Teaching and Learning
Move On with your learners – numeracy

Module 2
Working with whole numbers

Session plan

Module 2: Working with whole numbers

Group: _____

Teacher: _____

Location: _____

Aims
- To explore techniques for working with whole numbers.
- To revise the laws of arithmetic through active learning.

Outcomes
Participants will:
- be able to read, write, order and compare numbers, including large numbers
- carry out calculations with numbers of any size using efficient methods
- have an awareness of support strategies for manipulating numbers that can be used with less confident learners
- have identified their preferred learning style.

Activity and time	Teacher activity	Learner activity
Introduction 5 mins	• Show **module 2 presentation slides 1–3**.	• Listen and respond.
Directed numbers 5 mins	• Distribute **'Follow me' cards** and explain the game.	• Whole group activity.
Learning styles 15 mins	• Introduce concept of learning styles and their impact on teaching and learning. • Distribute **Learning styles questionnaire**. • Discuss profile of group.	• Fill in **Learning styles questionnaire**. • Give feedback. • Record preferred learning style on learner profile.

Activity and time	Teacher activity	Learner activity
Mental versus written techniques 25 mins	• Explain purpose of task and dictate calculations from **Mental versus written techniques** handout. Facilitate discussion regarding different techniques used and record on flipchart. • Distribute **Mental versus written techniques** handout. Ask learners to use written methods for calculations, take feedback and record methods, noting different methods used. • Refer to *Adult Numeracy Core Curriculum* pp. 25, 29 and 31. Compare techniques listed with flipchart results.	• Calculate mentally and record method. • Contribute to discussion and feedback. • Individual work on written calculations. • Feedback to flipchart. • Identify any additional methods and contribute to discussion.
Estimation and approximation 10 mins	• Q and A: Why are these skills important? • Set these two sums: 23 × £1.40 and $\frac{1}{3}$ of 98p. • Discussion and feedback.	• Participants use calculators. • Discuss issues for learners.
Place value and large numbers 15 mins	• Explain task and dictate numbers. Distribute **Blank number chart** handout and repeat task. • Distribute **Completed number chart** handout. Take feedback on any issues or problems. • Use **module 2 presentation slides 4 and 5** to explore common problems with place value.	• Learners record numbers on paper, then with support of **Blank number chart**. • Compare answers and explore issues. • Listen and respond.
Multiplication methods 10 mins	• Distribute **Multiplication square**, **9s table** and **Handy Multiplication** (from Move On Maths Methods Module – File 2 Part 8). Link to learning styles.	• In pairs, discuss techniques and value for learners.
Break 15 mins		

Activity and time	Teacher activity	Learner activity
BODMAS/ BIDMAS 15 mins	• Use **module 2 presentation slide 6** to explore learners' knowledge of BODMAS/ BIDMAS. Distribute **What is BODMAS/BIDMAS?** handout and facilitate discussion.	• Listen and respond. • Read handout and provide feedback. • Individual/paired activity.
Understanding the laws of arithmetic 45 mins	• Check learners' prior knowledge using activities outlined. • Distribute **Card sets A–C.** • Review and extend learning by encouraging participants to generalise, as outlined in the teacher's notes.	• Listen and respond. • Contribute to discussion. • In groups of two or three, participate in card matching game.
Summary 20 mins	• Summarise learning using **module 2 presentation slides 7–9**. • Revisit session aims and objectives (**module 2 presentation slides 2 and 3**). • Identify personal study tasks towards ILP. • Offer extension activities/individual support where appropriate. • Distribute **Sample test questions for BODMAS/ BIDMAS** and **Number**, with the **answers**. • Give out **Journal** sheet for module 2.	• Listen and provide feedback. • Agree personal study tasks to be completed before next session. • Complete journal.

Resources/aids

- Module 2 PowerPoint presentation/OHP slides
- Handouts: Learning styles questionnaire; Learning styles questionnaire: feedback; Mental versus written techniques; Blank number chart; Completed number chart; Multiplication square; 9s table; What is BODMAS/BIDMAS?; Inter-session tasks; Journal; Sample test questions for BODMAS/BIDMAS; Sample test questions: Number
- Activity sheets: 'Follow me' cards; Answers sheet
- Supplementary materials: *ANCC* (one for each participant); Move On Maths Methods Module (File 2, Part 8)
- Personal whiteboards
- Flipchart and markers.

Assessment evaluation

Individual learning planning

Learner	Skills	Activity/ Resources	Evaluation (where next?)

Teacher's notes

Module 2: Working with whole numbers

This is a demanding and interactive session, providing a review of the bulk of curriculum coverage for N1 work, via a brief overview of the main concepts and techniques whilst modelling and providing examples of support tips for lower level learners.

Introduction

Recap on the last module. Use **slides 1–3** to introduce module 2.

Directed numbers

Before the session you will need to have prepared a set of **'follow me' cards** for each group. Explain that they are going to explore the benefits of developing mental maths techniques during this and subsequent modules. Distribute 'follow me' cards and explain the game. Remind participants of the use of the thermometer as a practical example of a number line using directed numbers, and encourage them to use the example from module 1 to support with this task if required.

Learning styles

Introduce the concept of learning styles and their impact on teaching and learning. Distribute the **Learning styles questionnaires** and, after participants have completed them, the **feedback sheets**. Ask whether, and if so how, participants use the results of learning styles questionnaires with their learners. Stress that using the results comes with a 'health warning': if a learner uses one style predominantly, this doesn't necessarily mean that this is the one that will always bring success – it could even be a barrier. Learners need to explore and exploit all the styles to achieve the most success – they need to develop a multi-sensory approach. The session will use different approaches to exploit all learning styles, and ask participants to try to spot them as the session progresses. Ask them to write their results on their individual learner profiles.

Mental versus written techniques

Explain that the purpose of the task is to explore the different strategies we can use when using mental and written methods to perform calculations, starting with mental strategies. Ask the group for their views on why we can benefit from developing mental calculation strategies. Do they actively encourage their learners to develop

mental techniques? There is an argument that mental calculation is the foundation for all mathematical reasoning. Children who learn to calculate successfully develop understanding of concepts of numbers, size and space through group activities, discussions and demonstrations. An adult who has not successfully formed number bonds or learnt multiplication tables, or who is not able to perform simple mathematical operations, may have missed out on this stage.

Dictate the calculations from the **Mental versus written techniques** handout, and ask the group to work individually, doing the calculations mentally without using pen and paper. They should record their answers, and take note of how they approached each one. Take feedback from the group and record methods used on the flipchart. In summary, make the following points:

- Teaching written procedures too early can prejudice learners' chances of developing efficient ways of working with numbers 'in their heads'.
- Mental calculation requires a different way of approaching place value – for example for vertical addition we stress that 54 is five 10s and four 1s, but for mental calculations it is more useful to think of 54 as 50 and 4 more.
- When doing mental calculations, we read or say the calculation to ourselves first and therefore look more carefully at the numbers involved.
- We choose a strategy to suit the numbers, so that 45 – 29 is done in a different way from 45 – 6.
- We often change a calculation to make it easier to understand and do, e.g. 142 – 99 becomes 143 – 100, and to multiply by 25, simply multiply by 100 and divide by 4.
- We draw upon existing knowledge, such as known facts, different ways of counting and knowledge of how the number system works.

Estimation and approximation

Questions and answers: Why are these skills important? Link to mental strategies above. Explain that we will be revisiting estimation and approximation skills throughout the course, but stress their significance for unconfident learners who are overly dependent on calculators.

Set the sums: 23 × £1.40 and 1/3 of 98p. What implications are there for learners in making sense of the answers given by calculators? How can participants encourage learners to develop estimation and approximation skills to develop their confidence in calculations?

Place value and large numbers

Explain that the purpose of the task is to explore ways of handling large numbers. Firstly, ask them to record the numbers you are about to dictate on paper. Use the numbers from the **Completed number chart** handout. Repeat the activity, but this time distribute the **Blank number chart** handout and ask the participants to record

their answers within the number chart template. Which did they find easier? Do they use place charts with their learners? What other strategies do they or could they use to support learners with place value and understanding large numbers?

Use **slide 4** to explore common problems for learners, and strategies for overcoming these.

Multiplication methods

Distribute **Multiplication square** and **9s table**, and refer to **Handy Multiplication** from the Move On Maths Methods Module. In pairs, ask the participants to calculate nine times seven using each method and to discuss the techniques and their value to learners. Link to learning styles.

What is BODMAS/BIDMAS?

Use questions and answers to assess prior knowledge. Explain that they may use the variant BIDMAS (where I = indices) instead, or that the O may also stand for 'of', 'over', etc. Use **slide 6** to support discussion, and distribute the **What is BODMAS/BIDMAS?** handout. Give participants time to read the handout and assess understanding.

Understanding the laws of arithmetic

This activity assumes that participants are familiar with indices and with the area of simple compound shapes made up of rectangles joined together. Check, through questioning, that participants understand the following:
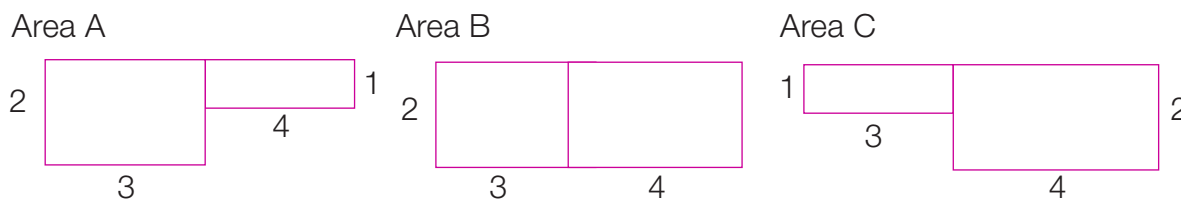
- What is the difference between 3×2 and 3^2?
- Draw two different rectangles with an area of 36 square units.
- What is the area of this shape?
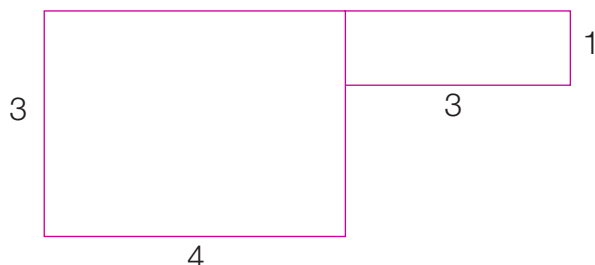
Each participant will need a personal whiteboard, and each group will need:

- Card set A: Calculations
- Card set B: Areas
- Card set C: Solutions.

Draw three compound shapes on the board.

Area A   Area B   Area C

Ask questions to explore participants' existing understanding:

1   If you work out $3 + 4 \times 2$, which area are you working out? Explain how you know.

2   If you work out $(3 + 4) \times 2$, which area are you working out? How do you know?

3   What answers does your calculator give for these questions?

4   Can you give me an expression for the other area?

5   What is the difference between $(2 + 3)^2$ and $2^2 + 3^2$? Can you show me a diagram to explain the difference?

Arrange participants in pairs or groups of three. Give each group a set of the **calculations, areas and solutions cards**. Ask them to place the cards face up on the table and take it in turns to match them. If they feel that cards belong together, they should place them side by side, so that they are all visible. Each time that a learner matches two or three cards, they should try to explain to their partners why the cards belong together. Encourage them to challenge their partners if they think that an explanation is not clear enough.

Participants will soon realise that there are more calculations cards than areas and solutions cards. Do not comment at this stage. They will soon find that some areas may be obtained by more than one calculation and that they need to provide additional answers for themselves. The blank cards are provided for this.

Encourage them to explain how they can immediately see when a calculations card matches an areas card, without working out the answers. Ask them to look for alternative ways of finding the areas.

Participants who match the cards quickly may be challenged to move towards generalisation:

1   What happens when we change the numbers?

2   Suppose we change the 4 in every card to a 5. Will the calculations cards still match the areas cards in the same way?

3   Will this still be true when we change the 4 to a large number, a negative number or a decimal?

4   Do the area pictures help to explain why this happens?

Draw out the general learning points that have emerged:
- the equivalence of multiplying by ½ and dividing by 2
- the order of operations (BODMAS/BIDMAS).

Equivalent expressions:

$2 \times (3 + 4) = 2 \times 3 + 2 \times 4$ (multiplication is distributive over addition)

$(\frac{1}{2})(3 + 4) = (\frac{3}{2}) + (\frac{4}{2})$ (division is distributive over addition)

Note: This is based on an activity from *Improving Learning in Mathematics*, The Standards Unit, 2005. The source material contains further ideas for extension and consolidation. Although a 'teacher's instinct' may be to intervene and actively teach these concepts, the feedback from the participants was that they learnt much more and gained confidence in their own mathematical reasoning abilities from this activity than they would have done from 'talk and chalk' methods.

Summary

Summarise the learning points and support tips for participants to use with their learners using **slides 7–9**. Revisit the module aims and objectives using slides 2 and 3. Explain Inter-session tasks handout and agree homework and individual tasks, signposting participants to individual work in N1 informed by their diagnostic assessment results. Distribute the **Sample test questions for BODMAS/BIDMAS** and **Number**, with the **answers**. Give out the **Journal** sheet for module 2 and allow time for participants to complete.

Module 2 PowerPoint presentation

The National Certificate in Adult Numeracy

Level 2 Skills for Life Support Strategies

Module 2: Working with whole numbers

move on

department for
education and skills
creating opportunity, releasing potential, achieving excellence

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Aims

➔ To explore techniques for working with whole numbers.

➔ To revise the laws of arithmetic through active learning.

2

Outcomes

Participants will:

➔ be able to read, write, order and compare numbers, including large numbers

➔ carry out calculations with numbers of any size using efficient methods

➔ have an awareness of support strategies for working with numbers that can be used with less confident learners

➔ have identified personal preferred learning style.

3

Large numbers

➔ For learners who have difficulty with place value, get them to prepare a number chart.

➔ Recommend that numbers are broken up using commas or spaces.

➔ Use zeros to build larger numbers.

4

Checking techniques

➔ To improve understanding of rounding, use money in examples.

➔ Linking estimation and rounding helps learners grasp rounding principles.

➔ A discussion is a good way of introducing inverse operations.

5

BODMAS

B – **b**rackets
O – **o**rder
D – **d**ivision
M – **m**ultiplication
A – **a**ddition
S – **s**ubtraction

6

BODMAS continued

- → Asking learners to work out calculations and then comparing answers can be used to introduce BODMAS.

- → Have a competition, with one group using a calculator and the other group using pen and paper.

7

Support tips: summary

- → Use number/multiplication charts.

- → Break large numbers up with commas or spaces.

- → Temperature is a good way of introducing directed numbers. ('Follow me' cards.)

- → Use money to introduce rounding.

8

Support tips: summary

- → Give plenty of practice at exam type questions.

- → Don't reinvent the wheel. Utilise free resources off the web wherever possible.

- → Use maths tricks to stimulate interest and reinforce learning.

9

Activity: 'Follow me' cards

It's 3 degrees. There's a rise of 7 degrees. What's the temperature?	It's −3 degrees. There's a drop of 5 degrees. What's the temperature?
It's 10 degrees. There's a drop of 11 degrees. What's the temperature?	It's −8 degrees. There's a rise of 9 degrees. What's the temperature?
It's −1 degrees. There's a drop of 5 degrees. What's the temperature?	It's 1 degree. There's a drop of 5 degrees. What's the temperature?
It's −6 degrees. There's a rise of 4 degrees. What's the temperature?	It's −4 degrees. There's a drop of 4 degrees. What's the temperature?
It's −2 degrees. There's a rise of 6 degrees. What's the temperature?	It's −8 degrees. There's a rise of 3 degrees. What's the temperature?

It's 4 degrees.

There's a drop of 11 degrees. What's the temperature?

It's –5 degrees.

There's a rise of 20 degrees. What's the temperature?

It's –7 degrees.

There's a drop of 3 degrees. What's the temperature?

It's 15 degrees.

There's a drop of 30 degrees. What's the temperature?

It's –10 degrees.

There's a rise of 12 degrees. What's the temperature?

It's –15 degrees.

There's a rise of 21 degrees. What's the temperature?

It's 2 degrees.

There's a rise of 7 degrees. What's the temperature?

It's 6 degrees.

There's a rise of 5 degrees. What's the temperature?

It's 9 degrees.

There's a drop of 12 degrees. What's the temperature?

It's 11 degrees.

There's a drop of 8 degrees. What's the temperature?

Handout: Learning styles questionnaire

Activity	Column A	Column B	Column C
When you spell:	Do you try to 'see' the word in your mind, or try it out on paper to see what it looks like? ☐	Do you 'sound out' the word? ☐	Do you write the word out to see if it 'feels' right? ☐
When you try to imagine something:	Do you see things in pictures in your mind? ☐	Do you think of the sounds you would hear? ☐	Do you imagine what it would feel like to be there? ☐
When you concentrate:	Do you need to work in a tidy and uncluttered place? ☐	Does the noise or talking stop you working and make you listen instead? ☐	Do you need to move around and perhaps talk to yourself to help you work? ☐
When you are angry:	Do you become silent and tense? ☐	Do you shout angrily or make a noise? ☐	Do you storm off, grit your teeth, clench your fists or slam the door? ☐
When you forget something:	Is it mostly names, but you remember faces and places? ☐	Do you forget places and faces but remember names and stories you were told? ☐	Do you remember best the things you have actually done and the places you have actually visited? ☐
When you need to ask someone to do something for you:	Do you like to meet someone face to face so that you can see them? ☐	Do you prefer to talk to them over the phone? ☐	Do you work out what you're going to say in advance and practise it while walking along or doing something else? ☐
When you are relaxing:	Do you prefer to watch TV, read, see a play or look at magazines? ☐	Do you prefer to listen to the radio, play music or hear stories? ☐	Do you prefer to play sports or games or take part in a physical activity? ☐

Activity	Column A	Column B	Column C
When you want to praise someone:	Do you write a card or note to them? ☐	Do you tell them face to face how pleased you are? ☐	Do you show your pleasure physically with a hug or a pat on the back, or do you give them a present? ☐
When you try to work out what someone is feeling:	Do you look at the expression on their faces? ☐	Do you listen to the tone of their voices? ☐	Do you watch the way they are moving? ☐
When you are reading:	Do you like the parts that describe things then perhaps stop to imagine them for yourself? ☐	Do you like speech and conversation and try to 'hear' the characters talking? ☐	Do you prefer stories with plenty of action – or perhaps you don't enjoy reading very much? ☐
When you learn:	Do you prefer to see demonstrations, diagrams, slides and pictures? ☐	Do you like someone to give you instructions, talks, lectures and explanations? ☐	Do you prefer to learn by doing things, roleplay or practical situations? ☐
When you have nothing much to do or you are filling in time and waiting:	Do you look around, doodle, study something, watch people around you? ☐	Do you talk to yourself or chat to other people? ☐	Do you fidget, walk up and down, find something to do? ☐
When you are talking:	Do you dislike having to listen to someone else for long? ☐	Do you enjoy listening to others and talking yourself as well? ☐	Do you move quite a bit and use gestures? ☐
Do you remember:	What you see? ☐	What you hear? ☐	What you actually do? ☐
Do you remember:	Funny things you have seen? ☐	Jokes and stories? ☐	Feeling and sensations? ☐
Which is easiest:	To concentrate on watching something? ☐	To concentrate on listening to something? ☐	To do an activity for a long time? ☐

Activity	Column A	Column B	Column C
If you have learnt to drive:	Did you find that you had to look down whenever you changed gear or braked? ☐	Did you find it easy to listen to the engine noise so you would know when to change gear? ☐	Did you find it all quite easy? ☐
If you could, would you choose to be:	An artist, or a photographer? ☐	A musician or composer? ☐	A sportsperson, athlete, rally driver, engineer? ☐
Totals	**Total As** ☐	**Total Bs** ☐	**Total Cs** ☐

Now add up the total number of ticks in each column and write it in the space at the bottom of each. See the next page to find out what the results mean.

Handout: Learning styles questionnaire – feedback

How did you get on?

- If you answered mostly As – you appear to learn best by seeing.
- If you answered mostly Bs – you appear to learn best by hearing.
- If you answered mostly Cs – you appear to learn best by doing.
- If you answered a mixture of As, Bs, and Cs – you use a mixture of learning styles.

The person who appears to learn best by **seeing** is a **visual** learner.	The person who appears to learn best by **hearing** is an **auditory** learner.	The person who appears to learn best by **doing** is a **kinaesthetic** learner.

Tips for improving your learning

If you are a **visual** learner:

- you will learn best when there is a lot of visual information; try using colour – pens and paper – to help sharpen your visual memory
- practise using mind maps
- make sure that your desk is tidy and clear from clutter before you start working
- practise improving visual memory – 'photograph' information you need to learn
- try playing classical music quietly in the background when you are concentrating.

If you are an **auditory** learner:

- you will learn best by listening and discussing
- you will be able to concentrate best in a quiet room; if this is not possible, play classical music very quietly on headphones – you may find that this works best if the volume is turned off in your right ear only
- try using a tape recorder for learning material or for planning assignments
- make sure that you get copies of any visual material used in lectures
- ask your lecturer to explain things to you in words if you do not understand something.

If you are a **kinaesthetic** learner:

- you will learn best by doing things and practising
- make sure that you get good notes from lectures – if necessary from someone else
- you may find it difficult to sit still to learn – this can be difficult in a classroom; try using something like worry beads or squeezing a ball if it is not possible to walk around.

Experiment and practise with all the styles to develop a multi-style approach to suit different situations.

Handout: Mental versus written techniques

10 000 − 100 =

25 × 29 =

5% of 260 =

304 − 99 =

94 − 86 =

Half of 476 =

1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 =

Handout: Blank number chart

100 000 000	10 000 000	1 000 000	100 000	10 000	1 000	100	10	1
(hundreds of millions)	(tens of millions)	(millions)	(hundreds of thousands)	(tens of thousands)	(thousands)	(hundreds)	(tens)	(units)

Handout: Completed number chart

100 000 000	10 000 000	1 000 000	100 000	10 000	1 000	100	10	1
(hundreds of millions)	(tens of millions)	(millions)	(hundreds of thousands)	(tens of thousands)	(thousands)	(hundreds)	(tens)	(units)
						6	3	2
					3	4	7	8
				4	5	3	6	0
			3	6	5	5	0	0
		2	4	5	0	0	0	0
	7	9	5	0	0	0	0	0
3	7	5	0	0	0	0	0	0

Handout: Multiplication square

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

Handout: 9s table

This is, almost literally, a rule of thumb.
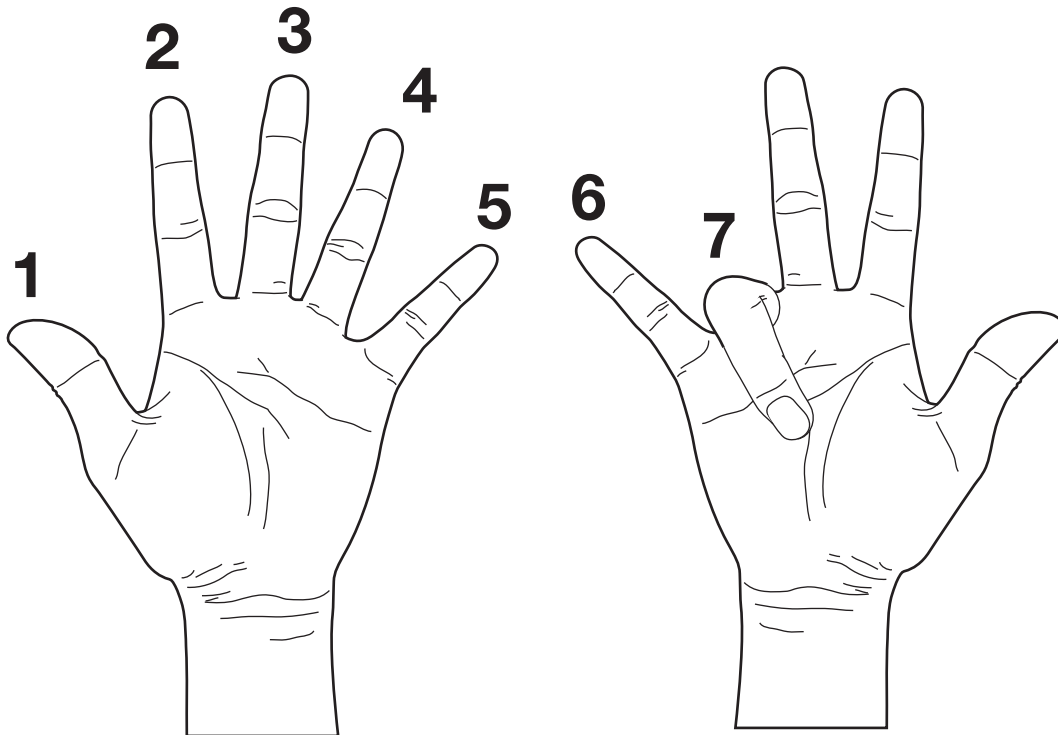
The above example illustrates the multiplication of 9 by 7 by showing the seventh finger held down. The six fingers before the one held down give the 10s, while the three fingers after give the units, giving 63. This works for multiplication of 9 by all numbers up to 10.

It may also help learners realise that multiplication is reversible: 9 multiplied by 5 is equivalent to 5 multiplied by 9. Recognising this can help learners by reducing the amount of learning that they need to do: if they already know how to multiply by numbers up to 8, then they will also know how to multiply 8 by numbers from 2 to 7. Learners should be reminded that multiplying anything by 0 always equals 0 – many forget!

How well learners progress with tables depends on their ability to memorise information – a problem with some learners – and on their level of motivation. It is possible to become obsessed with the need to learn them, so you should remember that the learners often become more comfortable with multiplication bonds as they become more numerate. Most of the numerical skills learners acquire over time will reinforce their knowledge of multiplication tables, and should this prove difficult there is no shame in depending on multiplication squares or calculators.

Based on *Link Up training materials – Unit 3 Numeracy*

Handout: What is BODMAS/BIDMAS?

BODMAS/BIDMAS is an acronym for the sequence of performing mathematic operations. In particular, electronic calculators have to use a rule (known in computing circles as an algorithm) to know which answer to calculate when given a list of numbers to add, subtract, multiply, divide etc.

What do you think the answer to $4 + 3 \times 5$ is?

Is it: $(4 + 3) \times 5 = 35$?

Or is it: $4 + (3 \times 5) = 4 + 15 = 19$?

BODMAS can come to the rescue and give us rules to follow so that we always get the right answer:

Brackets

Order*

Division

Multiplication

Addition

Subtraction

* 'Order' means anything raised to the power of a number – for example 3^4 is 3 raised to the power of 4 (or $3 \times 3 \times 3 \times 3$).

Note: Sometimes instead of 'order', we use 'indices', which would make the acronym BIDMAS.

According to BODMAS, multiplication should always be done before addition, therefore 19 is actually the correct answer according to BODMAS and will also be the answer which some calculators will give you if you type in $4 + 3 \times 5 =$.

You may have heard of Einstein's famous equation $E = mc^2$. Here it can be said that c is raised to the power 2, or c has order 2, or c is squared (they all mean the same thing).

Based on *Link Up training materials – Unit 3 Numeracy*

Activity: Card set A (calculations)

$3^2 + 4^2$	$2 \times (3 + 4)$
$(3 + 4)^2$	3×4^2
$(3 \times 4)^2$	$\dfrac{3}{2} + \dfrac{4}{2}$
$2 \times 3 + 4$	$4 + 3 \times 2$
$3^2 \times 4^2$	$2 \times 3 + 2 \times 4$
$\frac{1}{2}(3 + 4)$	$3^2 + 4^2 + 2 \times 3 \times 4$
$\dfrac{3 + 4}{2}$	$\dfrac{3}{2} + 4$

Activity: Card set B (areas)

Activity: Card set C (solutions)

144	**48**
49	**3.5**
5.5	**14**

Handout: Inter-session tasks (homework!)

Referring to page 35 of the *Adult Numeracy Core Curriculum* and the sections on multiplication and division methods in Move On Maths Methods Module:

- choose one of the problems below
- consider the possible methods
- decide what calculation you need to make
- record your calculation, using your chosen method, ready to explain it to someone else.

Your method must be one that is not your preferred method!

Problem 1: Multiplication

Fourteen learners are on a 30-hour course. How many guided learning hours in total does this represent?

Problem 2: Division

The National Certificate in Adult Numeracy requires a candidate to answer 40 questions in 75 minutes. How many minutes do they have to answer each question, to the nearest minute?

Handout: Sample test questions (BODMAS/BIDMAS)

1 Harry buys four CDs at £13.99 each. He gives the cashier £60. Which method below would give Harry the closest estimate to let him check his change?

a) 60 − 13 × 4

b) 60 − 4 −13

c) 60 − 4 + 14

d) 60 − 4 × 14

2 The cost of printing tickets for a play is £4.85 for each 100 tickets plus a fixed charge of £21.50. Which is the best estimate of the cost of printing the 500 tickets?

a) 5 + 5 + 20

b) 20 + (5 × 5)

c) (20 + 5) × 5

d) 5 × 5 × 20

3 Aliya has a picture she wants framing. The cost is £5.99 plus an amount that depends on the length of framing needed. The shopkeeper says, 'It will cost £5.99, plus 1.9 times 8.99. That's £25.07 altogether.' Which of the following calculations could she use to check?

a) (5 + 2) × 8 =

b) (6 + 2) × 9 =

c) 5 + (2 × 8) =

d) 6 + (2 × 9) =

4 The table below summarises the income and costs of producing a play.

Item	£
Printing costs (tickets, posters, programmes)	95
Cost of hire of hall (rehearsals and performances)	125
Cost of hiring lights and costumes	310
Refreshment sales	42
Refreshment costs	18
Ticket sales	1 840

Which of these calculations gives the overall profit?

a) £(95 + 125 + 310 + 18 − 1 840 − 42)

b) £(95 + 125 + 310 + 18) − (1 840 + 42)

c) £(1 840 + 42 − 95 + 125 + 310 + 18)

d) £(1 840 + 42) − (95 + 125 + 310 + 18)

Questions 5 and 6 are about a window cleaner.

A window cleaner needs some leaflets to advertise his business. The printer gives him the following list of costs:

	Cost
Basic setting-up charge	£10
First 500 leaflets	£5 per 100 leaflets
Extra leaflets above 500	£2.50 per 100 leaflets

5   Which formula shows the cost of printing 1 000 leaflets?

a) Cost in £s = 10 + (2.5 × 10)

b) Cost in £s = 10 + (2.5 × 5) + (5 × 5)

c) Cost in £s = 10 + (5 × 10)

d) Cost in £s = 10 + (7.5 × 10)

6   The window cleaner can afford to spend £30 on printing. How many leaflets can he get for this?

a) 400

b) 600

c) 700

d) 800

7   Anne's food intake should contain no more than 1250 calories per day. The table shows the number of calories in different foods.

Food	**Quantity**	**Calories**
Banana	25 g	20
Marmalade	25 g	66
Muesli	25 g	94
Toast	Slice	55
Milk	100 ml	47
Orange Juice	100 ml	46
Tea (no sugar)	Any	0
Sugar	Level teaspoon	17

For breakfast she has 50 grams of muesli and a cup of tea. She uses a total of 150 ml of milk and two level teaspoons of sugar. She wants to know what this is as a percentage of her maximum daily calorie intake. Which of these calculations shows this?

a) $\dfrac{(94 \times 2) + (47 \times 1.5) + (17 \times 2)}{1\ 250} \times 100$

b) $\dfrac{1250 \times 100}{(94 \times 2) + (47 \times 1.5) + (17 \times 2)}$

c) $\dfrac{94 + 47 + 17}{1\ 250} \times 100$

d) $\dfrac{1\ 250 \times 100}{94 + 47 + 17}$

Handout: Sample test questions (number)

1   A pop concert has an audience of 8496 people. Two thirds of the people at the concert pay a £15 entrance fee while the remainder pay a reduced rate of £7. What is the income from the concert to the nearest thousand pounds?

   a) £80 000

   b) £82 000

   c) £104 800

   d) £105 000

Questions 2 to 4 are about temperatures in different parts of the world.

The table shows the temperature for one day in January.

City	Max °C	Min °C
Athens	12	5
London	7	0
Moscow	−10	−16
New York	1	−6
Oslo	−18	−23
Paris	6	−2
Sydney	29	25

2   Which city had the lowest temperature?

   a) London

   b) New York

   c) Oslo

   d) Sydney

3   Which city had the greatest range of temperatures?

   a) Athens

   b) Moscow

   c) Oslo

   d) Paris

4   What is the difference between the maximum temperature in Sydney and the maximum temperature in Oslo?

   a) 11 °C

   b) 37 °C

   c) 46 °C

   d) 47 °C

5   Joan has a part-time job in a restaurant. She gets paid £3.80 per hour. On Sundays she is paid one and a half times as much per hour. On Bank Holidays she is paid twice as much per hour. She works five hours on Saturday, three hours on Sunday and four hours on Bank Holiday Monday. How much does she earn altogether?

   a) £46.60

   b) £66.50

   c) £68.40

   d) £70.30

6   Helen plans to hire a minibus for a four-day brownie camp. She estimates that she will do a total of 125 miles. The hire company charges £30 per day plus 15p per mile. How much will the minibus cost for the trip?

   a) £121.87

   b) £138.75

   c) £180.00

   d) £245.00

Questions 7 to 9 are about a camping holiday.

Some friends are planning a camping holiday in May.

7   The table shows information on the prices of some of the campsites available.

Site	Price per night	Discounts
Happy Camper	£10 per head	50% off third night
Rovers Return	£4 per tent plus £2 per person	–
Emmerdale Farm	£15 per tent	25% off all nights in May
Home from Home	£2 per tent plus £4 per person	–

There are four people in the group and they are taking two tents for three nights in May. They calculate that Rovers Return is the cheapest for them and Emmerdale Farm would be the most expensive. How much would they save by going to Rovers Return rather than Emmerdale Farm?

a) £6.50

b) £8.50

c) £19.50

d) £25.50

8 Their car uses one litre of petrol to travel 14.8 kilometres. The campsite is 88 kilometres away from their home town. They estimate how much fuel they will need for the trip there and back. Which of these four attempts gives the closest estimate of the fuel required?

a) 90 ÷ 15 = 6 litres

b) 90 ÷ 10 = 9 litres

c) 180 ÷ 15 = 12 litres

d) 180 ÷ 10 = 18 litres

9 One of the items on their list of supplies is 6 tins of beans. The local shop has several special offers. Which would work out the cheapest?

a) Original price 26p: buy one, get a second half price

b) Original price 26p: buy two, get the third free

c) Original price 27p: one third off

d) Original price 28p: 25% off

10 Abdul is doing research into food storage temperatures for his catering course. He finds the following table in a book.

8 °C	Perishable goods for public consumption must not be stored above this temperature
5 °C	This is the highest temperature for very high risk food in a fridge
3 °C	Ideal temperature for a domestic refrigerator
−6 °C	One-star-rated freezer (*)
−12 °C	Two-star-rated freezer (**)
−18 °C	Three-star-rated deep-freeze (***)

His own domestic refrigerator has a fault and is 4 °C higher than the ideal temperature. What is the difference in temperature between his domestic refrigerator and the three-star-rated deep-freeze if the deep-freeze is at the correct temperature?

a) 17 °C

b) 19 °C

c) 25 °C

d) 27 °C

11 The table is an extract from the current and new council tax rates for East Coast District Council.

Band	Current Council Tax	New Council Tax
F	£1150	£1207
G	£1327	£1393
H	£1580	£1659

There are 2500 houses in Band H. How much extra money will the new tax raise from these houses, compared with the current tax?

a) £194 500

b) £195 500

c) £196 500

d) £197 500

Questions 12 to 15 are about the balance sheet of a small business.

A business has a bank balance of £300 in January. The balance sheet for the first eight months of the year is shown below, but some of the amounts are missing.

Balance sheet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Sales (£)	256	321	317	352			528	684
Expenses (£)	421	403	416		375	362	372	
Profit and loss (£)	−165	−82		−49	3	35		331
Bank balance (£)	135	53	−46	−95		−57		430

Profit or loss = Sales − Expenses

12 What were the sales in June?

a) £327

b) £378

c) £397

d) £401

13 What were the expenses in April?

a) £353

b) £378

c) £397

d) £401

14 What was the profit or loss in March?

    a) −£99

    b) −£92

    c) £99

    d) £156

15 What was the bank balance in July?

    a) −£99

    b) −£92

    c) £99

    d) £156

Answers: Module 2

Inter-session tasks

- Multiplication: 420
- Division: 2

Sample test questions (BODMAS/BIDMAS)

1 d
2 b
3 d
4 d
5 b
6 a
7 a

Sample test questions (Number)

1 d
2 c
3 d
4 d
5 b
6 b
7 c
8 c
9 b
10 c
11 d
12 c
13 d
14 a
15 c

Journal

Module 2: Working with whole numbers

What have you learnt from this module?

How will you apply skills/strategies learnt with learners within your organisation?