Trainer pack

Module 12a: Developing functional mathematics with vocational learners

Handling data

Course information	**Length of session:** 2.5 – 3.5 hours, depending on activities required by participants. Trainers can customise, shorten and lengthen the session to suit the audiences and settings.
Audience	**Job roles:** Practitioners who are vocational specialists and teaching or supporting the development of numeracy / maths skills or functional mathematics up to and including Level 2. **Sector / setting:** Vocational learning
Links to other modules	**Handling data** is a module that can be undertaken on its own or can be undertaken as one of a group of three CPD modules. **Developing numeracy with vocational learners:** **12a: Handling data** **12b: Number concepts and skills** **12c: Common measures, shape and space** Each module is linked to one aspect of the adult numeracy core curriculum and uses examples and discusses issues concerning how curriculum content might be applied to the needs of vocational learners studying functional mathematics. Module 12a also provides a general overview of the aims and challenges of functional mathematics, and this is relevant to Modules 12b and 12c.

Aims

To introduce participants to the aims and demands of functional mathematics

To provide practical ideas and activities for embedding data handling within vocational contexts

Outcomes

By the end of the session participants will have:

- understood the role of process skills within functional mathematics;

- identified challenges to learners presented by functional mathematics accreditation;

- identified how data handling skills are used within their vocational area;

- experienced a variety of data handling activities and identified how they might be adapted for vocational learners; and

- created a functional data handling activity, relevant to vocational learners.

Module overview

Activity		Content
1	**Starter: transport to work**	Participants generate simple data using a functional skills approach.
2	**Introductions**	Introductions and content of the session.
3	**Functional mathematics: process skills**	Introducing process skills in functional mathematics, and identifying these in practical problems.
4	**Challenge of functional skills**	Identifying the difference between contextualised and functional maths, and examining the content of functional skills assessments.
5	**Data handling in vocational areas**	Identifying the content of the numeracy core curriculum – data handling, and relating this to vocational areas.
6	**Creating a story**	Creating a story for a bar chart with no labels on the axes. Identifying different types of questions that can asked of the chart.
7	**Carousel of activities**	Experiencing a range of activities for active learning in data handling, and adapting these for vocational learners.
8	**Planning a data handling activity**	Planning a purposeful data handling activity that is relevant to learners' vocational areas.
9	**Summary and next steps**	Reflecting on what has been learned and what can be put into practice.

Note for trainers

Timings are quite tight for many of the activities and trainers may need to adjust activities during the CPD session, depending on the level of knowledge and expertise of participants. Ideally trainers will have the opportunity to explore these well before the session. The planning below is based on participants having a reasonable working knowledge of functional skills; this is not a functional skills awareness session but rather a session which focuses on the more practical issues of interpreting these requirements within vocational contexts.

Trainers

Trainer experience or qualifications required	Trainers must have experience of numeracy / maths teaching and learning in vocational contexts and teacher education / staff development in a range of contexts, plus knowledge of the Adult Numeracy Core Curriculum http://www.excellencegateway.org.uk/node/1514 and functional skills subject criteria: http://www2.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria
Reference material for trainers	Trainer notes

Resources

Resources for reference during the session	Trainer notes Functional skills subject criteria for mathematics downloadable from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria
Pre-course activity for participants	Participants should bring a copy of a summative assessment for Functional Mathematics Level 1 used in their own organisations.
Useful websites	See HO 7: Further useful websites
Before the session the trainer needs to:	Distribute small white boards and marker pens ready for use in TN 1. These can be ordered from the internet (just search for mini whiteboard). Alternatively (but not so easy to wipe clean) they can be made by laminating A4 sheets of coloured / white paper or card. Print copies of the Participant pack, which contains the handouts and PowerPoint slide notes (but not the resources). TN 2: this session refers to the adult numeracy curriculum which is an interactive tool available at: http://www.excellencegateway.org.uk/node/1514.

Ideally you would be able to demonstrate this during TN 2. The Ofqual criteria for functional skills are also referred to; these can be downloaded from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria)

TN 3: Print an appropriate number of copies of the Ofqual Functional Skills criteria (downloadable from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria). Alternatively, be prepared to locate these on a laptop during the session.

TN 4: participants are asked to bring along sample copies of summative assessments (Level 1) used in their organisation. In case there are gaps it is suggested that trainers download examples from a range of awarding organisations, for example:

- **OCR:** http://www.ocr.org.uk
- **City & Guilds:** http://www.cityandguilds.com
- **Edexcel:** http://www.edexcel.com
- **AQA:** http://web.aqa.org.uk
- **NOCN:** http://www.nocn.org.uk

TN 5: the extension activity requires access to the adult numeracy core curriculum.

TN 7: carousel of activities. Prepare R 1 – R 7 and set out on separate tables if possible. See TN 7 instructions for further details.

TN 8: internet connection is desirable to demonstrate various data sites such as:

- Office for National Statistics: http://www.ons.gov.uk/ons/index.html

- Health and Safety Executive: http://www.hse.gov.uk/statistics/

- Guardian Data Store: http://www.guardian.co.uk/data

Session plan

Aims

To introduce participants to the aims and demands of functional mathematics

To provide practical ideas and activities for embedding data handling within vocational contexts

Outcomes

By the end of the session participants will have:

- understood the role of process skills within functional mathematics;

- identified challenges to learners presented by functional mathematics accreditation;

- identified how data handling skills are used within their vocational area;

- experienced a variety of data handling activities and identified how they might be adapted for vocational learners; and

- created a functional data handling activity, relevant to vocational learners.

Suggested timings are for guidance purposes only. Trainers should adapt content to meet the needs and experience levels of the participants.

TN – trainer notes   HO – handout   R – resources   PPT - PowerPoint

Time	Content	Resources		
		No.	**Style**	**Title**
15m (Total 15m)	**TN 1. Starter: Transport to work** Ask participants to identify the main form of transport they use to travel to work then group themselves accordingly (**PPT 2**). Next, ask them to individually display the data on their mini-whiteboards – using whatever representation they see fit. Pairs then compare their representations; bar charts will mainly be produced - discuss essential aspects of a bar chart; e.g. title,	PPT 1-2	Slides Mini-whiteboards and marker pens	Transport to work/college

Time	Content	Resources		
		No.	**Style**	**Title**
	labels, scales, clear messages. Get pairs to write a statement about their findings on modes of transport to college. Ask participants questions about the data to emphasise the purpose of data handling, e.g. • Who might want to know this sort of information? • What other information might they want to know? Emphasise how functional maths is used to solve problems – it is about applying maths to the real world. Provide definition (**PPT 3**). Ask participants what sorts of data their learners need to collect and analyse – and for what purpose. Discuss how to adapt data collection to another context to make it easier or harder. **HO 1** is an overview of data.	PPT 3 HO 1	Slide Handout	What are functional skills? What is data?
10m (Total 25m)	**TN 2. Introductions** Outline the aims and outcomes for the day (**PPT 4-5**). Ask participants to introduce themselves and say: • the work / vocational / apprenticeships they teach or support; • what they would like to gain from the day; and • one interesting number fact about themselves. Record the numbers on flipchart / board and ask participants to find connections between them (e.g. one number is the difference between two other numbers). Draw participants' attention to HO 2: Personal reflection sheet and confirm that they should complete this during each part of the session.	PPT 4-5 Flipchart and markers HO 2	Slides Handout	 Personal reflection sheet
15m	**TN 3. Functional mathematics: process skills**			

Time	Content	Resources		
		No.	Style	Title
	Use **PPT 6** to introduce the idea of process skills, and illustrate with an example related to a vocational context.	PPT 6	Slide	Functional skills process skills
	Refer to **HO 3** which shows the process skills, and also make available copies of the Ofqual Functional Skills criteria (downloadable from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria)	HO 3	Handout	Functional mathematics process skills
			Ofqual document	Ofqual Functional skills criteria
	Show **PPT 7**. Trainer asks participants to consider starter activity and identify: **Representing** – how did they make sense of the situation? **Analysing** – how did they process and use mathematics? **Interpreting** – how did they interpret and communicate the results of the analysis?	PPT 7	Slide	Transport to work
	Ask to discuss briefly in pairs / small groups then take feedback.			
(Total 40m)	Ask for further suggestions of how process skills might be used within participants' vocational areas.			
25m	**TN 4. Challenge of functional skills**			
	Use **PPT 8** to highlight the difference between a contextualised maths question and a functional maths question. The next activity asks them to examine a functional mathematics examine paper at level one, and see what challenges it presents.	PPT 8	Slide	Contextualised versus functional
	Ask participants to refer to the functional skills assessment paper that they have brought in (alternatively provide a copy of a recent Level 1 exam paper from one of the awarding body websites).		Functional maths Level 1 exam papers	
	Refer to **PPT 9** and ask participants to work in pairs to analyse the exam paper, and identify: • what sorts of skills, knowledge and understanding are required • how the exam differs from previous numeracy assessments (e.g. key skills and adult numeracy)	PPT 9	Slide	Functional skills assessment

Time	Content	Resources		
		No.	**Style**	**Title**
(Total 1hr 5m)	• what difficulties their learners might have with the exam Take feedback and highlight the key challenges to vocational learners. Refer to information from examiners' reports from awarding bodies (**HO 4**), and use **PPT 10** to summarise key issues.	HO 4 PPT 10	Handout Slide	Functional skills examiners' report Examiners' reports
20m (Total 1h 25m)	**TN 5. Data handling in vocational areas** Indicate that the focus is shifting now to a specific focus on data handling, and how this relates to participants' vocational areas. Introduce the Adult Numeracy Core Curriculum with **PPT 11**. (If time allows, link to the interactive on-line curriculum: http://www.excellencegateway.org.uk/node/1514 and demonstrate its content, referring to key documents within it.) Divide participants into vocational groups, and provide copies of **HO 5**. Ask them to spend 5-10min discussing the skills listed under **Handling data** and make a list of which skills are needed within their vocational areas, with examples. Take feedback from each group, and highlight commonly-occurring skills.	PPT 11 HO 5	Slide Handout	Adult numeracy core curriculum Adult Numeracy Core Curriculum overview
25m	**TN 6. Creating a story** Display **PPT 12**, and ask participants to discuss in pairs what they think the chart represents. Take a few suggestions from the group, and ask them to explain their reasoning. Now reveal the months as labels, and ask: What could it show now? Next reveal the title of the graph: What could it show now? Finally, reveal the key to the bars. Discuss the purpose of the activity: What skills were they using? What might their	PPT 12	Slide	What could the graph represent?

Time	Content	Resources		
		No.	**Style**	**Title**
(Total 1h 50m)	learners gain from such an activity? How was it different to a traditional activity? Point out that traditionally maths has been taught in a very didactic (or 'transmission') style, but that research has shown that more active approaches to learning are far more effective. Briefly discuss different approaches to effective questioning then ask participants to work in pairs to compose questions about the graph that they could ask of learners, noting what sort of answers they might expect. Allow about 5-10 min for discussion then ask participants for examples of their questions. Afterwards, hold a discussion about what sorts of questions are most useful, and how the activity might be adapted to different vocational contexts.			
40m (Total	**TN 7. Carousel of activities** This activity allows participants the opportunity to try out a range of other active learning approaches that are particularly suitable for small group collaborative work. Lay out carousel activities on tables, and display **PPT 13**. Ask participants to work in pairs / small groups and carry out 4/5 carousel activities. As they complete the activities, participants should reflect on how the activities might be adapted for their vocational area, and for different levels, and record this on **HO 6.** Suggest to participants that they spend 5-10min for each activity (depending on time available), before moving on. After 30min or so, ask participants to return to their seats, and take brief feedback on the activities, for example: • Which activity did you like best? Why? • How might you adapt each activity for your vocational area? • How might you adapt it for different levels?	R 1-7 PPT 13 HO 6	Carousel activities Slide Handout	Data handling carousel Data handling activities Data handling activities

Time	Content	Resources		
		No.	**Style**	**Title**
2h 30m)	Draw participants' attention to **HO 7**, with links to useful websites with maths and numeracy resources.	HO 7	Handout	Further useful websites
40m	**TN 8. Planning a data handling activity** Use **PPT 14** to introduce the 5-stage model of data handling – emphasising the importance of each stage. Highlight the difference between: • Primary data (collected by learners) • Secondary data (published data collected by others) Discuss where secondary data can be obtained, highlighting the vast amount of data available through the Internet. (If Internet facilities are available and time allows, show some examples.) Also emphasise the use of spreadsheets as a tool for data analysis (with links too to Functional Skills ICT).	PPT 14	Slide	Five aspects of data handling
	Use **PPT 15** to highlight the fact that functional data handling activities should be purposeful, relevant, challenging and achievable.	PPT 15	Slide	Handling data functionally
	Distribute **HO 8**, outlining the activity, and ask participants to work in small groups to develop a data handling activity for their learners. The activity should meet the criteria listed on **PPT 15**.	HO 8	Handout	Planning a data handling activity
(Total 3h 10m)	Allow 20 minutes for the activity, and ask groups to outline their activities on a flipchart sheet. Afterwards, ask groups to display their activities on the wall and provide brief feedback – highlighting the rationale in particular.			
10m	**TN 9. Summary and next steps** Refer back to the session outcomes (**PPT 16**) and summarise what has been covered in the session.	PPT 16	Slide	Outcomes
(Total 3h	Ask participants to complete their	HO 2	Handout	Personal

Time	Content	Resources		
		No.	Style	Title
20m)	reflections on what they have learned (**HO 2**) and what they feel they can apply to their own practice. Ask for volunteers to share their reflections with the group. If relevant, refer to what will be covered in Module 12b: Number concepts.		Evaluatio n forms (if used)	reflection sheet

Trainer notes

These notes are to support trainers to facilitate the different activities in the module. They are not meant to be prescriptive, and trainers can adapt the activities as needed to suit the participants. Some activities can be omitted, and others extended, according to the group.

> Suggestions for **alternatives** or for **differentiation** strategies (according to the background and experiences of participants) are given in boxes in the notes for each activity.

PowerPoint slides, resources and handouts can be adapted or omitted as needed. The instructions for the activities are given on the PowerPoint slides. Trainers can decide to show the instructions on PowerPoint or to print off the 'instructions' slides and lay copies on tables.

All of the running times are suggestions. Each training session can be adapted to the group the trainer is working with. The suggested total running time for the session as it stands is 2.5- 3.00 hours. This allows for a 2½ hour session (e.g. 10am – 12.30), with, for example, a 10-minute break. However, these times can be changed.

TN 1

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
15m	**TN 1. Starter: Transport to work**			
	Ask participants to identify the main form of transport they use to travel to work then group themselves accordingly (**PPT 2**).	PPT 1-2	Slides	Transport to work/college
(Total 15m)	Next, ask them to individually display the data on their mini-whiteboards – using whatever representation they see fit. Pairs then compare their representations; bar charts will mainly be produced - discuss essential aspects of a bar chart; e.g. title, labels, scales, clear messages.		Mini-whiteboards and marker pens	
	Get pairs to write a statement about their findings on modes of transport to college. Ask participants questions about the data to emphasise the purpose of data handling, e.g. • Who might want to know this sort of information? • What other information might they want to know?			
	Emphasise how functional maths is used to solve problems – it is about applying maths to the real world. Provide definition (**PPT 3**).	PPT 3	Slide	What are functional skills?
	Ask participants what sorts of data their learners need to collect and analyse – and for what purpose.			
	Discuss how to adapt data collection to another context to make it easier or harder. **HO 1** is an overview of data.	HO 1	Handout	What is data?

The purpose of this starter activity is to introduce participants to analysing 'real' data in a purposeful way and assess what they know about presenting data. The activity needs to be carried out with a minimum of six participants.

Alternatives
You may wish to do the introductions, aims and objectives first, before this activity.

It may be that in particular areas of the country there is insufficient variation in how people travel to work to make this activity useful. If this is the case, select another topic as the basis for this activity.

The instructions are on **PPT 2**. Participants are asked to identify the **main form of transport** that they normally use to travel to work (only one allowed). They should be asked to move around the room to find out other participants' transport methods, and to group themselves according to this form of transport. You should **avoid telling them exactly what categories to use** and let them decide these for themselves (e.g. bus, car, bicycle, walk).

Suggested Question: *'Which is the most popular method of transport?'* This should encourage participants to count the categories and the number in each category. Participants will need to note the numbers.

Once participants have grouped themselves, they should be asked to work on their own and use their mini-whiteboards to display the data. Allow them to choose whatever representation they consider appropriate.

Ask them to compare their representations with a partner, and discuss any differences and the reasons for their choices. Ask each pair to write a statement about what the data shows about modes of transport. Briefly compare these across the group.

To emphasise the purposeful use of data and make the links with functional mathematics, ask participants supplementary questions about how the data might be used. **Suggested questions:**

- *Who might want to know this sort of information?*

- *Is this a representative sample? How could it be made more representative?*

- *What other information might they want to know?*

- *How might you obtain more data on modes of transport?* Ensure that both primary (e.g. survey) and secondary (e.g. internet) sources are highlighted here.

Emphasise how functional mathematics is about the application of maths to the real world. It takes key skills a step further by focusing on **problem solving.** Use **PPT 3** to provide a definition – drawing attention to key words.

Ask participants for examples of how their learners might use data to solve vocational problems:

- *What data might they collect and where from?*

- *How might they present and analyse the data?*

HO 1 gives basic information on data that might be discussed and some more websites that might be useful to help participants develop their knowledge of data handling.

(Note that the data handout states that 'In order to emphasise the fact that the categories are discrete, a gap is *often, but not always,* left between the bars on the x-axis.' Particular awarding bodies may require spaces between the bars but learners should be aware this is not always the case when they see data displayed e.g. in newspapers.)

Differentiation

Each participant will produce their own unique presentation of the data. This section is useful for trainers to assess what participants know about presenting data and who can draw accurate pie charts and / or bar charts.

In a whole group draw attention to displays with essential aspects of display such as title, labels, scales for bar charts, encourage accuracy.

Ensure that you encourage participants with correct displays, and do not draw attention to particular participants' mistakes. Most who have made a mistake will correct them during the whole group discussion. This is acceptable as you know who has made mistakes and who is willing to learn to correct them.

Discuss difference between bar charts that touch and those that are separate. Touching unusually depicts continuous data, whilst separate bars usually depict discrete data.

Discuss different labels and scales, acceptable as long as accurate.

Discuss pie charts if they have been produced. How they are drawn? It is unlikely they will be accurate but you can discuss the process of calculating angles with simple numbers. Try to use data that produces 180 and 90 degree angles, otherwise the calculations may be too complex.

The purpose of the first part of this activity is to illustrate how easy and fun it can be to identify, collect and display data.

If working with a small group, ensure that you have at least one bar that is a different value from another. Even a small amount of data will draw out the issues to discuss around data presentation.

TN 2

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
10m	**TN 2. Introductions**			
	Outline the aims and outcomes for the day (**PPT 4-5**).	PPT 4-5	Slides	
	Ask participants to introduce themselves and say:			
	• the work / vocational / apprenticeships they teach or support;			
	• what they would like to gain from the day; and		Flipchart and markers	
	• one interesting number fact about themselves. Record the numbers on flipchart / board and ask participants to find connections between them (e.g. one number is the difference between two other numbers).			
(Total 25m)	Draw participants' attention to HO 2: Personal reflection sheet and confirm that they should complete this during each part of the session.	HO 2	Handout	Personal reflection sheet

Purpose of the activity: to introduce the aims and intended outcomes, confirming that these are appropriate for the audience; to begin to understand participants' background, level of understanding of maths and their current involvement in supporting learners' maths.

Outline the aims and outcomes for the session, using **PPT 4-5**.

During the introduction to the session ask participants to introduce themselves. In addition to their name, you might want to ask them:

• the vocational areas that they teach or support;

• what they would like to gain from the day; and

• one interesting number fact about themselves.

If time allows, record the numbers on flipchart / board and ask participants to find connections between them (e.g. one number is a multiple of another). This can

provide a bit of a 'warm up' for participants, and might also provide some useful information on the level of participants' maths skills.

You may wish to confirm that this session is part of a wider suite of three CPD sessions around the theme of developing functional mathematics with vocational learners, and outline the content of the other modules.

Terminology
In this module, the terms 'numeracy' and 'maths' will be used interchangeably. However numeracy usually refers to the application of maths in practical contexts, whereas maths refers to developing the underpinning skills and knowledge, e.g. how fractions work. The definition of **functional maths** is more akin to that of numeracy

Background information: the adult numeracy curriculum and functional skills
The content of this pack is linked both to the **adult numeracy curriculum** and the criteria for **functional mathematics.**

- The adult numeracy curriculum outlines the skills and competencies required by adults from Entry 1 to Level 2. The interactive tool is available at: http://www.excellencegateway.org.uk/node/1514

- **Functional skills** address skills from Entry 1 to Level 2. The Ofqual criteria for functional skills can be downloaded from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria)

Draw participants' attention to **HO 2**: Personal reflection sheet. You should ask them to complete this at the end of each part of the training session, and give a further opportunity at the end of the session.

TN 3

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
15m	**TN 3. Functional mathematics: process skills**			
	Use **PPT 6** to introduce the idea of process skills, and illustrate with an example related to a vocational context.	PPT 6	Slide	Functional skills process skills
	Refer to **HO 3** which shows the process skills, and also make available copies of the Ofqual Functional Skills criteria (downloadable from: http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria)	HO 3	Handout	Functional mathematics process skills
			Ofqual document	Ofqual Functional skills criteria
	Show **PPT 7**. Trainer asks participants to consider starter activity and identify: **Representing** – how did they make sense of the situation? **Analysing** – how did they process and use mathematics? **Interpreting** – how did they interpret and communicate the results of the analysis?	PPT 7	Slide	Transport to work
(Total 40m)	Ask to discuss briefly in pairs / small groups then take feedback.			
	Ask for further suggestions of how process skills might be used within participants' vocational areas.			

Purpose: to introduce the idea of process skills in functional mathematics, and help participants to identify them within the starter activity.

Use **PPT 6** to introduce participants to the process skills that underpin functional skills. Choose an example from a relevant vocational context to illustrate the skills. For example, a chef might need to decide how much of each ingredient to buy for a meal:

- **Representing.** This might involve thinking about how many people are being catered for, how much of each ingredient are needed per person, and what maths is needed to work out the total ingredients required.

- **Analysing** This might involve carrying out the relevant calculations to scale up the quantities required. It might also involve converting between different units of measure.

- **Interpreting.** This might involve deciding how accurate the calculation needs to be, and relating the calculated quantities to the pack sizes that are available from the supplier.

Make sure participants are clear about the three skills sets before going on to the next activity. **HO 3** has an overview with the link to the criteria.

Show **PPT 7** and ask participants to reflect on the starter activity – transport to work – and identify what aspects of the activity in TN 1 could be categorised within each of the process skills.

The following is one possible response, though there is no definite right or wrong answer.

Representing   making sense of the situation
(e.g. identifying and categorising modes of transport, and deciding on the best way to summarise the data)

Analysing   processing and using mathematics
(e.g. calculating the numbers in each category and presenting this in the chosen graphical format)

Interpreting   interpreting and communicating the results of the analysis
(e.g. which was the most frequently used mode of transport, what other modes were used / not used – and what are the implications for those planning events)

Afterwards, you might want to ask the group for other examples of how the process skills are used within their vocational areas.

TN 4

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
25m	**TN 4. Challenge of functional skills** Use **PPT 8** to highlight the difference between a contextualised maths question and a functional maths question. The next activity asks them to examine a functional mathematics examine paper at level one, and see what challenges it presents. Ask participants to refer to the functional skills assessment paper that they have brought in (alternatively provide a copy of a recent Level 1 exam paper from one of the awarding body websites). Refer to **PPT 9** and ask participants to work in pairs to analyse the exam paper, and identify: • what sorts of skills, knowledge and understanding are required • how the exam differs from previous numeracy assessments (e.g. key skills and adult numeracy) • what difficulties their learners might have with the exam Take feedback and highlight the key challenges to vocational learners. Refer to information from examiners' reports from awarding bodies (**HO 4**), and use **PPT 10** to summarise key issues.	PPT 8 PPT 9 HO 4 PPT 10	Slide Function al maths Level 1 exam papers Slide Handout Slide	Contextualise d versus functional Functional skills assessment Functional skills examiners' report Examiners' reports
(Total 1hr 5m)				

Purpose: to make participants aware of how functional mathematics qualifications differ to similar key skills and adult numeracy qualifications, and to highlight common difficulties faced by functional mathematics learners.

Show **PPT 8** and discuss the differences between the two questions, what knowledge and skills each involves, and which question is more realistic. The first question is typical of traditional 'contextualised' maths questions, in which an artificial

context is used as a vehicle for learners to practice a particular mathematical skill (in this case, multiplication). In contrast, the second question is a realistic practical question. Highlight the fact that the functional question is different because:

- It is open-ended – there is no one correct answer.

- It is dependent on more than just mathematical knowledge, but also an understanding of the context.

Make the link with process skills discussed in the previous activity, and ask participants if they can say what they are in this example. Note that the question used here is deliberately more open-ended than questions which would be found on exam questions in order to illustrate a point.

The next activity provides an opportunity for participants to examine and analyse the demands of an awarding body functional skills assessment. It is suggested that participants are asked in advance to bring a recent past paper relating to their organisation's awarding body. Alternatively, papers can be downloaded from most awarding body websites, for examples:

- OCR: http://www.ocr.org.uk
- City & Guilds: http://www.cityandguilds.com
- Edexcel: http://www.edexcel.com
- AQA: http://web.aqa.org.uk
- NOCN: http://www.nocn.org.uk

The activity suggests using a Level 1 assessment, as it is likely to be the most relevant to participants, though this can be changed to suite the audience.

Show **PPT 9** and ask participants to work in pairs or small groups to analyse the content of the assessment, focusing on:

- the skills, knowledge and understanding that are required;

- how the exam differs from previous numeracy assessments (e.g. key skills and adult numeracy); and

- what difficulties their learners might have with the exam.

When taking feedback, trainers should focus particularly on the final point, and use it to highlight issues that should be the focus for teaching and learning. This can be compared with **PPT 10**, which shows issues that have often been highlighted in chief examiners' reports.

Conclude the activity by discussing the implications of this for teaching and learning functional mathematics – what strategies and approaches are needed. The list should include:

- provide plenty of opportunities for learners to discuss and solve functional problems;

- make links between skills used to solve a similar problem in different contexts (e.g. the use of ratios for hair colorants, food recipes, sand and cement, etc);

- encourage learners to show clear working out;

- encourage learners to justify the decisions they make;

- model close reading skills and highlighting of key information;

- focus on commonly functional language (which is different from mathematical language); and

- highlight strategies for checking calculations, and encourage learners to use them.

Alternative

If more time is available, **HO 4** is a principal examiners' report from Edexcel. Participants can be asked to read this, and highlight the key issues, rather than presenting **PPT 10.**

Similar reports are available from all main awarding body websites.

TN 5

Trainer Notes

Time	Content	Resources		
		No.	**Style**	**Title**
20m	**TN 5. Data handling in vocational areas** Indicate that the focus is shifting now to a specific focus on data handling, and how this relates to participants' vocational areas. Introduce the Adult Numeracy Core Curriculum with **PPT 11**. (If time allows, link to the interactive on-line curriculum: http://www.excellencegateway.org.uk/node/1514 and demonstrate its content, referring to key documents within it.)	PPT 11	Slide	Adult numeracy core curriculum
(Total 1h 25m)	Divide participants into vocational groups, and provide copies of **HO 5**. Ask them to spend 5-10min discussing the skills listed under **Handling data** and make a list of which skills are needed within their vocational areas, with examples. Take feedback from each group, and highlight commonly-occurring skills.	HO 5	Handout	Adult Numeracy Core Curriculum overview

Purpose: to introduce the content of data handling curriculum and make links with participants' vocational subjects.

The focus of the training shifts at this point to a specific focus on data handling. The adult numeracy core curriculum is both a useful tool in its own right for vocational teachers, and also provides a useful point of reference for identifying how data handling skills are relevant to vocational subjects.

When introducing the core curriculum, **PPT 11** can be used to provide an overview of the three strands. For this module, focus particularly on the handling data strand, highlighting the different skills involved. Distribute **HO 5** as a reference for participants, and make them aware of the online curriculum tool: http://www.excellencegateway.org.uk/node/1514

If possible, group participants according to their vocational area for this activity, and ask them to work in pairs or small groups. The aim is for them to highlight the relevance of data handling to their vocational subject.

Remind participants about the travel to work activity (TN 1), when they were asked for examples of how their learners might use data to solve vocational problems. For this activity they need to think about this issue in more depth, and relate it more systematically to the curriculum. Ask them to list the occasions when their learners need to work with data, and highlight the data handling skills their learners need to use in each case.

When taking feedback, you may want to ask participants to highlight any skills that learners have particularly difficulties with (and so should be the focus of teaching and learning).

Extension

Demonstrating the interactive curriculum tool
If time allows, and if you have access to the internet, you might want to quickly demonstrate the interactive curriculum tool. The following is one suggestion on how you do this.

- Go to the adult numeracy core curriculum main page (http://www.excellencegateway.org.uk/node/1514), and look at the search criteria on the right-hand side.

- Search for handling data at a particular level (e.g. Level 1). This will reveal a list of the relevant curriculum elements.

- Ask participants to select one particular element to view in detail, e.g. HD1/L1.3: Find the arithmetic average (mean) for a set of data.

- Use this element to explore:
    o Skills, knowledge and understanding
    o Activities and examples
    o Ideas & suggestions
    o Resources (including Access for All)

- You might also want to briefly explain the reference system (e.g. HD1/L1.3)

- Returning to the adult numeracy core curriculum main page, you might also want to highlight the *Numeracy progression overview*, which can be downloaded and either printed or used online.

TN 6

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
25m	**TN 6. Creating a story** Display **PPT 12**, and ask participants to discuss in pairs what they think the chart represents. Take a few suggestions from the group, and ask them to explain their reasoning. Now reveal the months as labels, and ask: What could it show now? Next reveal the title of the graph: What could it show now? Finally, reveal the key to the bars. Discuss the purpose of the activity: What skills were they using? What might their learners gain from such an activity? How was it different to a traditional activity? Point out that traditionally maths has been taught in a very didactic (or 'transmission') style, but that research has shown that more active approaches to learning are far more effective. Briefly discuss different approaches to effective questioning then ask participants to work in pairs to compose questions about the graph that they could ask of learners, noting what sort of answers they might expect. Allow about 5-10 min for discussion then ask participants for examples of their questions. Afterwards, hold a discussion about what sorts of questions are most useful, and how the activity might be adapted to different vocational contexts.	PPT 12	Slide	What could the graph represent?
(Total 1h 50m)				

Purpose of the activity: to explore an approach to engaging learners in data handling.

It can be interesting to ask learners to create a story about a graph or chart that has

no labels on the axes. A graph or chart that is to be used as part of a question in an exercise problem could first be shown with its labels removed. This will make learners examine the graph carefully and think about the significance of each of its parts.

Use **PPT 12** to exemplify this approach by showing a graph first with no title or labels, then revealing these with subsequent clicks. Ask participants to work in pairs or small groups, and see if they can come up with a scenario that fits with what the graph shows – if possible, they should come up with something that is relevant to their vocational subject.

When taking feedback, ask participants to explain their reasoning – and what 'story' the chart is showing. Also ask what titles, labels and scales would need to be added.

If time allows, the labels and titles can then be revealed one-by-one, gradually narrowing down the options.

Finish by discussing the purpose of the activity, what their learners might gain from this approach, and take any ideas for adapting it for specific vocational areas.

The activity can used to lead into a more general discussion about how maths is traditionally taught – you might want to make reference to participants' own experiences here. Emphasise that there is considerable research showing that active learning – where learners participate fully, and use their thinking and reasoning skills – has far more impact than more traditional 'didactic' teaching methods. This is equally true of maths as it is of other subjects. See the Mathematics Matters report: https://www.ncetm.org.uk/resources/12491. Note that you need to log in to this part of the NCETM site.

In the second part of the activity, ask participants to work collaboratively to devise questions about the graph that they could ask of learners to help them understand and interpret it. Often, questions used by maths teachers tend to be closed, demanding a single answer that is clearly right or wrong (sometimes labelled 'guess what's in the teacher's head'!). In contrast, open questions can encourage higher-order thinking skills, which focus on methods, strategies, and reasoning, rather than just 'answer getting'.

Participants should be encouraged to come up with a range of questions – not just closed questions that require reading specific data from the graph, but also higher-order questions, which focus on interpretation, and functional questions, relating to the purpose. For example:

- What trends does the chart show?
- Which soaps appear to be getting more popular?
- How do you know that?
- What do you think happened in February?
- How do you think this data was collected?
- Who might want to know this information?
- How else could the data be presented?

If time, trainers might also want to ask participants to think about who participates most in the question and answer sessions in their classes, and discuss strategies to maximise participation across the whole class. Useful strategies here include:

- Directing and distributing questions equally across the members of the class - one way of doing this is by randomising the process, e.g. by writing all learners' names on sticks and drawing them out of a jar.

- Insisting on a pause before anyone answers to allow everyone thinking time.

- Providing mini-whiteboards for learners to record their answers, and holding them up so the teacher can see everyone's response.

- If available, using voting technology – learners enter their responses on a hand-held device, and a summary of the answers appears on an interactive whiteboard. A low-tech alternative is to use voting cards – e.g. given everyone a green and a red card for 'true' and 'false', or cards labeled A, B, C and D for multiple choice.

- Reflecting learners' answers back to the group – e.g. 'What do others think', 'Does everyone agree with that?', 'Can anyone add anything to that?'

Discuss who has used these different methods, and what impact they think they've had.

TN 7

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
40m	**TN 7. Carousel of activities** This activity allows participants the opportunity to try out a range of other active learning approaches that are particularly suitable for small group collaborative work. Lay out carousel activities on tables, and display **PPT 13**. Ask participants to work in pairs / small groups and carry out 4/5 carousel activities. As they complete the activities, participants should reflect on how the activities might be adapted for their vocational area, and for different levels, and record this on **HO 6.** Suggest to participants that they spend 5-10min for each activity (depending on time available), before moving on. After 30min or so, ask participants to return to their seats, and take brief feedback on the activities, for example: • Which activity did you like best? Why? • How might you adapt each activity for your vocational area? • How might you adapt it for different levels?	R 1-7 PPT 13 HO 6	Carousel activities Slide Handout	Data handling carousel Data handling activities Data handling activities
(Total 2h 30m)	Draw participants' attention to **HO 7**, with links to useful websites with maths and numeracy resources.	HO 7	Handout	Further useful websites

Carousel of activities

Purpose: To allow participants to try out a range of active learning materials for data handing which are suitable for collaborative small-group work, and to adapt the approaches to their vocational subjects.

There are seven activities to choose from – trainers may want to limit the selection to 4 or 5 if there are time constraints. The trainer should lay out the carousel activities

on tables. Ensure there is plenty of space around each activity. **PPT 13** provides instructions.

Participants must work in pairs or small groups, not on their own. They carry out the tasks discussing their answers. Direct participants to **HO 6** for them to note down how they might adapt the activity for their vocational area, and also for different levels of learner.

Data handling carousel of activities:

R1: sampling	R2: an average exercise
R3: using averages	R4: which is better?
R5: labels	R6: true or false?
R7: clues	

Source: QIA Learning Mathematics in Context
http://tlp.excellencegateway.org.uk/tlp/xcurricula/lmic/sessions/index.html
(NB Point out that all materials in the carousel can be downloaded from this page)

One activity to be set out per table, tables in cabaret style around the room (if short of space, activities can be placed face-down in the centre of each table until required). Participants move from one table to another to try out the activities, and use **HO 6** to record comments. Trainers may want to allow participants to decide when to move on, or alternatively ask them change activity every 5-7 mins. Trainers should provide support with activities where requested, and ask questions to provoke small group discussion.

Feedback.
Take brief feedback, and discuss both general and activity-specific issues. For example:

- What are the advantages of collaborative small group work?

- What did you learn from discussions with your peers?

- Which activities did you particularly like? Why?

- How could you adapt the activities to make them suitable for your vocational learners?

- How could they be adapted for different levels?

HO 7 contains links to a selection of useful websites as a source of further activities and materials.

TN 8

Trainer notes

Time	Content	Resources		
		No.	**Style**	**Title**
40m	**TN 8. Planning a data handling activity** Use **PPT 14** to introduce the 5-stage model of data handling – emphasising the importance of each stage. Highlight the difference between: • Primary data (collected by learners) • Secondary data (published data collected by others) Discuss where secondary data can be obtained, highlighting the vast amount of data available through the Internet. (If Internet facilities are available and time allows, show some examples.) Also emphasise the use of spreadsheets as a tool for data analysis (with links too to Functional Skills ICT).	PPT 14	Slide	Five aspects of data handling
	Use **PPT 15** to highlight the fact that functional data handling activities should be purposeful, relevant, challenging and achievable.	PPT 15	Slide	Handling data functionally
	Distribute **HO 8**, outlining the activity, and ask participants to work in small groups to develop a data handling activity for their learners. The activity should meet the criteria listed on **PPT 15**.	HO 8	Handout	Planning a data handling activity
(Total 3h 10m)	Allow 20 minutes for the activity, and ask groups to outline their activities on a flipchart sheet. Afterwards, ask groups to display their activities on the wall and provide brief feedback – highlighting the rationale in particular.			

Purpose of this activity: to explore reasons for collecting and analysing data, for use with functional maths, and to develop an activity for learners.

The purpose of collecting and analysing data in the real world is to provide information as a basis for planning and decisions. It is important, therefore, that activities for functional mathematics approach data handling in the same way. Traditionally, when learning about data handling, learners are taught to calculate averages or to plot different graphs with little idea of purpose. In functional mathematics, learners need to appreciate that they are collecting and analysing data for a reason: to answer questions and inform decisions. Furthermore, data handling needs to be relevant to the learners' vocational subject or wider interests.

Remind participants of the list of skills and applications of data handling that they produced in TN 5.

PPT 14 introduces participants to the 5-stage model of data handling:
- Specify the problem
- Plan
- Collect data
- Process and represent
- Interpret and discuss

When discussing collection of data, it is important to emphasise the difference between:

- **Primary data**: collected directly by learners (e.g. a survey of learners in the college canteen).

- **Secondary data**: published data, collected by a third party (e.g. data on the number and types of accidents at work).

Although both are relevant, it is important to point out the amount of data that can be downloaded via the internet, and used by learners to analyse and interpret. Ask participants if they know of any websites that contain data relevant to their vocational area.

Participants should also be made aware of the use of spreadsheets for analysing and presenting data – though learners still need to do the interpretation! It may also be relevant here to make links with functional skills ICT.

Exploring a website
If internet facilities are available, you may want to explore a relevant website with participants, and see how data can be downloaded and used. Some useful general websites include:

- Office for National Statistics: http://www.ons.gov.uk/ons/index.html

- Health and Safety Executive: http://www.hse.gov.uk/statistics/

- Guardian Data Store: http://www.guardian.co.uk/data

Participants are required to work in small group to develop an appropriate data handling activity for their learners. If possible, participants should be grouped by vocational area – otherwise groups will need to agree on one vocational area on which to focus.

Explain to participants that the activity should meet the criteria listed on **PPT 15** – and in particular it should be purposeful and relevant to learners' vocational subject. **HO 8** provided full information on the task, and uses the 5-stage model as a framework for developing the activity.

Allow at least 20 minutes for groups to complete the activity, then ask them to display their posters for others to see. Allow 5 minutes or so for participants to view each other's posters.

If time allows, ask each group to provide brief feedback on the rationale for their activity, e.g. why it is purposeful and relevant to learners' needs. Also ask for any particular considerations in devising the activity.

TN 9

Trainer Notes

Time	Content	Resources		
		No.	**Style**	**Title**
10m	**9. Summary and next steps**			
	Refer back to the session outcomes (**PPT 16**) and summarise what has been covered in the session.	PPT 16	Slide	Outcomes
	Ask participants to complete their reflections on what they have learned (**HO 2**) and what they feel they can apply to their own practice.	HO 2	Handout	Personal reflection sheet
(Total 3h 20m)	Ask for volunteers to share their reflections with the group. If relevant, refer to what will be covered in Module 12b: Number concepts.		Evaluation forms (if used)	

Purpose of this activity: to summarise and close the session; to signpost participants towards other modules in the series.

Display **PPT 16** and refer participants back to the original session intended outcomes, and summarise what has been covered in the session.

Allow participants a few minutes to reflect on what they have learned from the session and what they feel they can put into practice – they should do this by completing **HO 2**. Ask for volunteers to share their reflections with the group.

If participants are completing all three modules in the series *Developing functional mathematics with vocational learners*, you might want to highlight what will be covered in Module 12b: Number concepts.

Thank participants for their contributions, and ask them to complete an evaluation sheet before departure.

Module 12 a

Handouts and resources

The resources for the data handling carousel in TN 7 are taken from *Learning mathematics in context*:
http://tlp.excellencegateway.org.uk/tlp/xcurricula/lmic/sessions/index.html

Prepare and lay out the carousel activities on tables and display PPT 13 with instructions.

Handouts are here for trainers' information and are contained in the separate participant pack.

Resources
R 1: Sampling. Cut out the cards (Ease / Bias / Other) and have coloured pens or sticky spots (in red, yellow and green) for participants to rate each card.
R 2: An average exercise
R 3: Using averages
R 4: Which is better?
R 5: Labels. Please note that the diagram with the title 'Digital technology' has had the labels obscured. It may be that these labels become visible when you open the file. If this is the case, make sure the labels in the diagram are fully obscured before printing the resource. Cut out the labels on the sheet for participants to use in the exercise.
R 6: True or false?
R 7: Clues

Handouts
HO 1: What is data?
HO 2: Personal reflection sheet
HO 3: Functional mathematics process skills
HO 4: Functional skills examiners' report
HO 5: Adult numeracy core curriculum
HO 6: Data handling activities
HO 7: Further useful websites
HO 8: Planning a data handling activity

R1: Sampling

Two learners are planning a survey among their fellow learners to find out what sort of things people have for breakfast and whether they eat breakfast in the canteen.

They are feeling ambitious and want to ask 100 learners.

They are discussing where they should find their sample of 100 learners. They come up with the possibilities listed on the accompanying sheets.

Discuss each method proposed, and rate it on a traffic light system, using **red** (bad), **yellow** (OK) or **green** (good) marks.

The ratings should be for:
- Ease of collection
- Lack of bias
- Other issues – any other negative or positive that you come up with

	Ease	Bias	Other
Stand at the main entrance at 08:30 on Monday and ask the first 100 learners who come through the door.			
Ask all the other learners in your group and in nearby rooms during one of your sessions.			
Stand at the entrance at 08:30 each day for a week and ask the first 20 learners you see each day.			
Give every learner in the organisation a number. Choose 100 numbers at random from a hat and ask those learners to answer the questionnaire.			
Go into 20 classrooms of different subjects during the morning and ask five learners in each classroom.			
Go round during the day asking learners to complete the questionnaire, but first ask learners where they live to make sure that different distances are represented.			

	Ease	Bias	Other
Email a questionnaire to every learner in the organisation.			
Go to the canteen at lunchtime and ask 50 male and 50 female learners.			
Stand at the entrance at five different times during the day and ask 10 female and 10 male learners each time.			
Wander around the organisation at break time and ask the first 50 female and the first 50 male learners you meet.			
Go around during the day asking learners to complete the questionnaire, but ask them which course they are doing to make sure that every type of course is represented.			
Go to the canteen at 08:30 each day and ask 20 learners.			

R 2: An average exercise

Look at the exercise on averages below, which has been completed by a learner.

Go through it and correct all the errors made.

Write comments against each error that would help the learner who completed it to understand the mistakes they have made.

1. Find the median of the set of numbers: 2, 5, 7, 8, 9, 12
    Answer: There are 6 numbers so the median is the third which is 7

2. Find the median of the set of numbers: 4, 7, 8, 8, 9, 12
    Answer: Median is 8.5

3. Find the median of the set of numbers: 3, 6, 12, 15, 11, 21, 15, 16, 22
    Answer: Median is 11

4. Find the mean of the set of numbers: 3, 11, 12
    Answer: Mean is 11

5. Find the mean of the set of numbers: 0, 0, 0, 1, 2, 2, 3, 3, 5, 5
    Answer: Mean is $21 \div 7 = 3$

6. Find the mode of the set of numbers: 1, 3, 1, 3, 1, 2, 3, 4, 4, 4, 1, 2
    Answer: Mode is 4

R 3: Using averages

Look at the newspaper headlines and reports below. For each one, comment on why the use of the word 'average' is misleading.

Hedon United spend an average of twice as much on each new player!

Over the last few weeks both Hedon United and Paull Town have bought new players but Hedon United have spent an average of £4 million whereas Paull Town have spent a mere £2 million on average.

The most expensive player was Tim Wall who cost Hedon United £13 million – their other three new signings cost £1 million each. Paull Town, on the other hand, paid between £1.5 million and £3 million for each of their new players.

Teenagers lose out to parents!

Sixteen-year-olds make fewer calls on their mobile phones than their parents. In a survey of a group of 10 teenagers and their parents, it turned out that the average number of calls made by the teenagers the previous day was 5.3. The number of calls they made ranged from three to seven.

However the dads who were asked made an average of 6.5 calls, even though nine of the ten dads questioned admitted they had not used their phone the previous day. Mr Ingram, one of the dads, revealed that he made a massive 65 calls. He explained that he used his phone as part of his job.

All children have a right to be above average

Schools should ensure that no child is below average in maths and English, said the shadow spokesperson on education at a meeting of head teachers today.

R 4: Which is better?

Look at the sets of charts below.

For each set, decide whether Chart A or Chart B gives a better representation of the data.

Make sure you give reasons for your choices.
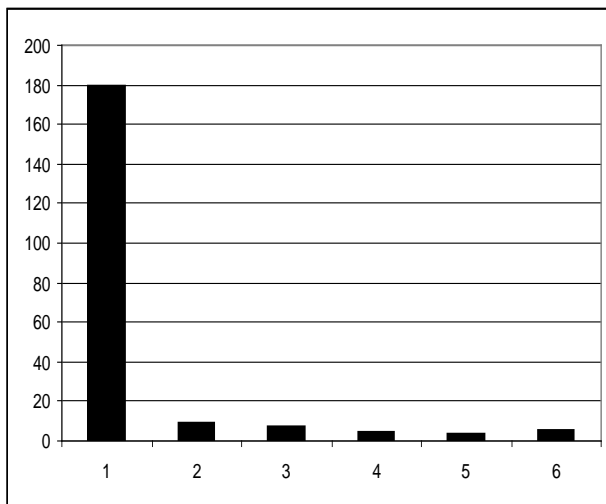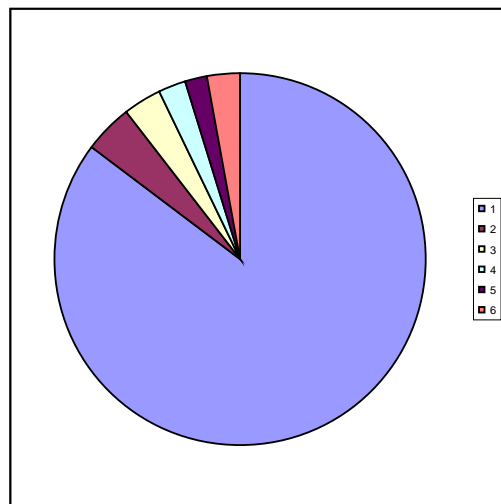
Set 1

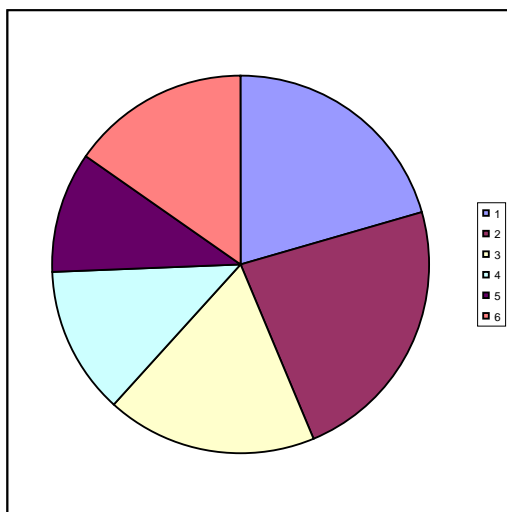| Chart A	Chart B

Set 2

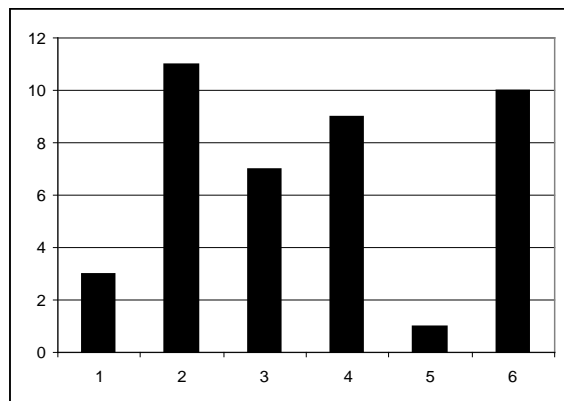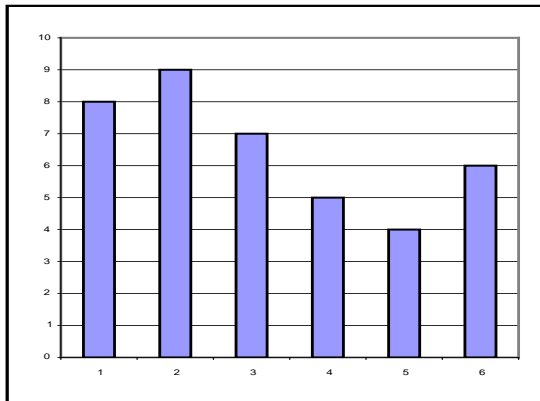| Chart A	Chart B
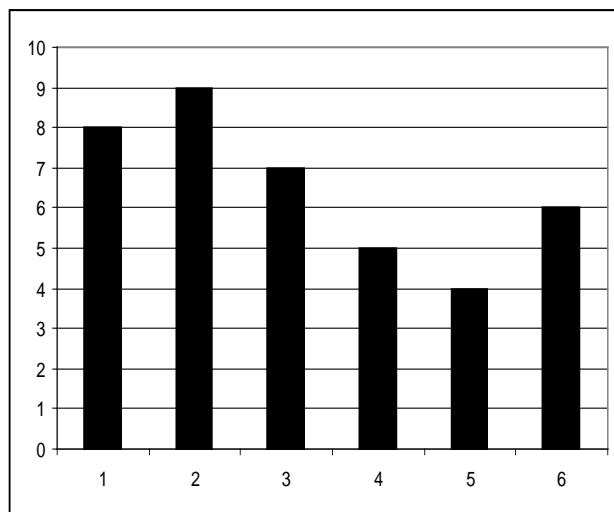
Set 3

Chart A
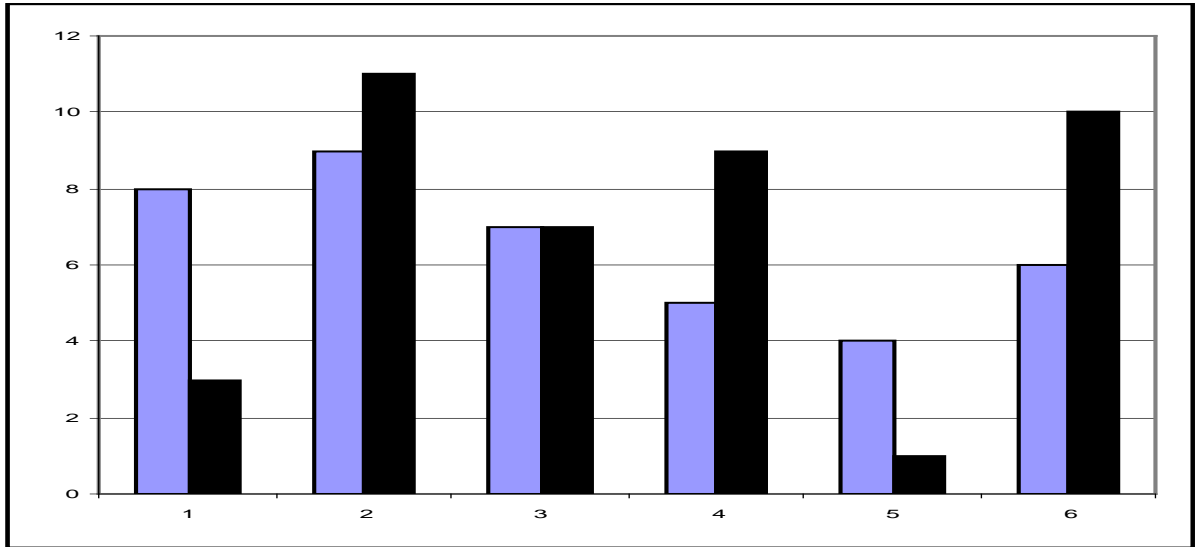
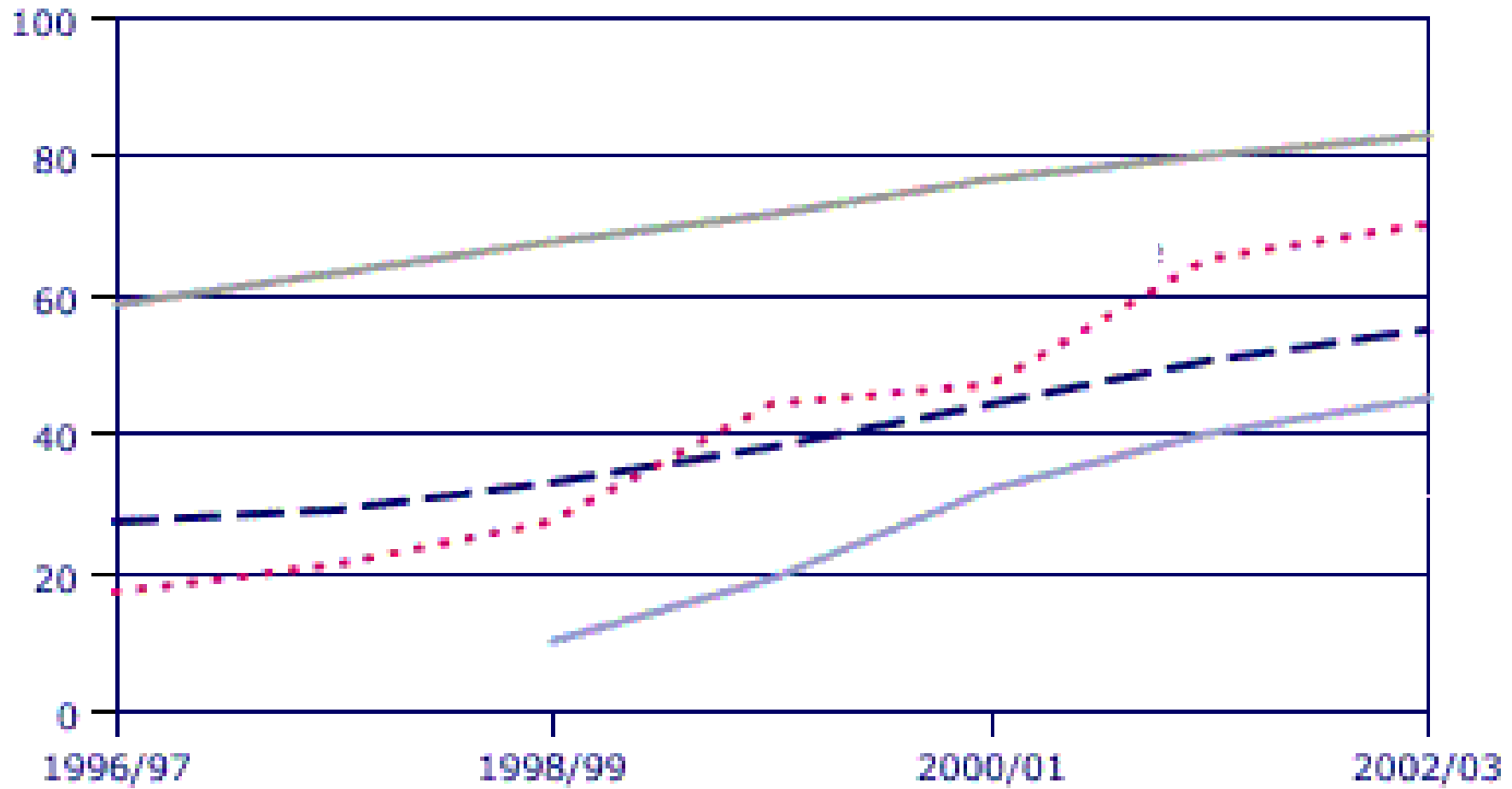

Charts B

R 5: Labels

In groups, look at the two charts that you've been given. You will see that the labels are missing.

The labels are provided on the accompanying sets of cards. Match the labels to the appropriate part of each chart.

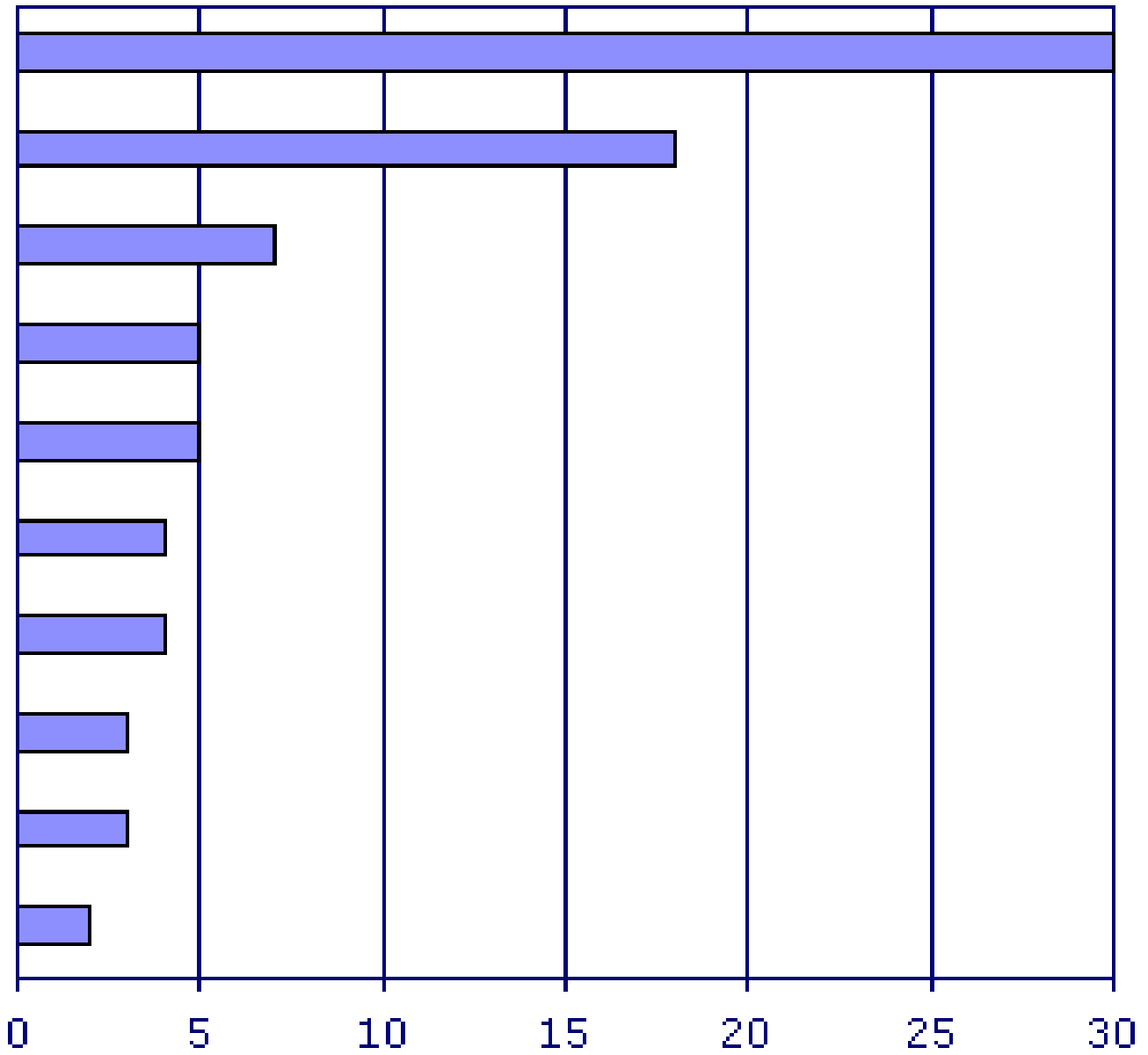Don't forget to give reasons for your choices.

Digital technology

Holiday destinations

Percentages

Digital technologies

Internet access	**CD player**	**Mobile phone**
Digital TV	**Home computer**	**DVD player**

Holiday destinations

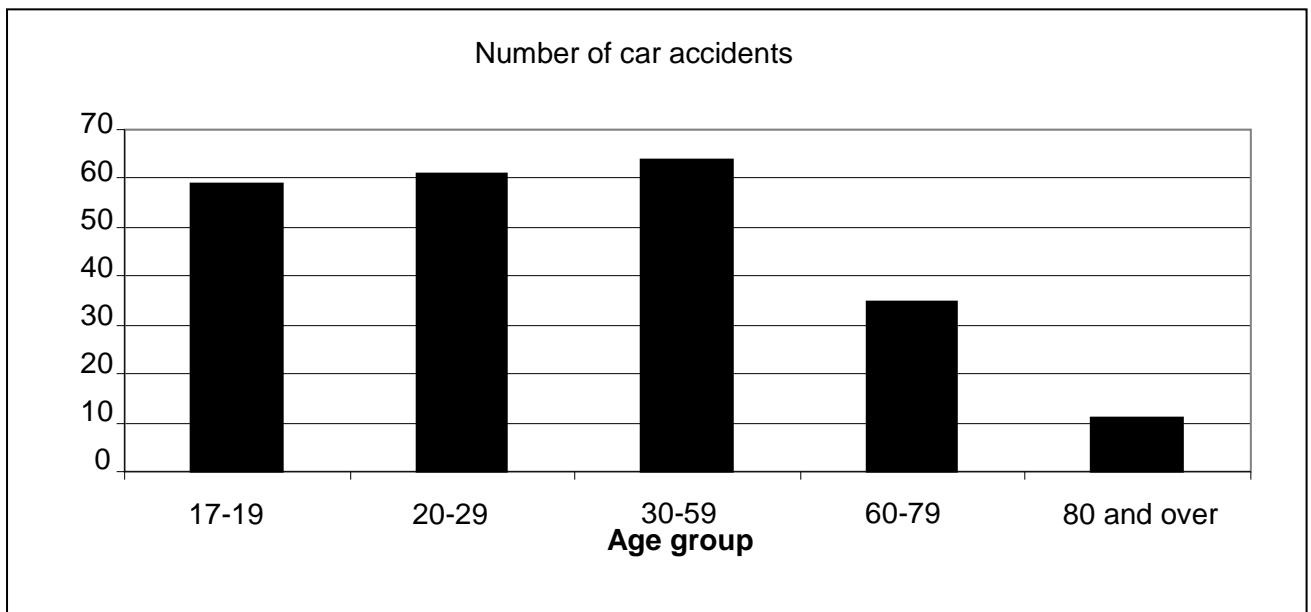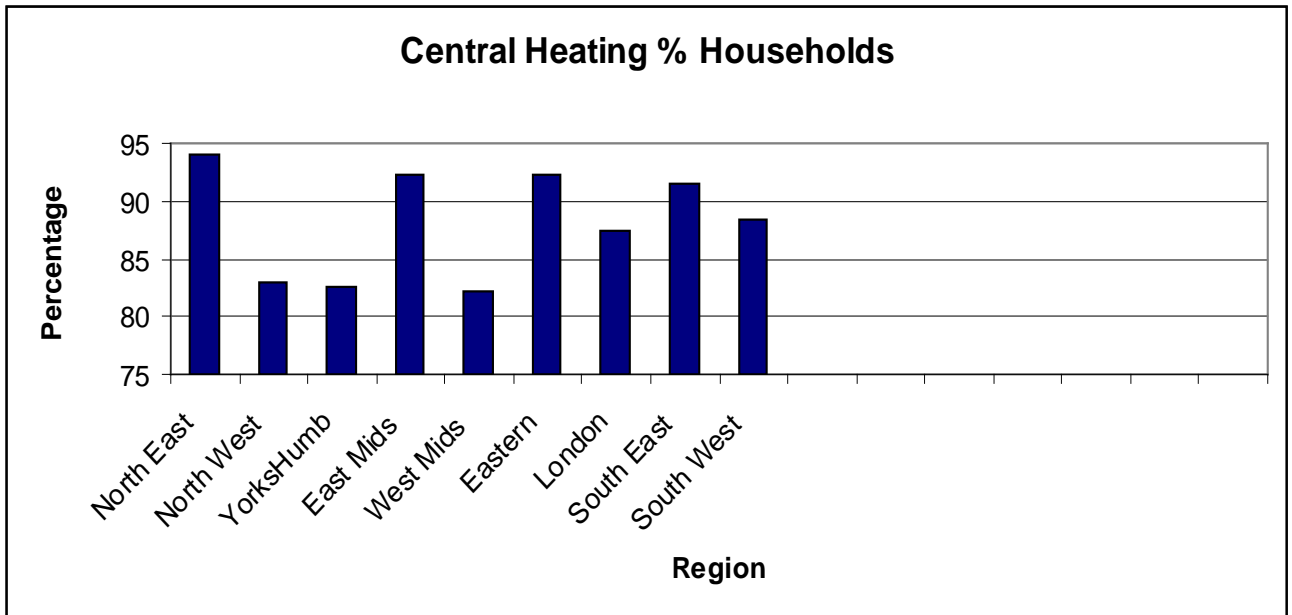|		
Turkey	**Portugal**	**France**
USA	**Netherlands**	**Italy**
Ireland	**Spain**	**Cyprus**
Greece		

R 6: True or false?

Look at the two charts below.

In your group, decide whether each of the statements on the accompanying cards is true or false.

Give reasons for your decisions.

Central Heating % Households

Number of car accidents

The safest drivers are those aged 80 and over.

17-19 year olds are safer drivers than those aged 20 to 59.

The 60-79 age group accounts for approximately 15% of all accidents.

30-59 year olds are the most dangerous drivers.

The percentage of households with central heating in the South East is twice that in Yorkshire and Humberside.

The difference between the South East and London is 5%.

More than three quarters of houses in the West Midlands have central heating.

R 7: Clues

Below is a list of statements based on a chart about DVD rentals. In groups, use these statements as clues to help you to reconstruct the original chart.

When you have finished, compare your chart with that of another group. Is your chart the same? If not, why not? Are both charts equally valid?

1. *Comedy* was the most popular type of DVD with 33% of the rentals being in this category.

2. *Science fiction* was the least popular with only 4% of the rentals.

3. *Children's programmes* and *Horror* were only slightly more popular than *Science fiction*.

4. *Horror* had 3% more than *Science fiction*.

5. The *Thriller* and *Adventure* categories were second to *Comedy* but were a long way behind.

6. *Drama* accounted for 7% more of the rentals than *Horror* but 8% less than *Thriller*.

HO 1: What is data?

Data is a collection of facts, such as values or measurements. It can be numbers, words, measurements, observations or even just descriptions of things.
Data can be qualitative or quantitative.

- Qualitative data is descriptive information (it *describes* something)

- Quantitative data, is numerical information (numbers).

(For more information, visit: http://www.mathsisfun.com/data/data.html)

And **Quantitative data** can also be discrete or continuous:

- Discrete data can only take certain values (like whole numbers)

- Continuous data can take any value (within a range)

Put simply: **discrete data** is counted, **continuous data** is measured.
For more information, visit: http://www.mathsisfun.com/data/data-discrete-continuous.html

How to draw a bar chart

Further information on how to draw a bar chart, using discrete data, is available on the Excellence Gateway. This information sheet shows how to display data on income and expenditure in a bar chart. The title is Hairdressing: how to construct a bar chart http://www.excellencegateway.org.uk/node/22539

If you would like to further develop your knowledge and understanding of data handling and statistics, you might find the following interactive websites useful:

BBC Skillswise: http://www.bbc.co.uk/skillswise/topic-group/graphs

BBC GCSE Bitesize: http://www.bbc.co.uk/schools/gcsebitesize/maths/statistics/

Centre for Innovation in Mathematics Teaching (esp. units 8, 16 and 18): http://www.cimt.plymouth.ac.uk/projects/mepres/book9/book9int.htm

HO 2: Personal reflection sheet

Module 12a: Handling data

As you go through the different topics and activities during the session, make notes below regarding topics you feel confident about and those that you need to consolidate further.

Topic / activity	Reflections
Transport to work	
Introductions	
Functional maths: process skills	
Challenge of functional skills	
Data handling in vocational areas	
Creating a story	
Carousel	
Planning a data handling activity	

HO 3: Functional mathematics process skills

Functional skills qualifications in mathematics assess three interrelated process skills:

Representing – selecting the mathematics and information to model a situation	**Analysing** – processing and using mathematics	**Interpreting** – interpreting and communicating the results of the analysis
Candidates recognise that a situation has aspects that can be represented using mathematics Candidates make an initial model of a situation using suitable forms of representation Candidates decide on the methods, operations and tools, including ICT, to use in a situation Candidates select the mathematical information to use	Candidates use appropriate mathematical procedures Candidates examine patterns and relationships Candidates change values and assumptions or adjust relationships to see the effects on answers in models Candidates find results and solutions	Candidates interpret results and solutions Candidates draw conclusions in light of situations Candidates consider the appropriateness and accuracy of results and conclusions Candidates choose appropriate language and forms of presentation to communicate results and solutions

Source: Functional skills criteria for mathematics : Entry 1, Entry 2, Entry 3, level 1 and level 2 (September 2011) Ofqual/11/4953
http://www.ofqual.gov.uk/downloads/category/68-functional-skills-subject-criteria

HO 4: Functional skills examiner's report

FSM02 - Functional Skills Mathematics Level 2

Introduction

Most candidates attempted the majority of the questions and gave thoughtful answers to the problems set. Overall, candidates found questions most difficult when the context was unfamiliar to them, the question was open-ended or multi stage. As candidates are required to show success in problem solving in real life situations these types of questions are an essential part of functional skills papers. Centres need to ensure that candidates are offered many opportunities to solve such problems in preparation for the tests.

Many candidates did show their working clearly and were consequently able to obtain process marks. Centres need to place emphasis on the meaning of the notepad symbol as some candidates are ignoring the key need to show **clear** working. Those candidates who provided no working or disorganised working made it very difficult to credit their efforts.

Awarding credit in multi stage problems was particularly difficult when a candidate's communication was poor.

Candidates need to understand that when dealing with questions that require them to 'explain their answer', it is important to provide both a decision and a reason for it.

Centres need to place emphasis on understanding of functional language such as 'overcharging', 'budget' and 'survey'.

Calculating with time is a functional skill which is very poorly done. Candidates need to practise adding times in many functional contexts.

Candidates should be encouraged to ask themselves whether a data collection sheet they have produced is fit for purpose.

They also need to practice choosing a suitable linear scale for a graph.

Candidates sometimes missed key elements in questions. Centres should place emphasis on highlighting, underlining or circling key information in questions to minimise the errors caused by lack of careful reading.
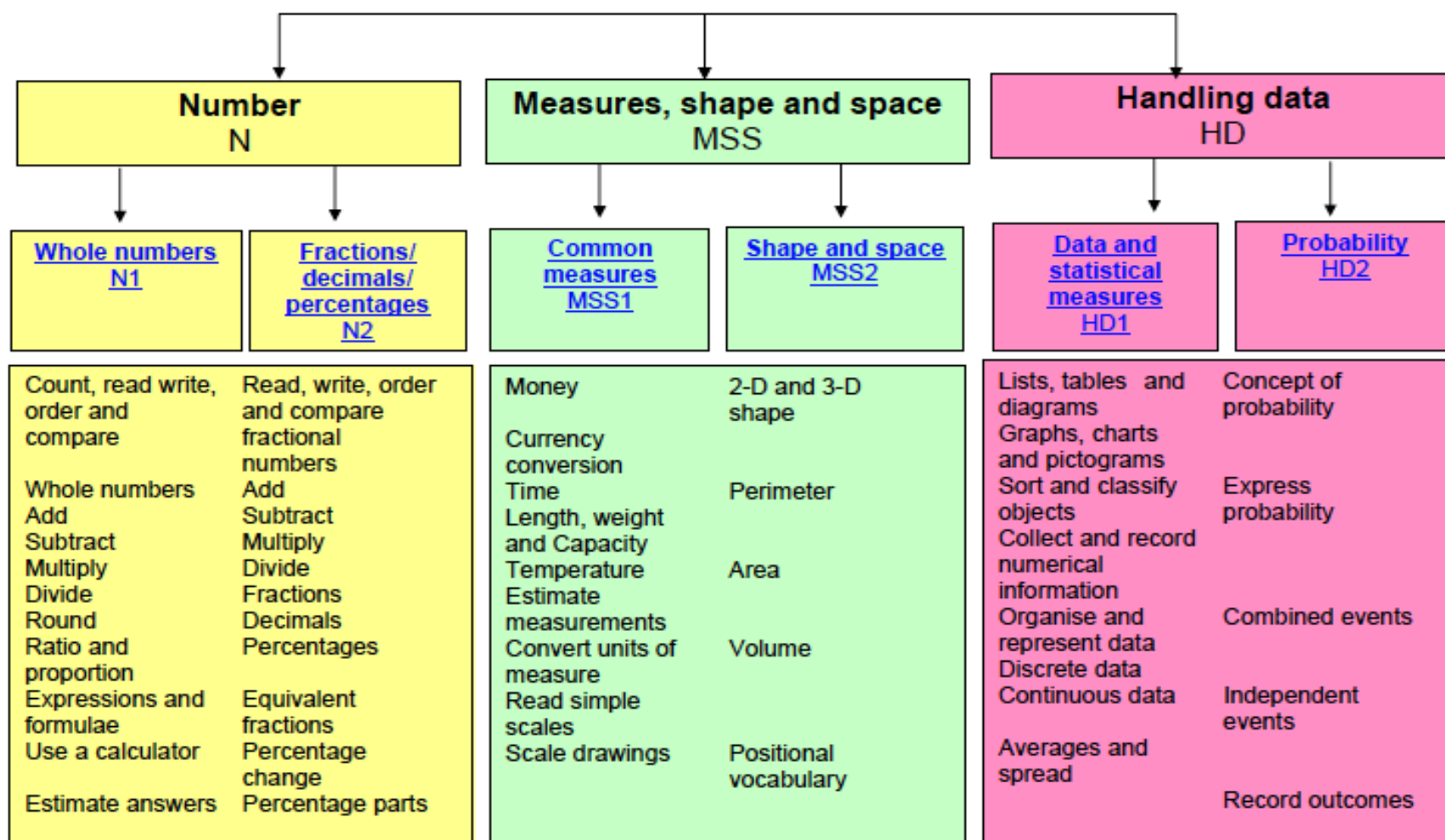
There is evidence that some candidates are not using calculators. Centres need to ensure that there is always access to a calculator during the test and, when preparing candidates for the test, encourage them to make use of a calculator.

Source:
http://www.edexcel.com/migrationdocuments/QS%20FS%20and%20Diploma/February%202011%20-%20ER/FSM02_01_pef_20110328.pdf

HO 5: Adult numeracy core curriculum

Adult Numeracy Core Curriculum

Number N	Measures, shape and space MSS	Handling data HD

Whole numbers N1	Fractions/ decimals/ percentages N2	Common measures MSS1	Shape and space MSS2	Data and statistical measures HD1	Probability HD2
Count, read write, order and compare Whole numbers Add Subtract Multiply Divide Round Ratio and proportion Expressions and formulae Use a calculator Estimate answers	Read, write, order and compare fractional numbers Add Subtract Multiply Divide Fractions Decimals Percentages Equivalent fractions Percentage change Percentage parts	Money Currency conversion Time Length, weight and Capacity Temperature Estimate measurements Convert units of measure Read simple scales Scale drawings	2-D and 3-D shape Perimeter Area Volume Positional vocabulary	Lists, tables and diagrams Graphs, charts and pictograms Sort and classify objects Collect and record numerical information Organise and represent data Discrete data Continuous data Averages and spread	Concept of probability Express probability Combined events Independent events Record outcomes

HO 6: Data handling activities

Activity	How could this be adapted for my vocational learners?	How could this be adapted for different levels?
A. Sampling		
B. An average exercise		
C. Using averages		

Activity	How could this be adapted for my vocational learners?	How could this be adapted for different levels?
D. Which is better?		
E. Labels		
F. True or false?		

Activity	How could this be adapted for my vocational learners?	How could this be adapted for different levels?
G. Clues		

HO 7: Further useful websites

Adult numeracy core curriculum
http://www.excellencegateway.org.uk/node/1514 New interactive online version. As well as the numeracy curriculum, there are sections on embedding, family learning and employability, links to resources and other curricula, ideas, suggestions and activities, personal space, contributions from other tutors and more.

BBC Skillswise
http://www.bbc.co.uk/skillswise/maths
Online and paper-based resources for adult numeracy learners.

Being Functional resources
http://tlp.excellencegateway.org.uk/tlp/fs/fs-resources/about.php
A range of functional skills resources, including CPD activities.

Excellence Gateway - nationally developed Skills for Life materials
http://rwp.excellencegateway.org.uk
Resources developed over the period 2001 to 2010 to support the national Skills for Life Strategy and other Skills for Life developments.

Embedded learning materials
http://rwp.excellencegateway.org.uk/Embedded%20Learning/
An extensive range of materials to support embedded learning (including numeracy) in over 25 vocational, community, employability and health settings.

Functional skills on the Excellence Gateway
http://www.excellencegateway.org.uk/node/21154
See this menu page to access the range of functional skills resources on the Excellence Gateway, including the new functional skills starter kit:
http://www.excellencegateway.org.uk/node/20280

Improving Learning in Mathematics
http://tlp.excellencegateway.org.uk/teachingandlearning/downloads/default.aspx#/math
Resources for improving teaching in mathematics, including a selection of downloadable materials. Aimed primarily at Level 2 and 3 learners.

Learning Mathematics in Context
http://tlp.excellencegateway.org.uk/tlp/xcurricula/lmic/
Ideas and resources to help you explore teaching and learning mathematics within vocational and other subject areas.

Mathematical Moments
http://tlp.excellencegateway.org.uk/tlp/stem/stem-mm.html
Each Mathematical Moment invites you to focus on a particular mathematical topic, offers you suggestions for activities you could carry out with your learners, prompts you to anticipate, and then reflects on learners' responses, and finally offers you some follow-up ideas. The topics are addressed at levels ranging from Entry to Level

3.

Move On
http://www.move-on.org.uk/
English and Maths resources for teachers, learners and providers, encompassing promotion, engagement and delivery. Check out Stop 4 of the Teacher Route.

National Centre for Excellence in the Teaching of Mathematics
https://www.ncetm.org.uk/
Resources and tools for teachers of maths and numeracy across all sectors (primary, secondary and FE). Check out the following pages. Note that you need to register before accessing these materials.
   Numeracy Challenge https://www.ncetm.org.uk/resources/13790
   Maths at Work https://www.ncetm.org.uk/resources/11329
   FE Magazine https://www.ncetm.org.uk/resources/14609
   Mathemapedia https://www.ncetm.org.uk/mathemapedia/
   Thinking Through Maths (online CPD module) https://www.ncetm.org.uk/reflective-learning/ttm

Northern College
http://www.northern.ac.uk/content/?id=133
Active resources for teaching functional mathematics (Entry 3 and Level 1).

Nrich
http://nrich.maths.org/public/index.php
Free mathematics enrichment materials (problems, articles and games) for teachers and learners. Aimed at ages 5 to 19 years, but much is suitable for adults.

OCR support materials for Functional Skills Maths:
Level 1: http://www.ocr.org.uk/qualifications/type/fs%5F2010/maths/l1/documents/
Level 2: http://www.ocr.org.uk/qualifications/type/fs%5F2010/maths/l2/documents/
Tasks to use as teaching resources or practice assignments.

Office of Fair Trading Skilled to Go
http://www.oft.gov.uk/about-the-oft/partnership-working/partnership-working-info/consumer-education/resources/sthome
A teacher's toolkit of games and resources for consumer education, with literacy and numeracy embedded.

Resources to support the pilot of functional skills
http://www.excellencegateway.org.uk/page.aspx?o=201311
Teaching and learning functional mathematics

Skills Workshop
http://www.skillsworkshop.org/
Free downloadable Skills for Life and functional skills resources from this private website.

Subtangent
http://www.subtangent.com

Interactive maths games and resources that can be used on line or downloaded.

Tarsia Formulator
http://www.mmlsoft.com/index.php?option=com_content&task=view&id=4&Itemid=5
Free downloadable software to help create your own mathematical jigsaws and domino activities.

HO 8: Planning a data handling activity

For this activity, you will work with a small group to plan a data handling activity that is both **purposeful** and **relevant to the vocational needs** of your learners.

In planning the activity, you should consider the 5-stage model of data handling:

1. **Specify the problem**
   - Why do learners need to carry out this activity?
   - What questions are they trying to answer?
   - What problem are they trying to solve?

2. **Plan**
   - Where will learners obtain their data?
   - Will they collect primary data or use secondary data?

3. **Collect data**
   - If *primary*: how will they collect this? What sample will they use? What questions will they ask? What types of error might there be?
   - If *secondary*: what data are available? Is data in an accessible form?

4. **Process and represent**
   - How will learners record and group the data?
   - What graphs and charts are most useful to summarise the data?
   - Will you tell learners which graphs and charts to choose, or allow them to decide?

5. **Interpret and discuss**
   - How will you encourage learners to question and interpret the data?
   - How will they use their findings to answer the initial questions from stage 1 (specify the problem)?

Feeding back
- Use a flipchart sheet to provide an outline of your activity, which can be displayed to the whole group.
- Prepare to provide brief feedback on:
   o The rationale for your activity
   o Any key considerations in developing the activity