, suggest appropriate tools and techniques	1.2b Demonstrate understanding of the stages and iterative nature of mathematical modelling including development, trialling, evaluating, amending, applying and representing/displaying
	1.3b Make reasoned selection of tools such as ICT, measuring, calculating and recording equipment
	2.3a Identify variables and their characteristics
C. **Applying 1**: With others, apply appropriate mathematical techniques to solve the problem	1.3a Make reasoned selections of appropriate mathematical procedures
	2.1a Use efficient procedures in familiar situations and coping strategies in unfamiliar settings accepting that change to efficient procedures is necessary for future development
	2.4c Use extended logic and structures when working in multi-step situations
	3.3c Demonstrate logic in choice of appropriate stage of mathematical interrogation and processing to revisit/revise if results obtained are considered to be inappropriate

D. **Applying 2**: With others, adapt the techniques used in the problem solving task where necessary	1.1b Use interrogation/interpretation by asking questions and considering responses. This is in order to negotiate and hence recognise the mathematics within situations
	2.3b Adapt mathematical models to modify/improve the mathematical representation
	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools
	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison
E. **Interpreting**: With others, interpret the mathematical solution and relate back to the given context	2.2a Identify and justify patterns for summarising mathematical situations
	2.3c Use the analysis of pattern to evaluate particular predicted examples of pattern summaries
	3.1a Apply numerical/mathematical solutions to original context
	3.1b Use solutions to inform future mathematical practice
F. **Communicating**: With others, communicate the results of the process in an appropriate way	4.1c Use communication techniques that display accurately the development of mathematical processing and analysis, including multi-step processing
	4.1d Use oral debate appropriately in communicating results
	4.2b Evaluate the clarity of mathematical arguments to self and audience
G. **Evaluating**: With others and individually, evaluate the solution to the mathematical problem	2.4b Collaborate and engage in critical debate as a mechanism for development and testing of logic and structure during processing/ analysis
	4.2a Evaluate efficient/ rigorous and coping strategies, comparing advantages and disadvantages
	4.2c Use self and group reflection as a mechanism to address mathematical efficiency
	4.2d Evaluate impact of conclusions on future investigations

res no. style title

04.3 **Assessment sheet** **Group Task 1: Estimation of births**

Name/initials of participant:				
A. Engage in the solution to a problem using mathematical means				
B. With others, suggest appropriate tools and techniques				
C. With others, apply appropriate mathematical techniques to solve the problem				
D. With others, adapt the techniques used in the problem solving task where necessary				
E. With others, interpret the mathematical solution and relate back to the given context				
F. With others, communicate the results of the process				
G. With others and individually, evaluate the solution to the mathematical problem				

Key:

Relevant criteria from process skills: ✓ met fully P partially met × not met

res no.	style	title
04.4	**Answer**	**Group Task 1: Estimation of births**

Number of babies born in the UK in 2006: 741,952

res no.	style	title
05.1	**Task**	**Group Task: Gift wrapping**

Gift wrapping task – Instructions to assessors:

You will need to provide calculators, wrapping paper, scissors, rulers, sellotape, and access to Excel.

Candidates should be placed in small groups (ideally no more than four in a group) and be asked to take part in a group task based on algebra.

It is a discussion based task and you will need to emphasise that every group member will need to participate and contribute as they are being assessed against some of the entry criteria.

There will need to be one assessor per group as you will need to assess each group member against the areas in the assessment sheet. You will need to intervene if you feel that one group member is dominating or one member is being reticent about contributing. You may need to prompt them if you feel that their contributions are insufficient to enable you to assess them against the areas on the assessment sheet (alternatively, any gaps could be followed up at interview).

Provide them with the instructions for candidates (see below) and a copy of the assessment sheet and allow them several minutes reading and thinking time.

Give the groups ten minutes to work on the task initially, then provide them with the actual formula and tell them to use the information to adjust their solution if necessary. Give the groups a further ten minutes to work on the task and then ask them to come up with a solution and to feedback on their solution and their approach to solving the problem.

Provide the candidates with the proposed solution to the task and give them five minutes to write a reflection on their involvement in the task and to evaluate the group's solution, suggesting improvements and reasons for differences from the actual solution. Collect these written reflections in to help you assess each candidate.

Instructions to candidates:

This is a discussion based task and every group member should aim to participate as you will be assessed on your ability to select and justify procedures. Each group member should be prepared to be involved in feeding back on justifying their group's choice of methods and solution.

You may use a calculator and/or an Excel spreadsheet to help you perform the task but you must not access the internet.

- You should identify the different areas of mathematics that are involved in the task.
- It is important to discuss and negotiate which mathematical procedures you are going to use to perform this task. You should consider the advantages and disadvantages of each method proposed by group members. Also consider testing various different procedures and adapting/rejecting them as appropriate.

You will be given further instructions after you have addressed the points above.

Task:

A free newspaper recently reported that Warwick Dumas of the University of Leicester had devised a formula to work out the most efficient amount of paper for wrapping a gift.

They reported the formula as being ‘A = 2(ab + ac + bc + c) where A is the area of paper needed and a, b and c are the dimensions of the gift’. (London Metro 4.12.07)

The newspaper omitted what type of shape Dumas suggested this works for and to give any more details about the dimensions other than that quoted above.

- In your groups, discuss whether you think this formula is correct.
- If you think it is correct, justify how this would work.
- If you think it is not correct, suggest what the correct formula might be.
- Show how you might test the formula to see if it does actually give the most efficient amount of paper needed.

Further instructions / actual formula:

The actual formula Dumas came up with is:

$A = 2(ab + ac + bc + c^2)$
where A is the area of paper needed to wrap a cuboid, a is the longest side and c is the shortest side.

Does this tally with what you came up with?

If not, whose formula is more efficient – yours or that of Dumas?

The website also states that:

'In layman's terms, the length of the wrapping paper should be as long as the perimeter of the side of the gift, with no more than 2cm allowed for an overlap. The width should be just a little over the sum of the width and the depth of the gift.'

Are they correct in saying this?

Finally, reflect on your involvement in the task and evaluate your group's solution, identifying any reasons for differences between that and the given solution and suggesting how the approach could have been improved.

London Metro 4.12.07

University of Leicester Press release (4.12.07) (online)

www2.le.ac.uk/ebulletin/news/press-releases/2000-2009/2007/12/nparticle.2007-12-04.6745557516

accessed 06.12.07

res no.	style	title
05.2	**Criteria References**	**Group Task: Gift wrapping**

Process skills	Extent
A. **Purpose**: Engage in the solution to a problem using mathematical means	1.1a Recognise situations can be explored beneficially by using mathematics
	1.2a Demonstrate understanding of the purpose and benefits of mathematical modelling
	1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures
	1.2d Demonstrate that making conceptual links between different areas of mathematics and differing mathematical procedures can support mathematical modelling
B. **Reflecting:** With others, suggest appropriate tools and techniques	1.2b Demonstrate understanding of the stages and iterative nature of mathematical modelling including development, trialling, evaluating, amending, applying and representing/displaying
	1.3b Make reasoned selection of tools such as ICT, measuring, calculating and recording equipment
	2.3a Identify variables and their characteristics
C. **Applying 1**: With others, apply appropriate mathematical techniques to solve the problem	1.3a Make reasoned selections of appropriate mathematical procedures
	2.1a Use efficient procedures in familiar situations and coping strategies in unfamiliar settings accepting that change to efficient procedures is necessary for future development
	2.4c Use extended logic and structures when working in multi-step situations
	3.3c Demonstrate logic in choice of appropriate stage of mathematical interrogation and processing to revisit/revise if results obtained are considered to be inappropriate
D. **Applying 2**: With others, adapt the techniques used in the problem solving task where necessary	1.1b Use interrogation/interpretation by asking questions and considering responses. This is in order to negotiate and hence recognise the mathematics within situations
	2.3b Adapt mathematical models to modify/improve the mathematical representation
	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools

	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison
E. **Interpreting**: With others, interpret the mathematical solution and relate back to the given context	2.2a Identify and justify patterns for summarising mathematical situations
	2.3c Use the analysis of pattern to evaluate particular predicted examples of pattern summaries
	3.1a Apply numerical/mathematical solutions to original context
	3.1b Use solutions to inform future mathematical practice
F. **Communicating**: With others, communicate the results of the process in an appropriate way	4.1c Use communication techniques that display accurately the development of mathematical processing and analysis, including multi-step processing
	4.1d Use oral debate appropriately in communicating results
	4.2b Evaluate the clarity of mathematical arguments to self and audience
G. **Evaluating**: With others and individually, evaluate the solution to the mathematical problem	2.4b Collaborate and engage in critical debate as a mechanism for development and testing of logic and structure during processing/ analysis
	4.2a Evaluate efficient/ rigorous and coping strategies, comparing advantages and disadvantages
	4.2c Use self and group reflection as a mechanism to address mathematical efficiency
	4.2d Evaluate impact of conclusions on future investigations

res no. style title

05.3 Assessment sheet Group Task 2: Gift wrapping

Name/initials of participant				
A. Engage in the solution to a problem using mathematical means				
B. With others, suggest appropriate tools and techniques				
C. With others, apply appropriate mathematical techniques to solve the problem				
D. With others, adapt the techniques used in the problem solving task where necessary				
E. With others, interpret the mathematical solution and relate back to the given context				
F. With others, communicate the results of the process				
G. With others and individually, evaluate the solution to the mathematical problem				

Key:

Relevant criteria from process skills: ✓ met fully P partially met × not met

Assessor notes – Maths tests

It is suggested that anyone with a Level 3 maths qualification i.e. Maths A level or Key Skills 3 Application of Number should be exempt from the maths test element of this assessment.

There are two maths tests in this pack (06 and 07) consisting of Key Skills Level 3 Application of Number questions. Both tests have a total of 25 marks and the suggested duration for both is 1 hour 10 minutes. It is up to individual assessment centres to decide on a 'pass mark' or sufficient meeting of the criteria.

Candidates who are not exempt should take one of the tests at the assessment session. We recommend that sample questions are sent to candidates before they attend the assessment session. Calculator use should be permitted in the tests and an open book approach is also recommended.

res no.	style	title
06.1	**Task**	**Personal Maths Skills Task: Maths Test 1**

1. In the United Kingdom (UK) the number of credit cards and debit cards and the amount spent on them is increasing year by year. The table gives this information for the years 1998 and 2003.

Year	Number of credit cards and debit cards used (millions)	Total amount of spending (£ billions)
1998	118.3	140
2003	160.6	244

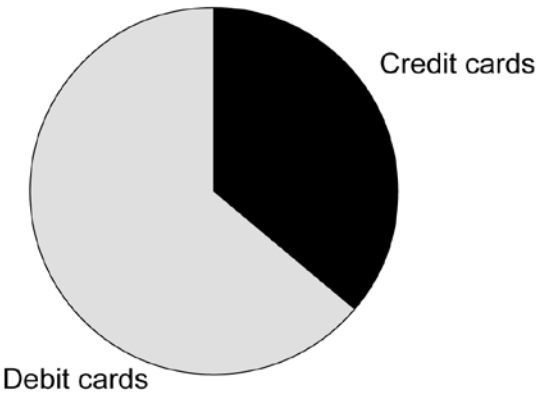
1 billion is 1 000 000 000

(a) Calculate the increase in the average amount spent on one credit card or one debit card between the years 1998 and 2003 in the UK.

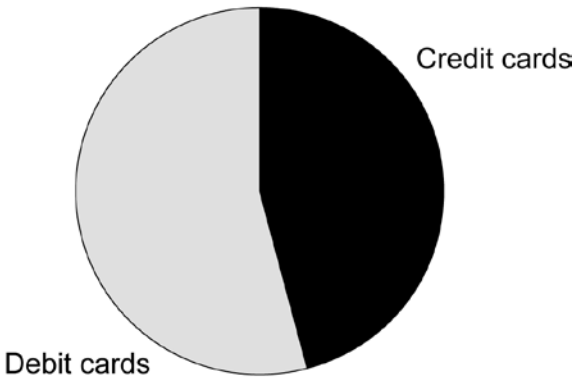
2 marks

The pie charts below show the proportions of the total number of transactions and the total spending using credit cards and debit cards in the UK in 2003.

Proportions of transactions using credit and debit cards in the UK in 2003



Proportions of spending on credit and debit cards in the UK in 2003



(b) Compare the two pie charts and comment on the average amount per transaction spent on credit cards compared to the average amount per transaction spent on debit cards in the UK during 2003.

2 marks

At the beginning of April 2004 the total debt in the UK from credit cards, personal loans and mortgages amounted to £956 billion. The number of households in the UK in 2004 was 2.45×10^7

(c) What was the average debt of each UK household from credit cards, personal loans and mortgages at the beginning of April 2004?

1 mark

At the end of July 2004 the total debt in the UK from credit cards, personal loans and mortgages rose to £1.004 trillion from a total debt of £956 billion at the beginning of April 2004.

1 trillion is 1 000 billion

(d) Calculate the percentage increase in debt in the UK from credit cards, personal loans and mortgages in the 4 months between the beginning of April 2004 and the end of July 2004.

1 mark

At the end of July 2004, BBC News predicted that
'In three years time, debt in the UK from credit cards, personal loans and mortgages will exceed £1.5 trillion.'

(e) Show calculations to check the BBC News prediction.

2 marks

(f) What assumption had BBC News made in making this prediction?

1 mark

(Key Skills Application of Number Level 3 January 2006)

2. For each child born in the UK on or after 1 September 2002, parents receive a £250 voucher from the Government to invest in a Child Trust Fund account.

   The child will be given access to the money in this account at the age of 18 years.

   The parents of a child born on 1 October 2002 open a Child Trust Fund account with their £250 voucher. The account pays interest at a fixed rate of 5.25% per year; the interest is added at the end of each complete year. The formula below can be used to calculate the future value of the money in the Child Trust Fund.

$$V = A(1 + \frac{r}{100})^n$$

where: **V** is the future value of the Child Trust Fund account

A is the amount invested in the Child Trust Fund account

r is the rate of interest per year

n is the number of times interest is added to the account over the investment period.

(a) Use the formula to find what the value of the £250 invested in the Child Trust Fund will be after 18 complete years have elapsed.

2 marks

At the same time as the parents open the Child Trust Fund account the grandparents of the child invest £250 in a savings account that pays interest at a fixed rate of 0.45% per month.

(b) Adapt **r** and **n** in the formula from part a. Use the amended formula to find what the value of the £250 invested in this savings account will be after 18 complete years have elapsed.

2 marks

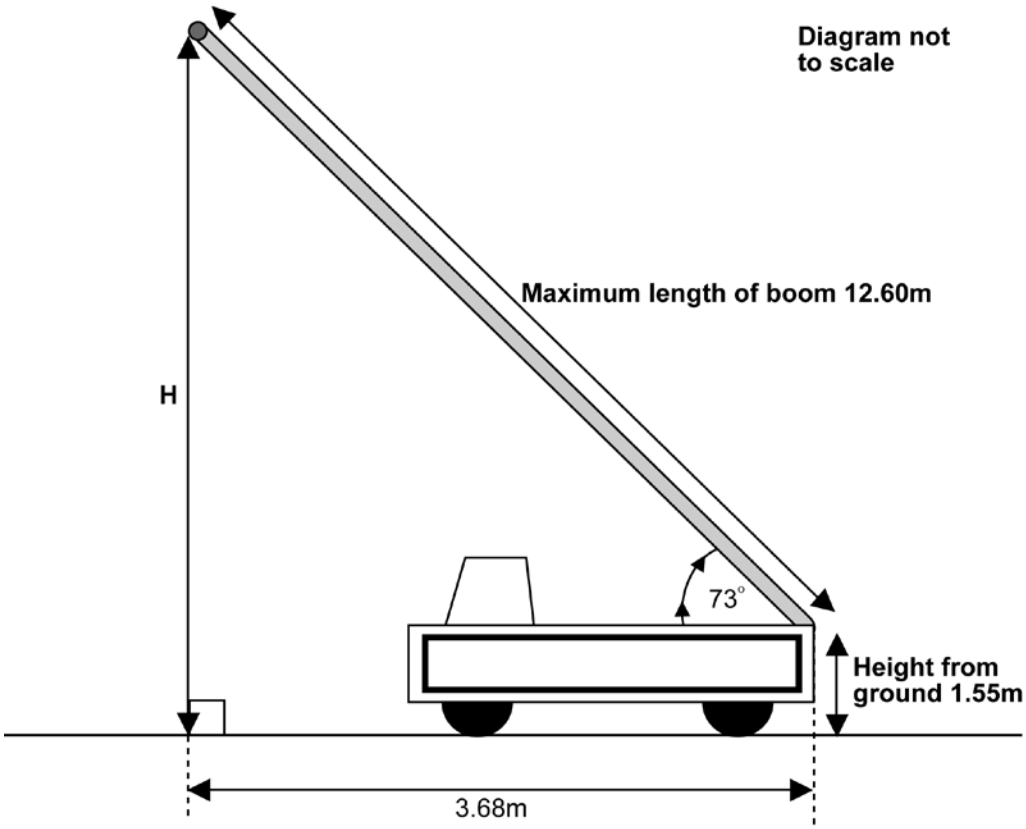
(c) Compare your answers for part (a) and part (b). Which investment is better and by how much? **1 mark**

(Key Skills Application of Number Level 3 May 2006)

3. A building contractor uses a crane to transport materials on a building site.

The crane has a boom that is 1.55 metres from the ground at its lower end. The boom extends to a maximum length of 12.60 metres at a maximum angle of 73° from the horizontal.

Simplified diagram of the crane to show the boom extended to its maximum length



(a) What is the maximum vertical height (**H**), from the ground to the top of the boom, when the boom is extended to its maximum length?

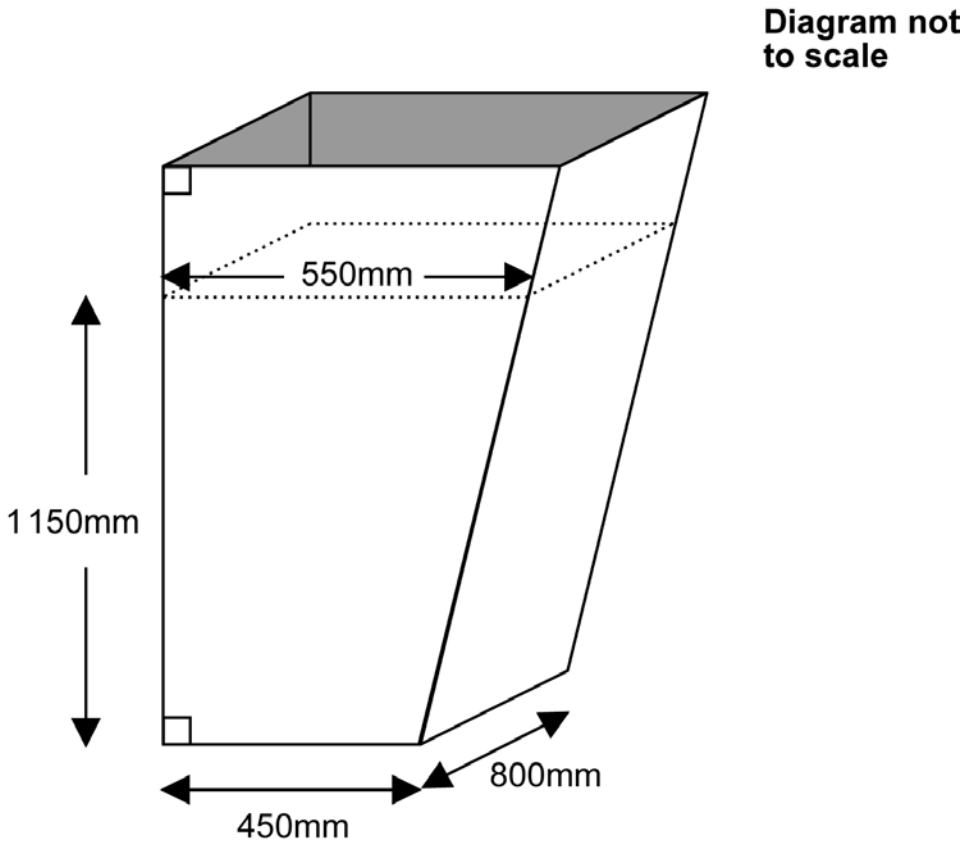
2 marks

(b) Show how to check your answer to part a using a different method.

1 mark

To lift concrete mix, the crane uses a bucket with a roughly uniform cross section as shown in the simplified diagram below.

Simplified diagram of the bucket used to lift concrete mix



The maximum depth of concrete mix allowed in the bucket is 1 150 millimetres.

(c) What volume of concrete mix, in cubic metres, will the bucket hold when it is filled to its maximum depth of 1 150 millimetres?

2 marks

(Key Skills Application of Number Level 3 November 2005)

4. To help to raise funds for a new climbing frame, a playgroup plan to sell children's T-shirts and sweatshirts bearing the playgroup logo. They order 20 of each from the manufacturer. The costs are shown below.

T-shirts	£2.45 each
Sweatshirts	£5.95 each
Postage and packing per order	£8.22 (including VAT)

They plan to sell the T-shirts for £3.99 each.

(a) What is the lowest price they can sell each sweatshirt for in order to make at least £50 profit overall?

2 marks

The playgroup decides to sell the T-shirts for £3.99 each and sweatshirts for £7.99 each. At a promotional event they sell a total of 28 shirts. The total takings are £159.72

(b) Use this information to form two equations about the T-shirts and the sweatshirts sold at the event.

1 mark

(c) Use your equations to calculate the number of T-shirts sold and the number of sweatshirts sold at the event.

2 marks

(d) Show how to check your answers to part (c).

1 mark

(Key Skills Application of Number Level 3 March 2006)

res no. style title

06.3 Answers Personal Maths Skills Task: Maths Test 1

1(a)	2 marks	2	(a) £336 Accept £ 335.87
		1	For $\frac{140\times10^9}{118.3\times10^6}$ or £1 183.431953 seen rounded or unrounded for 1998 OR $\frac{2440\times10^9}{160.6\times10^6}$ Or £1 519.302615 rounded or unrounded for 2003 Or complete correct method with one calculation error
1(b)	2 marks	2	A correct comment on the average amount per transaction spent on credit cards compared to the average amount per transaction spent on debit cards e.g. 'ore spent per credit card transaction'
		1	For a correct comment about the first pie chart e.g. 'there are fewer transactions on credit cards than debit cards' AND a correct comment on the second pie chart e.g. 'total spending on debit cards is greater than total spending on credit cards'
1(c)	1 mark	1	£39 020 Accept £39 020.41 OR £39 000
1(d)	1 mark	1	5.02(%) OR 5(%) OR 5.0(%)
1(e)	2 marks	2	Correct calculations to show that the debt exceeds (£ trillion) 1.5 in 3 years. Follow through from part d
		1	For (£ trillion)1.162950352 **OR** (£trillion) 1.162919773 **OR** (£ trillion)1.1622555 seen rounded or unrounded for end July 2005 **OR** complete correct method with one calculation error
1(f)	1 mark	1	Correct assumption e.g. *'that debt continues to increase at same rate as in the period from the beginning of April 2004 to the end of July 2004'*

2(a)	2 marks	2	£627.9685441 rounded or unrounded. Accept £628 or £627 or £627.96 or £627.97
		1	For 250 $(1+\frac{5.25}{100})^{18}$ or equivalent seen
2(b)	2 marks	2	£659.367114 rounded or unrounded. Accept £659 or £659.36. Accept £659.
		1	For 250 $(1+\frac{0.45}{100})^{216}$ or equivalent seen
2(c)	1 mark	1	Grandparents/investment part 5b better by £31.40. Accept £31.41. Allow follow through from part a and b rounded or unrounded.
3(a)	2 marks	2	13.59 m or 13.60 m Accept 13.6 m
		1	For correct use of tangent, sine, or Pythagoras with substitution into formula seen **Or** complete correct method with one calculation error
3(b)	1 mark	1	For a complete correct check shown using a different method from that used in part a; accept reverse calculations.
3(c)	2 marks	2	0.46(m^3)
		1	For 575 000 mm^2 or 0.575 m^2 for the area of the trapezium or 460 000 000 mm^3 **or** complete correct method with one calculation error.
4(a)	2 marks 1 mark	2	(£)7.33
		1	For (£)176.22 seen for cost of order and (£)79.80 seen for the possible income from sale of T-shirts or complete correct method with one calculation error or (£)7.321 rounded or unrounded
4(b)	1 mark	1	T + S = 28 and 3.99T+ 7.99S = 159.72 or equivalent using pence, other symbols or words
4(c)	2 marks	2	16 T-shirts AND 12 sweatshirts
		1	For 16 T-shirts **or** 12 sweatshirts **or** complete correct method with one calculation error
4(d)	1 mark	1	Correct check shown e.g. by substituting into the 'other' equation

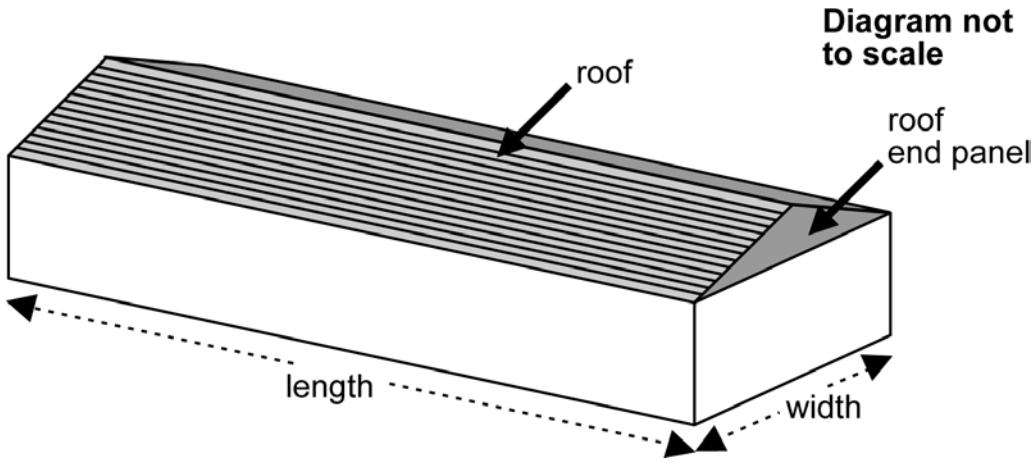
Process skills	Element	Extent	Q1	Q2	Q3	Q4
1. Making sense of situations and representing them	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures	✓	✓	✓	✓
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information	✓	✓	✓	✓
2.Processing and analysis	2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2a Identify and justify patterns for summarising mathematical situations 2.2b Identify and justify patterns for prediction of trends/changes/ probabilities 2.2c Compare patterns to find potential simultaneous meeting of conditions	✓			✓ ✓
	2.3 The role of changing values and assumptions in investigating a situation	2.3a Identify variables and their characteristics		✓		✓
	2.4 Use of logic and structure when working towards finding results and solutions	2.4c Use extended logic and structures when working in multi-step situations	✓	✓	✓	✓
3. Interpreting and evaluating results	3.3 The appropriate-ness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/ accuracy via experimentation, inverse operations, alternative methods, comparison	✓		✓	✓

res no.	style	title
07.1	**Task**	**Personal Maths Skills Task: Maths Test 2**

1. A petfood factory stores cartons of petfood in a warehouse.

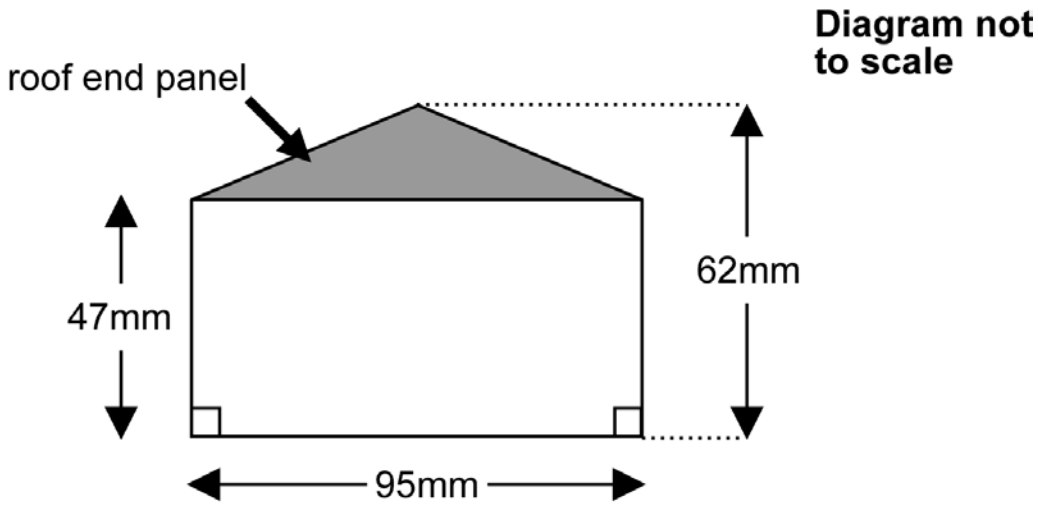
   The roof end panels and the roof of this warehouse need replacing with metal sheeting.

Simplified diagram of the warehouse



To get an estimate for the cost of this work, the owner sends a contractor a simplified diagram with measurements taken from plans drawn to a scale of 1 : 100.

Simplified diagram of the end of the warehouse



(a) What is the total area, in square metres, of the **two roof end panels** of the actual warehouse?

2 marks

The length of the warehouse measures 288 millimetres on the plans drawn to a scale of 1 : 100.

(b) What is the total area, in square metres, of the roof of the actual warehouse?

3 marks

(c) Show how you can use approximation to arrive at an answer to (b) and state whether you think this approximate answer would be an appropriate answer to (b) in the context of the question.

1 mark

The owner asks the contractor for another estimate. He wants to know the price for replacing the roof of his office block with the same roofing material.

The contractor calculates that he will need 224 square metres of roofing material for the office block. His basic price is £16.92 per square metre to provide and install the roofing material plus 17.5% VAT calculated on the basic price.

(d) What is the total price, including VAT, for the contractor to replace the roof of the office block with roofing material?

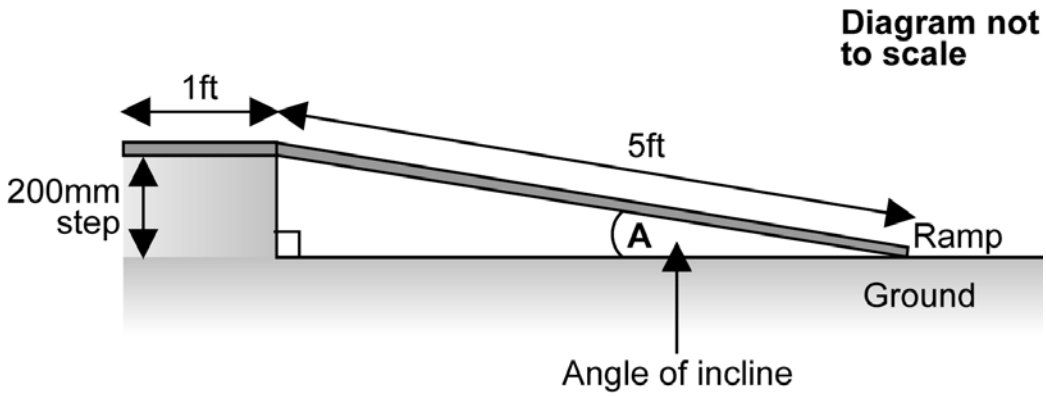
2 marks

(Key Skills Application of Number Level 3, January 2007)

2. All organisations that provide a service to the public must have wheelchair access.

The front entrance of a community hall has a step 200 millimetres high. The management committee of the hall decides to use a portable ramp to provide wheelchair access. The portable ramp is 6 feet (ft) long in total including a one-foot section of the ramp that rests on the top of the step.

Simplified diagram to show how the 6-feet long portable ramp will be used at the front entrance



1 foot is equivalent to 300 millimetres

Using portable ramps, the recommended maximum incline for wheelchair access is:

Recommended maximum angle of incline	
Manual wheelchairs	**Electric wheelchairs**
7°	9.5°

(a) Comment on how the angle of incline (**A**) provided by the 6-feet long portable ramp meets the recommended incline for wheelchair access using portable ramps. Show calculations to support your comment.

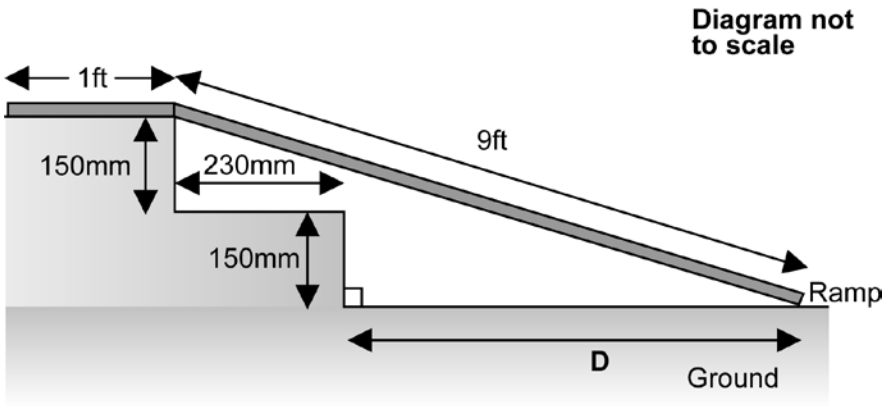
3 marks

(b) Show how to check your calculations in part (a).

1 mark

The side entrance to the community hall has two steps each 150 millimetres high. The depth of the lower step is 230 millimetres. For this entrance, the management committee buy a portable ramp with a total length of 10 feet including a one-foot section that rests on the top step.

Simplified diagram to show how the 10-feet long portable ramp will be used at the side entrance



(c) Calculate the distance (**D**), in metres that the 10-feet ramp will extend from the base of the bottom step to the base of the ramp.

2 marks

(Key Skills Application of Number Level 3, March 2006)

3. A mobile phone company sells bundles of air time. One bundle offers customers 30 text messages and 20 minutes of voice calls for £5.30. Another bundle offers customers 200 text messages and 100 minutes of voice calls for £29.00.

Assume the cost of a text message and the cost per minute of a voice call is the same in both bundles.

(a) Use this information to write two equations about the cost of text messages and the cost per minute of voice calls in the bundles of air time.

1 mark

(b) Find the cost to send a text message and the cost per minute for a voice call in the bundles of air time.

2 marks

(c) Show how to check your answers to part (b).

1 mark

In 2005 an article in The Times newspaper predicted that

'By the end of 2005, 82% of the 12.6 million people in the UK aged between 5 and 24 years will own a mobile phone; this percentage will rise to 87% by the end of 2007.'

The article also stated that the population of people in the UK aged between 15 and 24 years was growing at a rate of 0.4% a year.

(d) Use this information to predict how many more young people aged between 15 and 24 years will own a mobile phone by the end of 2007 than by the end of 2005.

2 marks

(Key Skills Application of Number Level 3, January 2007)

4. Replacing traditional light bulbs with low energy light bulbs saves money and reduces carbon dioxide (CO_2) emissions.

The table below gives information about two light bulbs with a similar light output.

Information about two types of light bulbs with a similar light output

Type of bulb	Expected life of bulb (hours)	Purchase price (£)
Traditional 60-watt	1000	0.47
Low energy 11-watt	12000	8.98

The cost of electricity is 7.24 pence per kilowatt hour.

A 1 000-watt electrical appliance uses 1 kilowatt hour of electricity in 1 hour

(a) What is the total cost of buying and using a traditional 60-watt light bulb over its expected life?

1 mark

The UK government is committed to reducing carbon dioxide (CO_2) emissions from 5.81×10^8 tonnes per year in 2004, to a target level of 5.31×10^8 tonnes per year in 2007.

The formula below gives the annual percentage decrease in CO_2 emissions required to achieve this target level in 2007.

$$r = 100\left(1 - \sqrt[3]{\frac{T}{P}}\right)$$

where **r** is the annual percentage decrease in CO_2 emissions
T is the target level of CO_2 emissions in tonnes in 2007
P is the amount of CO_2 in tonnes in 2004

(b) Use the formula to find the annual percentage decrease in CO_2 emissions required to achieve the target level in 2007.

2 marks

In 2004, the average UK household used 4 890 kilowatt hours of electricity. Generating this amount of electricity produced 2 103 kilograms ofCO_2 emissions.

If the average household, in 2004, had replaced just one traditional 60-watt bulb with a low energy 11-watt light bulb this would have reduced the electricity it used by 45 kilowatt hours.

1 000 kilograms are equal to 1 tonne

There were 2.41×10^7 households in the UK in 2004.

(c) If every household in the UK in 2004 had replaced one traditional 60-watt light bulb with a low energy 11-watt light bulb, what would have been the total reduction in CO_2 emissions over this year? Give your answer to the nearest 1000 tonnes.

2 marks

(Key Skills Application of Number Level 3, March 2007)

res no. style title

07.3 Answers Personal Maths Skills Task: Maths Test 2

1(a)	2 marks	2	14.25(m^2)
		1	For 7.125(m^2) or equivalent seen for the area of one end panel or 1 425(mm^2) or equivalent seen for the area of both end panels in plan or 9.5(m) and 1.5(m) seen for the actual dimensions of the base and the vertical height of an end panel **or** complete correct method with one calculation error
1(b)	3 marks	3	286.9(m^2) OR 287(m^2) OR 286.92(m^2) Accept 301(m^2) OR 301.17(m^2) OR 301.2(m^2)
		1	For 286.9179674(m2) rounded, unrounded or truncated seen **or** 143.4589837(m2) or equivalent seen rounded, unrounded or truncated for half roof area **or** 4.981214711(m) or equivalent seen rounded, unrounded or truncated for the slant height of the roof **or** 28 691.79674(mm2) or equivalent seen rounded, unrounded or truncated for the area of the roof in the plan **or** complete correct method with one calculation error or early rounding
1(c)	1 mark	1	30m x 5m x 2 = 300m^2 or equivalent
1(d)	2 marks	2	(£)4 453.34 OR (£)4 453.35
		1	For (£) 4 453.344 rounded, unrounded **or** (£)3 790.08 seen for basic cost of roofing **or** (£)663.264 seen rounded or unrounded for VAT **or** complete correct method with one calculation error

2(a)	3 marks	2	correct answer for the angle of incline Angle of incline 7.662255661(°) rounded or unrounded or truncated (as far as 7.6(°))
		1	For $SinA = \frac{200}{5 \times 300}$ or equivalent
		1	Correct comment which is for both electric and manual wheelchairs based upon 'their' answer e.g. 'Does not meet the recommendation for manual wheelchairs but does meet the recommendation for electric wheelchairs'
2(b)	1 mark	1	Correct check seen e.g. reverse calculation
2(c)	2 marks	2	2.453281573(m) unrounded or rounded (as far as 2.5(m))
		1	For 2 453.281573(mm) seen rounded or unrounded or truncated or 2683.281573(mm) seen rounded or unrounded or truncated for the base of the triangle prior to subtraction of 230(mm) or complete correct method with one calculation error
3(a)	1 mark	1	For correct equations e.g. 30T + 20V = 530 AND 200T + 100V = 2 900 OR equivalent
3(b)	2 marks	2	text message cost = 5(p) AND voice mail cost per min = 19(p)
		1	text message cost = 5(p) or voice mail cost per min = 19(p)
3(c)	1 mark	1	Valid check e.g. using substitution into the 'other' equation
3(d)	2 marks	2	718 000 Accept 717 900 OR 717 870 OR 717 871 or equivalent
		1	For 11.04987139 million seen rounded, unrounded or truncated for the number of young people with a mobile phone in 2007 or 12.7010016 million seen rounded, unrounded or truncated for the population of 5 to 24 year-olds in 2007
4(a)	1 mark	1	(£)4.81 Accept (£)4.82 or 481(p) or 482(p) or 481.4(p)
4(b)	2 marks	2	2.9550822(%) rounded or unrounded **or** 2.9550823(%)
		1	For correct substitution into formula

4(c)	2 marks	2	466 000 (tonnes)
		1	For 466 401.5337 (tonnes) or 46.64015337 x 107 kg seen rounded, unrounded or truncated **or** 0.430061349(kg) seen rounded or unrounded or truncated for CO_2 emissions per kwh **or** 19.35276074(kg) seen rounded or unrounded or truncated for reduction in CO_2 emissions per household **or** 2 083.647239(kg) per household or 5.021589847 x 1010(kg) total seen rounded or unrounded or truncated for CO_2 emissions with reduction or 2102.999997(kg) per household or 5.068229992 x 1010(kg) seen rounded, unrounded or truncated for CO_2 emissions without reduction **or** complete correct method with one calculation error

Process skills	Element	Extent	Q1	Q2	Q3	Q4
1. Making sense of situations and representing them	1.3 Methods, operations and tools that can be used in a situation	1.3a Make reasoned selections of appropriate mathematical procedures	✓	✓	✓	✓
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4a Select and extract information appropriately from text, numerical, diagrammatic and graphical sources in contextual based information	✓	✓	✓	✓
2. Processing and analysis	2.2 The role of identifying and examining patterns in making sense of relationships (Linear and non-linear situations)	2.2a Identify and justify patterns for summarising mathematical situations 2.2b Identify and justify patterns for prediction of trends/changes/ probabilities 2.2c Compare patterns to find potential simultaneous meeting of conditions			✓ ✓ ✓	
	2.3 The role of changing values and assumptions in investigating a situation	2.3a Identify variables and their characteristics			✓	✓
	2.4 Use of logic and structure when working towards finding results and solutions	2.4c Use extended logic and structures when working in multi-step situations	✓	✓	✓	✓
3. Interpreting and evaluating results	3.2 The effect of accuracy on the reliability of findings	3.2a Demonstrate understanding of the role/application of approximation across processing/analysis and summary	✓			

	3.3 The appropriateness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison		✓	✓	

Error analysis tasks – Assessor notes

There are two error analysis tasks (08 and 09). Candidates should complete one of these tasks at the assessment session. The tasks are designed to enable candidates to meet a similar range of criteria. The suggested duration of the error analysis task is 20 minutes. Calculators should not be used in this part of the assessment.

res no.	style	title
08.1	**Task**	**Error Analysis Task: Marking students' work (1)**

Error Analysis Task – instructions to candidates: The following five questions are from assessments by adult students. Each answer is incorrect.

For each question:

a) show how **you** would solve the question

b) comment on what mistakes you think the student has made

c) say why you think they have made the mistakes

d) suggest a strategy that could be used for checking the answer for appropriateness and accuracy.

We will be awarding three marks for each question:

- 1 mark for identifying what mistake the learner has made
- 1 mark for identifying why they made the mistake (i.e. what didn't they understand / what misconceptions might cause this error?)
- 1 mark for suggesting a strategy they could use for checking the answer for appropriateness and accuracy.

Question	Answer / comments
Q1. Multiply 62 and 17 *Student answer* 62 x 17 4214 62 4276	
Q2. 42.4 + 29 *Student answer* = 45.3	
Q3. Seven friends go to a café. They share the bill of £35.28. How much does each person have to pay? *Student answer* $7\overline{)35.28}$ 5.40	

Q4. On Saturday I walked 8½ miles and on Sunday 5½ miles. How far did I walk altogether? *Student answer* $8\frac{1}{2} \times 5\frac{1}{2} = 13\frac{2}{4}$	
Q5. What is 20% of £40? *Student answer*: $\frac{20}{40} \times 100 = \frac{200}{4} = £50$	

Part 2b)

The following is a question taken from a multiple choice numeracy exam paper.
Suggest what errors might lead to the wrong answers being selected.

3 marks

A committee increases its membership fee from £12 to £15 per year.
What is the percentage increase?

A 3%

B 20%

C 25%

D 80%

res no.	style	title
08.2	**Criteria References**	**Error Analysis Task: Marking students' work (1)**

Process skills	**Element**	**Extent**
2. Processing and analysis	2.1 The importance of using appropriate procedures	2.1b Recognise, visualise and represent mathematical equivalences as a mechanism for finding/using an appropriate procedure
3. Interpreting and evaluating results	3.3 The appropriateness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison 3.3b Recognise errors/misconceptions

res no.	style	title
08.3	**Answers**	**Error Analysis Task: Marking students' work (1)**

Question	Answer / comments
Q1. Multiply 62 and 17 *Student answer* 62 x 17 4214 62 4276	1054
Q2. 42.4 + 29 *Student answer* = 45.3	71.4
Q3. Seven friends go to a café. They share the bill of £35.28. How much does each person have to pay? *Student answer* $7\overline{)35.28}$ = 5.40	£5.04

Q4. On Saturday I walked 8½ miles and on Sunday 5½ miles. How far did I walk altogether? *Student answer* $8\frac{1}{2} \times 5\frac{1}{2} = 13\frac{2}{4}$	14 miles
Q5. What is 20% of £40? *Student answer:* $\frac{20}{40} \times 100 = \frac{200}{4} = £50$	£8

Part 2b)

The following is a question taken from a multiple choice numeracy exam paper.

Suggest what errors might lead to the wrong answers being selected.

3 marks

A committee increases its membership fee from £12 to £15 per year.
What is the percentage increase?

A 3%

B 20%

C 25%

D 80%

Correct answer:

$$\frac{£15 - £12}{12} \times 100 = 25\%$$ C

A 15 - 12 = 3%

B $$\frac{£15 - £12}{15} \times 100 = 20\%$$

D $$\frac{12}{15} \times 100 = 80\%$$

res no.	style	title
09.1	**Task**	**Error Analysis Task: Marking students' work (2)**

The following five questions are from assessments by adult students. Each answer is incorrect.

For each question:

a) Write the correct answer

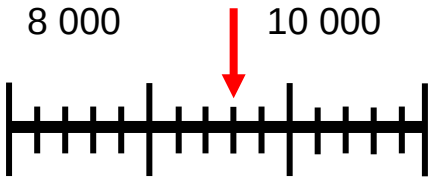
b) Comment on what mistakes you think the student has made

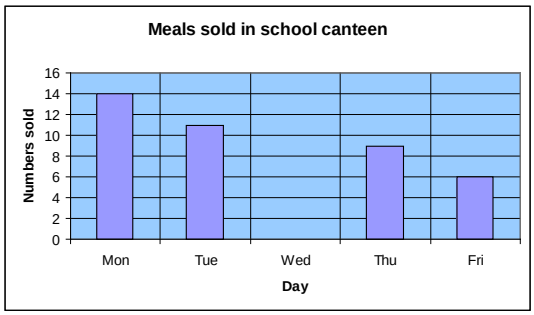
c) Why you think they have made the mistakes?

d) Suggest a suitable checking strategy or use of approximation that could be used to check the answer.

We will be awarding three marks for each question:

- 1 mark for identifying what mistake the learner has made,
- 1 mark for identifying the mathematical misconception that may have led to the error being made
- 1 mark for suggesting a suitable checking strategy or use of approximation that could be used to check the answer.

Question	Answer / comments
Q1. Subtract 196 from 208 *Student answer* : 208 196 - 192	
Q2. What is the reading on the scale?  *Student answer*: 9 300	
Q3. Round 67 934 to the nearest ten thousand. *Student answer* : 67 000	

Q4. The label on a large bottle of juice states 'dilute 1 part juice to 5 parts water'. How much water must be added to 2 litres of juice? *Student answer*: 2 ½ litres	
Q5. The graph shows the numbers of a particular meal sold in a week in a school canteen. What is the average for the week?  *Student answer*: 10	

Part 2b Strategies

A learner is struggling with the following question:

> *A man works 8 hours each day. He spends 1 hour each day on paperwork. What percentage of his working day is spent on paperwork?*

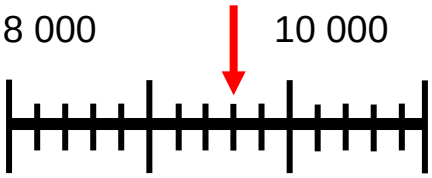
Show how you might use visual representation and mathematical equivalences between fractions, decimals and percentages to help the learner solve this problem.

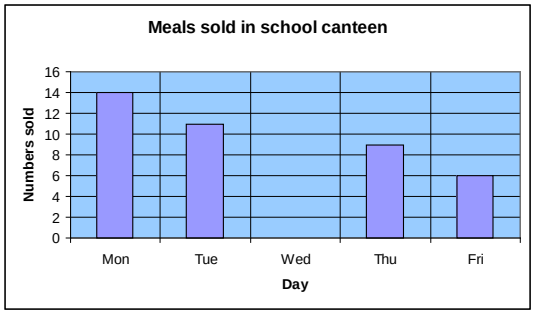
res no. style title

09.2 Criteria References Error Analysis Task: Marking students' work (2)

Process skills	Element	Extent
2. Processing and analysis	2.1 The importance of using appropriate procedures	2.1b Recognise, visualise and represent mathematical equivalences as a mechanism for finding/using an appropriate procedure
3. Interpreting and evaluating results	3.3 The appropriateness and accuracy of results and conclusions	3.3a Test solutions for appropriateness/accuracy via experimentation, inverse operations, alternative methods, comparison 3.3b Recognise errors/misconceptions

res no.	style	title
09.3	**Answers**	**Error Analysis Task: Marking students' work (2)**

Question	Answer / comments
Q1. Subtract 196 from 208 *Student answer* : 208 196 - 192	12
Q2. What is the reading on the scale? 8 000 10 000  *Student answer*: 9 300	9600
Q3. Round 67 934 to the nearest ten thousand. *Student answer* : 67 000	70 000
Q4. The label on a large bottle of juice states 'dilute 1 part juice to 5 parts water'. How much water must be added to 2 litres of juice? *Student answer*: 2 ½ litres	10 litres

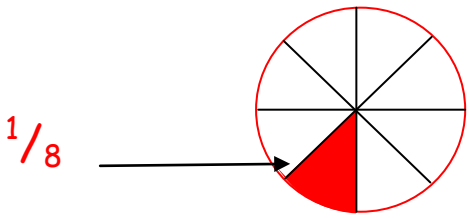
Q5. The graph shows the numbers of a particular meal sold in a week in a school canteen. What is the average for the week?  *Student answer*: 10	8

Part 2b Strategies

A learner is struggling with the following question:

> *A man works 8 hours each day. He spends 1 hour each day on paperwork. What percentage of his working day is spent on paperwork?*

Show how you might use visual representation and mathematical equivalences between fractions, decimals or percentages to help the learner solve this problem.



$^1/_8$ is half of $^1/_4$ Since $^1/_4$ = 25%, half of 25% = 12.5%

Or $^1/_8 \times 100 = 12.5$ %

Writing tasks – Assessor notes

There are two writing tasks in the pack (10 and 11). Candidates should complete one of the writing tasks at the assessment session. The suggested duration of the writing task is 20 minutes.

res no.	style	Title
10.1	**Task**	**Writing Task: Written task 1**

Writing task – instructions to candidates:

You have 20 minutes to write answers to the questions below.

Your work will be marked for (1) content, (2) structure, (3) grammar and punctuation and (4) spelling. For content, we are looking for insight into the use of numeracy in everyday contexts.

a) What is estimation?

b) When do people need to use estimation in their lives? (Illustrate your answer with different examples, including an example of where you have used estimation.)

c) When would estimation be an unsuitable strategy to use? (Illustrate your answer with a suitable example that shows the effect of using a series of approximations.) (500 words)

res no. style title

10.2 Criteria References Writing Task: Written task 1

Process skills	Element	Extent
1. Making sense of situations and representing them	1.1 Situations that can be analysed and explored through numeracy	1.1a Recognise situations can be explored beneficially by using mathematics
	1.4 The importance of selecting the appropriate numerical information and skills to use	1.4c Demonstrate understanding of and act on the implications of estimation
	2.4 Use of logic and structure when working towards finding results and solutions	2.4a Organise methods and approaches during investigative processes that allow structured development and testing of models and acceptance/rejection of particular methods/operations/tools 2.4b Collaborate and engage in critical debate as a mechanism for development and testing of logic and structure during processing/ analysis 2.4c Use extended logic and structures when working in multi-step situations
3. Interpreting and evaluating results	3.2 The effect of accuracy on the reliability of findings	3.2a Demonstrate understanding of the role/application of approximation across processing/analysis and summary 3.2b Demonstrate understanding of the characteristics of error including the effect of compounding in predictive situations 3.2c Evaluate the impact of inaccuracies in the application of mathematical procedures

res no.	style	title
11.1	**Task**	**Writing Task: Written task 2**

Writing task – instructions to candidates:

You have 20 minutes to write answers to the questions below.

Your work will be marked for (1) content, (2) structure, (3) grammar and punctuation and (4) spelling. For content, we are looking for insight into the use of numeracy in everyday contexts.

a) What numeracy skills you think people need to be taught to be able to use maths effectively in everyday contexts? Give an example of an everyday context that requires mathematics.

b) Do you think we should teach students a range of strategies or just one strategy for performing different calculations? Justify your answer with examples.

c) Research suggests that good teachers of mathematics make connections between different areas of mathematics. Why do you think this might be? Give some examples of where these connections could be made.

res no.	style	title
11.2	**Criteria References**	**Writing Task: Written task 2**

Process skills	Element	Extent
1. Making sense of situations and representing them	1.1 Situations that can be analysed and explored through numeracy	1.1a Recognise situations can be explored beneficially by using mathematics
	1.2 The role of models in representing situations	1.2c Demonstrate understanding of the benefits of identifying and applying the most appropriate and efficient mathematical conceptual knowledge and procedures 1.2d Demonstrate that making conceptual links between different areas of mathematics and differing mathematical procedures can support mathematical modelling