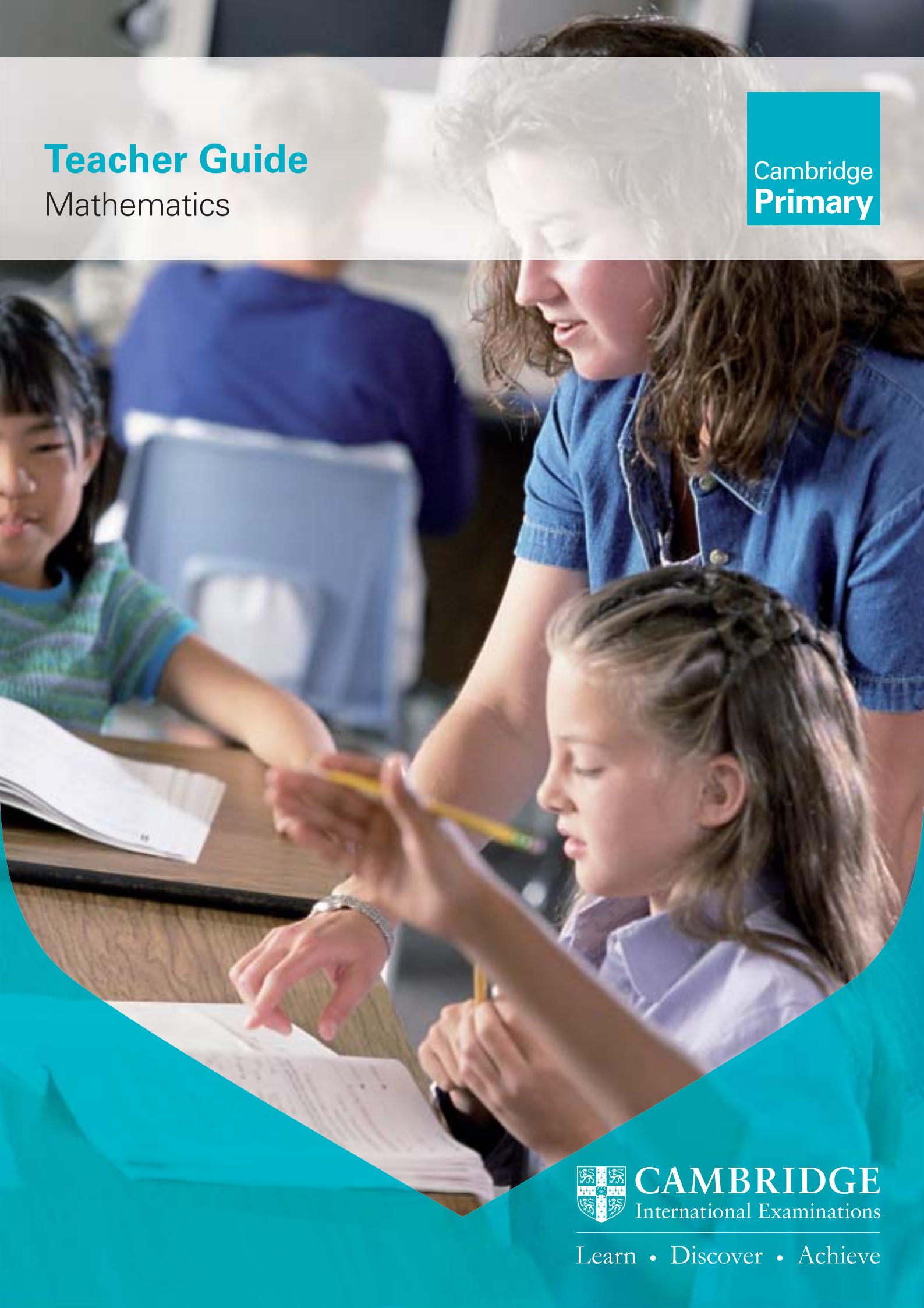


# Teacher Guide

## Mathematics

Cambridge  
**Primary**



**CAMBRIDGE**  
International Examinations

Learn • Discover • Achieve



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## SECTION 1: INTRODUCTION

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Welcome to the Cambridge Primary Teacher Guide for Mathematics.

This guide is designed to provide a suggested approach to the implementation and management of Cambridge Primary in your school.

It offers:

- An introduction to the Cambridge Primary Mathematics curriculum framework
- Step-by-step guidance on the planning process, with exemplification at each point and helpful teacher training activities with resources
- Advice on differentiation and how to integrate this into your teaching
- Suggested techniques for implementing formative assessment and integrating this into your lesson planning
- Sample lesson plans and some ideas on activities and resources to help get you started
- Advice on monitoring
- Advice on classroom practice
- Advice on resources
- Information on Progression Tests and Cambridge Primary Checkpoint tests
- Guidance on support and training available from Cambridge
- Guidance on administration

### A comprehensive scheme of work

In addition to extracts provided in this guide a full scheme of work covering the entire programme has been provided as a starting point. Full coverage is provided in this way to accommodate new schools starting at any stage in the programme. As we will explain, a scheme of work is a process rather than a rigid structure and these plans should be constantly amended in response to your own observations as a classroom teacher and other local considerations including the resources you may already have available at your school. These schemes of work are therefore in no way compulsory but simply offer a suggested starting point for covering the content of the curriculum within a suggested year of three terms each of 10 weeks duration. These can be expanded to suit the number of weeks available in your own terms and the holiday arrangements at your school.

## 1.1 How to Use this Teacher Guide

This guide provides guidance and advice on the essential processes of implementing Cambridge Primary and it is designed to cater for:

- Schools that are teaching a Cambridge programme for the first time and need to move from a completely different system of planning
- Schools that already deliver one or more Cambridge programmes but are new to Cambridge Primary

Schools new to Cambridge will find all sections of the Teacher Guide will be relevant to them. It provides a step-by-step guide through the process of implementing Cambridge Primary, offering a suggested breakdown of the curriculum across the available teaching time, sample lesson plans and sample lessons to get you started.

Existing Cambridge schools may be more familiar with certain aspects covered in this guide, especially if they already deliver the lower secondary phase of the Cambridge programme (now called Cambridge Secondary 1). This guide is written so that schools new to Primary can make use of the sections most relevant to them (e.g. Section 2: Planning or Section 3: Teaching Approaches).

## 1.2 Cambridge Primary

Cambridge Primary is an education programme for young learners. It combines a world-class curriculum, high-quality support for teachers and integrated assessment. The programme has been developed by University of Cambridge International Examinations and is used in primary schools around the world. Cambridge Primary helps schools develop learners who are confident, responsible, innovative and engaged.

Cambridge Primary covers

- English
- English as a Second Language
- Mathematics
- Science

for learners aged 5–11. It provides curriculum frameworks with integrated assessment for each subject.

### Cambridge Primary provides a solid foundation for later stages of education.

It starts learners on an educational journey, focusing on what they should be able to do at each stage of primary education. It develops skills, knowledge and understanding that will prepare them for a smooth transition to Cambridge Secondary 1 and beyond.

### Cambridge Primary offers optional, integrated assessment.

The assessment structure tracks learner progression through primary education. Learners taking Cambridge Primary Checkpoint receive a Statement of Achievement and detailed feedback on strengths and weaknesses.

### Cambridge Primary supports teachers in providing the best teaching and learning.

Schools adopting Cambridge Primary gain access to first-class support for teachers through publications, online resources, training and professional development.

### Cambridge Primary is practical and flexible.

No part of the Cambridge Primary curriculum is compulsory, giving schools the flexibility to choose the elements that are right for their learners. This means that they can use Cambridge Primary while following their school or national curriculum, or offer the entire programme.

Cambridge Primary has been developed by University of Cambridge International Examinations, the world's largest provider of international education programmes and qualifications for 5–19 year olds. Our programmes and qualifications are taken in over 160 countries in 9,000 schools and recognised by universities, education providers and employers across the world.

Cambridge international education programmes and qualifications	
Cambridge Primary (5–11 years*)	Cambridge Primary
	Cambridge Primary Checkpoint
Cambridge Secondary 1 (11–14 years*)	Cambridge Secondary 1
	Cambridge Checkpoint
Cambridge Secondary 2 (14–16 years*)	Cambridge IGCSE
Cambridge Advanced (16–19 years*)	Cambridge International AS and A Level
	Cambridge Pre-U

\*Age ranges are for guidance only.

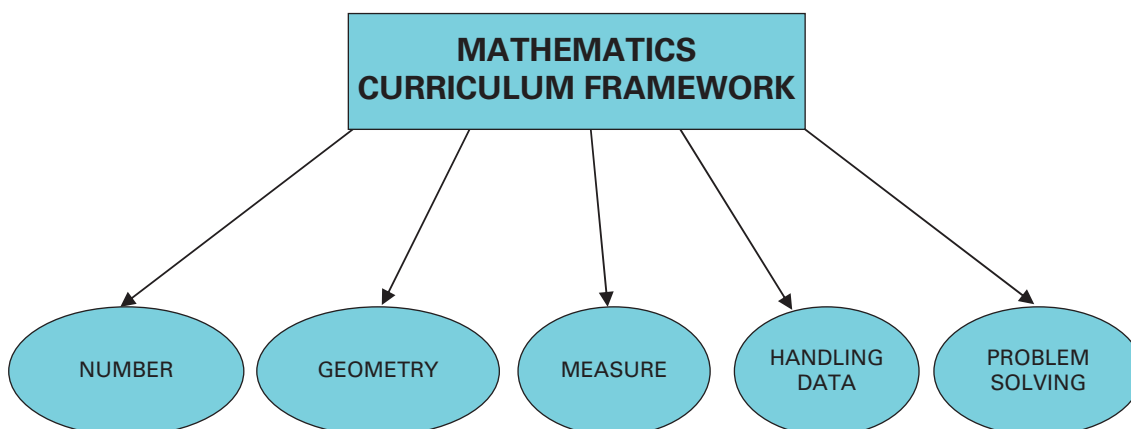
## 1.3 The Curriculum Framework

The Cambridge Primary Mathematics framework provides a comprehensive set of learning objectives for Mathematics. The objectives deal with what the learner should know and what they should be able to do in each year of primary education. The learning objectives provide a structure for teaching and learning and a reference against which learners' ability and understanding can be checked.

There are six stages. Each stage reflects the teaching targets for a year group. Broadly speaking, stage 1 covers the first year of Primary teaching, when learners are approximately five years old. Stage six covers the final year of Primary teaching when learners are approximately eleven years old. It may be appropriate to introduce this framework at slightly different ages to suit your own particular circumstances.

The Mathematics framework is presented in five content areas. The first four content areas are all underpinned by Problem Solving. Mental strategies are also a key part of the Number content.

### Strands in the Curriculum Framework



### Continuity, progression and balance

The framework allows for continuity and progression both within and between the stages. You can pick any objective and trace its pathway through the stages of the framework. This continuity allows the curriculum to be consistent and 'uninterrupted' between stages whilst progression ensures that learners move forward steadily. The table below shows how knowledge and skills can be traced through the framework.



## An example of progression through the framework

Stage 1	Stage 6
<p><b>Number</b> Begin partitioning two-digit numbers into tens and ones and reverse.</p> <p><b>Geometry</b> Name and sort common 3D shapes using features such as number of faces, flat or curved faces.</p> <p><b>Measure</b> Begin to understand and use some units of time, e.g. minutes, hours, days, months and years.</p> <p><b>Handling Data</b> Answer a question by sorting and organising data or objects in a variety of ways.</p> <p><b>Problem Solving</b> Choose appropriate strategies to carry out calculations, explaining working out.</p>	<p><b>Number</b> Know what each digit represents in whole numbers up to a million.</p> <p><b>Geometry</b> Visualise and describe properties of 3D shapes, e.g. faces, edges and vertices.</p> <p><b>Measure</b> Recognise and understand the units for measuring time (seconds, minutes, hours, days, weeks, months, years, decades and centuries); convert one unit of time into another.</p> <p><b>Handling Data</b> Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams.</p> <p><b>Problem Solving</b> Explain why they chose a particular method to perform a calculation and show working.</p>

The strands of the curriculum framework have been selected in order to provide balanced coverage of the fundamental skills and knowledge of the subject at this level and they have also been designed to provide a sound foundation for stages seven to nine. Learners should be prepared at the end of stage six to move on smoothly to stage seven.

The selection of content in the framework at each level has been chosen to ensure a coherent progression for the learner. The curriculum framework has been designed to allow sufficient time for each learner to develop a true understanding of the skills and knowledge required. Teachers themselves are best placed to know the capabilities of their learners and can, of course, choose to supplement the framework as appropriate. What is within the curriculum framework is the content that will be assessed and analysed using the Cambridge Progression Tests on the Cambridge Primary support site. It is also tested in the Cambridge Primary Checkpoint tests for which feedback reports are provided.

Whilst it is important to be able to identify the progression of objectives through the curriculum, it is also essential for teachers to bring the different strands together into a logical whole so that their teaching makes learning meaningful, purposeful and enjoyable. This can be achieved through detailed planning and with the teacher's ability to constantly re-tune their teaching to the needs of the learners.

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## SECTION 2: PLANNING

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### 2.1 Getting Started

This section will look at the process of planning, ensuring that you cover all of the content of the curriculum for stages 1 to 6, given the teaching time you have available within each year.

We will start with identifying exactly what you need to plan:

- Complete coverage of the Mathematics content for all of the stages, or those that you teach
- Progression and continuity of the relevant underpinning skills and content of Mathematics
- The best order in which to teach the required units
- Detailed lessons, led by clear learning objectives that the learners will understand

And why you need to plan:

- To ensure appropriate timings are given to the different aspects of the curriculum
- To be clear about what can be assessed as a result of a lesson/unit of work
- To ensure a mix of teaching and learning styles in delivery – according to your learners’ needs
- To ensure that all resources are available to deliver a successful lesson

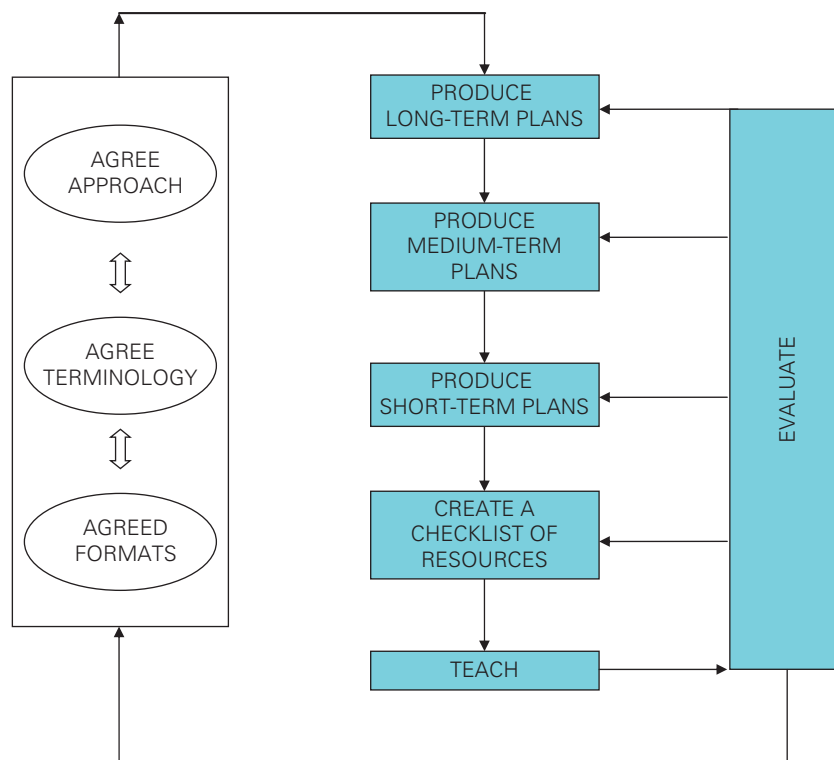
The following section lays out a step-by-step guide to the planning process including how you can build in flexibility to allow you to adapt coverage, delivery style and timing to suit your needs.

### 2.2 A Consistent Approach

Download the curriculum framework for Mathematics from the Cambridge Primary support site [www.cambridgeprimary.cie.org.uk](http://www.cambridgeprimary.cie.org.uk) and familiarise yourself with the coverage and structure of the programme. Next we are going to consider how to begin breaking this work down. We can do this in three clear stages but first it is worth getting all the primary teachers together to coordinate a consistent approach.

Look at the diagram below. Start by thinking about the decisions in the **white box**: approach, terminology and formats.

### A pathway to implementation



**Approach:** The general approach will largely be decided by colleagues in management. This, for example, may concern the whole curriculum and not just Mathematics. Some schools merge subjects across the curriculum. For the purpose of this guide we assume that Mathematics is going to be taught as a separate subject.

**Terminology:** Everyone involved needs to understand the terminology used so that, for example, 'long-term' plan means the same to all. This is true whatever the overall approach within a school.

#### Training Activity: Agreeing Terminology (Appendix A1)

In the appendices of this guide you will find an exercise that may be carried out by groups of teachers to reach an understanding of the planning terms:

Long-term [overview],

Medium-term [scheme of work] and

Short-term [lesson plan].

It also includes other relevant terms. When the terminology has been agreed, planning can begin.

- Formats:** It is not vital to all use the same documentation for planning but it is very helpful for communication and common understanding. They may vary from subject to subject if considered necessary, but it is particularly helpful if the formats used for planning are the same for each stage. Templates for all stages are provided at the back of the guide. Here it is suggested that formats for each stage of planning are used by all teachers who deliver Mathematics. These will be discussed in more detail later.
- Evaluation:** Perhaps the most important box is the 'Evaluation' box. It is **always** a good idea to check how well something works. The diagram shows that this can be for any stage. If there is a problem delivering a lesson, it is often assumed that there is something wrong with the lesson plan. This can be true, but sometimes it may be because the medium or long term plan that is being used needs changing in some way. The **white box** issues may also need to be revisited.

## 2.3 Descriptions of the Planning Stages

**Long-term planning** involves considering the whole Mathematics curriculum for the whole school. This includes taking account of the school calendar for the academic year and allocating a specific percentage of time for Mathematics to be taught throughout the school. This is generally carried out by senior management.

It requires pre-planning in terms of required resources, whether these are shared, limited or need buying in. The most important consideration is timing, thinking about when you will be delivering a new unit and how often skills need to be re-visited throughout the year. You will need to think about the order in which knowledge and skills need to be learned.

You will need to manage a balance between Number, Geometry, Measures and Handling Data. Problem Solving skills need to be ongoing and sequential.

**Medium-term planning** involves planning coverage of the curriculum in units across an entire stage. This includes taking account of seasons, school events and possible visits to enhance the learning process.

Again, you will need to manage a balance between Number, Geometry, Measure and Handling Data. Problem Solving skills need to be ongoing and sequential across all units taught.

Medium-term planning is usually broken down into individual terms. The Scheme of Work provided by Cambridge for each stage has assumed covering three units per term in an academic year structured as three terms of 10 weeks each. Term length varies around the world so we have chosen a relatively compact approach so that you should be able to add further time as necessary.

The units of work can be arranged in various ways to provide a varied and interesting approach to delivering and ensuring coverage of the Mathematics curriculum at each stage.

At this point in the process, planning generally considers specific units and the **best order** in which they can be taught, building on previous learning and developing knowledge and understanding throughout the year. Depending on what you decide, this permits units to be taught in isolation, or in a cross-curricular way, particular to each school's policies. Over time, you will be able to adapt these plans according to resources and available teaching time, and in the light of your own particular teaching expertise and confidence.

**New Teacher's Tip:** *If you are new to teaching and unsure about the length of time it takes to deliver a particular topic, then we have provided a comprehensive plan for all stages from which you can make a start. This is not intended to be followed to the letter; it only provides an initial starting point. Do not expect your plan to be perfect first time. Start with an estimate of how long you think a subject will take and adjust your long, medium and short term plans as you go along so that as you are delivering it you are also fine-tuning it. You are the best judge of the capabilities of your learners and how long it will take them to understand each topic, given their existing knowledge.*

**Short-term planning** is a lesson plan for a particular lesson. Most commonly, this evolves into a weekly plan. This is a detailed, working document and is led by the learning objectives for that session.

It provides:

- Essential information for all adults involved in the learning and considers the learning needs of all learners, including those with special educational needs (SEN) and/or gifted and talented
- Continuity in the absence of regular teaching staff, for example, in times of absence
- An outline of resources, timings, working groups and assessment

The real value of a short-term plan is that it influences the next steps in the light of the learner's response to the learning opportunities presented. Detailed examples and templates are provided in the appendices.

The following sections provide a step-by-step guide to the planning process, including some advice about meeting the training needs of colleagues.

The steps of the planning process (1–8) outlined in the diagram overleaf are divided into three logical phases that form the sub-sections of this section of the guide:

2.4 Phase 1 – Creating a Long-term Plan (steps 1–4)

2.5 Phase 2 – Creating a Medium-term Plan (steps 5–6)

2.6 Phase 3 – Creating a Short-term Plan (steps 7–8)

The 8 steps of the process are dealt with in each related sub-section as shown above.

## The Planning Process

### 2.4 Phase 1 Creating a Long-term Plan

**Step 1. Teaching time**  
Find out:

- how many hours there are to teach the subject?
- how is the teaching time divided?
- how many units you will be able to comfortably fit into a term.

**Step 2. Approach**  
Think about:

- how you want to structure the teaching of the subject?

**Step 3. Allocate the strands**  
Allocate the strands for each stage across the number of units available per term. Think about the different proportion of work required for each strand.

**Look at Long-Term Planning 1**  
You can show the allocation of strands here across the terms.  
Later you can use this grid to show how the units are allocated either for one stage or all six, by entering their titles instead.

**Step 4. Learning objectives by term**

- Look at the curriculum framework.
- Decide which learning objectives will be covered in each part of the year, e.g. each term within a stage.
- Decide which learning objectives will be covered on an ongoing basis throughout the year.
- Decide where you are going to fit in the Problem Solving objectives.

You can mark up the curriculum framework (e.g. use a colour code) to show the results.

**Look at Long-Term Planning 2**  
You can use this to record your decisions on when each learning objective should be introduced in the year.

**Look at Long-Term Planning 3**  
You can use this to show the results of your decisions in Long-Term Planning 2 term by term.



### 2.5 Phase 2 Creating a Medium-term Plan

**Step 5. Creating Units**

- Group ongoing and other learning objectives into topics and themes creating a logical, progressive sequence of learning including Problem Solving.
- Rearrange for challenge, balance, timing, pace and appeal.
- Organise the number of units to match the estimated time available from step 1.

Print and cut out the individual learning objectives so you can try different arrangements on a separate sheet before finalising if it is helpful.

**Step 6. Creating Medium-Term Plans**  
Identify suitable activities and resources to deliver the learning objectives in each unit. Indicate how the lesson is to be taught.

**Look at Medium-Term Planning 1**  
You can record your decisions with comments and timings on this template alongside the other information.  
**Medium-Term Planning 2** does not have these additional columns.



### 2.6 Phase 3 Creating a Short-term Plan

**Step 7. Creating Lesson Plans**  
Identify what you are going to teach and how you are going to teach it.

**Look at Short-Term Planning**  
Instructions are printed on the template on Page 31 of the Planning section.

**Step 8. Evaluate the lesson and the planning**  
Amend your scheme of work and lesson plans to best suit the needs of your learners.

## 2.4 Phase 1 – Creating a Long-Term Plan

### Step 1. Teaching Time

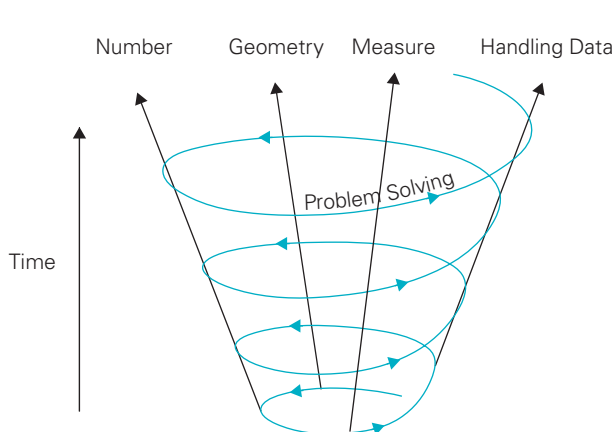
First you will need to establish the number of terms available, the length of the terms and the number of teaching units you will roughly be able to fit into each term. In this guide we will follow a structure of three terms of ten weeks, per stage.

### Step 2. Approach

Next, you will need to decide the over all approach you want to take to the teaching structure of the subject. Here are a few helpful prompts to get you thinking along the right lines.

- Do I have a preferred way of working?
- How are Mathematics resources available in school? (If they are shared, this could dictate when you need to teach specific strands.)
- How can I ensure that I cover the whole curriculum for the stage during the year?
- How will I provide opportunities for Problem Solving continuously throughout the year?
- What is the best order of learning for Problem Solving skills, given the order and content of the rest of the learning?
- How can I sensibly group learning objectives from the curriculum framework to incorporate them into meaningful units of study?

Different planning models may be useful in deciding the most effective way of meeting learners' needs. Models can be either linear (each topic delivered consecutively) or spiral (see below) or even a combination of both. In this guide and in the published Cambridge Scheme of Work (which is available on the Cambridge Primary support site to all registered centres) we have chosen a model in which a combination of all strands are covered within each term. Problem Solving objectives are worked in to every teaching unit as these skills underpin all other strands and help learners understand mathematical relationships and functions more holistically. This model is sometimes referred to as '**the spiral curriculum**'..



### The Spiral Planning Model

The spiral model, shown here, provides a structure where the different strands, represented by the vertical arrows, are visited and then revisited in a continuous teaching and learning process that allows each strand to support progress and understanding in the other strands.

The practical nature of the skills and knowledge of the Problem Solving strand means they form part of the substance *and structure* of that process.

### Step 3. Allocating the Strands

Think about how you might distribute the strands over the teaching time available for each stage. Following the spiral model for example, you might include Problem Solving alongside your delivery of every other strand. An overview of the whole six stages might look something like the table below.

	Term 1	Term 2	Term 3
Stage 1	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Geometry Problem Solving	Handling Data Problem Solving	Handling Data Problem Solving
	Measure Problem Solving	Measure Problem Solving	Measure Problem Solving

	Term 1	Term 2	Term 3
Stage 2	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Geometry Problem Solving	Handling Data Problem Solving	Geometry
	Measure Problem Solving	Measure Problem Solving	Measure Problem Solving

	Term 1	Term 2	Term 3
Stage 3	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Geometry Problem Solving	Measure Problem Solving	Geometry Problem Solving
	Measure Problem Solving	Handling Data Problem Solving	Measure Handling Data

	Term 1	Term 2	Term 3
Stage 4	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Measure Problem Solving	Geometry Problem Solving	Measure Problem Solving
	Handling Data Problem Solving	Measure Problem Solving	Handling Data Problem Solving

	Term 1	Term 2	Term 3
Stage 5	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Geometry Problem Solving	Handling Data Problem Solving	Geometry Problem Solving
	Measure Problem Solving	Measure Problem Solving	Measure Problem Solving

	Term 1	Term 2	Term 3
Stage 6	Number Problem Solving	Number Problem Solving	Number Problem Solving
	Measure Problem Solving	Measure Problem Solving	Measure Problem Solving
	Geometry Problem Solving	Handling Data Problem Solving	Geometry Problem Solving



You will need to decide your approach collectively at the outset of the planning process.

#### Step 4. Ordering the Learning Objectives

Next you need to work through all the learning objectives in the order in which they appear in the curriculum framework writing alongside each one which Term or Terms (Term 1 (**T1**), Term 2 (**T2**) or Term 3 (**T3**)) you think each one should be delivered in within each stage. An objective may need to be revisited in subsequent terms so could appear in T1 and T3 for example. You will need to think about the order of learning difficulty in allocating the objectives. The template **Long-Term Planning – 2** has been produced to help you record term allocations, it has a column on the right hand side in which you can write the appropriate timing for delivery.

You will find that some learning objectives relate to skills that apply to many strands as well as across the three terms. We have called these '**Ongoing**' objectives in this guide. You will need to identify these in the curriculum framework and put an '**O**' beside them in your list. See the completed example of Long-Term Planning – 2 included on page 15.

Next you will need to consider the **Problem Solving** objectives. As explained earlier, these are designed to be addressed alongside the other strands and this means that they can easily be fitted into the content of your final teaching units.

#### Problem Solving in Mathematics

The strand Problem Solving in the Mathematics framework provides a structure for developing a set of skills for investigating and exploring the relationships between functions, skills and knowledge, drawing together the other strands into an articulate whole. This continuous exposure to methods of Problem Solving creates a network of associations in learners' minds that link multiple aspects of the curriculum together. It improves learners' willingness to try and solve problems and their perseverance in doing so because over time they will see the success of this method and be able to believe that the systematic nature of it gets results. One crucial aspect of applying Problem Solving techniques is that learners come to understand that there is more than one way to solve a problem. This leads them on to the understanding that there is a selection of strategies they could employ to solve a particular problem and that they have the power to select the most effective.

Once you have allocated your learning objectives to a relevant term or terms you might want to produce a document that separates these lists out into their individual terms. This way you can see when learning objectives are first introduced to learners. You can either include the relevant ongoing objectives within this list or make a separate list for them against each stage. You can use the template **Long-Term Planning – 3** for this. Alternatively you can also keep the list all together and simply colour-code the times of first delivery, all those first delivered in Term 1 for example, then Term 2, then Term 3. A completed example of this has been included on page 18.

You are now ready to move on to creating your Medium-Term Plans where you will need to organise your learning objectives for each term into groups based around topics and themes. We call these groups 'Units'.

## A completed example of Long Term Planning – 2

All the learning objectives are listed with a reference to the terms in which they appear. The example below is from stage 1.

Framework Code	Learning Objective	Ongoing (O) Term ref (T1, T2, T3)
	<b>Number Numbers and the number system</b>	
1Nn1	Recite numbers in order (forwards from 1 to 100, backwards from 20 to 0).	T1
1Nn2	Read and write numerals from 0 to 20.	T1
1Nn3	Count objects up to 20, recognising conservation of number.	T1
1Nn4	Count on in tens from zero or a single-digit number to 100 or just over.	T1, T2, T3
1Nn5	Count on in twos, beginning to recognise odd/even numbers to 20 as “every other number”.	T1, T2
1Nn6	Begin partitioning two-digit numbers into tens and ones and reverse.	T2, T3
1Nn7	Within the range 0 to 30, say the number that is 1 or 10 more or less than any given number.	T2
1Nn8	Use more or less to compare two numbers, and give a number which lies between them.	T2
1Nn9	Order numbers to at least 20 positioning on a number track; use ordinal numbers.	T1
1Nn10	Use the = sign to represent equality.	T1, T2
1Nn11	Give a sensible estimate of some objects that can be checked by counting, e.g. to 30.	T1
1Nn12	Find halves of small numbers and shapes by folding, and recognise which shapes are halved.	T3
	<b>Calculation Mental strategies</b>	
1Nc1	Know all number pairs to 10 and record the related addition/subtraction facts.	T2, T3
1Nc2	Begin to know number pairs to 6, 7, 8, 9 and 10.	T1, T2
1Nc3	Add more than two small numbers, spotting pairs to 10, e.g. $4 + 3 + 6 = 10 + 3$ .	T2
1Nc4	Begin using pairs to 10 to bridge 10 when adding/ subtracting, e.g. $8 + 3$ , add 2, then 1.	T2, T3
1Nc5	Know doubles to at least double 5.	T3
1Nc6	Find near doubles using doubles already known, e.g. $5 + 6$ .	T3
1Nc7	Begin to recognise multiples of 2 and 10.	T2, T3
	<b>Addition and subtraction</b>	
1Nc8	Understand addition as counting on and combining two sets; record related addition sentences.	T1
1Nc9	Understand subtraction as counting back and ‘take away’; record related subtraction sentences.	T1
1Nc10	Understand difference as ‘how many more to make?’	T1

(Continued)

Framework Code	Learning Objective	Ongoing (O) Term ref (T1, T2, T3)
1Nc11	Add/subtract a single-digit number by counting on/back.	T1
1Nc12	Find two more or less than a number to 20, recording the jumps on a number line.	T1
1Nc13	Relate counting on and back in tens to finding 10 more/less than a number (< 100).	T2
1Nc14	Begin to use the +, – and = signs to record calculations in number sentences.	T2
1Nc15	Understand that changing the order of addition does not change the total.	T3
1Nc16	Add a pair of numbers by putting the larger number first and counting on.	T3
1Nc17	Recognise the use of a sign such as $\square$ to represent an unknown, e.g. $6 + \square = 10$ .	T3
1Nc18	Begin to add single- and two-digit numbers.	T3
	<b>Multiplication and division</b>	
1Nc19	Double any single-digit number.	T3
1Nc20	Find halves of even numbers of objects up to 10.	T3
1Nc21	Try to share numbers to 10 to find which are even and which are odd.	T3
1Nc22	Share objects into two equal groups in a context.	T2, T3
	<b>Geometry Shapes and geometric reasoning</b>	
1Gs1	Name and sort common 2D shapes (e.g. circles, squares, rectangles and triangles) using features such as number of sides, curved or straight. Use them to make patterns and models.	T1
1Gs2	Name and sort common 3D shapes (e.g. cube, cuboid, cylinder, cone and sphere) using features such as number of faces, flat or curved faces. Use them to make patterns and models.	T1
1Gs3	Recognise basic line symmetry.	T1
	<b>Position and movement</b>	
1Gp1	Use everyday language of direction and distance to describe movement of objects.	T1
	<b>Measure Money</b>	
1Mm1	Recognise all coins and work out how to pay an exact sum using smaller coins.	T2, T3
	<b>Length, mass and capacity</b>	
1MI1	Compare lengths and weights by direct comparison, then by using uniform non-standard units.	T1, T2
1MI2	Estimate and compare capacities by direct comparison, then by using uniform non-standard units.	T1, T2

## (Continued)

Framework Code	Learning Objective	Ongoing (O) Term ref (T1, T2, T3)
1Ml3	Use comparative language, e.g. longer, shorter, heavier, lighter.	T1, T2
	<b>Time</b>	
1Mt1	Begin to understand and use some units of time, e.g. minutes, hours, days, weeks, months and years.	T2, T3
1Mt2	Read the time to the hour (o'clock) and know key times of day to the nearest hour.	T2, T3
1Mt3	Order the days of the week and other familiar events.	T3
	<b>Handling Data</b> <b>Organising, categorising and representing data</b>	
1Dh1	Answer a question by sorting and organising data or objects in a variety of ways, e.g. using block graphs and pictograms with practical resources; discussing the results in lists and tables with practical resources; discussing the results in Venn or Carroll diagrams giving different criteria for grouping the same objects.	T2, T3
	<b>Problem Solving</b> <b>Using techniques and skills in solving mathematical problems</b>	
1Pt1	Choose appropriate strategies to carry out calculations, explaining working out.	O
1Pt2	Explore number problems and puzzles.	O
1Pt3	Find many combinations, e.g. combinations of three pieces of different coloured clothing.	O
1Pt4	Decide to add or subtract to solve a simple word problem (oral), and represent it with objects.	O
1Pt5	Check the answer to an addition by adding the numbers in a different order.	O
1Pt6	Check the answer to a subtraction by adding the answer to the smaller number in the question.	O
1Pt7	Describe and continue patterns such as count on and back in tens, e.g. 90, 80, 70.	O
1Pt8	Identify simple relationships between numbers and shapes, e.g. this number is ten bigger than that number.	O
1Pt9	Make a sensible estimate of a calculation, and consider whether an answer is reasonable.	O

## A completed example of Long Term Planning – 3.

The example below is a list of objectives from stage 1 that can be colour-coded to gain an overview of when they are first introduced.

### Ongoing

*Introduced in term 1*

*Introduced in term 2*

*Introduced in term 3*

Framework Code	Learning Objective
	<b>Number</b> <b>Numbers and the number system</b>
1Nn1	Recite numbers in order (forwards from 1 to 100, backwards from 20 to 0).
1Nn2	Read and write numerals from 0 to 20.
1Nn3	Count objects up to 20, recognising conservation of number.
1Nn4	Count on in tens from zero or a single-digit number to 100 or just over.
1Nn5	Count on in twos, beginning to recognise odd/even numbers to 20 as “every other number”.
1Nn6	Begin partitioning two-digit numbers into tens and ones and reverse.
1Nn7	Within the range 0 to 30, say the number that is 1 or 10 more or less than any given number.
1Nn8	Use more or less to compare two numbers, and give a number which lies between them.
1Nn9	Order numbers to at least 20 positioning on a number track; use ordinal numbers.
1Nn10	Use the = sign to represent equality.
1Nn11	Give a sensible estimate of some objects that can be checked by counting, e.g. to 30.
1Nn12	Find halves of small numbers and shapes by folding, and recognise which shapes are halved.
	<b>Calculation</b> <b>Mental strategies</b>
1Nc1	Know all number pairs to 10 and record the related addition/subtraction facts.
1Nc2	Begin to know number pairs to 6, 7, 8, 9 and 10.
1Nc3	Add more than two small numbers, spotting pairs to 10, e.g. $4 + 3 + 6 = 10 + 3$ .
1Nc4	Begin using pairs to 10 to bridge 10 when adding/subtracting, e.g. $8 + 3$ , add 2, then 1.
1Nc5	Know doubles to at least double 5.
1Nc6	Find near doubles using doubles already known, e.g. $5 + 6$ .
1Nc7	Begin to recognise multiples of 2 and 10.

## (Continued)

Framework Code	Learning Objective
	<b>Addition and subtraction</b>
1Nc8	Understand addition as counting on and combining two sets; record related addition sentences.
1Nc9	Understand subtraction as counting back and 'take away'; record related subtraction sentences.
1Nc10	Understand difference as 'how many more to make?'
1Nc11	Add/subtract a single-digit number by counting on/back.
1Nc12	Find two more or less than a number to 20, recording the jumps on a number line.
1Nc13	Relate counting on and back in tens to finding 10 more/less than a number (< 100).
1Nc14	Begin to use the +, – and = signs to record calculations in number sentences
1Nc15	Understand that changing the order of addition does not change the total
1Nc16	Add a pair of numbers by putting the larger number first and counting on.
1Nc17	Recognise the use of a sign such as $\Delta$ to represent an unknown, e.g. $6 + \Delta = 10$ .
1Nc18	Begin to add single- and two-digit numbers.
	<b>Multiplication and division</b>
1Nc19	Double any single-digit number.
1Nc20	Find halves of even numbers of objects up to 10.
1Nc21	Try to share numbers to 10 to find which are even and which are odd.
1Nc22	Share objects into two equal groups in a context.
	<b>Geometry Shapes and geometric reasoning</b>
1Gs1	Name and sort common 2D shapes (e.g. circles, squares, rectangles and triangles) using features such as number of sides, curved or straight. Use them to make patterns and models.
1Gs2	Name and sort common 3D shapes (e.g. cube, cuboid, cylinder, cone and sphere) using features such as number of faces, flat or curved faces. Use them to make patterns and models.
1Gs3	Recognise basic line symmetry.
	<b>Position and movement</b>
1Gp1	Use everyday language of direction and distance to describe movement of objects.
	<b>Measure Money</b>
1Mm1	Recognise all coins and work out how to pay an exact sum using smaller coins.
	<b>Length, mass and capacity</b>
1Ml1	Compare lengths and weights by direct comparison, then by using uniform non-standard units.
1Ml2	Estimate and compare capacities by direct comparison, then by using uniform non-standard units.

(Continued)

Framework Code	Learning Objective
1MI3	Use comparative language, e.g. longer, shorter, heavier, lighter.
	<b>Time</b>
1Mt1	Begin to understand and use some units of time, e.g. minutes, hours, days, weeks, months and years.
1Mt2	Read the time to the hour (o'clock) and know key times of day to the nearest hour.
1Mt3	Order the days of the week and other familiar events.
	<b>Handling Data</b> <b>Organising, categorising and representing data</b>
1Dh1	Answer a question by sorting and organising data or objects in a variety of ways, e.g. using block graphs and pictograms with practical resources; discussing the results in lists and tables with practical resources; discussing the results in Venn or Carroll diagrams giving different criteria for grouping the same objects.
	<b>Problem Solving</b> <b>Using techniques and skills in solving mathematical problems</b>
1Pt1	Choose appropriate strategies to carry out calculations, explaining working out.
1Pt2	Explore number problems and puzzles.
1Pt3	Find many combinations, e.g. combinations of three pieces of different coloured clothing.
1Pt4	Decide to add or subtract to solve a simple word problem (oral), and represent it with objects.
1Pt5	Check the answer to an addition by adding the numbers in a different order.
1Pt6	Check the answer to a subtraction by adding the answer to the smaller number in the question.
1Pt7	Describe and continue patterns such as count on and back in tens, e.g. 90, 80, 70.
1Pt8	Identify simple relationships between numbers and shapes, e.g. this number is ten bigger than that number.
1Pt9	Make a sensible estimate of a calculation, and consider whether an answer is reasonable.

A comprehensive set of suggested long term plans are provided by Cambridge for each stage in the scheme of work on the Cambridge Primary support site.

Extracts from the full scheme of work are provided in Appendix B at the back of this guide.

## 2.5 Phase 2 – Creating a Medium-Term Plan

You should already have decided roughly how much time is available for each teaching unit as part of your long-term planning. For example it may be two weeks or it may be four depending on the length of time available in your terms.

### Steps 5 Creating Units and 6 Medium-Term Plans

The starting point for creating a medium-term plan is the list of objectives that you have allocated to each term. You need to order these now into themes and topics so that you have:

- A logical and progressive teaching sequence that takes into account prior learning and the ascending level of demand belonging to each skill
- Good timing so that the pace of learning is challenging and realistic for all learners
- Identified activities to deliver the objectives and resources
- Identified opportunities for ICT
- A variety of enjoyable and appealing learning opportunities for your learners

A set of questions can help to organise ideas. The table below shows some possibilities. The information (possible answers) given in the right-hand column shows what decisions have been made for the suggested medium-term plan provided by Cambridge and available to all registered Centres on the Cambridge Primary support site.

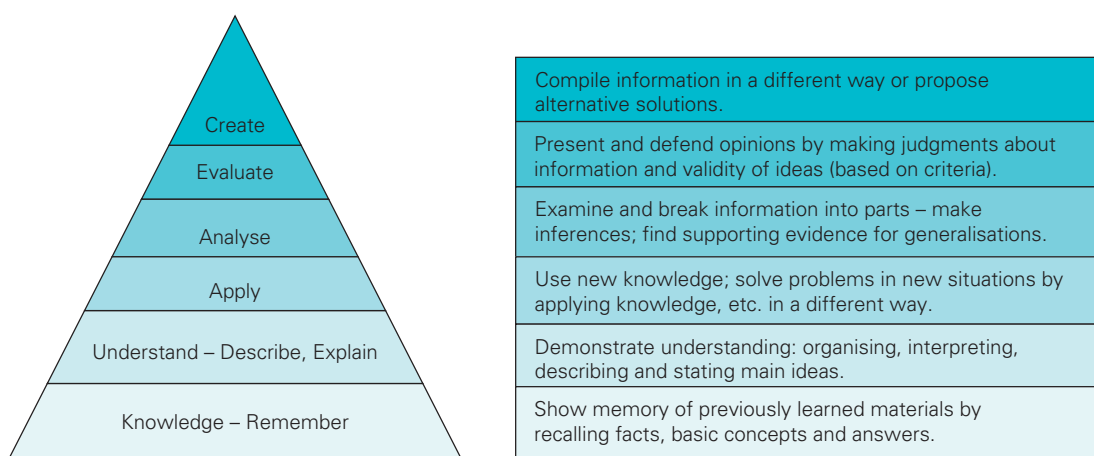
Questions	Approach taken in this guide
What do learners already know?	A consideration of prior knowledge gained from previous stages and units.
What skills (including practical skills) do I need to teach?	Check objectives to determine and list the skills for the unit. (Include ongoing element of the stage/unit.)
What knowledge do I need to teach?	As above but for knowledge.
Is there a natural order of teaching for these objectives?	The above information can be ordered so that skills and knowledge build up logically.
How long will my class need for learning to happen?	The time frame for the unit has already been decided. Consider the time required for teaching an objective/ group of objectives. The length of lessons will help here.
What resources in school are available? What purchases are required?	It is important that good quality resources are kept and used. They may need adapting. New resources may be identified and purchasing plans made. Remember Information Communication Technology (ICT).



To help you determine the order of learning by considering the level of difficulty of each required skill, the broad principles of Bloom’s taxonomy may be helpful.

Look at the ascending hierarchy of skills indicated in the triangle and exemplified in the two tables. Think about the levels of skill required by the learner across and within your units. Are you asking learners to perform tasks that require a higher level of skill towards the end of the term, having built up their knowledge systematically in previous lessons? Are the skills and knowledge required by any given unit built up gradually to form a logical progression? A clear hierarchy of skills in planning and delivery sets a good example to your learners of how the learning process works.

Bloom’s Taxonomy (Revised)  
[http://www.apa.org/ed/new\\_blooms.html](http://www.apa.org/ed/new_blooms.html)



Based on an APA adaptation of Anderson, L.W. & Krathwohl, D.R. (Eds.) (2001)

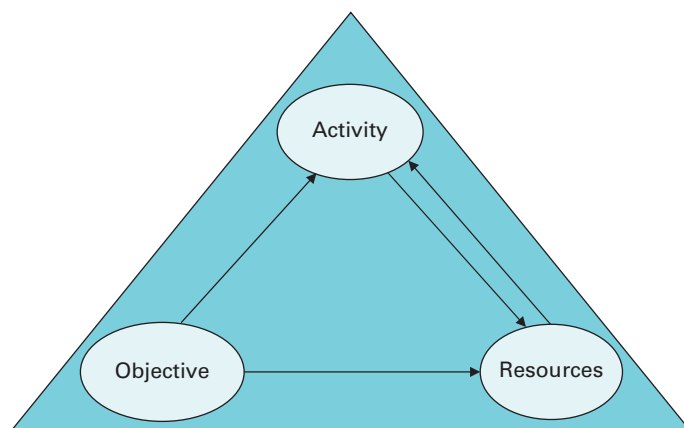
Possible questions that illustrate each level

Change an unhealthy fatty food to a 'healthy' low fat food by changing the ingredients. Explain the benefits of your choices vs. the originals.
Do you feel that a low fat yogurt is a healthy snack for children aged 8–11? Give reasons for your answer.
List three ways of serving low fat foods and explain which ones have the most health benefits. Provide evidence to support what you say.
Which kinds of fruit are best for baking a pie?
Compare the benefits of eating cheese vs. fruit.
What are the benefits of eating low fat foods?

Planning for the next term needs to be developed after the evaluation.

- Did learners achieve the objective in full?
- Does the objective still need to be taught in order for learners to gain full understanding?
- Was the objective covered at all?
- Was the objective taught but learners did not meet it?

The diagram below might help you in considering this. It is important that the activities are objective-led. Choose the objective – decide the activity from that – the resources needed will then become apparent.



Decisions about units, activities and resources should be recorded as a Medium-Term Plan. Two blank templates are provided in Appendix E for you to write your own medium-term plans.

Medium-Term Planning – 1 has additional columns for comments and time allocation

Medium-Term Planning – 2 is without these columns.

A completed example of Medium-Term Planning – 2 follows.

A comprehensive set of medium-term plans (or scheme of work) is provided on the Cambridge Primary support site. Extracts from the full scheme of work are provided as Appendix B at the end of this guide.

## A completed example of Medium-Term Planning – 2

### Stage 3, Unit 1A: Numbers and Problem Solving

Framework Codes	Learning Objective	Activities	Resources
3Nh1	<i>Numbers and the number system</i> Recite numbers 100 to 200 and beyond	Whole class counting	100 – 200 number square
3Nh2	Read and write numbers to at least 1000	Whole class reading numbers, targeted questions	Large three digit number cards
3Nh4	Count on and back in steps of 2, 3, 4 and 5 to at least 50	Whole class counting	Large 100 square, number line
3Nh9	Place a three digit number on a number line marked off in multiples of 100	Teacher demonstration, pair activity: takes turns to throw 1–6 dice three times. Make a three digit number and place on marked number line	1–6 dice, marked number lines
3Nh10	Place a three digit number on a number line marked off in multiples of 10	Teacher demonstration, pair activity and place on marked number line: take turns to throw 1–6 die three times. Make a three digit number	1–6 dice, marked number line

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources
3Nn3	Count on and back in ones, tens and hundreds from 2 and 3 digit numbers	Class counting	100 square, place value cards
3Nn5	Understand what each digit represents in 3 digit numbers and partition into hundreds, tens and units	Using place value cards, make 3 digit numbers and record the hundreds, tens and units	Place value cards
3Nn6	Find 1, 10 100 more/less than 2 and 3 digit numbers <i>Calculation: Mental strategies</i>	Whole class introduction, followed by ability groups	100 squares, counters, cubes
3Nc1	Know addition and subtraction facts for all numbers to 20	Learner responses to questions: How many more? How many less?	Counters or cubes should be available for those learners who need more support
3Nc2	Know the following addition and subtraction facts: Multiples of 100 with a total of 1000 Multiples of 5 with a total of 100	Learner responses to questions: How many do we need to add? How many do we need to subtract?	Number grids
3Nc3	Know multiplication/division facts for 2x, 3x, 5x and 10 x tables	Begin to know 4x table	Whole class chanting followed by a game for pairs: Take turns to throw a die marked 2, 3, 3, 5, 5, 10 On a 100 square, cover any multiple of the number shown

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources
3Nc5	Recognise 2 and 3 digit multiples of 2, 5 and 10	<p>Class chanting, followed by a game using 100 square, counters and cards</p> <p>Whole class: Use 100 square to see the pattern of the multiples. Add next 100 square (starting 101) and continue the pattern.</p> <p>Pairs: Use dice marked 2, 2, 5, 5, 10, 10. Take turns to throw and cover any multiple of that number</p>	<p>Marked dice, 1 per pair, 100 square, counters, different colour for each player in a pair.</p> <p>100 square, counters, pack of cards numbered 0 – 40 per pair</p> <p>100 square, 101 – 200 square, marked dice, counters or cubes</p>
3Nc9	<p><i>Addition and subtraction</i></p> <p>Add and subtract 10 and multiples of 10 to and from 2 and 3 digit number</p>	<p>Teacher demonstration: cover a start number on 100 square with a counter. Throw 2 dice, 1 marked + and –, the other marked with multiples of 10. Move the counter appropriately. Working in pairs, take turns to throw the dice and move your counter</p>	<p>Large demonstration 100 square, table top 100 squares, 2 marked dice per pair, counters</p>

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources
3Nc10	Add 100 and multiples of 100 to 3 digit numbers	Class introduction using place value cards. Make a 3 digit number, add a multiple of 100. Which card changes? Learners set challenges for others	Place value cards
3Nc11	Use the = sign to represent equality	Use dice to generate 2 and 3 digit numbers that can be added. Record as an addition using =.	Dice
3Nc12 3Nc16	Add several small numbers Re-order an addition to help with the calculation <i>Multiplication and division</i>	Working in pairs, each player takes a turn to throw appropriately marked dice 3 or 4 times. The partner records the numbers, arranges them, works out the calculation	Dice
3Nc19	Understand the relationship between doubling and halving	Half price sale: teacher shows prices in a shop. What will the price be if there is a half-price sale? What if we bought 2 of a half price item? Learners make their own price labels before and after the sale	Price labels before and after the sale Cards with 'what if' questions

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources
3Nc20	Understand the effect of multiplying 2 digit numbers by 10	Using a calculator, ask learners to put a 2 digit number in the display, press x and then press 10. What happens? Repeat with a new number? Will this always happen? Can we come up with a rule for x by 10?	Calculators
3Nc25	Understand and apply the idea that multiplication is commutative	Using a calculator, let learners explore putting in a single digit number and multiplying it by another single digit number, press =. Record the process. Repeat putting the numbers in in reverse order. What happens? What do you notice? Will it always happen?	Calculators

Once you have arranged and ordered your objectives around the topics and themes you can give meaningful titles to each group or 'Unit'. You should then be able to arrange these units to fit into the timings you decided on earlier. In this guide we have opted for three units per term and three terms per stage or year. A different time structure or the limitation of having to use shared resources might have an effect on the order in which you deliver the curriculum.

Now you are ready to decide what activities and resources can be matched to the learning objectives you have grouped together.

## 2.6 Phase 3 – Creating a Short-Term Plan

Short-term plans are for teachers to use in the classroom when delivering their lessons.

A blank template that can be used for either a single or a weekly lesson plan is provided in Appendix E. Producing lesson plans for single lessons is particularly useful when first introducing the framework. However, when teachers have become confident in their teaching, have a sound knowledge of the subject matter and know the best way to deliver it in the classroom, daily plans can become weekly.

In order to introduce the template to teachers it might be helpful to run a training exercise like the one below to familiarise all staff with the format and help them understand its requirements. It would also serve to reinforce what teachers already know about planning lessons.

### Training Activity: Producing a Lesson Plan Format (Appendix A2)

This activity describes an exercise that may be carried out by groups of teachers to explore what a short term plan (for a single lesson) should contain. They can then experiment with a format to include all that they decide would be useful. Photocopiable sheets are included.

### Step 7. Creating your Lesson Plan

On page 31 you will find a copy of the Cambridge Short-Term Planning template which contains the instructions for filling in each section of the plan. Spend a little time familiarising yourself with the different components.

The template is like a recipe. The quality of the ingredients will directly affect the quality of the overall outcome. In this case, good planning makes for successful teaching and an enjoyable learning experience.



Make sure that your lesson plans describe:

- What is to be taught and
- How it is to be taught

Sample short-term plans are available in Appendix C at the back of this guide.

An example of a completed short-term plan can be seen on page 32

## Step 8. Evaluating your Planning

Remember that your plans are a working document. You will need to be responsive to your learners and adapt your teaching as required. Here are a few things to consider regarding the creation and maintenance of lesson planning:

- Teachers need to keep in touch with the learners' needs and ensure learning is of good quality and that knowledge and skills are retained
- 'Over-planning' of a whole week's work can lead to inflexibility
- Sometimes lessons need to speed up, on other occasions it may be necessary to revisit an aspect of learning
- Teachers must be prepared to amend plans from lesson to lesson
- If learners' work is poor or they have struggled during the lesson, it might be sensible to revisit the work and not rush on to the next objective
- Plans should not just 'sit' in a neat folder. A good set of plans may have notes written all over them to show what went well and what might need adjustment for next time.
- What is the order in which you will teach the objectives? Some need to be taught in order, as the next part of learning depends on the first. Others can be done in any order. It is up to you as the teacher to make the curriculum work for you and your learners. Do not be afraid to adapt your plan to suit your learners' needs. Plan each day individually.

When planning a series of lessons, knowing what learners have already been taught and what they already know, understand and are able to do is crucial. Former plans and assessments can be used to plan for new learning.

There is a need to try and keep 'on track' or keep up with planned work but teachers should not stick so firmly to their plans that they cannot follow an idea that is unplanned. Quite often, excellent lessons result when something happens to stop the planned lesson – a local or national event, an individual brings something into school – and the learners are interested. Teachers should feel that they can use these stimuli to develop talk, reading or writing. Learning takes place when learners are motivated and enthusiastic.

Whilst it is true that 'unplanned' activities should not lead the teaching, it may be possible for teachers to revisit both short and medium term plans to see if any objectives can be met. In this way, a certain amount of flexibility can be allowed. At the same time it should be remembered that the time allowed for a term's units is 10 weeks – therefore an unplanned activity could happen AND the intended planning be followed as well.

Further advice on how to monitor the success of your teaching can be found in Section 3: Teaching Approaches and Section 4: Assessment. The techniques discussed can help you work active learning and formative assessment in to your lessons which will improve the feedback on your teaching.

## Short Term Plan Instructions

Week beginning: gives a date reference; daily plans should add the day				UNIT: The title of the unit of work		CLASS: The class to be taught	
Timing	Framework ref	Learning Objectives	Success Criteria (Details in sub-section 3.1)	Activities (see notes below re: differentiation details etc.)		Resources	Evidence of Achievement
				Description	W/G/I		
Shows the total lesson time down, showing how long is to be spent on each activity	This is the code taken from the medium term plan which is from the framework document	These are selected for each lesson, there is often more than one	These are questions or statements that will be used to measure achievement (success) – See Section 4 on Assessment	Description of the activity	W=whole class; G=group; I=individual or independent work	Materials that will be needed for the activity	A code shows what kind of evidence the teacher will use to decide if the success criteria have been met and the objective has been achieved. (See Section 4: Assessment)
Organisation: Details of differentiation / groups / adult role (linked to activities)							
How the class will be organised; this may be just for certain activities; it should include details of differentiation / groups / adult role (linked to activities).				Notes / extension opportunities / homework			
				This where any comments should be made about how the lesson has been and whether the next session plans need to be amended. Before the lesson, as part of the planning, extension activities and homework can be listed here.			
				<b>Q&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work			

# A completed example of a Short Term Plan

## Stage 1: Unit 1C, Measures and Problem Solving

Week beginning:		UNIT: Stage 1 C: Measures and Problem Solving		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Resources		Evidence of Achievement
				Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	W/G/I	
10 mins	1Pt2	Explore number puzzles and problems	Were the learners able to use knowledge of number and probability to solve the problem?	<p>A game for two teams. Shuffle the cards and show the first card to one of the teams, who decide whether the next card will be higher or lower. If they are correct, they score a point. If incorrect, play passes to the other team. Play continues until all 10 cards are showing. The team with the most points is the winner.</p> <p>Play again, starting with the other team.</p>	Set of number cards 0-9	O
40 mins	1M12	Main part Estimate and compare capacities by direct comparison, then by using uniform non-standard units	Were the learners able to compare the capacity of 2 containers? <i>What methods did they use?</i> <i>How many did they compare all together?</i>	<p>Show the class a set of containers. Which two containers do you think hold the same amount? How could we find out? Model to the class a method. Do you think there are any other ways of finding out? Try another way suggested by a learner. Move into group work. Find 2 containers on your table that you think hold the same amount. Test it.</p> <p>Find other pairs of containers that you think hold about the same amount</p>	Collection of suitable resources: boxes, paper cups, small jugs, countable items to compare capacities (beads, small cubes, dried peas)	<p>Q &amp; A</p> <p>D</p> <p>O</p> <p>D</p> <p>O</p>

**(Continued)**

Week beginning:		UNIT: Stage 1 C: Measures and Problem Solving		CLASS:			
Timing	Ref: Framework	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of Achievement	
				Description			W/G/I
	10 mins	Plenary sharing findings and strategies	Were you able to find 2 containers that held about the same amount? What did you do? What did you find out? Did you record anything to help you to remember? How did you record it?	Discuss methods and findings. Invite learners to share what they did and what they found out. Was anything difficult? What did they do to solve any problems?			
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)							<b>O&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work
If the items used for filling containers are small, and the learners are comparing quantities by counting how many of them fill the container, some learners may need to work with smaller containers than others. Learners should first of all study only 2 containers. Then move on to experimenting with materials provided. Allow them to decide on their own degree of accuracy, and encourage them to guess first before they try.		<b>Notes / extension opportunities / homework</b> Extension: Find some other containers which hold twice as much as this bottle (Need a supply of plastic bottles!)					
You may want them to make informal recordings which can be used as memory aids for the last part of the lesson							

## SECTION 3: TEACHING APPROACHES

This section considers some of the different ways that you may choose to deliver particular activities throughout the year.

There are as many ways to teach as there are teachers! We all have our own preferences – and ways in which we feel most comfortable teaching. However, it is important to remember that learners have different learning styles and we need to appeal to all of them in our teaching. Similarly there are times when lessons lend themselves to group work, pair work or working individually and you need to think about the best approach for the topic.

### Training Activity: Planning and Delivering a Lesson (Appendix A3)

In the appendices you will find a useful training exercise that helps to draw out just how many of these approaches teaching staff already practise and simply do not notice from familiarity.

### 3.1 Working in Groups, Pairs and as Individuals

All learners gain from working in groups, in pairs or as individuals. The grouping depends on the activity and where the class are within a series of lessons. It may be appropriate to teach to the whole class, for example, at the beginning of a series of lessons when explaining, demonstrating or asking questions to give learners an opportunity to answer and discuss.

During the following few lessons, the main activity may consist of group work, where learners work **as** a group (as opposed to **in** a group) on a related activity, although you may need to begin with a short whole class introduction and an explanation of what is required.

Depending upon the task (Problem Solving or an investigation), group work should allow learners of different abilities to work together. A more controlled degree of differentiated work can be used when grouping learners by attainment. In this case there can be a related but simplified task for some learners and a harder, related challenge for others.

The final lesson of a unit of work may be based on learners developing their own puzzles or games to show what has been learned throughout the unit. Sometimes levels of enthusiasm or aptitude for this kind of task may vary between learners. In this case, paired work may be the most appropriate. During the lesson different pairs can be supported as necessary.

Learners working individually can start getting on with their task immediately after the main introduction, once a few learners are already working on an activity or short exercise and others still need more input from the teacher.

The approach to teaching Mathematics recommended by the framework is based on very clear principles:

- A Mathematics lesson every day
- An emphasis on mental calculation
- Extensive use of active learning
- Controlled differentiation with all learners engaged in Mathematics relating to a common theme
- Interactive oral work with the whole class, groups, pairs and individuals

High quality teaching is oral, interactive and lively and should be a two-way process between the teacher and the learners. Learners should be playing an active part by asking and answering questions, contributing to discussions and explaining and demonstrating their methods to the rest of the class or group.

## Motivation

In order for learners to achieve their full potential, it is important that they stay on task, engage in the Mathematics and become active learners, often taking charge of their own learning. Active learning helps learners believe in the knowledge and skills being taught by seeing them applied. Teachers need to listen to and use learner ideas to show that these are valued. This can make learning enjoyable for both teacher and learner. Learners will, of course, make errors if they take risks but these are an important part of the learning process.

In order for this to happen, the classroom environment needs to be calm, open and honest so as to promote learning. Relationships need to be friendly and focused on learning, with respect being a two-way process.

## Challenge

In order for all learners to reach the level of attainment that has been planned for, teachers need to have very high but realistic expectations. These need to be shared with the learners.

Teachers need to challenge learners to:

- Take responsibility and use initiative
- Be independent and active
- Question and evaluate
- Share experiences and ideas
- Set their own learning objectives
- Value high quality work and never be satisfied with anything less

## 3.2 Sharing the Learning Intention

Making objectives clear to learners is an essential part of giving them power over (and responsibility for) their own learning. Knowing how the objectives link together over time as an articulated whole in the medium and long term provides a kind of learning landscape, a route along which learners are travelling. The short term plan will have selected objectives for the lesson. When delivering the lesson, the objectives need to be shared with the learners. It is at this stage that a further breakdown of the objectives is needed.

First of all, the word 'objective' itself may need to be made easier to understand. 'Today we are learning to . . . ' is an easier phrase.

When objectives or learning intentions are shared learners can become more involved, have a better understanding of what they have to do and can comment on their own learning.

- Understanding what is meant to be learned is vital for learners
- It takes very little time and should become an expectation for teachers and learners
- It sets the scene for learning
- It can be displayed and read together
- It needs to be made clear. . .conversion to 'learner-speak' may be necessary

### Training Activity: Sharing Learning Intentions (Appendix A4)

In the appendices you will find a suggested training activity that has some details about how this might be done with different groups of learners. This can also help with marking.

Finding the right words will improve with practise and need not be written in the lesson plan. A sheet of notes may be useful though. It is easier provided the learning intentions in the medium term plan are clear. The words used will also relate closely to the 'success criteria'(see below).

## Creating Success Criteria

The learners' understanding of the learning intention is developed much more fully if it is followed by an invitation to them to create '**success criteria**'. These success criteria provide a way for teachers and learners to know at what point a learning objective has been achieved.

There are many ways that this can be done.

- Whole class discussion
- Group discussion followed by feedback to whole class
- Group discussion where the task is differentiated and learners work with an adult on their own task
- Using talk partners

One of the best ways to generate the success criteria with learners is to use samples of work from, for example, the previous year.

- Select two pieces of work – one that has most, if not all of the requirements, and one that does not quite include all of them
- Ask learners to discuss with, for example, their talk partners what they like about the work and what could be improved
- Feedback comments can be collected and the learners can decide which are the most important things to think about when doing the task. In this way 'success criteria' are produced

The learning intention and the success criteria should be displayed throughout the lesson. The criteria may be in the form of 'steps' so that learners can check their 'success' by following the pathway created by the 'steps'.

Learners work independently on the lesson task. Before finishing they can be asked to say how far they have met the criteria and record this on their work. This could also be a shared activity if learners are grouped together in pairs creating a 'talk partner'.

Once learners are used to the routine of producing success criteria, it can happen often – not necessarily for all tasks. You may be concerned that there will not be enough time in lessons to do this. However, you will quickly discover that time is no longer wasted on repeating the task instructions because the learners now all understand what they have to do and are keen to get on and complete the task.

### **Giving success criteria a central role in lessons and allowing learners to produce them:**

- Helps learners to gain a deeper understanding of what to do
- Gives learners ownership of the criteria so that they can create a successful 'product'
- Gives learners a basis for self evaluation and peer evaluation
- Enables learners to become active learners

See the section on Assessment for how the creation of Success Criteria fits into formative assessment techniques.



### Training Activity: Creating Success Criteria with Learners (Appendix A5)

In the appendices you will find a training activity on how to create success criteria with your learners. Teachers will find their own ways of doing this as their expertise develops

## Talk Partners

Using talk partners can create a very positive atmosphere in the classroom as learners find themselves working with different people – people they do not know that well. Teachers can decide how to organise talk partners in either a structured or a random way.

Talk partners:

- Are all-inclusive
- Result in increased tolerance and respect
- Are excited by new partners
- Result in improved behaviour
- Have benefits for learners with special educational needs
- Result in increased self-esteem

## 3.3 Active Learning

Active or learner-centred learning is an approach to education focusing on the needs of the learners rather than of those involved in the education process such as administrators or teachers.

The focus is not just on what is taught but on **how** effective learning should be promoted. The way that learners learn therefore becomes the main focus of the teacher. We have already acknowledged that learners learn in different ways and have different learning styles, therefore personal and individual responses are encouraged in order to maximise the effectiveness of learning and transmit meaning along with facts and skills. It is a knock-on effect of this kind of approach that it helps to foster creativity in learners and build confidence.

- I listen      – I forget
- I see         – I believe
- I do          – I understand

Learning is an active, dynamic process in which connections (between different facts, ideas and processes) are constantly changing. Such connections are encouraged through dialogue between teachers and learners, and between learners and their peers.

Learners are encouraged to formulate and re-formulate their hypotheses in the solution of problems and tasks they work on as part of these discussions. In this way learners construct their **own meaning** by talking, listening, writing, reading **and** reflecting on content, ideas, issues and concerns.

The curriculum is organised not just around the 'facts' the learner is supposed to acquire but more fundamentally around the processes through which learning is to be developed. At Primary stage in particular it is important for teachers to understand that the aim of formative assessment is not to 'quantify' a learner's performance in terms of the number of 'facts' they are supposed to acquire but to get learners to understand the processes through which they arrive at certain conclusions in solving a given task/problem. Constructive and continuous feedback is important here. Developing learners' awareness and involvement in the planning and processes of their own learning as discussed above (for example, through the use of shared learning intentions and learner-generated success criteria and through the development of self and peer assessment skills) gives them power over their own progress and lends weight to the meaning of that process.

The role of the teacher in planning, providing and adapting learning experiences to cover a range of learning abilities (differentiation) is central to promoting skills and knowledge development. Good differentiation is the key.

### 3.4 Differentiation

Differentiation is when a teacher reflects on learner needs and matches the teaching methods, learning tasks, resources or environment to individual learners or groups of learners. There is a variety of reasons for the range in learners' needs, but the key principle is that through differentiation all learners can become successful learners.

The main reasons for the need for differentiation in the primary classroom are the:

- **learner level of ability** this is both for supporting the less able as well as challenging the most able
- **personal styles of learning** or pace of work

#### How to differentiate

There are many ways in which teachers can create or adapt teaching methods or materials to give every learner the opportunity for challenge and success. Some ways of differentiating are:

- **By using ability groups.** The most common way of differentiation is where learners are placed in high, average or low ability groups for some subjects. This can be the most effective way to help the teacher match the work to the different levels, but it sometimes causes the less able learners to develop a poor self-image, especially if groupings are rarely reviewed.
- **By using mixed-ability groups.** An alternative to this method might be to group learners according to gender, age, friendship, or other criteria. This prevents stigmatisation and research has shown that less able learners work better in mixed-ability groups. However, more able learners may not reach their potential and will not necessarily be as challenged as they are in same ability groups.
- **By varying the task.** This is when learners cover the same work or meet the same objectives but in different ways.

- **By varying the outcome.** This is when learners are expected to reach different standards by learning through adapted learning styles or resources. Some learners may need extension activities. These should be based on the same learning objective as the rest of the class and need to be very high but with realistic expectations. Challenge learners to take responsibility and be independent and active and to question and evaluate their learning. At the end of the lesson they can be asked to share experiences and ideas, so that all of the class can see and hear higher level Mathematics. In some cases they may be able to set their own success criteria.
- **By varying the use of resource.** This is when learners have activities planned which provide for their concrete or abstract understanding. Learners at a lower level of understanding will need to work with more physical, hands-on models (that soften the level of abstraction). Learners at a higher level of comprehension will be able to work with 2D models or with written information and diagrams much more readily.

Written work or homework can be adapted to suit particular needs if a learner needs more help with understanding the task. Simplifying the vocabulary or breaking the task down into simpler steps with more guidance can also help. Appropriate resources, which are manageable, should be provided. Learners who need extra support can be encouraged to choose their own support materials.

- By giving **open-ended tasks.** This is often the case when giving learners an investigation. They usually start with a question, to which there are several possible answers.

It is important that all learners have the opportunity to take part in a discussion, and can respond orally or through cards, symbols, tactile materials, specially adapted or specialised resources or with the support of an adult.

The important thing to remember is that you as teacher are aiming for the learners in your care to make progress **at their own particular level** throughout the year. There may be in-school targets that have to be met, but it is your job to demonstrate that **all** those you teach have improved knowledge, understanding and practical skills by the end of the year. This will only be possible if there is evidence of good differentiation in your lessons. This will enable you to plan for individual learning needs and to promote challenge and success for all learners in all your classes.

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## SECTION 4: ASSESSMENT

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### 4.1 What is Assessment?

As with planning, it is useful to think of assessment as three connected levels: short term assessments which are an informal part of every lesson; medium term assessments which are used to review and record the progress learners are making over time in relation to the key outcomes; and long term assessments which are used at the end of the school year in order to track progress and attainment against school and external targets.

#### Types of assessment

**Formative:** to establish whether learners have met the learning outcome or are on track to do so. (These are both short and medium term.)

**Summative:** to 'sum up' what learners have achieved. (These are long term.)

#### Functions

**Formative Diagnosis:** to identify why learners do not understand or have difficulty with some topic or idea and to use this information to take appropriate action to correct mistakes or misconceptions.

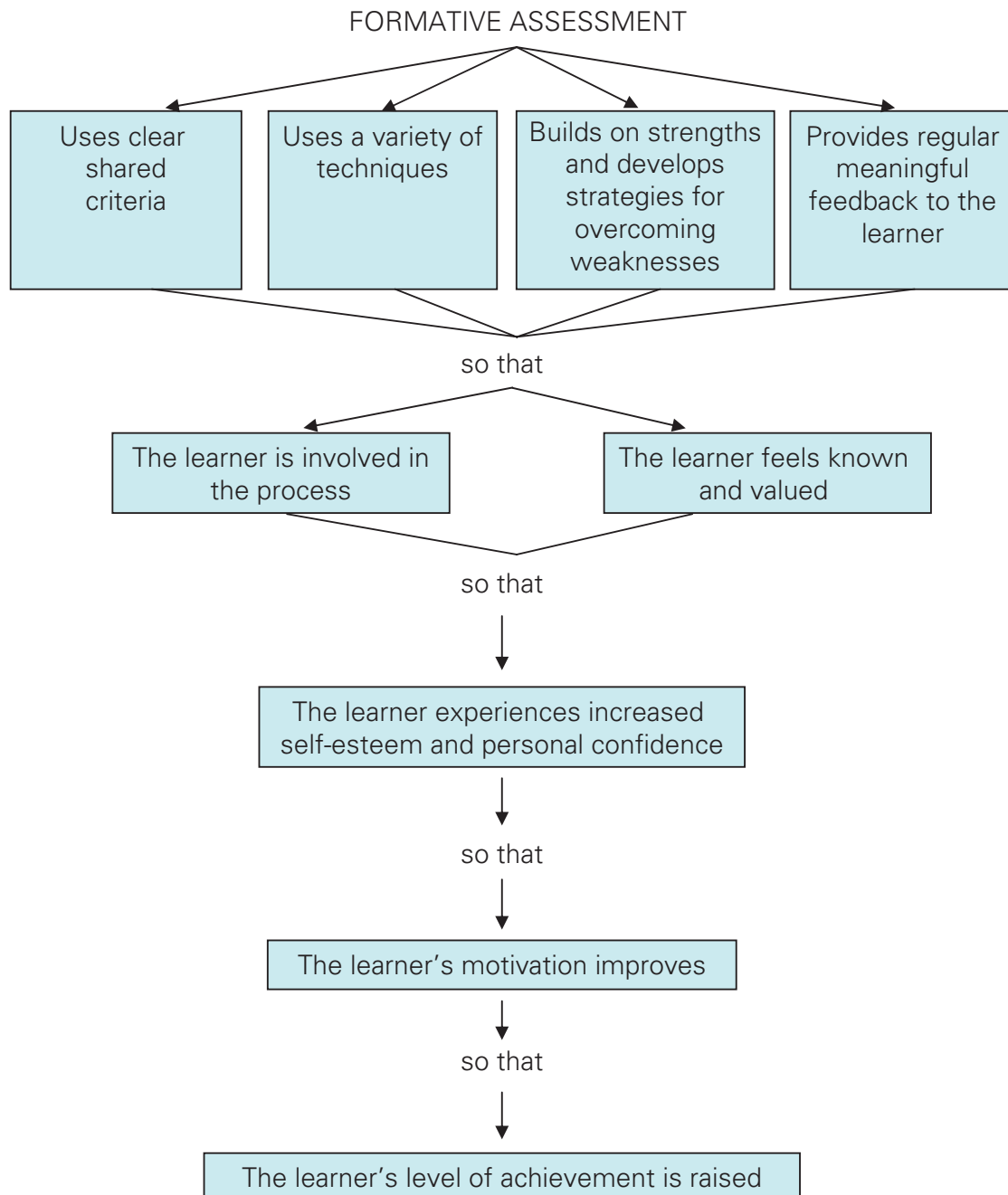
**Formative Evaluation:** to determine whether the action following the diagnosis has resolved the learner's difficulties.

**Summative Evaluation:** to establish what general level of ability the learner has attained in terms of understanding, selecting and applying the knowledge and skills they have been taught. This kind of assessment is used as a means of reporting to other establishments and to parents on the actual attainments of learners.

Formative assessment is the process by which we analyse and review what a learner has learned and how they have learned it. For most teachers this process is inseparable from the actual teaching process in which everyday observations in the classroom can help build up a fully rounded picture of an individual's progress over time. Effective formative assessment involves evaluating learners' progress and making decisions about the next steps that will be required to address their development needs.

## 4.2 Using Formative Assessment to Raise Achievement

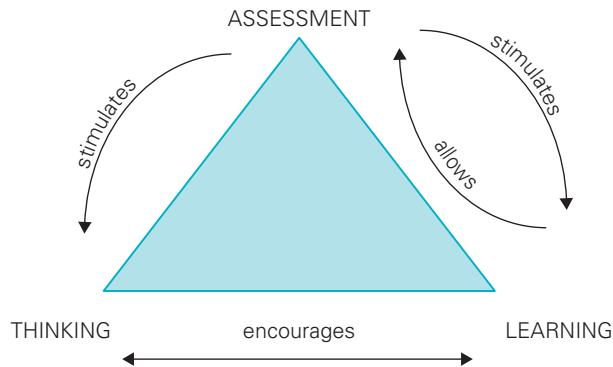
A summary of formative assessment as described so far.



Assessment makes a difference to learning. Furthermore, it can make a positive difference when learners are *actively* involved with their learning.

## The influence of assessment

In Mathematics, thinking, learning and assessment can be linked together in a creative and integrated (combined) way. The figure below attempts to show this relationship.



Thinking encourages learning which allows assessment to take place. In turn, assessment motivates both thinking and learning.

Think back to the earlier sections of this guide and consider how some of the things we have talked about, such as involving learners in their own learning, sharing learning outcomes and creating success criteria, making use of learner-centred learning etc. can be combined with the general and informal kinds of assessment you use in the classroom.

One of the purposes of assessment is to provide information for a variety of audiences.

Below is a summary of when and how assessment can take place.

- During a lesson:
  - direct questioning
  - interaction / discussion
  - observation
- End of lesson: quick revision test (yes/no, etc)
- After lesson:
  - marking work
  - homework task
- End of unit: test or focused task (homework)
- End of year: progress tests/achievement tests

Formative assessment is, therefore, an integral part of teaching and learning and should not be 'bolted on' to activities. It helps to give the curriculum meaning for each learner. Furthermore, it enables each learner's learning to progress at the optimum rate.

Assessment results whether in the short, medium or long term view should give direct information about learners' achievements in relation to objectives. Whether you are considering the steps required to reach a single objective or achievement of objectives over time, they should be **criterion referenced**. (An agreed measurement or standard that needs to be reached – such as the 'success criteria' discussed earlier.)

Such criteria should be clear and well established. The ways in which criteria are set up and used should reflect traceable routes of educational development which offer continuity to a learner's assessment at different ages: assessments should relate to **progression**. At the informal level, for example, you might want to measure how well individuals have grasped the content of a unit or lesson

At a larger scale, say end of year tests, assessment results should be capable of comparison between classes and schools so that colleagues may share a common language and agree standards: assessments should be **moderated**.

Perhaps most importantly, learners should have a role in their own assessment. They should know exactly what is expected of them and also be able to offer a personal view of their performance – this involvement of learners is described fully in sub-section 3.4 Active Learning and further in sub-section 4.2 Using Formative Assessment to Raise Achievement.

#### Learners need to know

- Where they are in their learning
- Where they are going
- How to get there

#### Core principles of formative assessment

- Share learning goals and success criteria, both long term and short term
- Activities must match the learning intentions
- Develop success criteria with learners
- Make the focus of the success criteria *how* they will achieve the learning intention
- Effective questioning needs to fit the purpose, giving learners thinking time
- Learners should be actively involved in self-evaluation

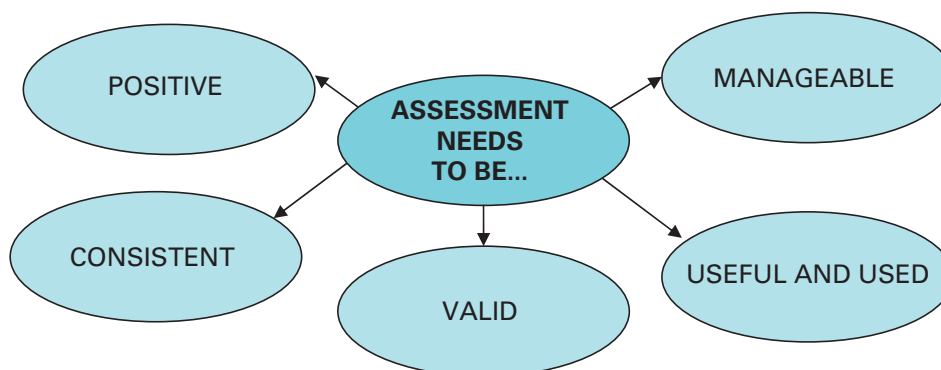
#### Assessment for Learning

'Assessment for learning' brings all of the above ideas together as a conceptual approach. A good working outline of the concept was provided by England's Qualifications and Curriculum Authority. It has become widely accepted and runs as follows:

1. The provision of effective feedback to learners
2. The active involvement of learners in their own learning
3. Adjustment of teaching to take account of the results of assessment
4. Recognition of the profound influence assessment has on the motivation and self esteem of learners, both of which are critical influences on learning
5. The need for learners to be able to assess themselves and understand how to improve

## 4.3 Developing Assessment in the Classroom

This sub-section is concerned with developing strategies for assessment in the classroom. The diagram below shows what assessment should be.



To support development of assessment in the classroom, teachers need to build their own skills and knowledge so that it becomes an integral part of classroom practice. The following training activity enables you to identify the extent to which formative assessment is already being practised in your school.

### Training Activity: Taking Stock of Formative Assessment Skills (Appendix A6)

- Take stock of what formative assessment skills already exist amongst staff – this gives everyone a chance to consider the elements of formative assessment. It is a valuable audit tool.
- You can then complete a summary sheet to show which areas you feel you need to support. (At the same time the audit also provides an opportunity for you to celebrate the skills that staff have developed already.)
- Finally, school managers can use the resulting information from the audit of skills to plan training needs for the whole school – some of these may be met by expertise already in school (shown on the individual summary sheets) or some of these may be met by the provision of an external trainer.

## 4.4 Assessment Techniques

There are many ways to approach formative assessment. You can identify the most appropriate ways at the planning stage and indicate them on your plans.

The amount of assessment that can realistically be carried out will be partially dependent upon the **assessment techniques** chosen and the suitability of the task for assessment. You will need to know that key aspects of the learning have been grasped in order to move on to the



next lesson or unit and you will have to decide on the best techniques for assessing these. Here are two pointers.

Assessment techniques generally fall into two broad categories:

- |         |  |
|---------|--|
| Product | – The learner must work alone for <i>effective</i> assessment to be made and the assessment is made after the task has been completed.   |
| Process | – The learner works alone but the <b>process</b> of learning is assessed and therefore the assessments must be done at the time that learning is taking place.                             |
| or      | The learner works in a collaborative group. Issues arise concerning how to identify the contribution of one learner, especially when the exercise depends on a co-operative effort by all. |

We will look at assessing the *Process* first.

## 1. Question and Answer

### Open and closed questions

**Open questions** – these allow a range of responses, and require the learners to think for themselves, make suggestions and plan appropriately to find answers. They are useful for assessing learners' applied knowledge of Mathematics.

- Higher-order form of questioning
- Requires an extended response
- Answers are generally varied
- Questions are open to interpretation

**Closed questions** – these require definite answers and require very little description or explanation. They are useful for assessing known facts.

- Lower-order form of questioning
- Usually requires only a single word response
- Usually has only a right or wrong answer

### Types of questions

#### **Recall questions**

- Often used at the beginning of a lesson to encourage recall and improve speed
- Can become boring if over-used
- Purpose needs to be clear to the learners
- Assumes that the knowledge is already known
- Requires only a single word response
- Useful to reinforce and assess learning at the end of a lesson

### **Observation questions**

- Used to get learners to see patterns
- Questions will assume some factual knowledge
- Learners are asked to explain or demonstrate something, usually using extended speech
- Usually asked in relation to a series of examples, a chart or a piece of structured apparatus

### **Thought questions**

- Answers tend to be extended
- Pertinent to Problem Solving
- Learners have to relate mathematical operations to real problems and contexts
- Learners need to unravel the Mathematics behind the words
- Learners might be asked to illustrate their explanations by showing an example whilst articulating the answer

Learners will give a better learning response if you:

- Ask fewer better questions

*Two or three well thought out questions are better than ten off the top of the head. Avoid asking questions that require only a 'yes' or 'no' response.*

- Seek better answers

*If there are fewer questions, there is time to invite more responses and allow more thinking time. Work at getting better responses.*

- Encourage learners to ask more questions

*The ability to question is one of the keys to learning well, and it is a skill that has to be learned and practised. Value learners' questions as much as their answers.*

#### **Training Activity: Using Questions Effectively (Appendix A7)**

This exercise may be carried out by groups of teachers to explore the different kinds of questions that teachers might ask. It also helps teachers decide about the kinds of questions they may wish to ask in the classroom. The activity aims to promote discussion between colleagues to improve their expertise.

## **2. Observation**

Think about what we have said concerning active learning and how it gives meaning to knowledge by placing it in the context of a rounded experience. Think also about how this experience and knowledge can be linked to a wider continuum of knowledge by allowing learners to understand where they are on their learning journey.

Learners have different learning styles and active/experiential learning gives you, as the teacher, the opportunity to approach a topic in many different ways at once. It also gives you the opportunity to observe how individual learners learn, which topics they learn best and in what particular way they learn best. This can inform your planning in terms of their development and also in terms of improving your own delivery over time.

Think what makes an impact on a young learner's mind:

seeing? \* thinking? \* hearing? \* feeling? \*

These might translate approximately into:

- practical activity
- investigation
- Problem Solving
- game

You will need to consider *how* any observation is to take place, such as:

### The physical location of the teacher

- The teacher sitting with a group of learners where any participatory role is 'outside' the assessment to be made
- The teacher sitting with a group of learners where the role is passive and understood by the learners – should any intervention be necessary to extend explanations etc., Then it must take place because assessment is not about creating a threatening situation that may prove intimidating for a young mind. It is about being part of a positive learning experience. (The assessment may continue even if adjustments have to be made to the main objective and anticipated outcomes.)
- The teacher sitting away from the learners but in a situation that can fulfil the requirements of the assessment

### The learners being assessed

- Learners must be involved, as with all assessments, with the relevant criteria at the outset of the activity
- Issues concerning collaboration must be addressed positively. As a means of promoting learning, learners need to interact and this should not be dismissed in terms of making valid assessments. Attention may be focused so that these issues are not perceived as a problem but as a positive contribution to the learning process. In this respect, the professional judgement of the teacher plays a crucial role in determining what each learner has achieved

Observation, assessment and planning all support learners' development and learning.

Observation describes the process of watching the learners, listening to them and taking note of what we see and hear. We assess learners' progress by analysing our observations and making decisions about them. We plan for the next steps in learners learning and this will follow from the observations and assessments.

**Techniques 1 and 2** (question and answer, and observation) are of the 'PROCESS' type where concentration on a single learner or small group is required for a short time. The number of assessment decisions is restricted to one or a small number of objectives.

**Technique 3** below is of the PRODUCT type. Much of it can take place outside the classroom. This allows recording of decisions away from the restrictions of the classroom. A larger number of objectives may be tackled. At the same time it must be emphasised that marking work with the learner can be an example of excellent practice.

### 3. Giving Feedback

Feedback may be oral or written

#### a. Oral feedback

Oral feedback is potentially the most effective form of feedback. Getting learners to talk together before answering questions increases their achievement. It is the most natural and frequent feedback experience for learners. The language of the classroom has an enormous impact on the learners, and should create an ethos where speaking freely about learning is positive. Teachers' oral feedback needs to be focused mainly around the learning outcome of the lesson. Feedback can be given to an individual, to a group or to the whole class. Where verbal feedback has been used to give a response to written work the task could be annotated V.F. (verbal feedback) and initialled by the marker.

#### b. Distance marking

Marking should be positive, clear and appropriate in its purpose – it needs to offer positive benefits to staff and learners, and the outcomes need to be fed back into planning. Most effective marking occurs when the work is marked together face-to-face, but if this does not occur and the work is marked away from the learner, the following should be considered:

Can the learners read your comments?

Can the learners understand your comments?

Do you allow them time to read your marking?

Do you allow time for some improvement on the work to be made before moving on to the next activity, or do you expect the learner to be able to transfer your improvement suggestions to another piece of work in a new context?

#### c. Acknowledgement marking

This is a courtesy look at the work, and may include a tick or an initial. It implies that some dialogue took place during the lesson, which will have had an impact on the learner's learning. The acknowledgement simply informs others that the work has been dealt with orally, in a group or whole-class setting.

#### d. Closed Exercise marking

This is where the work is marked together, and therefore fewer examples of the work have been given. Learning is the priority, and misconceptions or errors are shared, and not reinforced. Answer cards may be given to the learners to mark their own work, if it has been differentiated. Where this method has been used in class time the learner marking the work will annotate with their initial.

#### e. Motivational marking

Some learners seek confirmation from the teacher that they are achieving. We need to encourage intrinsic motivation where the learner can identify their own successes first, then celebrate them. As a general rule this marking should be as positive as possible.

#### f. Response partners

This is when two learners discuss their findings, thoughts, ideas or answers together before giving a response to the class or the teacher. They can be paired, in mixed ability or ability groups. It engages all learners in the lesson, develops collaborative and active learning, clarifies thoughts, and makes it a 'safe to talk' environment. It can occur in the introduction, independent work and plenary. A response partner helps you with your work, offers you a reflection on your work and helps you to make your work better.

#### g. Quality marking

This is when success and improvement needs are highlighted against the learning outcome. Asking for some small improvement is rich in its impact on learners' work and their attitude to improvement and learning. This would not take place for every piece of work, and with training and modelling by the teacher, learners can be encouraged to mark their own and each other's work using this approach. This approach can be done orally, especially with younger learners, as well as written.

#### h. Self and peer assessment

Learners should be involved as far as possible in the analysis and constructive criticism of their own work. We should encourage learners to use self evaluation continually, so that reflection, pride in success, modification and improvement become a natural part of the process of learning.

Peer assessment and self assessment is much more than learners marking their own or each other's work. To improve learning, it must be an activity that engages learners with the quality of their work and helps them reflect on how to improve it. Peer assessment enables learners to give each other valuable feedback so they learn from and support each other. It adds a valuable dimension to learning: the opportunity to talk, discuss, explain and challenge each other enables learners to achieve beyond what they can learn unaided. Peer assessment helps develop self assessment which promotes independent learning, helping learners to take increasing responsibility for their own progress.

### Further advice on marking

Time spent giving written feedback must lead to improving the learner's work. Sometimes a frustrating aspect can be when they keep repeating the same errors all the time. Written feedback strategies need to make it quicker and more effective.

Written feedback has other key functions:

It can show what needs to be taught next. Often, the same error may be identified – perhaps this can form the basis of a whole class discussion? Feedback from marking should be planned into the next session. Learners need to become used to feedback as a way of learning. They can often make improvements straightaway to their work.

It also shows teachers how successful their teaching has been – it is easy to identify when a lesson or activity has not contributed to the learning.

A positive outcome is the way that plans for the next lesson will be amended.

### Homework

Homework activities provide learners with the opportunity to practise and extend their skills and knowledge, to develop and extend their methods, techniques and strategies covered in the Mathematics lesson at school.

It is important to remember that not all homework needs to be written work. There are other ways of learners extending or consolidating what has been done in the classroom. You could, for example, ask them to:

- Learn some number facts or multiplication tables by heart
- Play a number or shape game or work on a puzzle. If this was the focus of the work in school, ask the learners to devise their own problem or puzzle
- Do some research, gathering data for use in the next, or following series of lessons
- Take part in an activity that uses the home context, one which could not be done in school, such as measuring a room, or planning new furniture, or drawing an accurate, to scale, plan of a bedroom
- Use information supplied by the family in order to solve a problem
- Prepare their contribution to group work started in school, and to be part of a presentation

Out of class activities need to be short, frequent and relevant as well as varied, interesting and fun.

Used regularly to extend and consolidate learning in class and swiftly responded to with constructive feedback, homework can be an important part of learning, and the efforts made by learners need to be valued.

Feedback can include how the work may be improved as well as recognising improvements already made.

## Keeping journals and portfolios

### Journals

Keeping a Mathematics journal is a means by which learners can record their individual responses to learning objectives. In other words, they carry out some self assessment. In Mathematics, the use of journals where learners record what they can do and the ways in which they tackle problems gives you a clear picture of the way in which an individual has worked things out and what they know, understand or can do. The reasons for keeping journals can be threefold:

- To raise the quality of learning
- To encourage self assessment
- To enable you to find out what the learner has or has not understood.

Various formats can be used for journals, open-ended reflections, responses or prompts. Open-ended reflections can take the form of short pieces of writing in which the learner writes about what has been learnt in the lessons and about their reactions to the activities that they have done during the week. It can also include reflections about their observations and mathematical experiences.

### Benefits of writing

There are definite benefits of writing about Mathematics. Journals allow learners to explore their thoughts and communicate them to another person, as well as to themselves. This communication can be pictorial, graphic or written. Learners' writing provides you with feedback about the content and the level of Mathematics. It is also a means of communication between you and the learners. Writing enables learners to explain concepts and thought processes. Writing fosters creativity and confidence and allows learners to reflect on their own learning.

### Portfolios

Portfolios can be a working record of work completed, which can include homework assignments, journal entries, or in-class work.

#### *Benefits of portfolios:*

Portfolios present a way for learners to self assess their learning. Learners' self assessment can improve confidence in their ability to 'do' Mathematics and allow them to become more independent.

Portfolios give learners an opportunity to pull together what they have learned and to document their progress. Learners do not always include their 'best' work, but can show examples of other work which shows their progression.

## 4.5 Assessment Available from Cambridge

As part of Cambridge Primary, end of stage tests (Progression Tests) are provided for stages 3–6. These are available from the Cambridge Primary support site.

### Progression Tests

These are for use within the classroom to measure the progress of the learners and identify strengths and weaknesses.

The tests are designed to be flexible and can be used to:

**Assess the performance of the learners against the learning objectives in the curriculum framework.** The Progression Tests are produced to precise specifications to ensure a representative coverage of skills and knowledge. The tests assess learning objectives from the entire stage and so should be used when teaching is complete. However, it is preferable that they are used when there is still time left in the term to provide learners with feedback and help them reflect on their achievements and consolidate the year's work.

**Diagnose strengths and weaknesses.** The results of the tests should be fed back to the learners. It is important that they know their strengths as well as being aware of the areas where they are weak. Feedback should always be constructive and should include practical advice on how to improve areas of weakness.

**Examine progress from one year to the next.** The Progression Tests can help you to see whether learners are progressing at a steady rate or better, or worse, than expected. The comparison against an external standard means that even the weakest learners can show progress, which may have been overlooked if these learners were always compared with their stronger peers. Similarly, lower than expected performance in an able learner can be identified and investigated.

**Inform planning.** The results of the tests can be used to reflect on their teaching over the year and promote changes for subsequent years. If there are areas where the entire class appears to be strong or weak, the teacher should consider the strategies used for those areas and adapt them as necessary. The data from the tests will also be of value to the following year's teachers to provide them with information about prior knowledge of the learners entering their classes. Alternatively, it is possible to give the test for the previous stage at the beginning of the next stage to determine the 'starting point' of the learners and identify any areas of weakness that need to be addressed.

**Aid reporting to parents.** The results of the Progression Tests can be combined with the teacher's own observations to produce informative reports to parents. Parents want to know how their learner is doing and the results of the tests provide quantitative evidence of this. Reports should include areas of strength as well as areas where improvement is needed.



## Administering the Progression Tests

You can administer the progression tests through the Cambridge Primary support site (<https://cambridgeprimary.cie.org.uk>). The site allows you to:

- set up different learner groups
- access the Progression Test papers and store marks
- generate reports to track learners' progress by comparing individual results against the rest of the class, the school or other schools around the world
- compare results on a year-by-year basis
- generate reports to help you reflect on your teaching practice, making relevant changes to focus your efforts where they're needed most
- download, print or email your analysis reports to share with other teaching staff and parents
- access your account on different devices

### Making use of the reports

These are useful analyses to gain an overview of the strengths and weaknesses in the whole group. They enable teachers to consider factors that might affect this. It is always a good idea to begin by reviewing the planning for the objectives where the weakness was shown, for example:

- Was a reasonable amount of time allowed for delivering the objectives?
- What do the notes say on the planning following the lessons?
- Was a balance achieved between whole class and differentiated tasks?
- Were there any activities which could be described as favouring either boys or girls (gender bias)?

It may be that the planning check alone does not directly reveal the possible reasons for any weaknesses shown in the reports. If this is the case, we need to consider the response of the learners and their performance in class. This could still lead back to planning.

It is possible that the content of a lesson was too difficult for some learners. If so, some amendments should be made to the original plans. Doing this does increase pressure on 'finishing' the set of lessons for the objectives in question. However, time spent revising materials can save time when new objectives are introduced because they will be delivered on a firmer base of understanding.

It is also important to check the areas that were strengths because some 'extra' time could be gained by reducing the input for these areas. This has to be carefully judged as you do not want to reduce the standard in those areas.

A content review for areas of weakness may show that the chosen activities were not as stimulating as others. This will affect learners' responses quite significantly.

All of this analysis will provide information that can help you improve the planning and teaching for the following year. Although groups of learners will vary from year to year - the review process needs to be ongoing to allow learners to gain a firm grasp of concepts and methods and should not be seen as a procedure that simply follows the tests.

The tests assess learning objectives from the entire stage and so should be used when teaching nears completion. Lessons following the test period will need careful planning so that learners can target the particular weaknesses identified in the reports. Differentiation is the key to the success of these lessons. The reports may show similar problems for groups of learners which will help with organisation – groupings created for this may change from lesson to lesson. Using adult support is essential.

More able learners can have a set of lessons prepared that extend their skills and understanding whilst ensuring that their areas of weakness are picked up as well.

Learners can have their own set of targets. These should be set up as part of regular practice in class. Setting up success criteria will support this as well as other self assessment tools so that learners are involved at all times.

For target-setting to be successful targets should be **S**pecific, **M**easurable, **A**chievable, **R**ealistic and **T**ime-bound (i.e. SMART). They also need to focus upon key priorities.

### Cambridge Primary Checkpoint

Cambridge Primary Checkpoint are additional (end of Primary) tests available to Cambridge Primary schools. These are intended for learners at the end of their final year of primary education, when they are around 11 years old. They provide an assessment for learning objectives from stages 4–6 of the curriculum framework.

They provide a form of detailed, diagnostic feedback that is a central feature of Cambridge Primary Checkpoint.

The feedback has two main purposes:

- It provides information on learners' areas of strength and weakness, which can be used **formatively** for future teaching. Strengths can be consolidated and the areas of weakness can be tackled
- It can be used to review the parts of the curriculum where teaching has been most effective and the parts where it has been less effective.

Feedback is provided at the level of individual learners, teaching groups and whole school.

Details about Cambridge Primary Checkpoint (including specimen papers) are available from [www.cie.org.uk](http://www.cie.org.uk)

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## SECTION 5: INFORMATION COMMUNICATION TECHNOLOGY AND MATHEMATICS

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ICT is a valuable resource which should be used appropriately to help develop learners' knowledge and understanding in their study of Mathematics. It is important, however, to consider where ICT may add value to the learning over other non-ICT resources.

### Planning

As with all planning, start with the objectives.

ICT should enhance good Mathematics teaching. It should be used in lessons only if it supports good practice in teaching Mathematics. The whole range of ICT can be used in various ways to meet two important goals in the teaching of Mathematics:

- To support your teaching
- To motivate learners' learning

Before making any decision about using ICT in a lesson or a series of lessons, some questions need to be addressed:

- Is it directly related to the teaching and learning objectives for that lesson?
- Can the teacher and/or the learners achieve something more effectively with it than without it? Look at the skills/knowledge required by a learning objective and think what activity would best deliver the objective. Does using ICT add any value to the outcome of this activity?
- Beware of creative software instead of creative learners. Does the ICT being used enhance and encourage creativity in learners?
- How does the ICT being used allow all learning styles to access it?
- Is it suitable for whole class, small group or individual work?
- Does it allow learners to discuss their learning?
- Is it only addressing passive learning?
- Does it allow for active learning? Are the learners in control?

Teachers should be able to choose and use the most suitable and most effective resources, including ICT, to meet their teaching objectives.

The right ICT resources can help teaching and learning Mathematics in several ways including:

- Exploring, describing and explaining number patterns
- Practising and consolidating number skills
- Exploring patterns in data
- Estimating and comparing measures of distance, angle, time
- Experimenting with properties of shapes and geometric patterns
- Developing mathematical vocabulary, logical thinking and Problem Solving skills

Depending on the learning objectives and the grouping of the class, different ICT resources can be used more effectively than others. Some are more suitable for whole class teaching, whilst others can be used with small groups.

For instance:

A digital camera can be used by learners of all ages and abilities to take pictures to show examples of pattern or shape in the environment. This could be useful when devising a Mathematics trail round the classroom, school or outside area. Back in school, these pictures can be looked at in more detail in close-up using a graphics package.

A floor robot can be used by learners of all ages and abilities. The teacher can work with groups of learners, setting them a challenge of working on a series of instructions to move the robot along a straight path or around a course. Learners can then change and modify the instructions as necessary. Some learners may be asked to record the instructions for other groups to use.

Calculators can be very basic for younger learners or more complex for older learners. They can be used for early number and pattern work through to a teacher working with the class to support the teaching of decimals and fractions.

An interactive whiteboard allows the whole class to be part of the activity. For instance, a teacher may want to discuss and demonstrate the pattern of the numbers containing the digit 5 using first a 1–100 grid, then a 101–200 grid.

Using a computer programme a teacher can provide electronic images to help learners develop their understanding of place value or of square or triangular numbers.

An audio cassette tape can be used with the whole class or a smaller group to reinforce work done on times tables. This pre-taped audio cassette tape of a 'times-table rap' can then be used for them to listen to, using headphones plugged into a tape recorder.

Television broadcasts allow the whole class to watch a Mathematics programme on specific areas.

The internet can be used by groups of learners in order to log on to the Teletext website for up-to-date weather information. They can then record the average, maximum and minimum daily temperatures and the weather forecasts for their home city or a holiday destination and compare the two sets of data.

A video camera can be set up to record data of birds visiting a bird table over a period of time. The teacher then plays back the video and the learners use tally sheets, and then a block graph, to represent the data gathered. A video camera can also be used by learners as a way of communicating their learning during a presentation at the end of a lesson.

Sensors connected to a computer can measure changes in ambient light and temperature over 12 hours. After that time, the teacher can ask the learners to look at the data in graph form and suggest explanations for any changes, encouraging them to look for and explain connections between the changes in the different sets of data.

Flash movie is more suitable to group work where the teacher works with a group of up to six learners at the computer using the 'Sorting 2D Shapes' Flash program to discuss properties of shape. The learners use the computer to help them sort shapes.

An OHP calculator can be used with the whole class and can be used to support the teaching and learning of basic number pattern work through to decimals and fractions, for example.

An audio cassette recorder can be used with the whole class for listening to number songs and rhymes.

### Opportunities for ICT in the Cambridge Primary Mathematics Framework

Appendix D of this guide lists ICT opportunities and suggestions for use within Mathematics.

## SECTION 6: THE LEARNING ENVIRONMENT

### 6.1 Classroom Organisation

There are many different ways of organising the classroom when teaching Mathematics. Over time, a mix of all the approaches outlined below will prove suitable – depending on the nature of the work being undertaken, available resources (including time), the abilities of the learners, and your personal preference.

#### Strategies for the Effective Management of Learning

Classroom Organisation	Advantages	Limitations
<b>Whole Class Teaching</b> Discussion Demonstration Watching DVD/TV	Easy to organise. Economical in terms of resources required.	No opportunities for first-hand experience. Not matched to the learners' abilities. Difficult to involve the whole class.
<b>Practical Work</b> Learners work in small groups doing similar tasks. Resource demands are known.	Easy to plan ahead. Provides opportunities for first-hand experiences. May need a lot of equipment. Can be matched to the learners abilities. Easy to compare observations between groups. Facilitates easy record-keeping.	Follow-up may prove difficult.
<b>Circus of Activities</b> Small groups of learners rotate around classroom during the lesson, trying out a variety of activities.	Easy to plan ahead. Offers opportunities for first-hand experiences. Less demanding in terms of resources.	Activities cannot be sequential. Assumes equal time for all activities and all groups. Makes record-keeping more difficult.

Classroom Organisation	Advantages	Limitations
<b>Thematic Approach</b> Small groups work independently to contribute to the whole theme or topic.	Learners work at their own pace. Provides opportunities for first-hand experience. Leads to good communication.	Difficult to arrange a balanced experience of science. Difficult to ensure coherence. Difficult to ensure that the rest of the class understand.
<b>Individual Topics</b> Individuals or small groups work on items selected by themselves.	High motivation. First-hand experience. Learners work to own potential.	Demanding on teacher. Structured framework necessary. Allows for mixed ability groups. Stretches resources.

It is at your discretion to choose which of the above approaches will best suit the learning situation for the lesson planned. This will enable the classroom to be managed, with learning opportunities facilitated in different ways – according to desired outcome.

Once the organisational method has been chosen, it is important for you to then decide how you will support, guide and assess during the session and to identify this in the lesson plan for each session.

### How can I support learners during an activity?

This needs to form the basis of your lesson plan.

Here is a list of things to think about when planning

#### Can I support and guide by:

- Working 1:1 with an individual
- Working with a small ability group and asking relevant questions to scaffold their thinking
- Differentiating work by giving different groups different outcomes to work to
- Organising them to work in mixed-ability groups, where mutual support can be given
- Providing appropriate worksheets/recording sheets to facilitate easier recording
- Giving groups different activities
- Using any other available adults to work alongside particular individuals/groups
- Moving between groups and acting as facilitator
- Challenging more able learners to extend their thinking

### Can I assess by:

- Observing and recording individual responses
- Questioning a particular group, e.g. boys, middle ability learners
- Giving immediate verbal feedback
- Giving written feedback on their work
- Setting questions in the same context and asking them to apply what they have learned in a new situation
- Giving a formal test

These decisions need to be included in your lesson plan so that any other adult who needs to be involved in the lesson can be included and is made aware of their role.

## 6.2 Creating a Positive Atmosphere

All of the above should set the classroom scene. Your role is to create the atmosphere in the classroom which is central to everything that happens to promote teaching and learning.

Teaching approaches should be consistent. Learners will struggle to engage in active learning where they work with talk partners and groups if they are usually discouraged from talking. Creative thinking would be difficult in a classroom where this is not encouraged. Working as a group is not easy if learners are used to working individually.

Excellent active learning activities resulting in such positive assessment practices will not take place in a 'non-productive' atmosphere.

The best assessment for learning will happen where you create an environment where everyone is comfortable and familiar with routines. Learners will respond to all kinds of activities if the atmosphere is one that encourages them to participate fully in developing their learning.

Your role will be to:

- Ensure that learners take an active role in the learning process
- Show appreciation of everyone's ideas
- Encourage learners to give good reasons for their ideas
- Involve everyone in discussions
- Inspire confidence in learners to test their own ideas
- Make sure learners have enough time to explore ideas properly
- Help learners to work together and share their ideas with others and to appreciate the ideas of others
- Encourage learners to make their own decisions
- Use varied questioning techniques and encourage learners to think of their own questions
- Make learning Mathematics enjoyable and fun



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## SECTION 7: SUPPORT AND RESOURCES

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### 7.1 Resources from Cambridge

Cambridge Primary centres receive access to a range of resources when they register. The Cambridge Primary support site (<https://cambridgeprimary.cie.org.uk>) is a password protected website that is the source of the majority of Cambridge-produced resources for the programme. Included on this website are:

- Curriculum Framework
- Progression Tests and analysis tools (see Section 4)
- Schemes of Work – these give a recommended course outline where teaching objectives are organised into a recommended teaching order. A brief outline of activities to achieve these objectives is provided. Some resources are recommended here
- Editable versions of the planning templates in this guide

### 7.2 Training Available from Cambridge

#### Online Training Opportunities

An online introductory course is available free to Cambridge Primary centres. Details including the enrolment key and instructions on how to access the course are sent to the main Cambridge Primary Co-ordinator at your centre upon registration and are also available from the Cambridge Primary support site. The course is self-study and as such can be completed at any time when you first register for Cambridge Primary. It provides an introduction to Cambridge Primary, the Cambridge educational philosophy and the services and resources available to Cambridge Primary centres.

Additional online tutor-led courses are also available. These courses will be advertised on the events page of the Cambridge public website at [www.cie.org.uk](http://www.cie.org.uk) as they become available through the year.

#### Face-to-face Training Opportunities

Face-to-face training is available in the form of workshops and lectures covering structure, planning and teaching strategies. To see what training courses are currently available in your region go to [www.cie.org.uk/events](http://www.cie.org.uk/events)

You can email Customer Services via [info@cie.org.uk](mailto:info@cie.org.uk) or call us on +44 1223 553554 or on 01223 553554 if you are in the UK.

If you would like to discuss bespoke training please contact our Training Services Team at [trainingservices@cie.org.uk](mailto:trainingservices@cie.org.uk). Bespoke training events can be arranged for either individual schools or for a collaboration of schools in a particular region. Please be aware that prices for bespoke training (beyond a basic minimum charge) will be negotiated on an individual basis according to requirements.

## 7.3 Support with Administration for Primary Checkpoint

There are three key documents that will be sent to your Cambridge Primary Administrator on an annual basis.

- Handbook for Centres
- Cambridge Primary Checkpoint Administrative Guide
- Procedures for the Submission of Entries booklet

These documents are made available on CIE Direct.

**CIE Direct** <https://direct.cie.org.uk> is the online tool for Cambridge Exams Officers and Administrators and can be used to submit and amend Cambridge Primary Checkpoint entries.

## 7.4 Enquiries

### Ask CIE

Ask CIE is an online bank of answers to frequently asked questions about Cambridge examinations and services. The next time you have a question about administering Cambridge examinations, just go to Ask CIE. Simply type your question into the search box, or use the menu to guide you. There is also a Noticeboard on the Ask CIE homepage to alert you to important announcements. You can find Ask CIE on our website at [www.cie.org.uk](http://www.cie.org.uk), or go direct to [ask.cie.org.uk](http://ask.cie.org.uk).

### Customer Services

You can also email us via [info@cie.org.uk](mailto:info@cie.org.uk) or call us on +44 1223 553554 or on 01223 553554 if you are in the UK.

## 7.5 Resources Recommended by Cambridge

The Cambridge Primary support site gives details of materials currently endorsed or recommended by Cambridge. These materials have been approved to support the delivery of the Mathematics framework and their content has been checked against the framework. Recommended schemes are useful as a set of resources from which teachers can select appropriate activities. Endorsed schemes are able to support Cambridge Primary comprehensively in all aspects. As publishers create new or updated materials, we review them and list these items on the website. Please note these items must be bought direct from the publisher or from a bookseller.

## 7.6 A Further Note on Mathematics Resources

Resources used both in the classroom and at home need to be ordered and attractive. All learners need to be able to access the resource. If a resource presents a barrier to learning it needs to be changed or adapted.

The learning environment needs to be well organised, safe, interesting and comfortable. ICT and visual aids need to be used imaginatively. It is the learners we want to be creative and imaginative. Some ICT resources take this away from the learner as they themselves are creative and imaginative without allowing much, if any, learner participation.

Resources need to be diverse and relevant to the learning and the objective. They need to be of a high quality so that learners use and respect them.

Resources can support, assist and, importantly, extend learning.

Resources need to be accessible to all learners in order for them to play a positive part in learning.

To promote wider access it is recommended that you use different types of activities and resources employing different senses to give a rounded learning experience.

For instance:

Visual activities:

- Drawing graphs and charts
- Taking notes and making lists
- Using highlighters which allow them to circle or underline important words or phrases
- Watching videos
- Using or watching demonstrations

Auditory activities:

- Using word association to remember facts
- Participating in group discussions

Kinaesthetic activities:

- Studying in short blocks
- Role playing
- Studying with others
- Using memory games

Some examples of resources can be found on the following pages.

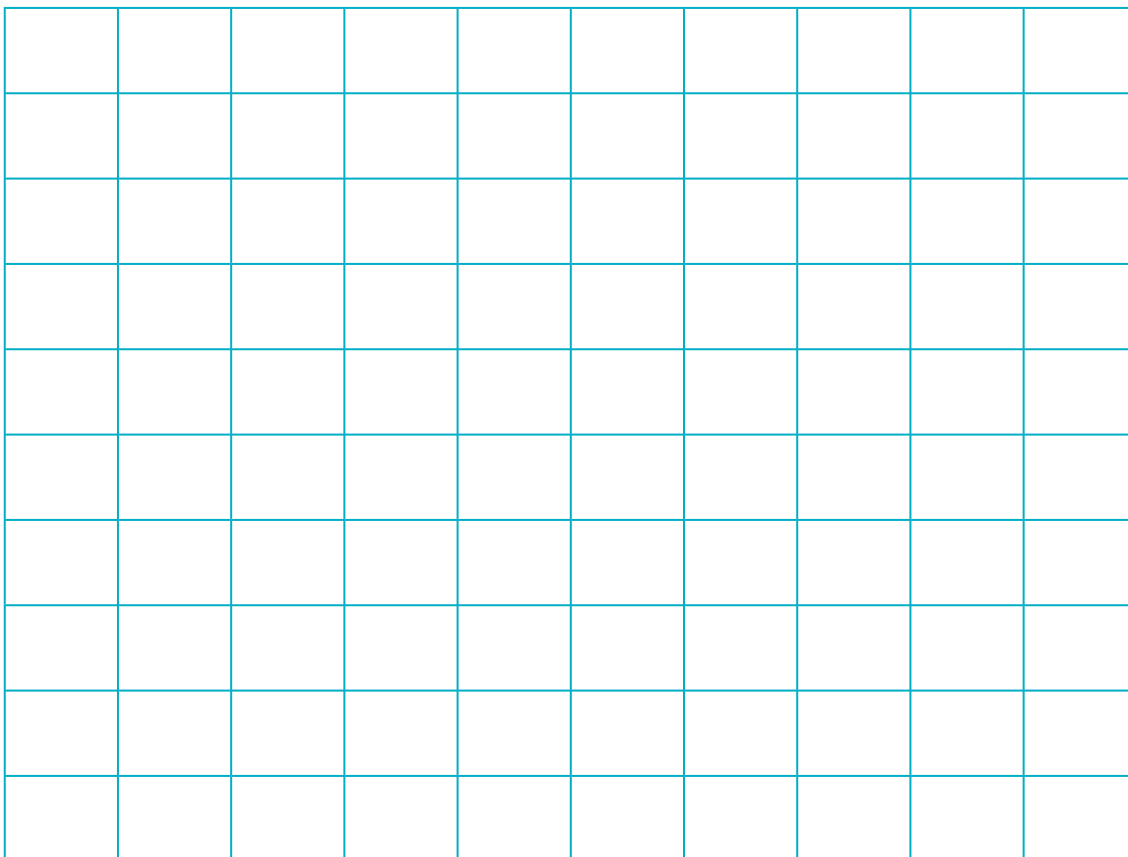
The following resources are easily made and suit a range of learners.

### 100 square

The use of 100 square will enable all learners to access the learning. Some may need to use it as support for longer than others. The idea of the activities is to encourage learners eventually to make it into a mental rather than a practical resource.

A large 100 square displayed so that learners can touch it is essential for work on computation, developing mental methods and pattern. There are different types of 100 squares: fabric where the numbers are placed in pockets; those fixed to a wall; lightweight and movable. It is also worth thinking about smaller 100 squares that can be placed on a table top, so that those learners who need extra support have easy access.

You can also make and use a multiplication grid and a percentage grid from the basic empty 100 square.



<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>
<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>
<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>80</b>
<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>	<b>85</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>
<b>91</b>	<b>92</b>	<b>93</b>	<b>94</b>	<b>95</b>	<b>96</b>	<b>97</b>	<b>98</b>	<b>99</b>	<b>100</b>

#### Activities:

1. Look, see and say: ask the learners to look at the square and say anything they notice, whether it be sequences, patterns or something else. Record on the board all the contributions ready for discussion later. Some learners may look at the diagonal patterns, whilst others look at vertical and horizontal. Build on the ideas that you think are most important and which you want to take further in your teaching
2. Before the learners come into the lesson remove or cover some of the numbers on the 100 square. Ask learners to work in pairs to find the missing number. How do they know? What clues did they use? Did all the learners use the same strategies?
3. Before the learners come into the classroom change some of the numbers around. Can they spot the mistakes? How did they know? What clues did they use?

4. Put your finger on a number on the top row. Count on 10. What do you notice about the number you landed on? (It's below the start number.) Will that always work? Try another number. Give some learners cubes or counters to place on their start and finish number to make the activity more visual
5. Start on any number and count back 10. What do you notice? Will that always happen?
6. Play a game of starting on a number and adding or subtracting 10 each time. As learners become more confident, go faster. Did they all end up on the same number?
7. Repeat the activity adding and subtracting 9 and 11. What do they notice each time?

The more these activities are done, the more the hundred square will become a mental image for most learners. After a while most will not need it, and will be able to use the mental image to calculate mentally.

1. Find a pathway moving horizontally and/or vertically between 2 numbers that total 56. Gather and record responses. How many different pairs of numbers could there be? Change the number and challenge the class to find as many ways as possible. This is a good team game or for pairs
2. Find a diagonal pathway using 2 numbers that total 105. Repeat the activity as above
3. Find a pathway using 3 diagonal numbers for 105. Is it possible? How do you know? How many different numbers as a set of 3 can you find?
4. Try a zigzag pathway in order to total 130. How many different ways are there? Ask learners to choose their own numbers and investigate different ways of finding totals
5. Jigsaw 100 square: cut out shapes from 100 square. Each piece should have between 7 and 10 squares. Ask the learners to write down all the numbers that would touch their square. Learners can then cut their own shapes for others to try. Some learners may need a smaller 100 square as support

#### Patterns on the number square:

1. Choose any  $3 \times 3$  square from the number square and add the four corner numbers. Is the total always the same for any  $3 \times 3$  square? Investigate. What happens if you add the four middle numbers on each side? Does that always happen? How do you know?
2. How many other ways can you get the same total by adding 4 numbers from your  $3 \times 3$  square?
3. Is it possible to predict the total for any  $3 \times 3$  square without adding the four corner numbers? How do you know?
4. How many different ways is it possible to add 4 numbers in a  $4 \times 4$  square so that their total equals the sum of the 4 corners?
5. Look at a  $2 \times 2$  square in the 100 square. Total the diagonal numbers. What do you notice? Try with a different  $2 \times 2$  square. Does the same thing happen? Will it always happen? Why?

6. Look at a  $3 \times 3$  square. Add the diagonal corners. What do you notice? Does it have any connection with the centre number?
7. Try with other  $3 \times 3$  squares
8. Using a  $3 \times 3$  square from the 10 square add the 4 corner numbers. Is there a relationship between the total and the centre number? Try with other  $3 \times 3$  squares. Does that always happen? Why?

### The digital route 100 square

The digit root of a number is found by adding together the digits of the number, then continuing the process until only 1 digit remains.

1. Rewrite the 100 square as a digit route square. What do you notice about the numbers in the digit route square? Join all the 2s. What do you notice?
2. On another digit route square join all the 3s. What do you notice?
3. Try with different numbers

### Eratosthenes Sieve

Eratosthenes was a Greek scientist who discovered something interesting about numbers.

1. Using the 100 square, ring the number 2, then count on in 2s crossing out each number in the 2s pattern as you go
2. Put a ring round the number 3, then count on in 3s crossing out each number in the 3s pattern
3. Look for the next number which has not been crossed out. Put a ring around this number and count on in steps of that number, crossing out AS BEFORE
4. Continue until you have covered all of the 100 square. What do you notice about the numbers that are circled?
5. What if you did the next 100 square which starts at 101? What do you think would happen? How do you know?

### Calculating on the 100 square

1. Throw 2 dice and make the largest number with the 2 digits. Place a counter on that number. Using a set of instructions, learners record the additions and subtractions that they do, e.g. add 10, add 20, subtract 10, subtract 20, add 9, add 11, subtract 9, subtract 11
2. Ask learners to think of other moves that they could make and record
3. Throw  $2 \times 1-6$  dice and make the smallest number with the 2 digits. Place a counter on that number and add the 2 numbers that are in the squares immediately above and below. Record the calculation. Do several examples. What do the learners notice? Can they explain?

4. Throw 2 x 1–6 dice and make the smallest number. Place a counter on that number and add the numbers immediately to the left and right of the covered number. Record the calculation and the start number. Do several examples. What do the learners notice? Can they explain?
5. Throw 2 x 1–6 dice and make the smallest number. Place a counter on the number and add the 4 vertical and horizontal numbers. Record the start number and the calculation. Do several examples. What do the learners notice? Can they explain?
6. Throw 2x 1–6 dice and make the smallest number. Place a counter on the number and add the 4 numbers that touch on the diagonal. Record the starting number and the calculation. Do several examples. What do the learners notice? Can they explain?
7. Throw 2x 1–6 dice and make the smallest number from the 2 digits. Place a counter on that number and add the 8 surrounding numbers. Do several examples. What do the learners notice? Can they explain?
8. Throw 2x 1–6 dice. Make the largest and the smallest numbers for the 2 digits and place a counter on each. Work out the difference between the 2 numbers by counting up or down on the 100 square. Do several examples. What do the learners notice? Can they explain?

## Number line resources

### The Empty Number Line

The empty number line is a resource that can be used to help develop mental calculation.

The line has no markings or scale; it does not need to be drawn neatly with a ruler. It does not matter which way up it is; it can be vertical or horizontal. The empty number line is used to provide a mental image which can be used to develop learners' thinking about the structure of numbers. It can be used with whole numbers, negative numbers, fractions or decimals.

The empty number line is flexible in that it can be drawn quickly and easily anywhere, and can provide visual support for those learners who need it. It is an excellent way for learners to record their mathematical thinking; it can be used effectively by younger learners who are just beginning to record their Mathematics, through to older learners needing a calculation method for more complex Mathematics.

Table top number lines, marked and unmarked, can also be provided for individual use.

### Digit cards



Each learner needs their own set of digit cards of 0 – 9. These can be used as a visual response to questions in a whole class or group setting. They can also be manipulated in individual or



pair activities. They are a useful aid to 'Show me' activities for both odd and even numbers, multiples and factors. Show me a 2 digit number; show me a 2 digit odd number; show me a multiple of 3; show me a number less than 43; show me a prime number; show me a number 10 more than 12.

#### Place value (arrow) cards



Place value cards are a set of cards which provide a visual image of place value. They are made up of overlapping cards of different lengths, which can be placed one over another to show what each digit in a 2 or 3 digit number represents. There are 9 cards printed with multiples of 100, from 100 – 900, 9 with multiples of 10 from 10 – 90 and 10 with 0–9. For some learners each set of cards can be a different colour so that they are more easily recognised. Other learners can work with cards showing higher values. Again, these are useful not only for reinforcing place value, but also for 'Show me' activities using both open and closed questions.

#### Target boards

17	10	7	19	25
8	31	46	6	37
14	3	12	41	28
29	5	11	51	13

A target board is a resource for numeracy that is very simple to use and very versatile. Reach target board is a collection of numbers (whole, decimal, fraction, money, length, capacity). Learners are asked to consider different mathematical relationships between the numbers on the board. They can be used with the whole class, groups, pairs or individuals. Effective questioning will involve the teacher using a range of both open and closed questions.

There are 3 main target board activities although both you and the learners may think of others!

1. Using a target number
2. Having a mystery number
3. Asking a range of questions about the numbers covering different topics

For example, using the board above:

Using a target number.

The target number is 27:

Point to different numbers on the target board and ask 'How can I get to my target number?'

Pointing to 17 the response can be 'add on 8' or 'add 3 and 5', or 'add 14, subtract 6' and so on. Only numbers shown on the board can be used.

Having a mystery number.

Today's mystery number is:

A multiple of 5 and has a digit sum of 7. It's 2 more than a prime number. (25)

Topic questions

Topic: Counting and properties of numbers

Vocabulary: Odd, even, multiple of, factor of, prime number, square number and so on.

Tell me an odd number.

How many even numbers? What are they? How do you know?

Which numbers are factors of 12?

Which numbers are multiples of 7?

Is there a number which is odd and square?

What is the relationship between the numbers 19, 25 and 6? Can you find other sets of numbers where there is a relationship?


They can also be used for learners to devise their own numbers and questions which can be used with the class.

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## **APPENDIX A: TEACHER TRAINING ACTIVITIES**

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The following pages include training activities referred to throughout the guide.

A1 Agreeing Terminology

A2 Producing a Lesson Plan Format

A3 Preparing and Delivering a Lesson

A4 Sharing Learning Intentions

A5 Creating Success Criteria with Learners

A6 Taking Stock of Formative Assessment Skills

A7 Using Questions Effectively

## Training Activity A1: Agreeing Terminology

Workshop session to agree terminology.

This is a very short activity which should lead towards a discussion that reaches an understanding of the different levels of planning:

### Objectives:

To identify different levels of planning.

To identify their purpose.

To obtain an oversight of different terminology.

### Instructions:

Explain activity using Training Activity A1: Handout sheet (photocopiable overleaf)

- Consider all of the terms used in planning and display them
  - e.g. long-term
  - medium-term
  - short-term
  - scheme of work
  - unit of work
  - framework
  - lesson plan
- Individuals or groups use the sheet to make notes identifying different planning levels and terminology and what they mean
- Discuss at end to reach agreement

The value of this activity is in working through the task and not so much the outcome. The discussion will make the levels of planning clearer.

At the end, leaders of the activity may wish to share the definitions as given in this guide. A shared understanding will make the guide easier to follow.

## Training Activity A1: Handout

### Objectives:

- To identify different levels of planning
- To identify their purpose
- To obtain an oversight of different terminology

#### Long Term Planning

#### Medium Term Planning

#### Short Term Planning

## Training Activity A2: Producing a Lesson Plan Format

### Objective:

To produce a format for lesson plans.

### Instructions:

- Handout 1: invite colleagues to list as many of the areas they think should be included on a lesson plan as possible
- Collate ideas on flip chart to gain some kind of consensus
- On A4 paper work out a possible format to include all of vital material
- Distribute Handout 2 with more details either during activity or as part of plenary
- Distribute Handout 3 as a sample format following discussion

### Possible inclusions that may be suggested:

Objective(s)

Success criteria – statements that support assessment (whether or not an objective has been achieved – see Section on Assessment)

Activity (ies)

Organisation

Any special arrangements/groups

Roles of different adults (including teacher)

Resources etc.

## Training Activity A2: Handout 1

### Objective:

To produce a format for lesson plans.

### LESSON PLAN FORMAT

#### WHAT SHOULD IT INCLUDE?

- 
- 
- 
- 
- 
- 
- 
- 
- 

### What could it look like?

Design a format for lesson plans. Include all of the appropriate headings and spaces for completion.

## Training Activity 2: Handout 2

### Information for formatting short term plans

Activity/lesson plans (for a single lesson or related lessons in a subject, taught over the course of a week) should show:

- Detail of the planned activity, including points to be covered by the teacher in introducing tasks and supporting the learners' learning during and after each lesson
- Key questions to be covered/addressed during each activity
- A breakdown of specific tasks in detail (steps the learners need to go through, rather than the overall activity)
- Differentiation and grouping of the learners, and any relevant staffing details
- Details showing how the lesson(s) will link to existing provision for special educational needs, such as learning support assistants or individual education plans
- Information about hours needed for the activity
- Resources needed for the activity
- Learning objectives
- Expected learning outcomes
- Success criteria – descriptions / statements to measure whether the learning objective has been achieved
- Assessment opportunities
- Space for notes about specific group or individual performances

Annotating the short-term plan should also support the teacher in preparing subsequent activities in the medium term plan, in response to the learners' performances or the outcomes of the task



Training Activity A2: Handout 3

Week beginning:		UNIT:		CLASS:	
Timing	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of Achievement
Framework Ref:			Description		
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)			<b>Notes / extension opportunities / homework</b>		
			<b>O&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work		

## Training Activity A3: Preparing and Delivering a Lesson

### Instructions:

*This is a motivational exercise to share experience and build confidence.*

### Objective:

*Distribute sticky labels or 'Post It' notes. Ask colleagues to think of all of the different things they do when preparing and delivering a lesson. Invite them to write each one on a separate label or note and stick it on a large sheet of paper displayed for all to see. The following discussion can be very entertaining but it has a serious side too in recognising all of the skills that a teacher has to practise in the classroom. . . .*

The list below is just a sample that might come from Activity 3.

They are not presented in order of importance:

- Preparing lessons / resources
- Instructing a class
- Letting learners talk
- Making tasks accessible to all
- Sharing achievements
- Giving praise and rewards
- Asking questions
- Setting tasks
- Marking work
- Leading discussions
- Sharing learning intentions (objectives)
- Setting homework
- Setting targets
- Letting learners take the lead
- Observing learners
- Discussing with groups
- Discussing with individuals
- Helping an individual
- Explaining things
- Answering questions
- Offering reassurance

The list can go on and on.

It is possible that all of the above could occur during one lesson. Good management of time, resources and, most important of all, the learners can make it all happen!

## Training Activity A4: Sharing Learning Intentions

### Objectives:

- To learn how to convert a range of learning objectives into child-friendly language
- To learn how to write appropriate success criteria
- To be made aware of the many ways in which learning intentions can be presented to learners

### Instructions:

1 Refer back to page 32 in Section 3: Teaching Approaches. Select a range of learning objectives from the curriculum framework that clearly represent the following categories of activity:

- To know
- To understand
- To be able to
- To be aware of

2 Ask teachers to re-word these objectives using child-friendly terms.

3 Refer back to pages 33 and 34 of Section 3: Teaching Approaches and ask teachers to suggest appropriate success criteria for each objective.

4 Give out Handouts 1 and 2. Ask teachers to suggest a range of methods in which learning intentions can be presented to a whole class, differentiated groups, younger and older learners etc. A list of possible methods can be found below.

- Verbally – not always as successful as a visual method which remains available throughout the session
- Writing on a black/whiteboard/flipchart – the simplest way (older learners may copy this into their books/working sheets)
- Completing a chart and displaying for all to see
- Saving it on a computer for display on an interactive whiteboard
- Having a set of pre-printed sticky labels for each learner's book – useful for younger learners
- Write on an individual or group sheet to display on the desk (good where tasks are differentiated and objectives are different)

Charts or posters might look like something like those suggested in Handouts 1 and 2.

Training Activity A4: Handout 1

*Today we are learning to*

*write learning intention here*

*We'll know we've done this because*



*list success criteria here*

Training Activity A4: Handout 2

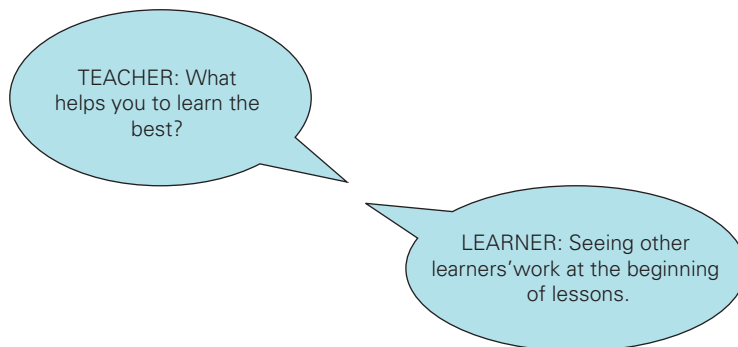
Learning  
Intention

*A more formal approach may  
appeal to older learners*

*We will know we have achieved this because. . .*

Success  
Criteria

## Training Activity A5: Creating Success Criteria with Learners



### Objective:

To plan and deliver a lesson in which learners write their own success criteria.

### Instructions:

#### Stage 1: Planning

- Learning objectives selected
- Create own estimation of success criteria
- Prepare samples of previous work – good and not so good  
*e.g. writing; artwork; photographs; 3D objects; video clips of P.E., games, drama*
- Plan good (open) questions that will get learners (in talk partners) thinking and discussing the subject matter of the learning intention. (Responses may reveal some misconceptions)

#### Stage 2: Lesson Delivery

- Introduce lesson
- Give task instructions
- Share learning intention
- Ask questions to promote discussion – record success criteria
- Share work samples: what can you see? Compare and check against list . . . this may add or subtract items
- Display the agreed list in ways already described
- Learners work on task referring to criteria as they work
- Invite learners to share work with class/talk partner
- Learners make improvements
- . . .and finally:  
Plan a discussion at the end that:
  - Summarises the learning
  - Selects examples where improvements have been made
  - Refers to the next step/learning focus

## Training Activity A6: Taking Stock of Formative Assessment Skills

- Take stock of what formative assessment skills already exist amongst staff – this gives everyone a chance to consider the elements of formative assessment. It is a valuable audit tool. You will find the elements listed helpfully in a document below
- You can then complete a summary sheet to show which areas you feel you need to support. (At the same time the audit also provides an opportunity for you to celebrate the skills that staff have developed already.)
- Finally, school managers can use the resulting information from the audit of skills to plan training needs for the whole school – some of these may be met by expertise already in school (shown on the individual summary sheets) or some of these may be met by the provision of an external trainer

Notes on the survey form:

- This form is to enable teachers and schools to consider which elements of formative assessment they feel most comfortable with and also to help identify where further training would be helpful
- The prompts are generic to suit teachers of all year groups and some may not be relevant to the Foundation Stage, for example. If this is the case, please put “not applicable” in the comments box

Desirable Outcomes	Always	Sometimes	Never	Comments
I write clear learning intentions in my medium term planning.				
I write clear learning intentions for each literacy and numeracy lesson on my weekly plans.				
I write clear learning intentions for every lesson or activity I plan to do.				
I share my learning intentions with the learners both verbally and in writing.				
My learning intentions are put into “learner speak” so they can be understood.				
I identify the success criteria for the lesson and share them with the learners.				

Desirable Outcomes	Always	Sometimes	Never	Comments
The learners identify the success criteria when the learning intentions have been shared.				
Learning intentions and success criteria are clearly displayed.				
Sharing learning intentions has become an expectation for the learners in the class.				
I tell the learners the reason for doing the activity.				
Learners write the learning intentions in their books (where appropriate).				
Learners are able to say the learning intention to each other or the teacher.				
I am using the learning intentions and success criteria as part of my marking strategy.				
I take time to teach learners to be self-evaluative.				
Learners are involved regularly in evaluating their own success.				
I give oral feedback during the lesson based specifically on the learning intention.				
In my marking, I indicate where the learner has met the success criteria.				
I show where some improvement can be made.				
I write a 'closing the gap' prompt to help learners make the improvement.				
Learners are given time to identify their own improvement.				
I give learners specific time to read my marking and respond to it.				



Desirable Outcomes	Always	Sometimes	Never	Comments
The learners are involved in setting and discussing their own targets.				
Targets are visual, e.g. using target cards, on display or in books.				
Targets are SMART so that learners know when they have met them.				
Targets are shared with parents.				
When a target has been met, a new target is agreed and recorded.				

Your view	Yes	No	Unsure	Comments
I think that sharing learning intentions has had a positive impact on learners' learning.				
I think that giving oral and written feedback based on success criteria has had a positive impact on learners' learning.				
I think that parents understand our approach to providing feedback and marking.				

### TEACHER SUMMARY SHEET

Your name ..... School .....

Stage taught .....

I feel really confident about these aspects of using formative assessment:

- ✓
- ✓
- ✓

I'd like further support with these aspects:

- ✓
- ✓
- ✓

Support to be given by -

**SCHOOL SUMMARY SHEET:** to be completed from the teacher summary sheets.

School Name: .....

Staff at this school feel really confident about –

- ✓
- ✓
- ✓

We would like further support with –

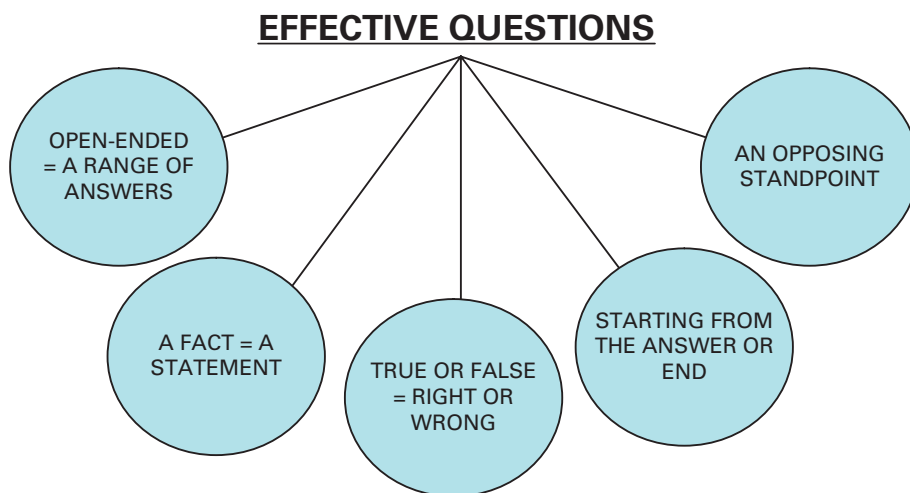
- ✓
- ✓
- ✓

We can offer expertise to other schools in –

- ✓
- ✓
- ✓
- ✓

**Agreed action points following discussion:**

## Training Activity A7: Using Questions Effectively



### Instructions

*Work with your talk partner.*

*Discuss each question and decide what type of question it is. Record the number in the appropriate circle.*

1. Everything is alive. Agree or disagree?
2. Why does this toy move and this one does not?
3. Bricks are the best material for building a house. Why?
4. How could Cinderella have helped her stepmother to become a better person?
5. The answer is square. What might the question have been?
6. (On reading the poem 'The Train Ride' and omitting the title) What is the setting for this poem? Is it a bus, train, bike, car, plane or boat?
7. This picture shows a Viking. Do you agree or disagree?
8. Should only girls be nurses?
9. What would you find in a healthy meal?
10. Glass is an excellent material for making a shelter. Agree or disagree?

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## APPENDIX B: SAMPLE SCHEMES OF WORK

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The following pages contain extracts from the comprehensive Scheme of Work provided on the Cambridge Primary support site.

They include:

- Stage 1: Unit 1B, Geometry and Problem Solving
- Stage 3: Unit 1B, Geometry and Problem Solving
- Stage 6: Unit 1B, Measure and Problem Solving

## Appendix B: Stage 1: Unit 1B, Geometry and Problem Solving

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
1Gs1	<p>Shapes and geometric reasoning:</p> <p>Name and sort common 2D shapes using features such as number of sides, curved or straight. Use them to make patterns and models.</p>	<p>Using a collection of flat shapes: choose own examples and describe. Choose an example to match properties set by teacher or another learner.</p> <p>Make pictures and patterns</p>	Flat shapes, drawn shapes	When talking about 2D make sure that only the face of a shape is used. Any shape with any depth is 3D	
1Gs2	<p>Name and sort common 3D shapes using features such as number of faces, flat or curved faces. Use them to make patterns or models</p>	<p>Identify solid shapes in the classroom.</p> <p>Sort 3D shapes according to properties.</p> <p>Choose an example and describe it.</p> <p>Make patterns and models</p>	Solid shapes		
1Gs3	Recognise basic line symmetry	Use mirrors to make and describe reflections	Mirrors	Also use any pictures, patterns from fabric, for example, to show symmetry in a real life setting	

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
1Pt8	Problem Solving Identify simple relationships between shapes.	Compare and contrast features of both 2D and 3D shapes.	Shapes both 2D and 3D		

## Appendix B: Stage 3: Unit 1B, Geometry and Problem Solving

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
3Gs1	Geometry Identify, describe and draw regular and irregular 2D shapes including pentagons, hexagons, octagons, semi-circles	Using a collection of flat shapes, choose an example to match properties chosen by others. Sort a set of flat shapes.	Flat shapes	Any shape that has depth is 3D, so for use in 2D activities refer to the shape of the face	
3Gs2	Classify 2D shapes according to the number of sides, vertices and right angles	Sort a set of flat shapes. Display them on a Venn or Carroll diagram according to properties such as the number of sides, has a right angle, has a line of symmetry etc.	Flat shapes, Prepared Venn and/or Carroll diagrams.		
3Gs3	Identify, describe and make 3D shapes including pyramids and prisms, investigate which nets will make a cube	Collect examples of 3D shapes and match them to name labels. Look for examples in the environment.	Collection of 3D shapes. Name labels	Items can be brought from home such as tins or boxes	
3Gs4	Classify 3D shapes according to the number and shape of faces, number of vertices and edges	Sort 3D shapes in different ways according to properties such as: whether or not they are prisms, number of faces, edges or vertices.	Name labels		



**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
3Gs5	Draw and complete 2D shapes with reflective symmetry, draw reflections of shapes	<p>Know that a prism has the same cross-section along its length, and that its 2 end faces are identical.</p> <p>Name and describe solids</p> <p>Use 2D shapes to make and describe pictures and patterns by drawing round and cutting out a shape to use as a pattern to make larger shapes with reflective symmetry. By folding and cutting. Use mirrors to find reflections and then draw them</p>	2D shapes, paper, scissors, mirrors		
3Gs6	Relate 2D shapes and 3D solids to drawings of them	Play 'Match' Shuffle cards and select 1 from each pile	Set of cards with shapes on one set and names on the other.		
3Gs7	Identify 2D, 3D shapes, lines of symmetry and right angles in the environment	Make a shape maths trail in the class, in the school, in the environment	Set of 2D shapes, prepared Venn/Carroll diagrams		
3Gs8	Identify right angles in 2D shapes	Sort a set of shapes. Display them on a Venn diagram or Carroll diagram: Criteria possible: triangles, quadrilaterals, pentagons etc. (regular and irregular), right angle, no right angle			

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
3Gp1	Use the language of position, direction and movement including clockwise and anti-clockwise	Use, read and extend the vocabulary from the previous year. Describe and find the position of a square on a grid of squares with rows and columns labelled. Play games: Noughts and crosses, Treasure Hunt, Battleship. Make your own grid games.	Grid paper Noughts and crosses grids. Treasure hunt: drawn or made in the class or in the grounds with clues, Battleship game		
3Pt8	Problem Solving Recognise the relationships between different 2D shapes	Using a collection of 2D shapes, choose an example or several examples of an example to match properties described by others.	2D shapes. Cards of properties	While learners are working on practical activities listen and observe. Are they using correct mathematical vocabulary? These can be used as an assessment tool	
3Pt9	Identify the differences and similarities between different 3D shapes	Using a collection of 3D shapes, choose an example or several examples of an example to match properties described by others.	3D shapes. Cards of properties		

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
3Ps6	Identify simple relationships between shapes such as: these shapes all have the same number of lines of symmetry	Sketch the reflection of a simple 2D shape in a mirror line along one edge. How many 2D shapes can be found with 1 line of symmetry? Recognise and sketch shapes that have 2 lines of symmetry. Discover shapes with more than 2 lines of symmetry.	2D shapes, Mirrors		

## Appendix B: Stage 6: Unit 1B, Measure and Problem Solving

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
6MI1	Measure Select and use standard units of measure. Read and write to 2 decimal places	Solve 'story' problems involving length, weight, capacity and explain and record how the problem was solved. E.g. I travelled 24.24 km by car, 1.7 km by bus and 2000 m on foot. How far did I travel?	A 'bank' of story problems Practical equipment to support those learners who need it.	Story problems can be added to as new ideas are suggested by the learners. Devising story problems could be a homework activity	
6MI2	Convert between two units of measurement, using decimals to three places	Solve 'story' problems involving length, weight, capacity and explain and record how the problem was solved. E.g. There is 425 ml of milk in the small bottle. There are six and one quarter times as much in the big bottle. How much milk is in the big bottle? How much milk is there altogether?	A 'bank' of story problems Practical equipment to support those learners who need it.		
6MI3	Interpret readings on different scales, on a range of measuring instruments	Read measuring scales, converting the unit to an equivalent metric unit	A range of measuring instruments		

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
6Ml4	Draw and measure lines to the nearest centimetre and millimetre	Build on work from the previous year. Measure lines, straight and curved, to the nearest centimetre and millimetre. Provide examples of materials from real life to measure. Share answers. Were any different? Why?	Rulers marked in cms and mm String/wool	Use examples from real life whenever possible	
6Mt1	Recognise and understand the units for measuring time: seconds, minutes, hours, days, weeks, months, years, decades and centuries; convert one unit of time into another	Use Problem Solving activities to estimate and check how many times can you...? Time races, getting ready for P.E... Gather ideas from learners	Gather ideas from learners for activities to use the measurement of time		
6Mt2	Tell the time using digital and analogue clocks using the 24 hour clock system	Build on work from the previous year. Use Problem Solving activities to build on knowledge and understanding of time	Analogue and digital clocks		
6Mt3	Compare times on digital/analogue clocks	Build on work from the previous year. Use Problem Solving activities to build on knowledge and understanding of time	Analogue and digital clocks		
6Mt4	Read and use timetables using the 24 hour clock system	Build on work from the previous year. Use Problem Solving activities to build on knowledge and understanding of time	Timetables from a variety of sources		

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
6Mt5	Calculate time intervals using digital and analogue times	Use a bus or train timetable: What time does the 8:30 train/bus arrive at the fourth stop? What is the fastest train/bus? How do you know? How long is the journey?	Timetables from a variety of sources	Use of the internet could be part of the lesson	
6Mt6	Use a calendar to calculate time intervals in days, weeks or months	Use a calendar to work out which day of the week 26 <sup>th</sup> October is, how many days and weeks until the 26 <sup>th</sup> December; the date of the second Monday in January until the same date in July; the number of days from 17 <sup>th</sup> June to 14 <sup>th</sup> August, and the number of weeks from 12 <sup>th</sup> July to 28 <sup>th</sup> November	Calendars		
6Mt7	Calculate time intervals in days, months or years	Begin to understand different times around the world using a world time chart	World time chart. Use of ICT		
6Ma1	Measure and calculate the perimeter and area of rectilinear shapes	Know the formula for finding the area of a rectangle. Revise the formula for the perimeter of a rectangle. Work out and express in words a formula for finding the perimeter of a regular polygon. Test with examples	Examples of rectilinear shapes Rulers, string	Use transparent overlays of cm squared paper for those learners who need more support	
6Ma2	Estimate the area of an irregular shape by counting squares	Use sets of irregular shapes on square paper. Estimate, then check. Record estimations and real area.	Cm square paper Sets of irregular shapes	Use transparent overlays of cm squared paper for those learners who need more support	

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
6Ma3	Calculate perimeter and area of simple compound shapes that can be split into rectangles	Revise work from the previous year. Select a variety of compound shapes. Discuss ways of splitting into rectangles and finding perimeters and area.	Cm square paper Sets of simple compound shapes	Use transparent overlays of cm squared paper for those learners who need more support	
6Pt2	Problem Solving Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations	Solve 'story' problems involving length, weight, capacity and explain and record how the problem was solved. E.g. I travelled 24.28 km by car, 1.7 km by bus and 2000 m on foot. How far did I travel? E.g. There is 425 ml of milk in the small bottle. There are six and one quarter times as much in the big bottle. How much milk is in the big bottle? How much milk is there altogether?		Collect ideas from learners to build a 'bank' of ideas. This could be part of a homework activity	
6Pt5	Estimate and approximate when calculating, e.g. use rounding and check working	Record estimated and measured lengths, weights or capacities. Round a measurement to the nearest whole unit or tenth of a unit			
6Ps1		Use of questioning techniques during and at the end of the lesson			

**(Continued)**

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
6Ps2	<p>Explain why they chose a particular method to perform a calculation and show their working</p> <p>Deduce new information from existing information and realise the effect that one piece of information has on another.</p>	<p>For example: Respond to questions such as: the perimeter of a rectangle is 105 cm. The shortest side is 21 cm. What is the length of the longest side?</p> <p>Respond to similar questions for all areas of measure.</p> <p>Test a hypothesis, sort and order information from data through work on measures.</p>	Resources for investigating different types of measure	The use of open questions is crucial here.	
6Ps4	Use ordered lists or tables to help solve problems systematically				



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## APPENDIX C: SAMPLE LESSON PLANS

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- Stage 1: Unit 1.1, Number and Problem Solving
- Stage 1: Unit 1.2, Number and Problem Solving
- Stage 1: Unit 1.3, Number and Problem Solving
- Stage 1: Unit 2B, Handling Data and Problem Solving
- Stage 1: Unit 3C, Measure and Problem Solving

## Stage 1: Unit 1A, Number and Problem Solving (1.1)

Week beginning:		UNIT 1: 1A Number and Problem Solving (1.1)		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of achievement
				Description	W/G/I	
10 mins	1Nn1 1Nn4  1Nn5	Oral starter: Recite numbers in order Count on in tens from zero or a single digit number to 100 or just over Count on in twos	Can I count in order? Can I start at any number and count on in ones? Can I count on in 10s from 0? Can I count in 2s?	Teacher leads counting starting from 0 or any other number. Learners suggest other ways of counting	W	Number lines or squares for support  O
40 mins	1Nn3  1Nn2 1Nn9	Main part: Count objects up to 20, recognising conservation of number Read and write numerals from 0 to 20 Order numbers to at least 20 positioning on a number track: use ordinal numbers	Can I say the number names to 20? Can I match a number word to an object, one to one? Can I organise my counting by moving each object as I count it? Can I identify the last number as the total of objects? Can I read and write the numerals from 0 to 20? Can I order the numbers on a number track?	Show the class a quantity of objects and ask them to count them. At first have no order or method (miss some out, count some twice) How many objects are there? Can you write that number? Can you find it on the number line? How do you know? How can you be sure? Give each group a set of objects to count. Each group member has a turn to remove and hide (or add) some of the objects. The rest of the group find ways of counting the set. Allow recording. and hide (or add) some of the objects. The rest of the group find ways of counting the set. Allow recording. How could you do that? How do you know if you have counted them all?	W and G	Objects to count Containers to help structure the counting Number tracks  Q & A D O

Week beginning:			UNIT 1: 1A Number and Problem Solving (1.1)		CLASS:	
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of achievement
10 mins		Plenary: Sharing ideas and strategies	How did you keep track of your counting? How could you organise your counting so that it's quicker?	Description Ask one or two groups to share their strategies, supported by their informal recordings		
<b>Notes / extension opportunities / homework</b>						
<p><b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)</p> <p>Oral starter: Whole class teacher led, targeted questions. Support group to have table top resources for checking</p> <p>Main part: Whole class then groups with support for some learners. More able work with numbers above 20, and count and organise higher quantities Adult role to support, observe or question</p> <p><b>O&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work</p>						

## Stage 1: Unit 1A, Number and Problem Solving (1.2)

Week beginning:		UNIT: 1A Number and Problem Solving (1.2)		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Evidence of achievement	
				Description	Resources	
10 mins	1Nn1 1Nn4  1Nn5	Oral starter: Recite numbers in order Count on in tens from zero or a single digit number to 100 or just over Count on in twos	Can I count in order? Can I start at any number and count on in ones? Can I count on in 10s from 0? Can I count in 2s?	Teacher leads counting starting from 0 or any other number. Learners suggest other ways of counting	Number lines or squares for support	O
40 mins	1Nc1  1Nc8	Know all number pairs to 10 and record related addition/subtraction facts Understand addition as counting on and combining two sets Understand subtraction as counting back and 'take away'	Can I solve simple problems adding cubes to make 10? Can I tell you how many cubes are in the pot for numbers up to at least 10? Can I check accurately how many cubes are in the pot? Can I solve simple problems involving adding or taking away cubes? Can I find ways to check accurately how many cubes are in the pot without counting every one? Can I find ways to check accurately up to 20 cubes without counting every one? (e.g. counting in 2s or 5s)	Choose a number of cubes less than 10. Hold the pot in a position so that the class cannot see inside it and put the cubes into the pot, one at a time. How many cubes in the pot? How can we find out? Tip the cubes out and count them. How many more do we need to make 10? Ask for responses. Count back in the original number then count in the new. Are there 10? How can we find out? Tip the cubes on to the table and count. Do we have too many? Not enough? Or the right amount? Repeat several times. Put a different start number in the pot. If I add 7 more, and I want a total of 10, will there be too many? Not enough or 10? Repeat several times, checking each time. Move beyond 10. Learners work in groups. Each takes a turn to throw the dice. If the number is red they remove (take away) that number of cubes and count the remainder. If the number is green	Large pot for demonstration Small pot for each group Cubes for demonstration Cubes per group Numbered dice for each group, 3 numbers red, 3 numbers green	O & A D O
						O

Week beginning:				UNIT: 1A Number and Problem Solving (1.2)		CLASS:	
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Description	Resources	Evidence of achievement
10 mins		Plenary: Sharing ideas and strategies	What ways did you find to check accurately how many cubes were in the pot? What did you do instead of counting every cube? Did you manage to find a way other than counting on or counting back to solve the problem of how many cubes were in the pot when they had been added as a group rather than one at a time?	they add that number and count. Continue until either all of the cubes are in the pot, or the pot is empty.	G		Q & A D
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)							
Oral starter: Whole class teacher led, targeted questions. Support: group to have table top resources for checking Main part: Whole class then groups with support for some learners. More able work with numbers above 20, and count and organise higher quantities Adult role to support, observe or question							
<b>Notes / extension opportunities / homework</b> Extension: Change the numbers on the dice so that groups of cubes rather than individual need to be added or removed. Look for ways of learner grouping rather than counting <b>O&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work							

## Stage 1: Unit 1A, Number and Problem Solving (1.3)

Week beginning:		UNIT: 1A Number and Problem Solving (1.3)		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of achievement
				Description	W/G/I	
10 mins	1Nn1 1Nn4  1Nn5	Oral starter: Recite numbers in order Count on in tens from zero or a single digit number to 100 or just over Count on in twos	Can I count in order? Can I start at any number and count on in ones? Can I count on in 10s from 0? Can I count in 2s?	Teacher leads counting starting from 0 or any other number. Learners suggest other ways of counting	W	Number lines or squares for support  O
40 mins	1Nc8 1Nc9 1Nc11	Understand addition as counting on and combining two sets Understand subtraction as counting back and 'take away' Add/subtract a single digit number by counting back/on	Can I find the total number of spots on that domino? Can I find another with that total number of spots? Can I find the difference between the number of dots on that side and the other side? Can I find another domino with that difference? Can I find the total number of spots on 2 dominoes? Or 3 dominoes?	Teacher leads the activity for 10 mins. Show large dominoes asking questions: How many spots on that half of the domino? Make a domino chain by matching spots What is the total number of spots on that domino What is the difference between the number of dots on that side and on the other side? Learners work in pairs or small groups. At all levels the learners start with a set of dominoes. Give each group/pair a set of Problem Solving cards, differentiated to ability. Learners choose a card 'How many spots are on that half of the domino? Can you find a domino to match it?' Draw all of the dominoes that you can find that will match it' What is the total number of spots on that domino? Can you find some others with the same total? Draw them' 'What is the difference between the number of dots on that side and on the other side? Can you find other dominoes with that difference?' 'How many different dominoes can you find with a total of ?'	W   G	A set of double 6 dominoes Extension: a set of double 9 or double 12 dominoes Problem Solving cards – some with support pictures  D O

Week beginning:		UNIT: 1A Number and Problem Solving (1.3)		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of achievement
				Description	W/G/I	
10 mins				<p>What is the total number of dots on these 2 (or 3) dominoes? Find other pairs of 2 (or 3) that have the same total'</p> <p>Ask one or two groups to feed back their findings. Allow other learners to question them about their findings or strategies.</p>		
		<p>Did you manage to make a domino chain by matching spots? Did you manage to use all of the dominoes? Do you think it's possible?</p> <p>How many different dominoes did you find with a total of 7 spots?</p> <p>Did you find more dominoes with lower totals/ higher or was it the same?</p> <p>What method did you use to make sure you found all the possibilities?</p> <p>Plenary: Sharing findings and strategies</p>				<p>Q &amp; A</p> <p>D</p>
<b>Notes / extension opportunities / homework</b>						
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)				<p>Make cards with questions to suit all abilities. Some learners may need pictures of the dominoes to support the words.</p> <p>Extension: Use sets of double nine or double twelve dominoes.</p>		
<p>Oral starter: Whole class teacher led, targeted questions. Support group to have table top resources for checking</p> <p>Main part: Whole class then groups with support for some learners.</p> <p>More able work with double 9 or double 12 dominoes</p> <p>Adult role to support, observe or question</p>				<p><b>Q&amp;A:</b> question/ answer</p> <p><b>D:</b> discussion</p> <p><b>O:</b> observation</p> <p><b>M:</b> marked work</p>		

## Stage 1: Unit 2B, Handling Data and Problem Solving

Week beginning:		UNIT: 2B Handling Data and Problem Solving		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.)	Resources	Evidence of achievement
				Description		
10 mins	1Nc1	Oral starter: Whole class chanting of pairs of numbers to 10. Use of targeted questions for pairs of numbers to 10 Targeted questions to find pairs of numbers to other totals (6, 7, 8, or 9)	Can I say pairs of numbers to 10 in order? Can I say pairs of numbers to 10 in random order? Can I say other pairs of numbers that make a different total?	Teacher leads chanting starting from 0 or any other number to 10. Teacher asks specific children to respond to questions: If I have 4 how many more do I need to make 10? (6, 7, 8, 9)	Poster of number bonds, or table top lists for those learners who need more support	O
40 mins	1Dh1	Main part: Answer a question by sorting and organising data or objects in a variety of ways Using block graphs and pictograms	Did all learners join in the discussion as a whole class and in groups? Were they able to draw a picture of their favourite food? Did they understand cardinal numbers? Did they collect the information and interpret it correctly? Were they able to order the dishes by popularity? Did they record their results clearly?	If you could choose your favourite food for a meal, what would you choose? What if we were to set up a café, how would we find out what to serve? Collect ideas as a whole class and then move into groups to discuss further. Collect all ideas after 10 minutes. Ask learners to draw a picture of their favourite food so that we can use their drawing to decide what to serve in the café. Collect all drawings and discuss ways of finding out which is the most popular dish, which is the second most popular and so on. Discuss ways of recording this information. Working as groups, learners decide upon a menu for their café, bringing in some of the most popular dishes. Each group designs and writes out a menu card for their café.	Examples of food posters and, menus,	Q & A D O



Week beginning:			UNIT: 2B Handling Data and Problem Solving		CLASS:		
Timing	Ref: Framework	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Resources	Evidence of achievement	
				Description	W/G/I		
10 mins		Plenary: Sharing ideas and strategies	How did you show the information that you collected? Did you show it in a different way to others? Which way shows the information clearly? How did you decide what to put on your menu card? Were there any problems when you were deciding? What did you do to solve the problems?		W	Q & A D O	
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)							<b>O&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work
Because the main part of the lesson is a very open task, all abilities will be able to have some success. There is no need for ability grouping. Some learners may need adult help in pouring and counting larger quantities.							

## Stage 1: Unit 3C, Measure and Problem Solving

Week beginning:		UNIT: 3C Measure and Problem Solving		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Evidence of achievement	
10 mins	1Pt2	Explore number puzzles and problems	Were the learners able to use knowledge of number and probability to solve the problem?	<p><b>Description</b></p> <p>A game for two teams. Shuffle the cards and show the first card to one of the teams, who decide whether the next card will be higher or lower. If they are correct, they score a point. If incorrect, play passes to the other team. Play continues until all 10 cards are showing. The team with the most points is the winner.</p> <p>Play again, starting with the other team.</p>	Set of number cards 0–9	O
40 mins	1M12	Main part Estimate and compare capacities by direct comparison, then by using uniform non-standard units	<p>Were the learners able to compare the capacity of 2 containers? What methods did they use? How many did they compare all together?</p>	<p><b>Description</b></p> <p>Show the class a set of containers. Which two containers do you think hold the same amount? How could we find out? Model to the class a method.</p> <p>Do you think there are any other ways of finding out? Try another way suggested by a learner.</p> <p>Move into group work. Find 2 containers on your table that you think hold the same amount. Test it.</p> <p>Find other pairs of containers that you think hold about the same amount</p>	<p>Collection of suitable resources: boxes, paper cups, small jugs, countable items to compare capacities (beads, small cubes, dried peas)</p>	<p>W</p> <p>G</p> <p>Q &amp; A</p> <p>D</p> <p>O</p>

Week beginning:				UNIT: 3C Measure and Problem Solving		CLASS:		
Timing	Framework Ref:	Learning Objectives	Success Criteria	Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Description	Resources	Evidence of achievement	
10 mins		Plenary sharing findings and strategies	Were you able to find 2 containers that held about the same amount? What did you do? What did you find out? Did you record anything to help you to remember? How did you record it?		Discuss methods and findings. Invite learners to share what they did and what they found out? Was anything difficult? What did they do to solve any problems?		D O	
<p><b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)</p> <p>If the items used for filling containers are small, and the learners are comparing quantities by counting how many of them fill the container, some learners may need to work with smaller containers than others. Learners should first of all study only 2 containers. Then move on to experimenting with materials provided. Allow them to decide on their own degree of accuracy, and encourage them to guess first before they try.</p> <p>You may want them to make informal recordings which can be used as memory aids for the last part of the lesson.</p>				<p><b>Notes / extension opportunities / homework</b></p> <p>Extension: Find some other containers which hold twice as much as this bottle (Need a supply of plastic bottles!)</p>				<p><b>O&amp;A:</b> question/ answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work</p>

## APPENDIX D: OPPORTUNITIES FOR ICT IN THE PRIMARY MATHEMATICS FRAMEWORK

*ICT is a valuable resource which should be used appropriately to help develop learners' mathematical knowledge, skills and understanding.*

*The following suggestions are not exhaustive. They are designed to be illustrative and demonstrate a range of opportunities where ICT can be utilised in the teaching of Mathematics.*

### General

There is potential for the use of ICT throughout the Mathematics curriculum and the ideas presented in this section can be applied to most areas. In addition, where an approach is particularly relevant to the aspect being studied, it is listed against that aspect.

**Online activities and resources:** There is a wealth of relevant materials designed to target different aspects of the curriculum. Not all are free, but most subscription sites have free resources. These are given on the resources sheet, categorised by area of learning.

**Interactive whiteboard hardware and software:** This resource is available in many educational settings and has huge potential, which is not always tapped. The software can be installed on learners' computers and used away from the board to support teaching and learning. Even where the physical board is not available, there are often "lite" versions of the software, which can be installed and used

1. The interactive whiteboard provides a very useful way of displaying numbers, number sentences and operations and 2D and 3D shape, as well as modelling approaches to calculation etc. The tools can be used to highlight elements, as well as to drag and drop numbers, operators etc. This supports the creation of simple activities to support maths learning.
2. Most interactive whiteboard software has banks of maths resources, ranging from still images and text, to animations and sound files. The software also frequently includes maths tools, such as rulers, protractors, compasses, set squares, which can show size of angles and lengths of line

measured. There are also likely to be flash-based activities including 100 squares, number lines, function machines, fraction-makers, graphing tools, single and multiple dice, dice with more than 6 faces, co-ordinates builders etc. These are a useful support in teaching, but could also be used by learners working independently. Teachers are strongly advised to explore these before looking elsewhere.

3. All interactive whiteboard software has the potential to combine text, graphics and sound in a simple way, allowing learners to match words to pictures and/or sounds by dragging and dropping. Such activities can be used to support teaching of varied maths concepts as well as being used independently by learners to consolidate their understanding.
4. As the software allows hyperlinks to be included, this can be used to guide learners to a specific website or resource for an activity or further study. Learners can also use simple tools within the software to capture any resources they have been using online.
5. As interactive whiteboard software is very simple to use, learners can develop their own games and activities to support an area of learning and then use these with their peers. As learners have to understand the teaching point to develop the activity, this can be an excellent approach to help consolidate learning.
6. Sound files (normally MP3) can easily be attached to writing or an image using interactive whiteboard software. This can be used to support learners in understanding maths concepts. For example, a 2D shape could have a sound file attached which explains why it is this shape and not another.

**Class response systems:** If the educational setting has such hardware, it will normally be linked to the interactive whiteboard and the software can be used by teachers and learners to assess mathematical understanding around a certain topic, as well as in a more open way to support Problem Solving and investigations.

**Visualisers:** Where these are available, they can be used to share work, model maths activities and capture still and moving images in the class during discussion and investigations.

**Calculators and graphical calculators:** In the framework, the calculator is not promoted as a calculating tool before level 5. The main emphasis at levels 1 to 4 is on developing mental calculation strategies. These lead, via personal jottings, towards developing efficient written methods. The calculator is, however, used to help develop learners' understanding of numbers and the number system, including place value, properties of number, fractions and decimals.

**Printers and graph plotters:** Can support analysis and development of mathematical understanding.

**Dataloggers:** These devices can be used to capture data by monitoring the physical environment (for example, sound, light and noise levels, motion and speed). The data can be downloaded, reviewed and copied to a spreadsheet for further analysis. Such devices are particularly relevant in joint Mathematics and Science investigations and support the development of data handling in Mathematics.

**Programmable devices and onscreen turtles:** The use of physical and onscreen turtles with their associated instruction languages such as Logo support understanding around shape and measure as well as the development of programming skills.

**Spreadsheets:** This software can be used to support the exploration of number and patterns and introducing the concepts of formulae and functions. It is also helpful in supporting data handling activities, especially with the use of embedded charts.

**Databases:** This software provides essential support in data handling, enabling learners to search and sort data and create reports and charts from the information. Learners can also create and use databases exploring object properties in specific areas of mathematics, for example, 2D and 3D shape.

**Organisational tools:** Mind mapping software can be used to develop ideas and plan for Problem Solving activities. Word processing software, interactive whiteboard and spreadsheet software can all be used to collect and organise information around an area of mathematics work. This approach supports learners in capturing their ideas and approaches during Problem Solving and investigative activities.

**Cartoons:** Creating cartoons can help learners explore maths rules, strategies and concepts, providing an engaging way for them to record their thinking and understanding.

**Sound recording:** Sound can help young learners and those with limited English writing skills, express and share mathematical concepts. Much standard software, MS Windows, Apple etc., has the capability to record sound direct to a computer. Alternatively MP3 player/recorders, able to capture and playback sound as well as download to the computer, are generally available. There are also many quick capture devices able to record a few seconds of sound, which are useful for short activities. Recorders, microphones etc can be sourced from general electronics suppliers. See resources list for open source sound editing software.

**Digital still and film capture:** Still and film cameras can be used by learners to capture their learning, especially in activities involving physical equipment (counters, dice, 3D shape etc) and in Problem Solving activities and investigations. Learners can also make short films around certain mathematical concepts and share them with their peers to support their learning.

**Image animation software:** Animating images, avatars and voki and writing and recording scripts for them provides good opportunities for learners to rehearse their mathematical understanding around a specific topic. (Bespoke software is normally needed for this.)

**Other multimedia software:** Generic and/or open source resources exist to combine pictures into slide shows, and/or to animate the picture and graphic elements. These can be used to support learners in presenting their learning or sharing ideas as well as being used by both teachers and learners to create resources to support learning.

**Online spaces:** There are many generally available online spaces for saving, sharing and commenting on materials. The educational setting may have its own learning platform or VLE. If this is not the case, teachers will need to ensure that the space is safe and reliable before encouraging learners to use it. Learners should also be taught to respect others' work online, understanding the rules for copyright, ownership and safe and responsible use. Learners' activity on the site/s should be monitored to ensure the rules for safe and responsible use are being applied.

1. Learners can be encouraged to save and share work online, providing the opportunity to discuss, review and improve their work

2. Learners and teachers can create blogs to explore and develop ideas around a topic or theme
3. Groups of learners can create wikis around an area of mathematics learning or to support an investigation or Problem Solving activity
4. Learners can engage in online discussion around a topic or idea, or use a discussion board to develop an investigation

## Opportunities for ICT in STAGE 1

NUMBER:		Opportunities for ICT:
		Learners should
Stage 1	1N (all)	<u>Numbers and the number system and calculation</u> 1. Use online and electronic activities and games, including the number ITPs, electronic dice and interactive whiteboard resources to: <ul style="list-style-type: none"> <li>• Practise reciting, reading and writing numbers to 20</li> <li>• Practise counting and comparing two sets of objects</li> <li>• Help develop an understanding of counting on and counting back</li> <li>• Help develop an understanding of partitioning</li> <li>• Help recognise multiples of 2 and 10</li> </ul>
Stage 1	1Nn5	<u>Count on in twos, beginning to recognise odd/even numbers to 20 as 'every other number'.</u> 1. Use interactive number mats to identify and practise odd and even numbers
Stage 1	1Nc11	<u>Add/subtract a single-digit number by counting on/back.</u> 1. Use interactive number mats to practise counting on and back

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 1	1Gs2	<u>Name and sort common 3D shapes (e.g. cube, cuboid, cylinder, cone and sphere) using features such as number of faces, flat or curved faces. Use them to make patterns and models.</u> 1. Drag and drop images of 3D shapes to organise them according to their characteristics
Stage 1	1Gs3	<u>Recognise basic line symmetry.</u> 1. Use online/electronic activities and the symmetry ITP to help recognise basic line symmetry
Stage 1	1Gp1	<u>Use everyday language of direction and distance to describe movement of objects.</u> 1. Use positional language when instructing a floor robot to follow a given path 2. Use similar language when role playing and acting the part of the robot or controller

**(Continued)**

MEASURE:		Opportunities for ICT:
		Learners should
Stage 1	1Mm1	<u>Recognise all coins and work out how to pay an exact sum using smaller coins.</u> 1. Use online and onscreen shopping games including interactive whiteboard resources to build exact money sums. 2. Use play tills in a role play shop to support this activity
Stage 1	1MI2	<u>Estimate and compare capacities by direct comparison, then by using uniform non-standard units.</u> 1. Use electronic scales on the interactive whiteboard to compare capacities; extend to using non-standard units
Stage 1	1Mt2	<u>Read the time to the hour (o'clock) and know key times of day to the nearest hour.</u> 1. Use online and electronic activities including interactive whiteboard resources which display analogue and digital times to support understanding of time 2. Use an electronic big clock in digital and analogue styles on the interactive whiteboard to reinforce learners' understanding

HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 1	1Dh1	<u>Answer a question by sorting and organising data or objects in a variety of ways.</u> 1. Use pictogram software, or an online resource to create different pictograms related to the learners' own experience. Use these to pose and answer questions. 2. Use interactive whiteboard software to create and use Venn and Carroll diagrams

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 1	IPS (all)	<u>Using techniques and skills in solving mathematical problems</u> 1. Use a range of online games and activities to support Problem Solving

## Opportunities for ICT in STAGE 2

In the framework, the calculator is not promoted as a calculating tool before level 5. The main emphasis at levels 1 to 4 is on developing mental calculation strategies. These lead, via personal jottings, towards developing efficient written methods. The calculator is, however, used to help develop learners' understanding of numbers and the number system, including place value, properties of number and fractions and decimals.



NUMBER: Opportunities for ICT:		Learners should
Stage 2	2N (all)	<u>Numbers and the number system and calculation</u> 1. Use online and electronic activities and games, including the number ITPs, electronic dice and interactive whiteboard resources to: <ul style="list-style-type: none"> <li>• Help recognise multiples of 2, 5 and 10</li> <li>• Model and aid the understanding of mental calculation strategies</li> <li>• Help develop an understanding of partitioning of two digit numbers</li> <li>• Practise placing two digit numbers</li> <li>• Help develop a variety of mental strategies such as counting on and counting back</li> </ul>
Stage 2	2Nn15	<u>Sort numbers, e.g. odd/even, multiples of 2, 5 and 10.</u> 1. Use a prepared spreadsheet or table and use the sort tool to reorganise
Stage 2	2Nn16 2Nn17	<u>Recognise that we write one half <math>\frac{1}{2}</math>, one quarter <math>\frac{1}{4}</math> and three quarters <math>\frac{3}{4}</math></u> <u>Recognise that <math>\frac{2}{2}</math> or <math>\frac{4}{4}</math> make a whole and <math>\frac{1}{2}</math> and <math>\frac{2}{4}</math> are equivalent.</u> 1. Use the fractions ITP within interactive whiteboard software to explore fractions and match with common fractional objects ( $\frac{1}{4}$ of a cake, $\frac{1}{2}$ of a pencil etc.)
Stage 2	2Nc2	<u>Partition all numbers to 20 into pairs and record the related addition and subtraction facts.</u> 1. Use interactive whiteboard software with all the numbers to 20, and drag and drop to make number pairs, before carrying out the related addition and subtraction
Stage 2	2Nc3 2Nc4	<u>Find all pairs of multiples of 10 with a total of 100 and record the related addition and subtraction facts.</u> <u>Learn and recognise multiples of 2, 5 and 10 and derive the related division facts.</u> 1. Use interactive number squares to 100 (available within interactive whiteboard software) to explore multiples.
Stage 2	2Nc22	<u>Work out multiplication and division facts for the 3x and 4x tables.</u> 1. Use a spreadsheet to explore these multiplication and division facts

GEOMETRY: Opportunities for ICT:		Learners should
Stage 2	2Gs1 2Gs2	<u>Sort, name, describe, visualise and draw 2D shapes (e.g. squares, rectangles, circles, regular and irregular pentagons and hexagons) referring to their properties; recognise common 2D shapes in different positions and orientations.</u> <u>Sort, name, describe and make 3D shapes (e.g. cubes, cuboids, cones, cylinders, spheres and pyramids) referring to their properties; recognise 2D drawings of 3D shapes.</u>

GEOMETRY:		Opportunities for ICT:
		Learners should
		<ol style="list-style-type: none"> <li>1. Use an online/electronic activity to draw and compare 2D and 3D shapes</li> <li>2. Match 2D and 3D shapes to their properties on an interactive whiteboard</li> <li>3. Use an online/electronic activity (e.g. an onscreen turtle, eg. Logo) or an isometric grid or tile drawing ITP to explore the properties of simple 2D shapes (square, rectangle) Begin to use the repeat function to increase efficiency of instructions</li> </ol>
Stage 2	2Gs3	<u>Identify reflective symmetry in patterns and 2D shapes; draw lines of symmetry.</u> <ol style="list-style-type: none"> <li>1. Use an online/electronic activity (e.g. a symmetry ITP to help develop an understanding of line symmetry)</li> </ol>
Stage 2	2Gp1 2Gp2 2Gp3	<u>Follow and give instructions involving position, direction and movement.</u> <u>Recognise whole, half and quarter turns, both clockwise and anti-clockwise.</u> <u>Recognise that a right angle is a quarter turn.</u> <ol style="list-style-type: none"> <li>1. Give sets of instructions to control onscreen and/or floor turtles</li> <li>2. Explore angles of turn using the turtles, beginning to use the repeat function to increase efficiency of instructions.</li> </ol>

MEASURE:		Opportunities for ICT:
		Learners should
Stage 2	2M (all)	<u>Measure</u> <ol style="list-style-type: none"> <li>1. Use online and electronic activities, simulation and games, including measurement ITPs and interactive whiteboard resources to explore different types of measurement</li> <li>1. Select from available digital and analogue devices to measure time, length, mass and capacity using standard metric units.</li> <li>2. Use an online/electronic clock simulation, which displays analogue and digital times, to start reading time to the nearest half hour</li> </ol>

HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 2	2Dh1	<u>Answer a question by collecting and recording data in lists and tables, and representing it as block graphs and pictograms to show results.</u> <ol style="list-style-type: none"> <li>1. Use a simple database to sort and organise data and display block graphs and pictograms using the results to help answer questions.</li> </ol>

PROBLEM SOLVING:		Opportunities for ICT:																																																						
		Learners should																																																						
Stage 2	2Pt9	<p>Identify simple relationships between numbers e.g. this number is double . . . ; .</p> <p>1. Use a simple spreadsheet to show the simple relationship between two sets of numbers</p> <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr> <th></th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr><td>1</td><td>Number</td><td>Double the number</td></tr> <tr><td>2</td><td>1</td><td>A2*2</td></tr> <tr><td>3</td><td>A2+1</td><td>A3*2</td></tr> <tr><td>4</td><td>A3+1</td><td>A4*2</td></tr> <tr><td>5</td><td>A4+1</td><td>A5*2</td></tr> <tr><td>6</td><td>A5+1</td><td>A6*2</td></tr> <tr><td>7</td><td>A6*1</td><td>A7*2</td></tr> <tr><td>8</td><td>A7+1</td><td>A8*2</td></tr> </tbody> </table> <table border="1" style="display: inline-table;"> <thead> <tr> <th></th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr><td>1</td><td>Number</td><td>Double the number</td></tr> <tr><td>2</td><td>1</td><td>2</td></tr> <tr><td>3</td><td>2</td><td>4</td></tr> <tr><td>4</td><td>3</td><td>6</td></tr> <tr><td>5</td><td>4</td><td>8</td></tr> <tr><td>6</td><td>5</td><td>10</td></tr> <tr><td>7</td><td>6</td><td>12</td></tr> <tr><td>8</td><td>7</td><td>14</td></tr> </tbody> </table> <p>e.g. Describe the relationship between the numbers in each row Describe the relationship between the numbers in each column</p>		A	B	1	Number	Double the number	2	1	A2*2	3	A2+1	A3*2	4	A3+1	A4*2	5	A4+1	A5*2	6	A5+1	A6*2	7	A6*1	A7*2	8	A7+1	A8*2		A	B	1	Number	Double the number	2	1	2	3	2	4	4	3	6	5	4	8	6	5	10	7	6	12	8	7	14
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## Opportunities for ICT in STAGE 3

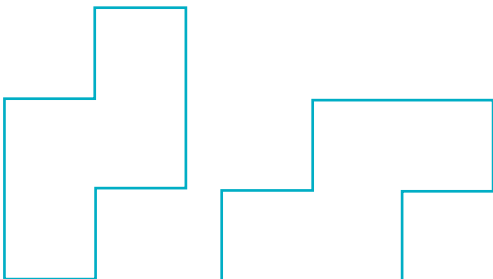
In the framework, the calculator is not promoted as a calculating tool before level 5. The main emphasis at levels 1 to 4 is on developing mental calculation strategies. These lead, via personal jottings, towards developing efficient written methods. The calculator is however used to help develop learners' understanding of numbers and the number system, including place value, properties of number, fractions and decimals.

NUMBER:		Opportunities for ICT:
		Learners should
Stage 3	3N (all)	<p>Numbers and the number system and calculation</p> <p>1. Use online and electronic activities and games, including the number ITPs, electronic dice and interactive whiteboard resources to:</p> <ul style="list-style-type: none"> <li>• Help recognise multiples of 2, 3, 4, 5 and 10</li> <li>• Model and support understanding of mental calculation strategies</li> <li>• Help develop an understanding of partitioning of three digit numbers</li> <li>• Practise placing three digit numbers</li> <li>• Help develop a variety of mental strategies relating to addition, subtraction, multiplication or division</li> <li>• Understand the effect of multiplying a two digit number by 10</li> </ul> <p>2. Use spreadsheets to explore number relationships and patterns</p>

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 3	3Gs1	<p><u>Identify, describe and draw regular and irregular 2D shapes including pentagons, hexagons, octagons and semi-circles.</u></p> <ol style="list-style-type: none"> <li>1. Use an isometric grid or tile drawing ITP to draw and explore the properties of 2D shapes, including regular polygons and circles, but excluding triangle.</li> </ol>
Stage 3	3Gs7	<p><u>Identify 2D and 3D shapes, lines of symmetry and right angles in the environment.</u></p> <ol style="list-style-type: none"> <li>1. Use an online/electronic activity (e.g. a symmetry ITP) to draw and complete shapes with reflective symmetry. Draw the images of shapes in mirror lines.</li> <li>2. Use an onscreen turtle (e.g. Logo) to program a simple 2D shape and the lines of symmetry for each.</li> </ol>
Stage 3	3Gp4	<p><u>Compare angles with a right angle and recognise that a straight line is equivalent to two right angles.</u></p> <ol style="list-style-type: none"> <li>1. Give instructions involving position, directions and movement, including clockwise and anti-clockwise, to direct a floor robot through a maze. During this process note the effect of turn instructions and compare the angles turned</li> </ol>

MEASURE:		Opportunities for ICT:
		Learners should
Stage 3	3M11	<p><u>Choose and use appropriate units and equipment to estimate, measure and record measurements.</u></p>
	3M12	<p><u>Know the relationship between kilometres and metres, metres and centimetres, kilograms and grams, litres and millilitres.</u></p> <ol style="list-style-type: none"> <li>1. Select and use a variety of digital and analogue measuring instruments. Consider the suitability of various instruments</li> </ol>
	3M13	<p><u>Read to the nearest division or half division, use scales that are numbered or partially numbered</u></p> <ol style="list-style-type: none"> <li>2. Use a measuring scale ITP to practise simulation or ITP to support reading scales both numbered or partially numbered</li> </ol>
Stage 3	3Mt2	<p><u>Read the time on analogue and digital clocks, to the nearest 5 minutes on an analogue clock and to the nearest minute on a digital clock.</u></p> <ol style="list-style-type: none"> <li>1. Use an online/electronic clock simulation, which displays analogue and digital times, to read an analogue time to the nearest 5 minutes and a digital time to the nearest 1 minute</li> </ol>

HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 3	3Dh1	<p><u>Answer a real-life question by collecting, organising and interpreting data</u></p> <ol style="list-style-type: none"> <li>1. Use dataloggers/sensors to capture real life data around temperature, sound volumes, light levels etc. Analyse the resulting graphs.</li> <li>2. Use a simple database, spreadsheet or graph drawing ITP to collect, sort and organise data. Use the software to display the data as bar charts, pictograms and simple frequency tables. Use the results to help answer questions</li> </ol>
Stage 3	3Dh3	<p><u>Use Venn or Carroll diagrams to sort data and objects using two criteria.</u></p> <ol style="list-style-type: none"> <li>1. Use interactive whiteboard tools to create Venn and Carroll diagrams. Use these to sort data and organise data.</li> </ol>

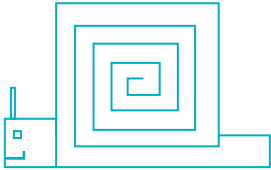
PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 3	3Pt8	<p><u>Recognise the relationships between different 2D shapes.</u></p> <p>1. Use a floor robot or onscreen turtle (eg Logo) to draw given 2D shapes and use the program instructions to help identify the relationships between them.</p> 

## Opportunities for ICT: STAGE 4

NUMBER:		Opportunities for ICT:
		Learners should
Stage 4	4N	<p><u>Numbers and the number system and calculation</u></p> <p>In the framework, the calculator is not promoted as a calculating tool before level 5. The main emphasis at levels 1 to 4 is on developing mental calculation strategies. These lead, via personal jottings, towards developing efficient written methods. The calculator is, however, used to help develop learners' understanding of numbers and the number system, including place value, properties of number, fractions, and decimals. For example:</p> <ol style="list-style-type: none"> <li>Use a calculator to extend understanding of place value by answering questions such as:       <ol style="list-style-type: none"> <li>What must be added to change: 200 to 238? . . .</li> <li>What must be taken to change: 454 to 400? . . .</li> <li>What must be added to change: 183 to 283? . . . etc</li> </ol> </li> <li>Use a calculator to add a number of odd numbers and/or even numbers and describe any patterns in the results</li> <li>Use a calculator to consolidate the effect of multiplying any two-digit number by 10</li> <li>Enter a simple fraction into a calculator, e.g. 5/10 and use the facilities to write the fraction in its simplest form and as a decimal (often keys labelled: SIMP and A.XXX )</li> <li>Enter a simple fraction into a calculator and convert it to its equivalent decimal form. Compare this decimal to the result of dividing the fraction's numerator by its denominator.</li> </ol> <p>Other number-related activities:</p> <ol style="list-style-type: none"> <li>Use a number grid program to highlight multiples of 2, 3, 4, 5, 6, 9 and 10 separately on different sizes of grid and investigate and explain the patterns produced.</li> </ol>

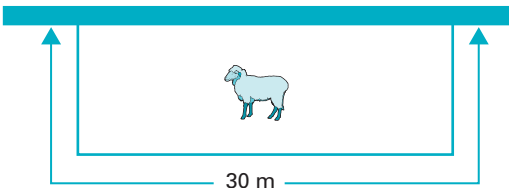
## (Continued)

NUMBER:		Opportunities for ICT:
		Learners should
		<ol style="list-style-type: none"> <li>Use spreadsheets to produce patterns of numbers. Explore these and discuss the reasons for them. For example, make statements about the sum and difference of odd and even numbers.</li> <li>Use a thermometer simulation or ITP to help develop an understanding of positive and negative numbers by exploring these in the context of temperature.</li> </ol>

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 4	4Gs1	<p><u>Identify, describe, visualise, draw and make a wider range of 2D and 3D shapes including a range of quadrilaterals, the heptagon and tetrahedron; use pinboards to create a range of polygons. Use spotty paper to record results.</u></p> <ol style="list-style-type: none"> <li>Use an onscreen turtle program to draw a wide range of 2D shapes. Make general statements about their properties.</li> <li>Use the program to devise a sequence of instructions (algorithm) to draw complex shapes. E.g. a snail. Devise commands to draw the shell and create these as a procedure</li> </ol>  <p>Produce separate procedures for the head and tail Finally produce a procedure to call each of the other procedures in turn creating an algorithm to draw the snail</p>
	4Gs3	<p><u>Identify and sketch lines of symmetry in 2D shapes and patterns.</u></p> <ol style="list-style-type: none"> <li>Use a tiling/transformation program and/or an onscreen turtle such as Logo to create a shape/pattern with one line of symmetry</li> </ol>
	4Gp1	<p><u>Describe and identify the position of a square on a grid of squares where rows and columns are numbered and/or lettered.</u></p> <ol style="list-style-type: none"> <li>Use an interactive co-ordinates game or activity to reinforce the position of squares placed on the grid. Understand the need to place objects precisely</li> </ol>
	4Gp3	<p><u>Devise the directions to give to follow a given path.</u></p> <ol style="list-style-type: none"> <li>Use an interactive co-ordinates grid with a map or maze etc to give and follow instructions to move from one location on the grid to another</li> <li>Program an onscreen turtle to move through a maze to an agreed location</li> </ol>

MEASURE:		Opportunities for ICT:
		Learners should
Stage 4	4MI4	<p><u>Interpret intervals/divisions on partially numbered scales and record readings accurately.</u></p> <ol style="list-style-type: none"> <li>1. Use simulations of various measuring devices to interpret and record different intervals/divisions on different scales.</li> </ol>
Stage 4	4Mt3	<p><u>Read simple timetables and use a calendar.</u></p> <ol style="list-style-type: none"> <li>1. Access online timetables and plan routes and times for a journey with reference to onscreen calendar</li> </ol>
Stage 4	4Ma3	<p><u>Find the area of rectilinear shapes drawn on a square grid by counting squares.</u></p> <ol style="list-style-type: none"> <li>1. Create shapes by colouring spreadsheet cells. Calculate by counting squares but begin to relate this to number values.</li> </ol>

HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 4	4Dh1	<p><u>Answer a question by identifying what data to collect, organising, presenting and interpreting data in tables, diagrams, tally charts, frequency tables, pictograms (symbol representing 2, 5, 10 or 20 units) and bar charts (intervals labelled in twos, fives, tens or twenties).</u></p>
	4Dh2	<p><u>Compare the impact of representations where scales have different intervals.</u></p> <ol style="list-style-type: none"> <li>1. Use the graphing facility on a spreadsheet or a graphing program to construct and interpret frequency tables, pictograms and bar charts, with the vertical axis labelled, for example, in 2s, 5s, 10s or 20s.</li> <li>2. Use the program to change the intervals on the vertical axis and discuss the effects</li> </ol>

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 4	4Ps5	<p><u>Use ordered lists and tables to help to solve problems systematically</u></p> <ol style="list-style-type: none"> <li>1. Find the maximum area of a rectangular sheep pen built up against a wall using 30 metres of fencing</li> </ol> <div style="text-align: center;">  </div>
Stage 4	4Ps4	<p><u>Describe and continue number sequences, e.g. 7, 4, 1, -2 . . . identifying the relationship between each number.</u></p> <ol style="list-style-type: none"> <li>1. Use a spreadsheet to explore number sequences. Identify the relationships between numbers in the sequence</li> </ol>

## Opportunities for ICT: STAGE 5

NUMBER:		Opportunities for ICT:
		Learners should
Stage 5	5N (all)	<u>Numbers and the number system and calculation</u> 1. Use online and electronic activities and games, including the number ITPs and interactive whiteboard resources to: <ul style="list-style-type: none"> <li>• Partition numbers up to 1 million</li> <li>• Round numbers to the nearest 10, 100 or 1000 and numbers with one or two decimal places to the nearest whole number</li> <li>• Review and practise equivalence between fractions and decimal forms</li> <li>• Find percentages of quantities</li> <li>• Use fractions to describe and estimate proportion</li> <li>• Use ratio to solve problems</li> <li>• Practise pairs of one-place decimals</li> <li>• Practise identifying multiples of 6, 7, 8, 9 up to the 10th multiple</li> <li>• Develop and explore calculation strategies</li> </ul>

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 5	5Gs2	<u>Recognise reflective and rotational symmetry in regular polygons.</u> 1. Use interactive whiteboard representations to explore and recognise reflective and rotational symmetry 2. Use an onscreen turtle program to draw and overlay rotations of regular polygons
Stage 5	5Gs3	<u>Create patterns with two lines of symmetry, e.g. on a pegboard or squared paper.</u> 1. Use a tiling/transformation program or onscreen turtle software (eg. Logo), to create patterns with two lines of symmetry
Stage 5	5Gs4	<u>Visualise 3D shapes from 2D drawings and nets, e.g. different nets of an open or closed cube.</u> 1. Use drawing tools and/or graphical modelling software to create nets of 3D shapes 2. Use animations of building 3D shapes from different nets to support understanding of the shapes and their nets
Stage 5	5Gs6	<u>Understand and use angle measure in degrees; measure angles to the nearest 5°; identify, describe and estimate the size of angles and classify them as acute, right or obtuse.</u> 1. Use interactive whiteboard protractors and/or measurement ITP to support measurement of angles. 2. Use onscreen turtle to support understanding of angle



MEASURE:		Opportunities for ICT:
		Learners should
Stage 5	5MI2	<p><u>Convert larger to smaller metric units (decimals to one place), e.g. change 2.6 kg to 2600 g.</u></p> <p>1. Use a calculator to solve problems involving different metric measures</p>
Stage 5	5MI5 5MI6	<p><u>Interpret a reading that lies between two unnumbered divisions on a scale.</u></p> <p><u>Compare readings on different scales.</u></p> <p>1. Use an online/electronic activity (e.g. a measuring scale ITP) to practise reading scales both numbered or partially numbered</p>
Stage 5	5Mt4	<p><u>Calculate time intervals in seconds, minutes and hours using digital or analogue formats.</u></p> <p>1. Use simulations of digital and analogue clocks to support complex calculations of time intervals</p>
Stage 5	5Mt5 5Mt6	<p><u>Use a calendar to calculate time intervals in days and weeks (using knowledge of days in calendar months).</u></p> <p><u>Calculate time intervals in months or years.</u></p> <p>1. Use a spreadsheet to work with dates and support exploration of date calculations</p>
Stage 5	5Ma3	<p><u>Use the formula for the area of a rectangle to calculate the rectangle's area.</u></p> <p>1. Create a formula for calculating the area of a rectangle and apply to a range of different rectangles to explore a pattern. Begin to apply to shapes, which are combinations of rectangles.</p>

HANDLING DATA:		Opportunities for ICT
		Learners should
Stage 5	5Dh1	<p><u>Answer a set of related questions by collecting, selecting and organising relevant data; draw conclusions from their own and others' data and identify further questions to ask.</u></p> <p>1. Use a database, graphing and spreadsheet software to collect and organise data, using this to find answers to questions and draw conclusions for data.</p>
Stage 5	5Dh2	<p><u>Draw and interpret frequency tables, pictograms and bar line charts, with the vertical axis labelled, for example, in twos, fives, tens, twenties or hundreds. Consider the effect of changing the scale on the vertical axis.</u></p> <p>1. Use the graphing facility on a spreadsheet or a graphing program, to construct and interpret frequency tables, pictograms and bar line charts, with the vertical axis labelled, for example, in 2s, 5s, 10s, 20s or 100s. Use the program to change the intervals on the vertical axis and discuss the effects.</p>

HANDLING DATA:		Opportunities for ICT
		Learners should
Stage 5	5Dh3	<u>Construct simple line graphs, e.g. to show changes in temperature over time.</u>
	5Dh4	<u>Understand where intermediate points have and do not have meaning, e.g. comparing a line graph of temperature against time with a graph of class attendance for each day of the week</u>
	5Dh5	<u>Find and interpret the mode of a set of data.</u> 1. Use dataloggers/sensors linked to related software to capture and work with graphs about temperature captured over time.
Stage 5	5Db1	<u>Describe the occurrence of familiar events using the language of chance or likelihood.</u> 1. Use electronic dice to explore ideas around probability.

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 5	5PS (all)	1. Use a calculator to solve problems such as: <ul style="list-style-type: none"> <li>• The perimeter of an equilateral triangle is 43.5 cm. What is the length of each side?</li> <li>• If James covers 56 cm every step he takes, how many steps will he need to take to cover 50 metres?</li> <li>• If a cup holds 400 millilitres of liquid, how many complete cups of liquid will be needed to make 5 litres?</li> <li>• Write the missing number: <math>4.85 + ? = 7.4</math>?</li> <li>• James saves \$5.50 a week. How much will he save in 12 weeks?</li> <li>• Use a spreadsheet to help to solve problems systematically e.g. <ul style="list-style-type: none"> <li>– find which number can be multiplied by itself to equal 30</li> <li>– find three consecutive numbers with a sum of 126</li> </ul> </li> </ul>

## Opportunities for ICT: STAGE 6

NUMBER:		Opportunities for ICT:
		Learners should
Stage 6	6N (all)	<u>Numbers and the number system and calculation</u> 1. Have the following competencies when using a calculator: <ul style="list-style-type: none"> <li>• Start to use the memory key</li> <li>• Be able to select the correct key sequence on a calculator to solve inverse operation problems and to carry out calculations needing more than one step</li> <li>• Recognise when it is appropriate to use mental/written methods or a calculator</li> <li>• Know how to enter negative numbers using the sign change key and recognise negative answers in the display</li> <li>• Know how to clear a calculation and how to clear the last entry</li> <li>• Know how to enter whole number and decimal calculations, including calculations with money or measures, and interpret the answer in the display</li> </ul>

NUMBER:		Opportunities for ICT:
		Learners should
Stage 6	6N (all)	<ul style="list-style-type: none"> <li>• Decide whether to round a decimal answer up or down after division, depending on the context</li> <li>• Know how to enter fractions, recognise simple recurring decimals, e.g. One third or 0.3333333. . . , And interpret rounding errors, e.g. Interpret 6.9999999. . . As 7</li> <li>• Be able to use the percentage key to find a percentage of a given amount</li> <li>• Be able to use the square root key</li> <li>• Be able to judge the approximate size of an answer and whether it is appropriate given the context</li> <li>• Know how to check a calculation by using an appropriate method</li> <li>• Use a calculator to extend understanding of squares of numbers by answering such questions as: <ul style="list-style-type: none"> <li>o Find which number which when multiplied by itself equals 2209</li> <li>o Find two consecutive numbers with a product of 6806</li> <li>o Find the length of the sides of a square whose area is 289 cm<sup>2</sup></li> </ul> </li> <li>• Use a calculator to extend understanding of place value by responding to problems such as: <ul style="list-style-type: none"> <li>o Use one operation to change 9.4 to 940</li> <li>o Use one operation to change 620 to 6.2</li> <li>o Use one operation to change 0.6 to 0.06</li> <li>o Use one operation to change 50 to 0.5</li> </ul> </li> </ul> <p>2. Be able to use electronic simulations/activities and ITPs to :</p> <ul style="list-style-type: none"> <li>• Position and order decimals on number lines with different scales</li> <li>• Recognise and extend number sequences</li> </ul>

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 6	6Gs1	<p><u>Classify different polygons and understand whether a 2D shape is a polygon or not.</u></p> <p>1. Use onscreen turtle software and/or a shape ITP, to draw 2D shapes, varying the number of sides and angles to produce different outcomes. Classify the different shapes.</p>
Stage 6	6Gs6	<p><u>Check that the sum of the angles in a triangle is 180°, for example, by measuring or paper folding; calculate angles in a triangle or around a point.</u></p> <p>1. Create and refine sequences of instructions, to construct triangles, using the process to explore the sum of angles in a triangle.</p>
Stage 6	6Gp2	<p><u>Predict where a polygon will be after one reflection, where the sides of the shape are not parallel or perpendicular to the mirror line, after one translation or after a rotation through 90° about one of its vertices.</u></p> <p>1. Use a tiling / transformation program or onscreen turtle software to transform shapes and predict the patterns made</p>

MEASURE:		Opportunities for ICT:
		Learners should
Stage 6	6MI2	<u>Convert between units of measurement (kg and g, l and ml, km, m, cm and mm), using decimals to three places, e.g. recognising that 1.245m is 1 m 24.5 cm.</u>
	6MI5	<u>Know imperial units still in common use, e.g. the mile, and approximate metric equivalents.</u>
	6Mt1	<u>Recognise and understand the units for measuring time (seconds, minutes, hours, days, weeks, months, years, decades and centuries); convert one unit of time into another.</u> <ol style="list-style-type: none"> <li>1. Use spreadsheet software to create converters for metric and metric/imperial units of measure and different units of time</li> <li>2. Use a calculator to solve problems involving different metric measures (see problems in the Problem Solving section below)</li> </ol>

HANDLING DATA:		Opportunities for ICT
		Learners should
Stage 6	6HD (all)	<ol style="list-style-type: none"> <li>1. Make a simple database, e.g. the results from a tables test out of 10, then use the software to answer the following types of question: <ul style="list-style-type: none"> <li>• Who scored over half marks?</li> <li>• What were the frequencies for: full marks? No marks?</li> <li>• What was the modal score?</li> <li>• What was the range of the scores?</li> <li>• What was the median score?</li> <li>• What was the mean score?</li> </ul> </li> <li>2. Interrogate a prepared database from other subjects, e.g. a traffic survey, and test given hypotheses, e.g. more traffic passes the school on a Friday than any other weekday. Develop their own questions and use the database to answer them. Begin to answer two or three stage questions using AND and OR. Produce appropriate graphs to show their results.</li> </ol>
Stage 6	6Dh1	<u>Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams, e.g. line graphs for distance and time; a price 'ready-reckoner' for currency conversion; frequency tables and bar charts with grouped discrete data.</u>
	6Dh2	<u>Find the mode and range of a set of data from relevant situations, e.g. scientific experiments.</u>
	6Dh3	<u>Begin to find the median and mean of a set of data.</u> <ol style="list-style-type: none"> <li>1. Use graphing software to collect and analyse data.</li> <li>2. Use dataloggers to capture data on environmental conditions (temperature, light and sound levels, pulse rate etc.) Use datalogging and spreadsheet software to analyse the data, create further graphs and draw conclusions.</li> </ol>

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 6	6PS (all)	1. Use a calculator efficiently and appropriately to carry out a range of calculations, e.g. <ul style="list-style-type: none"> <li>• If James covers 56 cm every step he takes, how many steps will he need to take to cover 50 metres?</li> <li>• If a cup holds 400 millilitres of liquid, how many complete cups of liquid will be needed to make 5 litres?</li> <li>• Write the missing number: <math>199.8 \div = 7.4</math>?</li> <li>• If 3400 people attend a music concert and the tickets cost \$7.50 each, how much money is made on the sale of the tickets?</li> <li>• Calculate 16% of 325</li> </ul>
Stage 6	6Ps4	1. <u>Use ordered lists or tables to help solve problems systematically, such as:</u> <ul style="list-style-type: none"> <li>• Find two consecutive numbers with a product of 6806</li> <li>• Compare the areas and perimeters of different 2D shapes</li> </ul>

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## APPENDIX E: PLANNING TEMPLATES

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This contains planning templates with accompanying notes as referred to in Section 2 of the guide.

- Long-term planning – 1
- Long-term planning – 2
- Long-term planning – 3
- Medium-term planning – 1
- Medium-term planning – 2
- Short-term planning

## Long-Term Planning Template 1

### Scheme of Work – An Overview

#### Stage

TERM 1	TERM 2	TERM 3
1A	2A	3A
1B	2B	3B
1C	2C	3C

#### Notes:

- *The current model of nine units per stage is recommended – three per term. Fewer would give too large a group of objectives to address in one unit although this may vary with the subject. More would be too fragmented to give coherence to the overall scheme*
- *Terminology can vary, although consistency is recommended within a school*
- *An audit of the learning objectives for the whole stage is recommended to ensure coverage<sup>1</sup>*
- *Each objective may be revisited in different ways in different units to continue to develop new skills in different contexts*
- *Some learning objectives will be ongoing throughout the stage – a grid to show this is recommended<sup>2</sup>*
- *Detail of the ongoing objectives may be given in an outline plan<sup>3</sup>*

<sup>1</sup> See audit tool.

<sup>2</sup> See table of ongoing objectives.

<sup>3</sup> See table of ongoing work.





### Notes for completing the audit (check) of objectives:

*How to complete the sheets:*

- *The number of lines in the table will match the total number of learning objectives for the stage. Several pages will be required*
- *Objectives and framework codes will be entered in the order that they appear in the framework*
- *Learning objectives will appear in full*
- *The final column will give a clear overview of coverage. Where an objective is addressed in more than one unit, all of the relevant units will be listed. If it is an ongoing objective then it will appear as 'O'*

*How to use the information collected on the sheets:*

- *The right hand column will show how often an objective appears in the whole scheme*
- *If an objective is ongoing then 'O' must be recorded. It will be assumed that work linked to the objective is taught in several (or maybe all) units*
- *For other objectives, how often each one appears in the whole scheme will be recorded. Some objectives will be taught more than once (but not as often as 'ongoing' ones!)*
- *The whole audit will help to achieve a balance, ensuring that coverage is sufficient and/or not too frequent at the expense of others*
- *A final adjustment may be required to make sure that all objectives are taught for, and at, an appropriate time*
- *Also, by doing this alongside the long term planning of units, the grouping of objectives can be changed before too much work has been done on medium-term plans*



### Notes for completing the overview sheets:

*How to complete the sheets:*

- *The number of lines in the table will match the total number of learning objectives for the stage. Several sheets may be required*
- *Objectives and framework codes will be entered in the order that they appear*
- *Learning objectives will appear in full*
- *The learning objectives can be colour coded:*
  - *Ongoing*
  - *A different colour for each term – once only when it is first introduced:*
    - Term 1*
    - Term 2*
    - Term 3*

*How to use the information collected on the sheets:*

- *The resulting overview is another kind of checklist to ensure coverage. It also shows whether too much is being introduced in the first term which may not be a balanced way of delivering the framework*
- *By doing this alongside the long term planning of units, the grouping of objectives can be changed before too much work has been done on medium-term plans*

## Medium-Term Planning Template 1

Stage

Unit: Title:

Framework Codes	Learning Objective	Activities	Resources	Comments	Time

*Notes:*

- *There may be more than one framework code in each block, e.g. if scheme considers weekly blocks within the whole unit. Objectives will be listed to match the first column*
- *The activities are given in outline only*
- *Main resource needs are required to enable strategic planning, e.g. spending*
- *This plan will require a statement in the opening rationale regarding prior knowledge*
- *Comments will highlight specific details:*
  - *where something requires advance preparation*
  - *where different assessment strategies may be in place, e.g. opportunities for active assessment (details will be in short-term (lesson) plans)*

## Medium-Term Planning Template 2

Stage

Unit: Title:

Framework Codes	Learning Objective	Activities	Resources

*Notes:*

- *There may be more than one framework code in each block. It may make sense to address certain objectives together*
- *The activities are given in outline only*
- *Main resource needs are required to enable strategic planning, e.g. spending*
- *No time budget is given for obvious reasons*
- *This plan will require a statement in the opening rationale regarding prior knowledge*

## Short-Term Planning Template

Week beginning:		Learning Objectives	Success Criteria	UNIT:		CLASS:	Evidence of Achievement
Timing	Framework Ref:			Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual	Description		
				Notes / extension opportunities / homework			
<b>Organisation:</b> details of differentiation / groups / adult role (linked to activities)						<b>Q&amp;A:</b> question/answer <b>D:</b> discussion <b>O:</b> observation <b>M:</b> marked work	

**Notes:**

- The plan can be formatted to view a week at a time and not every lesson – **this is important to support manageability**



- *Most of the plan is self-explanatory. It seeks to include most of the desirable elements. It is possible to expand the format to A3 but this risks the planning process taking too long for the time frame – also sometimes the detail required will be brief*
- *Class organisation is crucial to the plan working properly including differentiation and the role of additional adults. Plans can be shared to make expectations clear*
- **SUCCESS CRITERIA:**  
*These are an essential part of planning and should be clear and manageable*  
*These may be part of active assessment activities where learners determine the criteria. In planning, teachers need to write a broad outline of anticipated suggestions*

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