

Trainer pack

Developing functional mathematics with vocational learners

Module 12c: Common measures,
shape and space

Course information **Length of session:** 2.75 - 3.25 hours, depending on activities required by participants. Trainers can customise, shorten and lengthen the session to suit the audience and settings.

Audience **Job roles:** Practitioners who are vocational specialists and teaching or supporting the development of numeracy skills or functional mathematics up to and including level 2.
Sector/setting: Vocational

Links to other modules **Common measures, shape and space** (the third of three modules in the collection: *Developing functional mathematics with vocational learners*) is a module that can be undertaken independently or can be undertaken as part of 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.

Aims

To provide practical ideas and activities for embedding measures, shape and space within vocational contexts

To explore how assessment can be used to inform teaching and learning

Outcomes

By the end of the session participants will have:

- identified the content of the maths curriculum area: measure, shape and space;
- explored activities which can be used as formative assessment;
- reflected on the implications of the findings of examiners' reports for the teaching of aspects of the curriculum; and
- reviewed a specimen exam question and prepared one of their own.

Module overview

Activity		Content
1	Starter: Modelling a numeracy starter	Matching domino game: Common measures
2	Introductions	Introductions and content of the session. Discuss the initial, diagnostic and summative assessment used by the participants and / or their organisations.
3	Identify the measures, shape and space curriculum	Exploring the content of the measures, shape and space curriculum and its relevance to vocational contexts.
4	Examiners' reports and common errors	Identifying common errors in measures, shape and space and the reasons for these.
5	Example activities for teaching measures, shape and space	Modelling alternative approaches to teaching concepts where errors are frequently seen.
6	Links to summative assessment	Review of a specimen exam question and writing one for a given vocational context.
7	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, 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

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>

Resources

Resources for reference during the session

Trainer notes

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 3: Further useful websites

Before the session the trainer needs to:

Print copies of the Participant pack, which contains the handouts and PowerPoint slide notes (but not the resources).

Set up PPT and online links if needed.

TN 1: prepare domino cards using R 1 – ideally printed

on card and laminated. You can use the blanks in R 2 for your own ideas, perhaps based on known areas of concern.

TN 4: print R 3 on card and cut up each problem / error.

TN 5: see TN 5 notes for details of how these resources are used.

- For activity 5a – one sheet of squared paper per participant
- For activity 5b – sheets of plain paper, string and rulers; examples of perimeter worksheets (optional)
- For activity 5c – nets of a cube, e.g. from <http://www.numeracycd.com/contents/activities/nets/netscube+puzzle.pdf> There should be one net, with sides measuring 1 cm, per participant. In addition you need a representation of a cubic metre – see TN 5 for a diagram and full instructions of how to make this using paper, sticky tape and string.

TN 6: locate and print off copies of appropriate exam questions from a range of functional skills' awarding organisations (in case participants have not brought copies from their own centre).

Aims

To provide practical ideas and activities for embedding measures, shape and space within vocational contexts

To explore how assessment can be used to inform teaching and learning

Outcomes

By the end of the session participants will have:

- identified the content of the maths curriculum area: measure, shape and space;
- explored activities which can be used as formative assessment;
- reflected on the implications of the findings of examiners' reports for the teaching of aspects of the curriculum; and
- reviewed a specimen exam question and prepared one of their own.

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	TN 1. Starter: Modelling a numeracy starter Matching domino game: common measures Activity 1 Display PPT 2 which has the starter instructions. The domino tiles (cards) made from R 1 should be given as a mixed batch to the group(s). Remind participants of the basic strategy of a domino game - to match the right-hand part of one tile to the left-hand part of	PPT 2	Slide	Starter: domino game
		R 1	Resource	Giant dominoes
		R 2	Resource	Domino blanks

Time	Content	Resources		
		No.	Style	Title
(Total 35m)	<p>later in the training.</p> <p>Refer to the focus of the module as being on measures, shape and space. Underline how this fits with a functional approach to maths in which representing, analysing and interpreting are key.</p> <p>The additional focus for this module is assessment. Ascertain from participants:</p> <ul style="list-style-type: none"> • The forms of initial and diagnostic assessment used • How the results of these are used • Whether summative assessment is online or paper-based. <p>Show slide PPT 6. Ask participants to discuss the following on their table and be ready to feedback to the whole group:</p> <ul style="list-style-type: none"> • What methods of formative assessment (FA) do participants use? • How do they use FA to set / modify targets and inform their teaching? <p>Take quick feedback from the tables and record examples of formative assessment activities on flipchart / whiteboard.</p> <p>Conclude that assessment only has value when the results of it are used to inform teaching and learning - it is not an end in itself.</p>	PPT 6	Slide	Formative assessment
20m	<p>TN 3. Exploring the content of the measures, shape and space curriculum and its relevance to vocational contexts</p> <p>Display PPT 7 and provide a quick overview of the three strands, emphasising that coverage in functional mathematics has grown out of the adult numeracy core curriculum.</p> <p>Focus on the MSS strand and point out the opportunity for developing mathematical concepts, making connections with the starter activity.</p> <p>Leave PPT 7 displayed and draw</p>	<p>PPT 7</p> <p>HO 2</p>	<p>Slide</p> <p>Handout</p>	<p>Adult numeracy core curriculum</p> <p>What's involved in MSS</p>

Time	Content	Resources		
		No.	Style	Title
(Total 55m)	<p>participants' attention to HO 3: What's involved in measures, shape and space.</p> <p>Ask participants to work in vocationally-related pairs to identify aspects of measures, shape and space relevant to their learners and their programmes of study. Encourage them to make connections across the strands of the curriculum to show how all skills link together, e.g. rounding and levels of accuracy in measurement; multiplication in area. Notes can be made on HO 3 and shared with the group.</p> <p>If time allows, encourage participants to extend the discussion across vocational settings to gain understanding and insight into other contexts. Compare this with the 'familiarity' of functional skills.</p>			
30m	<p>TN 4. Examiners' reports and common errors</p> <p>Introduce the common errors at Level 1 and Level 2 by showing PPT 8-9 and ask participants to reflect on their own experience. Are there particular errors or misconceptions that they have identified in their learners?</p> <p>Show PPT 10 and ask participants to consider the two questions in small groups.</p> <ul style="list-style-type: none"> Why do learners find these aspects of measures, shape and space difficult? What teaching strategies might help learners overcome these difficulties? <p>Take feedback from the groups, recording suggestions on flipchart.</p> <p>If it is not forthcoming from the group then pose questions to elicit the importance of practical activities such as measuring, drawing, creating shapes and counting squares, stacking tins in boxes, taking boxes apart, etc.</p> <p>Now look at some common errors made</p>	<p>PPT 8-9</p> <p>PPT 10</p>	<p>Slides</p> <p>Slide</p>	<p>Extracts from examiners' reports</p> <p>Common errors</p>

Time	Content	Resources		
		No.	Style	Title
(Total 1h 25m)	<p>by learners when working on real-life problems which involve common measures.</p> <p>Cut R 3 into sets of cards and provide a set for each group of 3-4 participants.</p> <p>Explain that they should work in groups to identify the mistake made in each case, and what advice they would give to the learner.</p> <p>Allow about 10 minutes for the activity before taking feedback.</p> <p>During feedback highlight that when learners work on real-life problems they are often satisfied with completely unrealistic answers. Discuss the importance of checking strategies, and taking a 'reality check' on the answers.</p> <p>Discuss how this sort of activity – when learners are taking a teacher's role and marking a learner's work can be a powerful way of highlighting common errors.</p>	R 3	Resource	Reality check
45m	<p>TN 5. Example activities for teaching aspects of measures, shape and space</p> <p>Activity 5a (Squared paper is required) Participants work in pairs taking it in turns to draw a rectangle, calculate its perimeter and then challenge the other person to draw a rectangle with the same perimeter.</p> <p>Pose these questions:</p> <ul style="list-style-type: none"> • What other rectangles could they have drawn with the same perimeter? • What other shapes could they have drawn with the same perimeter? • What have they learned about the concept of perimeter as a result of the activity? • What did they note about the area of the shapes? <p>Activity 5b (Plain paper, ruler and string are required)</p>			

Time	Content	Resources		
		No.	Style	Title
(Total 2h 10m)	<p>for this activity.)</p> <p>Develop the previous activity by challenging all to draw an irregular shape with straight sides with a perimeter of, say, 18cm on plain paper.</p> <p>Take feedback on the approaches used. Now challenge them to draw a shape with no straight sides with a perimeter of, say, 18cms.</p> <p>Take feedback on the approaches used.</p> <p>Ask participants if they are familiar with a common approach to teaching area and perimeter – a worksheet with lots of rectangles and composite shapes where the learners have to work through finding the perimeter and area of each.</p> <p>Activity 5c Give each participant the net of a one centimetre cube. Ask participants to contribute words associated with shape and record on a flipchart. Supply any that are not forthcoming. Ask for volunteers to give definitions of the terms. Clarify if required.</p> <p>Ask them to fold the net to make their own little cube.</p> <p>Ask participants what their learners would say in response to the question “How many cm^3 are there in 1m^3?”</p> <p>Present the collapsed representation of a cubic metre and ask the group to recreate it. Now ask them to place their 1cm^3 within the 1m^3. How do they rate the impact value?</p> <p>Finish by referring to other suitable materials in Maths4Life <i>Thinking Through Mathematics</i> resources.</p>			
50m	<p>TN 6. Review of an example question from a functional skills maths paper</p> <p>The trainer will need to download the exam question and make copies for</p>			

Time	Content	Resources		
		No.	Style	Title
	<p>participants in case they have not all brought one with them.</p> <p>Activity 6a Distribute copies of an example question paper where the focus is on measures, shape and space.</p> <p>Ask participants to work through the question noting down any challenges they think their learners will face and how these can be overcome by better preparing their learners. Display PPT 11.</p> <p>Take feedback and pose the question:</p> <ul style="list-style-type: none"> • What steps can you take to better prepare your learners for the summative assessment? <p>Record feedback on a flipchart and summarise the points made.</p>	PPT 11	Slide	Example question – instructions
	<p>Activity 6b Form vocational groups for this activity. If numbers do not work then make equal-sized groups and ask participants to settle on a context for their question.</p> <p>Explain that they will be writing a question of their own which could be used as a practice for the summative assessment.</p> <p>Display PPT 12 and ask them to consider:</p> <ul style="list-style-type: none"> • The underpinning skills and problem solving skills required • The pre-teaching and preparation that would be required <p>Depending on the overall length of the session this activity could take up to 25 minutes.</p>	PPT 12	Slide	Question setting
(Total 3h)	<p>Ask each group to present their question to the rest of the group and offer the points they considered when writing it.</p> <p>Draw this to a close by referring participants to the variety of resources available to support them in planning and delivering activities of this kind.</p>			

Time	Content	Resources		
		No.	Style	Title
15m <i>(Total 3h 15m)</i>	<p>TN 7. Summary and next steps</p> <p>Refer back to the session outcomes (PPT 13) and summarise what has been covered in the session.</p> <p>Ask participants to reflect on what they have learned, complete HO 2: Personal reflection sheet, and what they feel they can apply to their own practice.</p> <p>Ask for volunteers to share their reflections with the group.</p> <p>Draw participants' attention to HO 3 but also suggest that materials can be given to participants electronically so that they have direct links.</p> <p>If relevant, refer to what will be covered in other modules in the suite.</p> <p>Thank participants for their contributions and ask them to complete an evaluation form, if required.</p>	<p>PPT 13</p> <p>HO 2</p> <p>HO 3</p>	<p>Slide</p> <p>Handout</p> <p>Handout</p> <p>Evaluation forms</p>	<p>Learning outcomes</p> <p>Personal reflection sheet</p> <p>Further useful websites</p>

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. Where appropriate 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 instead or in addition.

All of the running times are suggestions. Each training session can be adapted to the group the trainer is working with and the timings adjusted accordingly.

TN 1

Trainer notes

Time	Content	Resources		
		No.	Style	Title
15m	<p>TN 1. Starter: Modelling a numeracy starter</p> <p>Matching domino game: common measures</p> <p>Activity 1 Display PPT 2 which has the starter instructions. The domino tiles (cards) made from R 1 should be given as a mixed batch to the group(s).</p> <p>Remind participants of the basic strategy of a domino game - to match the right-hand part of one tile to the left-hand part of another.</p> <p>Indicate to the participants that if all matches are made correctly then the whole set of tiles can be arranged in a complete rectangle (or the last tile will match the first).</p> <p>Once completed ask participants the following questions:</p> <ul style="list-style-type: none"> • How they could use / adapt the activity with their learners? • What common challenges are highlighted by the activity? • How can this activity form part of formative assessment? <p>Take time to explore the challenges and make links back to the development of number concepts (Module 12b).</p> <p>Draw participants' attention to HO 1 and give participants time to make any notes from the discussion above.</p> <p>Draw participants' attention to HO 2: Personal reflection sheet and ask them to spend a little time during each session of the CPD completing the relevant section.</p>	PPT 2	Slide	Starter: domino game
		R 1	Resource	Giant dominoes
		R 2	Resource	Domino blanks
		HO 1	Handout	Domino games
		HO 2	Handout	Personal reflection sheet
<i>(Total 15m)</i>				

Time	Content	Resources		
		No.	Style	Title
	There will be further time for this at the end of the session.			

The purpose of this activity is to model a starter which tutors can use or adapt with their own learners. It raises a number of common challenges including:

- multiplying and dividing by 10, 100, 1000
- representing hours and minutes as decimals
- zero as a place holder

all of which link back to Module 12b and the development of number concepts. Participants are encouraged to see that these concepts can be explored in a vocational setting thus making them 'real' for learners.

The activity can be conducted as a whole group with one set of domino cards (**R 1**) or in small groups of 2/3 people in which case more sets of the cards will be required.

The domino tiles (cards) should be given as mixed batch to each group.

Remind participants that the basic strategy of a domino game is to match the right-hand part of one tile to the left-hand part of another. If necessary, select two matching tiles to illustrate or use a different example altogether. Indicate to the participants that if all matches are made correctly then the whole set of tiles can be arranged in a complete rectangle or, if undertaken as a whole group activity participants will end up standing in a circle.

Differentiation

Encourage participants to discuss their solutions in their small groups. This activity should not be completed alone or in silence. It may be helpful to reassure participants that they can start with any pair of tiles, and that one strategy to work towards a solution is to build little 'islands' of two or three tiles, which are later joined together. This allows for better known pairs to be identified and the less well-known to be seen more easily and discussed.

When all cards have been matched ask participants:

- How they could use / adapt the activity with their learners?
- What common challenges are highlighted by the activity?
- What is the value of this activity for formative assessment?

Select example cards and ask participants to comment on them individually ensuring that the challenges indicated above are all covered.

Some exploration of formative assessment may be appropriate here. How do they make use of the results of initial assessment and diagnostic assessment? What records do they keep?

There are further notes on domino games in **HO 1** and a set of domino blanks in **R 2** – note that you can use these to develop our own domino game for this group.

Introduce the personal reflection sheet (**HO 2**) and give a little time to complete this.

TN 2

Trainer notes

Time	Content	Resources		
		No.	Style	Title
20m	<p>TN 2. Introductions</p> <p>Outline the aims and intended outcomes for the day: PPT 3-4</p> <p>Show PPT 5. Ask participants from each group to say what they have learnt about each other during the starter activity. (Or ask participants to introduce themselves if introductions have been done first).</p> <p>Identify what vocational work and teaching experiences are represented in the group. With reference to the aims and objectives, discuss what they would like to gain from the day.</p> <p>Note issues that need to be returned to later in the training.</p> <p>Refer to the focus of the module as being on measures, shape and space. Underline how this fits with a functional approach to maths in which representing, analysing and interpreting are key.</p> <p>The additional focus for this module is assessment. Ascertain from participants:</p> <ul style="list-style-type: none">• The forms of initial and diagnostic assessment used• How the results of these are used• Whether summative assessment is online or paper-based. <p>Show slide PPT 6. Ask participants to discuss the following on their table and be ready to feedback to the whole group:</p> <ul style="list-style-type: none">• What methods of formative assessment (FA) do participants use?• How do they use FA to set / modify targets and inform their teaching? <p>Take quick feedback from the tables and record examples of formative assessment</p>	PPT 3-5	Slides	Aim, outcomes, introductions
		PPT 6	Slide	Formative assessment

Time	Content	Resources		
		No.	Style	Title
(Total 35m)	<p>activities on flipchart / whiteboard.</p> <p>Conclude that assessment only has value when the results of it are used to inform teaching and learning - it is not an end in itself.</p>			

The purpose of this activity is to introduce the session, and being to make links between the training and participants' practice and experiences. It also provides a useful opportunity for the trainer to explore participants' knowledge and expertise.

The trainer provides an introduction making connections between the participant introductions, the domino starter, and the aims and intended outcomes. Adjustments to the aims and outcomes can be made if necessary, and if possible given the trainer's planning.

Differentiation

Participants will probably have different levels of numeracy skills. The starter activity can provide useful information on their skills and knowledge which can be used to inform the organisation of small group activity and trainer support throughout the session.

The trainer may wish to further clarify 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.

The additional focus for this module is assessment. This part of the activity will vary according to the participants, and trainers will need to use their discretion over timings and content. Broadly, it is important that vocational tutors have access to, and make use of, the results of initial and diagnostic assessment of their learners' maths skills. Knowledge and experience of the summative assessment used by the organisation is also important in ensuring that learners are appropriately prepared.

Participants should be carrying out their own formative assessment and making use of the results in their planning and teaching.

In this part of the activity it may be necessary for the trainer to give some examples of formative assessment, for example the starter used in this module, preparation of information posters by learners, quizzes, discussions, observation, etc.

The trainer should take quick feedback from the discussion groups and draw threads together. The trainer could point out that there are further CPD modules specifically about assessment as part of the LSIS offer:

Module 8: Improving initial and diagnostic assessment for functional skills

Module 9: Target setting for functional skills

Module 10: Approaches to formative and summative assessment and problem solving for functional skills.

These can be accessed from: <http://www.excellencegateway.org.uk/node/21207>

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: adult numeracy curriculum and functional skills subject criteria

The content of this pack is linked both to the **Adult Numeracy Curriculum** and the subject criteria for **Functional Mathematics**.

The adult numeracy core 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/sflcurriculum>

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

TN 3

Trainer notes

Time	Content	Resources		
		No.	Style	Title
20m	<p>TN 3. Exploring the content of the measures, shape and space curriculum and its relevance to vocational contexts</p> <p>Display PPT 7 and provide a quick overview of the three strands, emphasising that coverage in functional mathematics has grown out of the adult numeracy core curriculum.</p> <p>Focus on the MSS strand and point out the opportunity for developing mathematical concepts, making connections with the starter activity.</p> <p>Leave PPT 7 displayed and draw participants' attention to HO 3: What's involved in measures, shape and space.</p> <p>Ask participants to work in vocationally-related pairs to identify aspects of measures, shape and space relevant to their learners and their programmes of study. Encourage them to make connections across the strands of the curriculum to show how all skills link together, e.g. rounding and levels of accuracy in measurement; multiplication in area. Notes can be made on HO 3 and shared with the group.</p>	PPT 7	Slide	Adult numeracy core curriculum
		HO 2	Handout	What's involved in MSS
(Total 55m)	If time allows, encourage participants to extend the discussion across vocational settings to gain understanding and insight into other contexts. Compare this with the 'familiarity' of functional skills.			

The purpose of this activity is to introduce the content of the measures, shape and space curriculum and make links with participants' vocational subjects.

Introduce the core curriculum by showing **PPT 7**. Provide an overview of the three strands and emphasise that connections between the strands should be made at all

times. (This part of the session can be covered quite quickly if participants have already attended modules 12a and 12b.)

Refer back to the starter activity which showed multiplication and division in the context of metric measures and fractions and decimals in the context of time. Remind participants that the natural occurrence of measures, shape and space in vocational settings provides a rich opportunity to integrate all mathematical topics – number, decimals, percentages, ratio, rounding, levels of accuracy, proportional reasoning and so on.

Draw participants' attention to **HO 3**. Ask participants to work in pairs to consider the breadth of measures, shape and space and ask them to identify in which vocational contexts some topics may occur naturally, for example: time in making appointments in hairdressing or measuring units in construction (metric and imperial). Notes can be made on **HO 3**. Ask the pairs to share their ideas with the whole group.

You may need to illustrate the difference between a topic occurring naturally and where it could be forced. For example, you could talk about the shape of the mirrors in a hairdressing salon but why would you need to (unless you were involved in the design or re-design of the salon)?

Differentiation

You may also wish to discuss links to functional skills and their requirements. This will be dependent upon whether participants have done Modules 12a and 12b.

It may be a good idea to pair participants from different vocational areas so that they have experience of more than one area to share.

Alternatively, ask participants from similar vocational backgrounds to work together and report back on that area.

If the participants struggle with this activity you could select one of the skills e.g. recognise, use and perform calculations with money and ask the participants for examples of how they need to use this skill in their vocational area.

TN 4

Trainer Notes

Time	Content	Resources		
		No.	Style	Title
30m	<p>TN 4. Examiners' reports and common errors</p> <p>Introduce the common errors at Level 1 and Level 2 by showing PPT 8-9 and ask participants to reflect on their own experience. Are there particular errors or misconceptions that they have identified in their learners?</p> <p>Show PPT 10 and ask participants to consider the two questions in small groups.</p> <ul style="list-style-type: none"> • Why do learners find these aspects of measures, shape and space difficult? • What teaching strategies might help learners overcome these difficulties? <p>Take feedback from the groups, recording suggestions on flipchart.</p> <p>If it is not forthcoming from the group then pose questions to elicit the importance of practical activities such as measuring, drawing, creating shapes and counting squares, stacking tins in boxes, taking boxes apart, etc.</p> <p>Now look at some common errors made by learners when working on real-life problems which involve common measures.</p> <p>Cut R 3 into sets of cards and provide a set for each group of 3-4 participants.</p> <p>Explain that they should work in groups to identify the mistake made in each case, and what advice they would give to the learner.</p> <p>Allow about 10 minutes for the activity before taking feedback.</p> <p>During feedback highlight that when</p>	<p>PPT 8-9</p> <p>PPT 10</p> <p>R 3</p>	<p>Slides</p> <p>Slide</p> <p>Resource</p>	<p>Extracts from examiners' reports</p> <p>Common errors</p> <p>Reality check</p>

Time	Content	Resources		
		No.	Style	Title
(Total 1h 25m)	<p>learners work on real-life problems they are often satisfied with completely unrealistic answers. Discuss the importance of checking strategies, and taking a 'reality check' on the answers.</p> <p>Discuss how this sort of activity – when learners are taking a teacher's role and marking a learner's work can be a powerful way of highlighting common errors.</p>			

The purpose of this activity is to draw participants' attention to the common errors demonstrated by candidates in functional maths Level 1 and 2 that are particularly associated with measures, shape and space. Once this has been done the challenge is to encourage them to consider how they can help their learners overcome their difficulties.

PPT 8 and **PPT 9** show comments taken from the examiners' reports of a range of awarding bodies. It may be helpful for trainers to point out that these detailed reports can be downloaded from awarding bodies' websites. They make interesting reading and many offer suggestions as to what centres should be doing to improve their preparation of the learners.

The trainer should show **PPT 8** and **PPT 9** and then ask if any of them come as a surprise to participants or whether they match their experience. Time should be given to allow participants to contribute their own observations here.

Two questions should then be posed (**PPT 10**):

- Why do learners find these aspects of measures, shape and space difficult?

If we know what learners find challenging, what steps should we be taking to help them overcome the challenges?

Ask participants to work in small groups to discuss and make notes on their responses to the questions. Then ask groups to feed back to the whole group. Collate the responses on flipchart paper and summarise the points.

Differentiation

Use mixed groupings with respect to experience of assessing numeracy skills.

When working on real-life problems, many learners make errors with units and will be satisfied with plainly unrealistic answers. Some are not used to checking to see

whether their answers are sensible while other do not have sufficient experience to know what a sensible answer would be.

For this activity, cut up the cards in **R 3** and provide a set for each group. Ask them to find out what mistake the learner has made in each case. Afterwards, take feedback, highlighting the need for learners to check whether an answer is realistic within the context. The answers also highlight the following errors:

- Incorrectly converting between metric units.
- Forgetting to convert between units, or mixing up units.
- Using the wrong calculation – especially with questions that require proportional reasoning.
- Not rounding to an appropriate degree of accuracy.
- Mixing up length and area.

Ask for participants' reflections on this activity, and what learners might gain from such an activity.

TN 5

Trainer notes

Time	Content	Resources		
		No.	Style	Title
45m	<p>TN 5. Example activities for teaching aspects of measures, shape and space</p> <p>Activity 5a (Squared paper is required) Participants work in pairs taking it in turns to draw a rectangle, calculate its perimeter and then challenge the other person to draw a rectangle with the same perimeter.</p> <p>Pose these questions:</p> <ul style="list-style-type: none"> • What other rectangles could they have drawn with the same perimeter? • What other shapes could they have drawn with the same perimeter? • What have they learned about the concept of perimeter as a result of the activity? • What did they note about the area of the shapes? <p>Activity 5b (Plain paper, ruler and string are required for this activity.)</p> <p>Develop the previous activity by challenging all to draw an irregular shape with straight sides with a perimeter of, say, 18cm on plain paper.</p> <p>Take feedback on the approaches used. Now challenge them to draw a shape with no straight sides with a perimeter of, say, 18cms.</p> <p>Take feedback on the approaches used.</p> <p>Ask participants if they are familiar with a common approach to teaching area and perimeter – a worksheet with lots of rectangles and composite shapes where the learners have to work through finding the perimeter and area of each.</p> <p>Activity 5c</p>			

Time	Content	Resources		
		No.	Style	Title
(Total 2h 10m)	<p>Give each participant the net of a one centimetre cube. Ask participants to contribute words associated with shape and record on a flipchart. Supply any that are not forthcoming. Ask for volunteers to give definitions of the terms. Clarify if required.</p> <p>Ask them to fold the net to make their own little cube.</p> <p>Ask participants what their learners would say in response to the question “How many cm^3 are there in 1m^3?”</p> <p>Present the collapsed representation of a cubic metre and ask the group to recreate it. Now ask them to place their 1cm^3 within the 1m^3. How do they rate the impact value?</p> <p>Finish by referring to other suitable materials in Maths4Life <i>Thinking Through Mathematics</i> resources.</p>			

Purpose of the activity: participants will experience a number of activities which illustrate different approaches to teaching area, perimeter and volume. They will discuss the advantages of these approaches in terms of concept development. The trainer can use these activities or substitute alternatives for example from Maths4Life’s *Thinking Through Mathematics: Strategies for teaching and learning* (NRDC, 2007) http://sflip.excellencegateway.org.uk/pdf/DA_Managing+the+mathematics+footprint+i+n+educational+organisations.pdf See *Exploring measuring instruments, Choosing appropriate units Part 1 and Part 2*.

Activity 5a

Check understanding of the word perimeter. Participants work in pairs (A and B) where one sets the problem and the other solves it:

- A draws a rectangle on squared paper and works out the perimeter but does not allow B to see what they’ve done.
- A then challenges B to draw a rectangle of the same perimeter.
- Discuss the outcome of the activity.
- Not unusually B will say they ‘got it wrong’ if their perimeter is not the same one as A’s.

- Reverse the process with B being the problem setter.

Explore the outcomes and develop the challenge further by posing these questions:

- What other rectangles could you have drawn with the same perimeter?
- What other shapes could you have drawn with the same perimeter?
- What have they learned about the concept of perimeter as a result of the activity?
- What did you notice about the area of the shapes? Was it always the same?
- What can you say about the relationship between perimeter and area?

Activity 5b

On plain paper ask participants to draw an irregular shape with a perimeter of, say 18 cm.

Discuss approaches adopted.

On plain paper ask participants to draw an irregular shape with no straight edges with a perimeter of, say 18cms. (Have string and rulers available on tables). Discuss approaches adopted.

Ask participants to compare these two activities with the often-used approach of a worksheet with pre-drawn rectangles where learners are asked to calculate perimeter and area of each shape. (It would be a good idea to have an example of such a worksheet available.)

Activity 5c

Preparations need to be done in advance. Nets of the cube can be downloaded from the internet. For example:

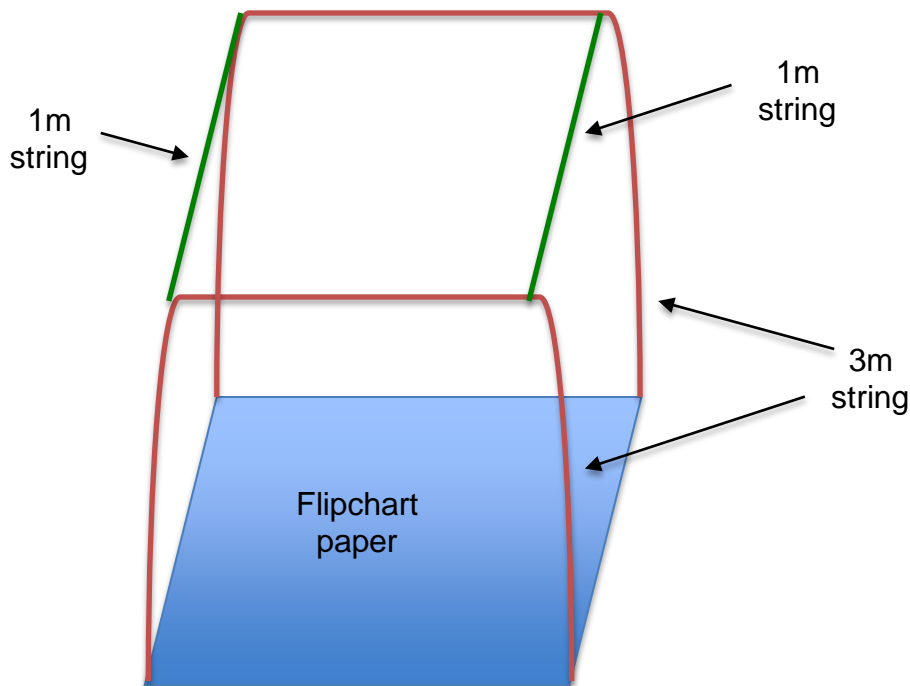
<http://www.numeracycd.com/contents/activities/nets/netscube+puzzle.pdf>

The trainer will need to ensure the nets produce a cube with sides measuring 1cm when printed off. They should be cut out in advance and there should be enough for one net per participant.

Trainers will also need to prepare a representation of a cubic metre for this activity. Below is one method, using paper and string, but there are other methods (e.g. using rods or canes).

1. Tape together pieces of flipchart paper to make a square 1m by 1m.
2. Cut two pieces of string each of which is just over 3m long.

3. Fix each end of one piece of string to adjacent corners of the square with sticky tape.
4. Repeat with the other piece of string.
5. Cut a further two pieces of string each of which is just over 1m long.
6. Fix / tie these two 1m lengths of string to form a skeleton of a cube (the paper forming the base and the string forming the remaining edges).
7. When the corners are held up the impression of a cubic metre is very realistic.



Distribute the nets of the once centimetre cubes and explore the associated terminology, e.g. net, face, edge, 3-D, 2-D. Ask participants to 'make up' their cube. Pose the question:

- How many cm^3 are there in 1m^3 ?

Present the collapsed 1m^3 and ask them to recreate it.

Alternative

If time allows the group can be challenged to create a 3-D representation of a one metre cube. Paper, sticky tape and string should be provided.

Typically the impact of the actual size of the cube on participants is huge.

Discuss the value of undertaking this type of activity with their learners. Pose the question:

- How could they extend it?

Conclude this section by running through **PPT 11-16**. Refer back to the list of ideas that came from the table discussion in the earlier activity in TN 4. Those ideas together with activities of this type can be used to help learners progress their conceptual development of measures, shape and space. The key thing is to apply the principles in a practical context not in two dimensions on an A4 piece of paper.

TN 6

Trainer notes

Time	Content	Resources		
		No.	Style	Title
50m	<p>TN 6. Review of an example question from a functional skills maths paper</p> <p>The trainer will need to download the exam question and make copies for participants in case they have not all brought one with them.</p> <p>Activity 6a Distribute copies of an example question paper where the focus is on measures, shape and space.</p> <p>Ask participants to work through the question noting down any challenges they think their learners will face and how these can be overcome by better preparing their learners. Display PPT 11.</p> <p>Take feedback and pose the question:</p> <ul style="list-style-type: none"> • What steps can you take to better prepare your learners for the summative assessment? <p>Record feedback on a flipchart and summarise the points made.</p> <p>Activity 6b Form vocational groups for this activity. If numbers do not work then make equal-sized groups and ask participants to settle on a context for their question.</p> <p>Explain that they will be writing a question of their own which could be used as a practice for the summative assessment.</p> <p>Display PPT 12 and ask them to consider:</p> <ul style="list-style-type: none"> • The underpinning skills and problem solving skills required • The pre-teaching and preparation that would be required <p>Depending on the overall length of the session this activity could take up to 25</p>	PPT 11	Slide	Example question – instructions
		PPT 12	Slide	Question setting

Time	Content	Resources		
		No.	Style	Title
(Total 3h)	<p>minutes.</p> <p>Ask each group to present their question to the rest of the group and offer the points they considered when writing it.</p> <p>Draw this to a close by referring participants to the variety of resources available to support them in planning and delivering activities of this kind.</p>			

Purpose of this activity: participants review an example question taken from a Level 1/2 functional skills paper. They then use the question as a basis for preparing a question of their own which is related to their vocational area.

Participants are asked to bring an example exam paper used by their organisation with them. They will need to identify those questions which focus on measures, shape and space. It is advisable that the trainer has several examples ready in case participants fail to bring any with them. Example questions can be taken from past papers. The one chosen here can be replaced with an alternative that the trainer considers reasonable. Select questions where there is a focus on measures, shape and space.

OCR Level 2 Functional Maths April 2011 Question 3 - downloadable from:
http://pdf.ocr.org.uk/download/pp_11/ocr_62770_pp_11_fs_qp_april.pdf

The accompanying data sheet can be downloaded from:
http://pdf.ocr.org.uk/download/pp_11/ocr_62771_pp_11_fs_qp_april_rb.pdf

Activity 6a

Distribute the example question and ask participants to work through the question noting down anything they think learners will find challenging or any implications the question has for their teaching. Display **PPT 11**.

Differentiation

Some participants may find the selected question challenging. The trainer should be ready to give support as required.

Alternatively more confident participants can be teamed with those who are less confident.

Take feedback from the groups on both points. Focus on the implications for teaching.

Pose the question:

- What steps can you take to better prepare your learners for the summative assessment?

Record the ideas on a flipchart for all to see. Summarise the suggestions and make any necessary additions.

Activity 6b

Participants work in small vocational groups to draft a sample summative assessment question. Suggest that they refer back to **HO 3** where they identified aspects of measures, shape and space relevant to their own vocational area. If there are insufficient numbers for this to be done in vocational groups then assign groups and ask them to choose the context for the example summative assessment question. Point out that in the examination learners could encounter questions in any context related to life or work so it is important that they have experience of this prior to the exam anyway. Many learners are thrown by their lack of familiarity with the context in an exam setting.

As well as setting the question, they should consider the underpinning skills and the problem solving skills required to address it. In their feedback to the whole group they will need to comment on both of these and give suggestions for the prior teaching and preparation required. Display **PPT 12**.

Allow each group to feedback and invite other groups to comment. Remind them that what is familiarity in one vocational area can be mastery in another so interaction with colleagues and sharing of resources is good practice. Reiterate comments from examiners' reports as necessary.

Flag up additional resources, for example:

Writing your own contextualised activities based on ideas from Teaching and Learning Functional Mathematics:

<http://archive.excellencegateway.org.uk/pdf/TandLMathematicsHT281107.pdf>

OCR Support for Functional Skills Mathematics - 24 tasks for use as teaching resources or practice assessments:

http://pdf.ocr.org.uk/download/sm/ocr_37315_sm_fs_sup_l2_nov_09.pdf

TN 7

Trainer notes

Time	Content	Resources		
		No.	Style	Title
15m (Total 3h 15m)	<p>TN 7. Summary and next steps</p> <p>Refer back to the session outcomes (PPT 13) and summarise what has been covered in the session.</p> <p>Ask participants to reflect on what they have learned, complete HO 2: Personal reflection sheet, and what they feel they can apply to their own practice.</p> <p>Ask for volunteers to share their reflections with the group.</p> <p>Draw participants' attention to HO 3 but also suggest that materials can be given to participants electronically so that they have direct links.</p> <p>If relevant, refer to what will be covered in other modules in the suite.</p> <p>Thank participants for their contributions and ask them to complete an evaluation form, if required.</p>	<p>PPT 13</p> <p>HO 2</p> <p>HO 3</p>	<p>Slide</p> <p>Handout</p> <p>Handout</p> <p>Evaluation forms</p>	<p>Learning outcomes</p> <p>Personal reflection sheet</p> <p>Further useful websites</p>

Display **PPT 13**, referring participants to the original session intended outcomes, and summarise what has been covered in the session.

Allow learners a few minutes to reflect on what they have learned from the session by completing **HO 2: Personal reflection sheet** and what they feel they can put into practice. This could be done individually, or discussed in pairs. Ask for volunteers to share their reflections with the group.

Draw participants' attention to **HO 4: Useful websites**.

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 the other modules unless they have been completed in order.

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

Module 12c: Common measures, shape and space

Handouts and resources

The resources are here for the trainer to prepare. Handouts are shown for the trainer's information and are included in the participant pack.

Resources

- R 1: Giant dominoes
- R 2: Domino blanks
- R 3: Reality check
- R 4: Useful websites

Handouts

- HO 1: Domino games
- HO 2: Personal reflection sheet
- HO 3: What's involved in measures, shape and space
- HO 4: Useful websites

R 1: Giant dominoes

50g

**1hr
15min**

1.25hr

30cm

0.3m

£2.90

290p

375ml

0.375l

1.4hr

1hr
24min

£2.09

209p

11.25pm

23:25

14mm

1.4cm

**8th Sept
2012**

08/09/12

$1\frac{1}{2}$ kg

500g

2km

2000m

**Twenty to 7
in the
evening**

18:40

**Three
pounds
and six
pence**

£3.06

375cm

3.75m

0.05kg

R 2: Domino blanks

R 3: Reality check

(Adapted from [Support for Functional Skills Mathematics Level 2](#), 2009, with the kind permission of OCR.)

Each morning Suneeta eats 25g of raisins with her porridge.
She buys a bag of raisins that weigh 1.5kg.
She wants to know how long this bag will last if she only eats the raisins with her porridge.

$$1.5 \times 100 = 150$$

$$150 \div 25 = 6$$

So the bag will last for 6 days.

Rita has a piece of silver ribbon that is 200cm long.
She wants to cut it into six pieces of equal length to wrap round some candles.

$$200 \div 6 = 33.3333333333333333 \dots$$

So she needs to cut six lengths that are each 33.333333 cm long.

Gail rents a holiday cottage.
She pays for her electricity at the end of the week.
The meter reading at the start of the week is 2058 units.
At the end of the week the reading is 2221 units.
The electricity costs 18.87p per unit.
She wants to work out the total cost of the electricity.

The number of units used is $2221 - 2058 = 163$

$18.87 \times 163 = 3075.81$

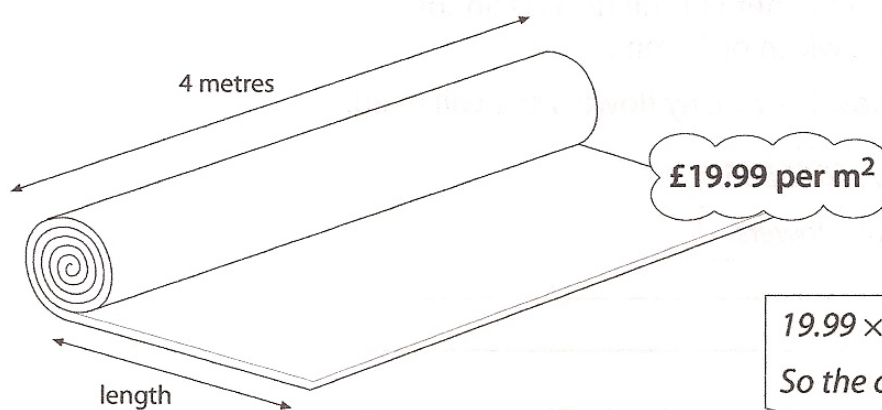
So the cost of the electricity will be £3075.81

Colin drives from Manchester to Cardiff, a distance of 195 miles.
The petrol he uses on the journey costs £22.48.
He wants to know how much he spent per mile on petrol for this journey.

$195 \div 22.48 = 8.6743772242 \dots$

So he spent £8.67 per mile.

Sheila buys a 5 metre length of carpet from this roll.
She wants to know how much it costs.



$19.99 \times 5 = 99.95$

So the cost is £99.95.

Asif lives in Oban.

He has a very important meeting in Glasgow on a Tuesday which begins at 1.30 p.m.

These are the times of the trains from Oban to Glasgow during the week.

Journey number	1	2	3
Dep. Station	Oban	Oban	Oban
Arr. station	Glasgow Queen St.	Glasgow Queen St.	Glasgow Queen St.
Departs	08:11	10:11	12:11
Arrives	11:30	13:30	15:30

He wants to know which train to catch.

Catch the 10:11

HO 1: Domino games

Domino games are a very adaptable resource providing opportunities for pairs or small groups of learners to work together in matching pairs of 'answers' in a repeated chain. If the solution allows for a complete rectangle to be formed then the structure includes a self-checking mechanism for the completely correct solution.

A numeracy domino game provides an activity which is tactile and worksheet-free, and which can consolidate previous learning and encourage commitment to memory of mathematical facts (rather than working it out from scratch each time).

The activity can be applied to many aspects of the curriculum, e.g. equivalent fractions, decimals and percentages; definitions of shapes and their names; maths language; and the four operations.

By including more or fewer types of conversion you can vary the level of skill and knowledge required to complete the game.

A blank for dominoes is provided in the resources for this unit (R 2) and there are a number of commercial producers of these sorts of games.

Tips and ideas

- Learners can be encouraged to design and make their own sets of dominoes. This task would then include measuring and marking out card as well as planning the questions and answers to go on them.
- Keep a copy of the originals as it can be used as an answer sheet and lost cards can be replaced easily.
- Ensure that the last domino card links back to the first.
- Although the activity promotes discussion it can be given to an individual to complete alone.

HO 2: Personal reflection sheet

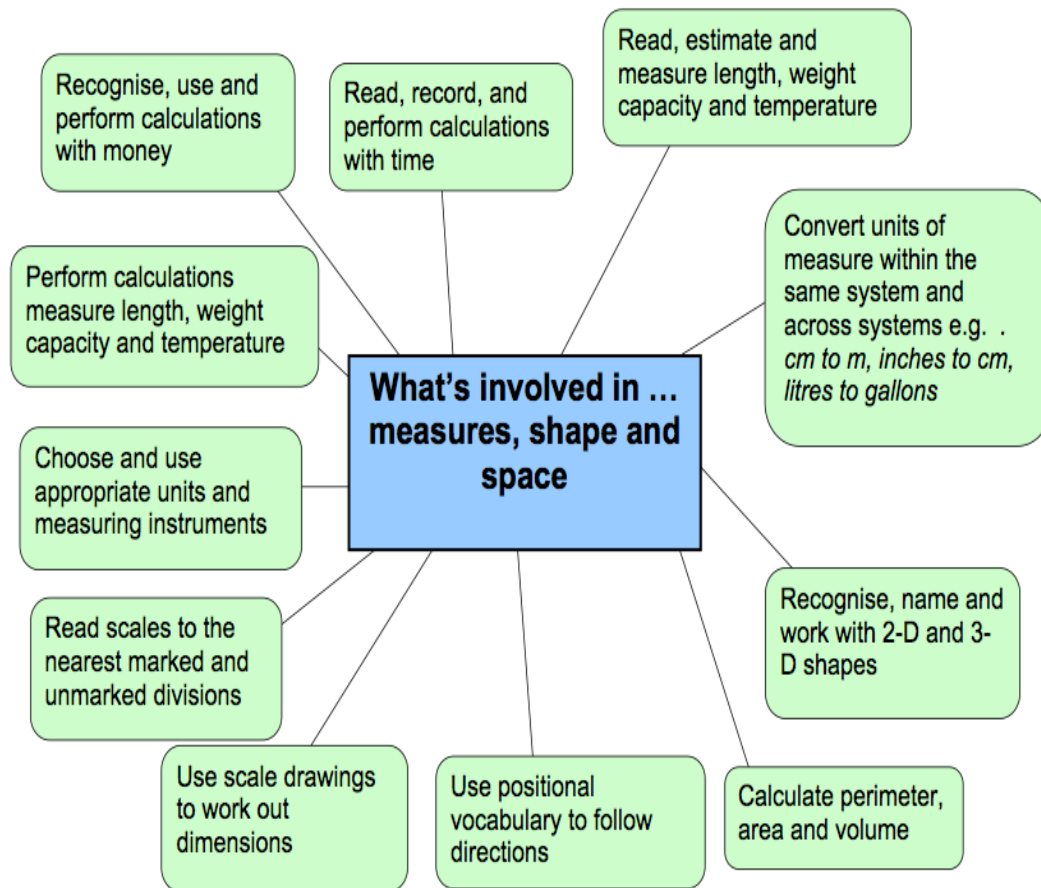
Module 12c: Common measures, shape and space

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
Matching domino game	
Introductions	
Exploring the curriculum	
Examiners' reports and common errors	
Example activities for teaching measures, shape and space	
Review of exam questions	
Question setting	
Summary and next steps	

HO 3: What's involved in measures, shape and space?

<http://www.excellencegateway.org.uk/node/15202>



HO 4: Further useful websites

Skills Workshop

<http://www.skillsworkshop.org/>

Free downloadable Skills for Life and functional skills resources from this private website.

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>

Mathemapeda <https://www.ncetm.org.uk/mathemapeda/>

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.offt.gov.uk/about-the-offt/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

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.