Teacher Guide

Mathematics

Cambridge
Secondary 1

UNIVERSITY of CAMBRIDGE
International Examinations
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Contents

SECTION 1: INTRODUCTION

Welcome to the Cambridge Secondary 1 Teacher Guide for Mathematics.

This guide is designed to provide a suggested approach to the implementation and management of Cambridge Secondary 1 in your school.

It offers:

- An introduction to the Cambridge Secondary 1 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 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 to help you get started. 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 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 Secondary 1 Mathematics and it is designed to cater for:

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

Schools new to Cambridge will find all sections of the Teacher Guide relevant to them. It provides a step-by-step guide through the process of implementing Cambridge Secondary 1, offering a suggested breakdown of the curriculum across the available teaching time and sample lesson plans to get you started.

Existing Cambridge Schools may be more familiar with certain aspects covered in this guide and will find particular sections more relevant to them (e.g. Section 2: Planning or Section 3: Teaching Approaches).

1.2 Cambridge Secondary 1

Cambridge Secondary 1 is an education programme which combines a world-class curriculum, integrated assessment and high-quality support for teachers. The programme has been developed by University of Cambridge International Examinations and is used in secondary schools around the world. Cambridge Secondary 1 helps schools develop learners who are confident, responsible, innovative and engaged.

Cambridge Secondary 1 covers

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

for learners aged 11–14. It provides curriculum frameworks and assessment for each subject.

Cambridge Secondary 1 provides a solid foundation for later stages of education.

It starts learners on an educational journey for their first years of secondary education, focusing on what they should be able to do at each stage of a lower secondary education. It develops skills, knowledge and understanding that will prepare them for a smooth transition to Cambridge Secondary 2 and beyond.

Cambridge Secondary 1 offers optional, integrated assessment.

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

Cambridge Secondary 1 supports teachers in providing the best teaching and learning.

Schools adopting Cambridge Secondary 1 gain access to first-class support for teachers through publications, online resource, training and progressional development.

Cambridge Secondary 1 is practical and flexible.

No part of the Cambridge Secondary 1 curriculum is compulsory, giving schools the flexibility to choose the elements that are right for their learners. This means that they can use Cambridge Secondary 1 while following their school or national curriculum, or offer the entire programme.

Cambridge Secondary 1 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 9000 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
	Cambridge Pre-U

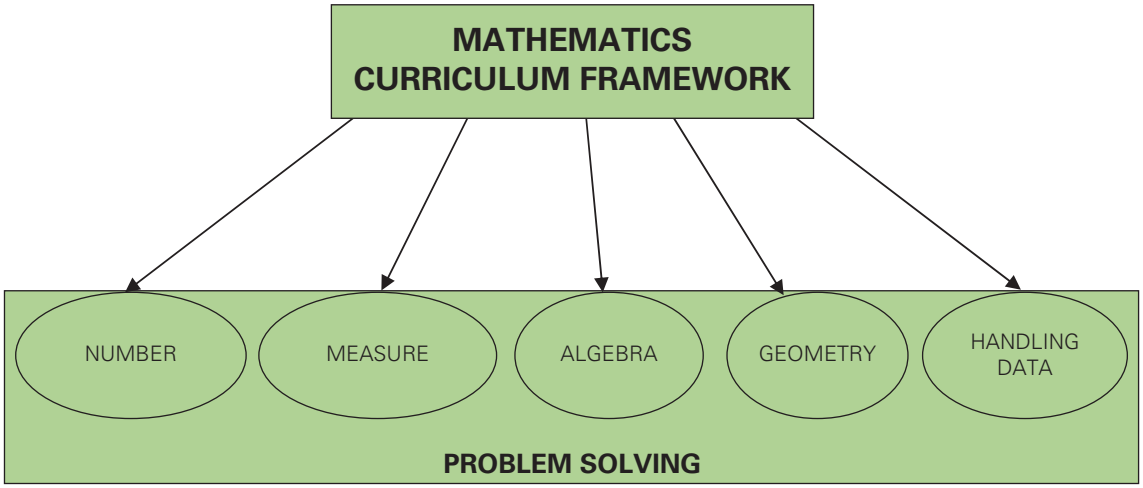
*Age ranges are for guidance only.

1.3 The Curriculum Framework

The Cambridge Secondary 1 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 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 three stages. Each stage reflects the teaching targets for a year group. Broadly speaking, stage seven covers the first year of secondary teaching, when learners are approximately twelve years old. Stage nine covers the third year of secondary teaching when learners are approximately fourteen years old. It may be appropriate to introduce this framework at slightly different ages to suit your own particular circumstances.

The curriculum framework is divided into five main areas called 'strands' which run through every stage:Number, Measure, Algebra, Geometry and Handling Data. Problem solving forms a sixth strand which involves sills that are used in every other strand.



Continuity, progression and balance

The framework allows for continuity and progression both within and between the stages. You can pick any topic and clearly 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 students move forward steadily. Teachers should ensure that plenty of opportunity for revision of learning and consolidation of skills can take place each term and within each unit. Later units have been arranged so that there is space for this review and consolidation. The class teacher is of course best placed to decide what should need to be reviewed and consolidated and how this might best take place using their knowledge of the class and individual students.

The table below shows how strands can be traced through the framework by selecting an objective from Stage 7 of the framework and one from Stage 9 that could effectively mark the 'beginning' and 'end' of a part of the framework.

Examples of progression in the curriculum framework

Stage 7	→	Stage 9
Fractions, decimals, percentages, ratio and proportion. Recognise the equivalence of simple fractions, decimals and percentages.		**Fractions, decimals, percentages, ratio and proportion**. Consolidate writing a fraction in its simplest form by cancelling common factors.
Algebra Expressions, equations and formulae. Use letters to represent unknown numbers or variables; know the meanings of the words *term, expression* and *equation*. Simplify linear expressions e.g. collect like terms; multiply a constant over a bracket.		**Algebra Expressions, equations and formulae.** Use index notation for positive integer powers; apply the index laws for multiplication and division to simple algebraic expressions. Simplify or transform algebraic expressions by taking out single-term common factors.
Processing and presenting data. Find the mode (or modal class for grouped data), median and range.		**Processing and presenting data.** Calculate statistics and select those most appropriate to the problem.
Probability. Use the language of probability to describe and interpret results involving likelihood and chance.		**Probability.** Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving probability problems.

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 considered in the light of demands placed on learners as they move into IGCSE level. Learners should be prepared at the end of stage nine to move on smoothly to Cambridge Secondary 2 for example. For this reason certain areas of the curriculum framework provide a structure for delivering skills that are highly transferable between the separate phases of education.

The selection of topics 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 skills and knowledge. 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 in the Cambridge Progression Tests and which you can analyse using the Progress Checker analysis software provided on the Cambridge Secondary 1 website. It is also tested in the Cambridge Checkpoint tests for which feedback reports are provided.

Problem solving, mental strategies and the ability to communicate ideas are integral parts of the curriculum framework. The ability to recognise patterns, draw inferences and link ideas together is the very essence of mathematical thinking. Learners will need to be able to communicate those ideas to others in a clear manner which may include diagrams as well as verbal or written explanations.

The principles and tools of Problem Solving will therefore apply to all your Mathematics lessons forming a context in which the other skills and knowledge can develop and acquire meaning. They should be present in all the thinking and discussion that takes place in the classroom. It is the teacher's responsibility to plan for and nurture these skills.

Whilst it is important to be able to identify individual progressions 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 and ultimately produces strong, confident and increasingly independent learners.

The key to success here lies with the quality of the planning for delivery in the classroom and with the teacher's ability to constantly re-tune their teaching to the needs of the learners they know so well.

SECTION 2: PLANNING

2.1 Getting Started

This next section will look at the process of planning, ensuring that you cover all of the content of the curriculum for Stages 7 to 9, given the teaching time you have available within each year.

We'll begin by 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 Problem Solving skills, Mental Strategies and Mathematics content
- The best order in which to teach the required units
- Detailed lessons, lead by clear learning objectives that the students 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 or group of lessons
- 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

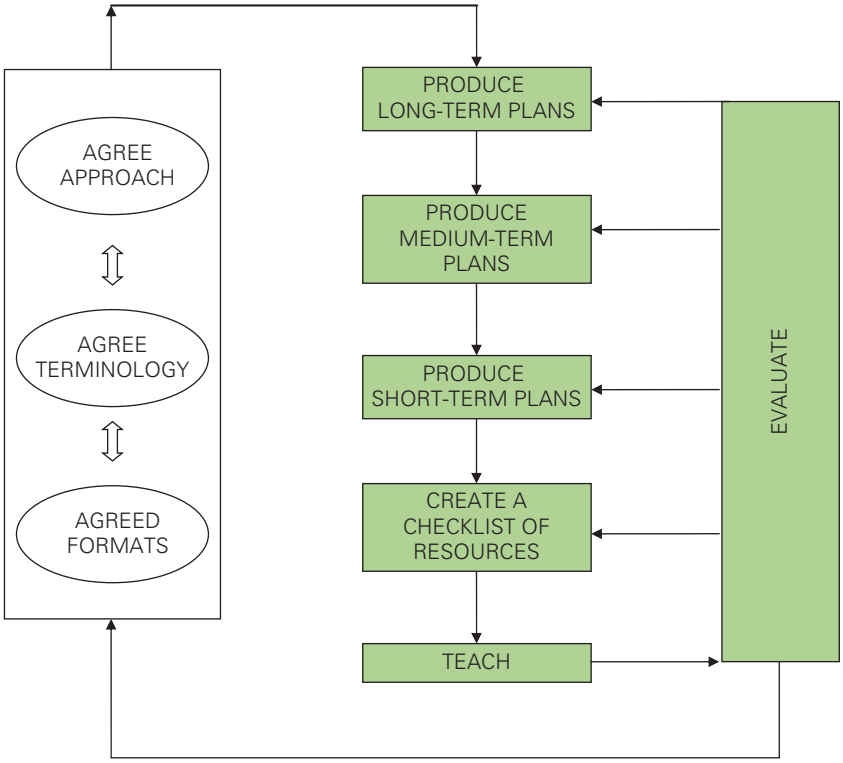
The following section lays out a step-by-step guide to the planning process including how you can build in flexibility to allow you to adapt coverage, delivery style and timing to suit your individual needs.

2.2 A Consistent Approach

Download the curriculum framework for Mathematics from www.cie.org.uk and familiarise yourself with the coverage and structure of the programme. We need to break the curriculum down and we can do this in three clear stages (or phases) but first it is worth getting all the Mathematics teachers together to coordinate a consistent approach.

Look at the diagram below. As you can see, decisions about the **'white box'** issues are required first; 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 are going to assume that Mathematics will 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 above 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, Algebra, Geometry, Measure, and Handling Data. Problem Solving skills need to be ongoing and sequential. New ideas need time to be assimilated before they can be used confidently. Formal assessment points need to be identified and clear periods of review, and reinforcement should be in place. You'll need to plan for opportunities for old topics to be re-visited and think about ways you might be able to move them forward.

Medium-term planning involves planning coverage of the curriculum in units across an entire stage. Again you will need to consider the time available and to manage a balance between the strands.

The scheme of work provided by Cambridge for each stage has assumed three units per term and three terms of 10 weeks per year. Term length varies around the world so we have chosen a relatively compact approach that should enable you to add further time as necessary. This will be easier than having to contract the plans that we have suggested, if you are using these.

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. This permits units to be taught in isolation, or in a cross-curricular way, particular to each school's policies. Alternatives will be provided for your consideration as a starting point. 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. 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 next time you are delivering it you will be able to fine tune it a bit more each time. 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. This is a detailed, working document and is led by the learning objective for that lesson.

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 e.g. 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 39 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. A good way to approach this is to create an Excel spreadsheet showing the week by week dates for the school year. Fill in the fixed items, such as school holidays and external exam dates. In this guide we will follow a structure of three terms of ten weeks, per stage.

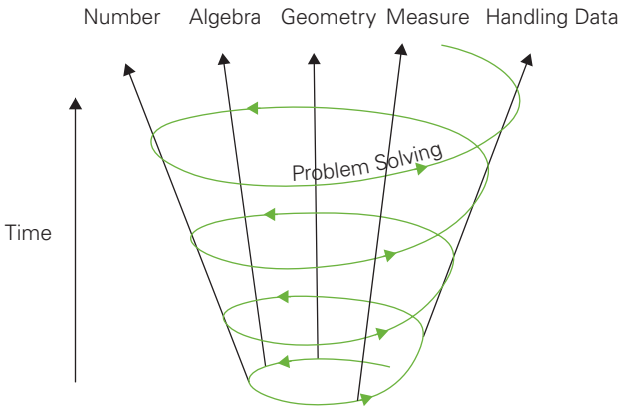
Step 2. Approach

Next, you will need to decide the overall 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 subjects may have different priorities and liaison with other subjects may mean some topics are studied at the same time or must be studied before a certain science topic. These cross curricula issues may shape the structure of your long-term plan for the benefit of your learners, so be willing to listen and discuss with other teachers

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 Secondary 1 website 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'. Cambridge recommends a spiral rather than a linear approach to planning.



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.

In the spiral approach, topics are repeatedly addressed as learners move through the stages The teacher does not assume that a learner has learnt and mastered a topic just because they have had an initial lesson on it. Instead, by returning to a topic after a period of time, the teacher builds in a review, consolidating the previous learning and adding in new skills and/or knowledge to enable progression.

Good teaching recognises that individual learners will require differing amounts of consolidation just as different learners will pick up new skills at different speeds and that most learners will, at times, be placed somewhere in between these two positions.

Step 3. Allocate 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. Think about the proportion of work in each strand within a stage. Some may require more work than others. For example, Number and Calculation are larger, generally speaking, than the other strands and so you need to allow a little more time in your plan to ensure coverage.

An overview of all three stages might look something like the table below.

A completed example of Long-term Planning_1

	Term 1	Term 2	Term 3
Stage 7	1A Number & Calculation	2A Number & Calculation	3A Number & Calculation
	1B Algebra & Measure	2B Algebra & Measure	3B Measure
	1C Handling Data & Geometry	2C Handling Data & Geometry	3C Handling Data & Geometry

	Term 1	Term 2	Term 3
Stage 8	1A Number & Calculation	2A Number & Calculation	3A Number & Calculation
	1B Algebra & Geometry	2B Algebra & Geometry	3B Algebra & Geometry
	1C Handling Data & Measure	2C Handling Data & Measure	3C Handling Data & Measure

	Term 1	Term 2	Term 3
Stage 9	1A Number & Calculation	2A Number & Calculation	3A Number & Measure
	1B Algebra & Geometry	2B Algebra & Geometry	3B Algebra & Geometry
	1C Handling Data & Measure	2C Handling Data & Measure	3C Handling Data & Geometry

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 16.

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 the template used in this way is included on page 22.

The templates:

Long-term_1	(For allocating strands by term and stage to the teaching time available)
Long-term Planning_2	(For listing objectives by term, corresponding to the order of Long-term Planning_1 decisions)
Long-term Planning_3	(This is a checklist to ensure comprehensive coverage of all learning objectives within the stage.)

You can either:

List the objectives in the order in which they appear in the framework, using colour coding to indicate the first term in which they are delivered

OR

List the objectives as they appear in the framework but separated into their individual terms per stage.

Whilst you may wish to work with a colleague on producing the long-term plan. It may be best not to involve too many people in the planning at this stage. You cannot change many of the restrictions you are going to be working with and many staff will just be grateful that you have had this much prepared for them

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

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
Number	**The number system, integers, powers and roots**	
7Ni1	Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative numbers in context.	T1
7Ni2	Recognise multiples, factors, common factors, primes (all less than 100) making use of simple tests of divisibility; find the lowest common multiple in simple cases; use the 'sieve' for generating primes developed by Eratosthenes.	T2
7Ni3	Recognise squares of whole numbers to at least 20 × 20 and the corresponding square roots; use the notation 7^2 and $\sqrt{49}$.	T2
	Place value ordering and rounding	
7Np1	Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.	T1
7Np2	Order decimal including measurements, changing these to the same units.	T1
7Np3	Round whole numbers to the nearest 10, 100 or 1000 and decimals including measurements to the nearest whole number or 1 decimal place.	T1
	Fractions decimals, percentages, ratio and proportion.	
7Nf1	Recognise the equivalence of simple fractions, decimals and percentages.	T1
7Nf2	Simplify fractions by cancelling common factors and identify equivalent fractions; change an improper fraction to a mixed number, and vice versa. Convert terminating decimals to fractions e.g. 0.23 = $\frac{23}{100}$	T1
7Nf3	Compare two fractions by using diagrams, or by using a calculator to convert the fractions to decimals, eg $\frac{3}{5}$ and $\frac{13}{20}$	T1
7Nf4	Add and subtract two simple fractions e.g. $\frac{1}{8} + \frac{9}{8}$, $\frac{11}{12} - \frac{5}{8}$ Find fractions of quantities (whole number answers); multiply a fraction by an integer.	T2
7Nf5	Understand percentages as the number of parts in every 100; use fractions and percentages to describe parts of shapes, quantities and measures .	T2
7Nf6	Calculate simple percentages of quantities (whole number answers) and express a smaller quantity as a fraction or percentage of a larger one.	T3
7Nf7	Use percentages to represent and compare different quantities	T3

(Continued)

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
7Nf8	Use ratio notation, simplify ratios and divide a quantity into two parts in a given ratio.	T3
7Nf9	Recognise the relationship between ratio and proportion.	T3
7Nf10	Use direct proportion in context; solve simple problems involving ratio and direct proportion.	T3
	Calculations mental	
7Nc1	Consolidate the rapid recall of number facts, including positive integer compliments to 100, multiplication facts to 10 × 10 and associated division facts.	T1
7Nc2	Use known facts and place value to multiply and divide two-digit numbers by a single digit number, e.g. 45 × 6, 96 ÷ 6.	T1
7Nc3	Know and apply tests of divisibility by 2, 3, 5, 6, 8, 9, 10 and 100	T1
7Nc4	Use known facts, place value to multiply simple decimals by one-digit numbers. e.g. 0.8 × 6.	T1
7Nc5	Calculate simple fractions and percentages of quantities, e.g. one quarter of 64, 20% of 50Kg.	T2
7Nc6	Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.	T2
7Nc7	Use the order of operations, including brackets, to work out simple calculations.	T3
7Nc8	Add and subtract integers and decimals, including numbers with different numbers of decimal places.	T3
7Nc9	Multiply and divide decimals with one and/or two places by single digit numbers, e.g. 13.7 × 8, 4.35 ÷ 5.	T3
7Nc10	Know that in any division where the dividend is not a multiple of the divisor; there will be a remainder, e.g. 157 ÷ 25 = 6 remainder 7. The remainder can be expressed as a fraction of the divisor e.g. 157 ÷ 25 = $6\frac{7}{25}$	T3
7Nc11	Know when to round up or down after division when context requires a whole number answer.	T2
Algebra	**Expressions, equations and formulae**	
7Ae1	Use letters to represent unknown numbers or variables; know the meanings of the words *term, expression* and *equation*.	T1
7Ae2	Know that algebraic operations follow the same order as arithmetic operations.	T1

(Continued)

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
7Ae3	Construct simple algebraic expressions by using letters to represent numbers.	T1
7Ae4	Simplify linear expressions e.g. collect like terms; multiply a constant over a bracket.	T1
7Ae5	Derive and use simple formulae e.g. to change hours to minutes.	T2
7Ae6	Substitute positive integers into simple linear expressions/ formulae.	T2
7Ae7	Construct and solve simple linear equations with integer coefficients (unknown on one side only) e.g. $2x = 8$, $3x + 5 = 14$, $9 – 2x = 7$	T3
	Sequences, functions and graphs	
7As1	Generate terms of an integer sequence and find a term given its position in the sequence; find simple term-to-term rules.	T1
7As2	Generate sequences from spatial patterns and describe the general term in simple cases.	T1
7As3	Represent simple functions using words, symbols and mappings.	T2
7As4	Generate coordinate pairs that satisfy a linear equation, where y is given explicitly in terms of x, plot the corresponding graphs; recognise straight-line graphs parallel to the x- or y-axis	T2
Geometry	**Shapes and geometric reasoning**	
7Gs1	Identify, describe, visualise and draw 2D shapes in different orientations.	T1
7Gs2	Use the notation and labelling conventions for points, lines, angles and shapes.	T1
7Gs3	Name and identify side, angle and symmetry properties of special quadrilaterals and triangles, and regular polygons with 5, 6 and 8 sides.	T1
7Gs4	Estimate the size of acute, obtuse and reflex angles to the nearest 10 degrees.	T1
7Gs5	Start to recognise the angular connections between parallel lines, perpendicular lines and transversals.	T2
7Gs6	Calculate the sum of angles at a point, on a straight line and in a triangle, and prove that vertically opposite angles are equal; derive and use the property that the angle sum of a quadrilateral is 360°.	T2
7Gs7	Solve simple geometrical problems by using side and angle properties to identify equal lengths or calculate unknown angles, and explain reasoning.	T3
7Gs8	Recognise and describe common solids and some of their properties, e.g. the number of faces, edges and vertices.	T3

(Continued)

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
7Gs9	Recognise line and rotation symmetry in two-dimensional shapes and patterns; draw lines of symmetry and complete patterns with two lines of symmetry; identify the order of rotational symmetry.	T2
7Gs10	Use a ruler, set square and protractor to: Measure and draw straight lines to the nearest millimetre. Measure and draw acute, obtuse and reflex angles to the nearest degree. Draw parallel and perpendicular lines. Construct a triangle given two sides and the included angle (SAS). Construct squares and rectangles. Construct regular polygons, given a side and internal angle.	T3
	Position and movement	
7Gp1	Read and plot coordinates of points determined by geometrical information in all four quadrants.	T3
7Gp2	Transform two-dimensional shapes by; Reflection in a given line, rotation about a given point, translation. Know that shapes remain congruent after these transformations.	T3
Measure	**Length, mass and capacity**	
7Ml1	Choose suitable units of measurement to estimate, measure, calculate and solve problems in everyday contexts	T1
7Ml2	Know and use abbreviations for and relationships between metric units; Kilo-centi-milli-; converting between; Kilometres Km, metres m, centimetres cm, millimetres mm; Tonnes t, kilograms km, and grams g Litres l, and millilitres ml.	T2
7Ml3	Read the scales on a range of analogue and digital measuring instruments.	T2
	Time and rates of change	
7Mt1	Draw and interpret graphs in real life context involving more than one stage e.g. travel graphs.	T3
7Mt2	Know the relationships between units of time; understand and use the 12-hour and 24-hour clock systems; interpreting timetables; calculate time intervals.	T2
	Area, perimeter and volume	
7Ma1	Know the abbreviations for and relationships between square metres (m^2) centimetres (cm^2) and millimetres (mm^2).	T2

(Continued)

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
7Ma2	Derive and use formulae for the area and perimeter of a rectangle; calculate the perimeter and area of compound shapes made from rectangles.	T2
7Ma3	Derive and use formula for the volume of a cuboid; calculate volumes of cuboids.	T3
7Ma4	Calculate the area of cubes and cuboids from their nets.	T3
Handling data	**Planning and collecting data**	
7Dc1	Decide which date would be relevant to an inquiry and collect and organise the data.	T1
7Dc2	Design and use a data collection sheet or questionnaire for a simple survey.	T1
7Dc3	Construct and use frequency tables to gather discrete data, grouped where appropriate in equal class intervals.	T3
	Processing and presenting data	
7Dp1	Find the mode (or modal class for grouped data), median and range.	T2
7Dp2	Calculate the mean including from a simple frequency table.	T2
7Dp3	Draw and interpret bar line graphs and bar charts, frequency diagrams for grouped discrete data, simple pie charts, pictograms.	T2
	Interpreting and discussing results	
7Di1	Draw conclusions based on the shape of graphs and simple statistics.	T3
7Di2	Compare two simple distributions using the range and the mode, median or mean.	T3
	Probability	
7Db1	Use the language of probability to describe and interpret results involving likelihood and chance.	T1
7Db2	Understand and use the probability scale from 0 to 1.	T1
7Db3	Find probabilities based on equally likely outcomes in simple contexts.	T1
7Db4	Identify all the possible mutually exclusive outcomes of a single event.	T2
7Db5	Use experimental data to estimate probabilities.	T2
7Db6	Compare experimental and theoretical probabilities in simple contexts.	T2

(Continued)

Framework Code	Learning Objective	Ongoing (O) term ref (T1, T2, T3 etc.)
Problem solving	**Using techniques and skills in solving mathematical problems**	
7Pt1	Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.	T1
7Pt2	Manipulate numbers, algebraic expressions and equations, and apply routine algorithms.	T1
7Pt3	Understand everyday systems of measurement and use them to estimate, measure and calculate.	T1, T2, T3,
7Pt4	Recognise and use spatial relationships in 2 and 3 dimensions.	T1, T2, T3
7Pt5	Draw accurate mathematical diagrams, graphs and constructions.	T2, T3,
7Pt6	Check results of calculations by using inverse operations.	T1,
7Pt7	Estimate, approximate and check their working.	T1, T2, T3
7Pt8	Solve word problems involving whole numbers, percentages, decimals, money or measures, by choosing operations and mental or written methods appropriate to the numbers and the context, including problems with more than one step.	T1, T2
	Using understanding and strategies in solving problems	
7Ps1	Identify and represent information or unknown numbers in problems, making use of numbers, symbols, words, diagrams, tables and graphs.	O
7Ps2	Recognise mathematical properties, patterns and relationships, generalising in simpler cases.	O
7Ps3	Work logically and draw simple conclusions.	O
7Ps4	Relate results and findings to the original context and check that they are reasonable.	O
7Ps5	Record and explain methods results and conclusions.	O
7Ps6	Discuss and communicate findings effectively, orally and in writing.	O

Notes:

- Framework codes will be entered in the order that they appear
- 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 – this will help to achieve a balance, ensuring that coverage is sufficient and/or not too frequent at the expense of others

A completed example of Long-term Planning_3

Term 1	Term 2	Term 3	Ongoing

Framework Code	Learning Objective
Number	**The number system, integers powers and roots**
7Ni1	Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative numbers in context.
7Ni2	Recognise multiples, factors, common factors, primes (all less than 100) making use of simple tests of divisibility; find the lowest common multiple in simple cases; use the 'sieve' for generating primes developed by Eratosthenes.
7Ni3	Recognise squares of whole numbers to at least 20 × 20 and the corresponding square roots; use the notation 7^2 and $\sqrt{49}$.
	Place value ordering and rounding
7Np1	Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.
7Np2	Order decimal including measurements, changing these to the same units.
7Np3	Round whole numbers to the nearest 10, 100 or 1000 and decimals including measurements to the nearest whole number or 1 decimal place.
	Fractions, decimals, percentages, ratio and proportion.
7Nf1	Recognise the equivalence of simple fractions, decimals and percentages.
7Nf2	Simplify fractions by cancelling common factors and identify equivalent fractions; change an improper fraction to a mixed number, and vice versa. Convert terminating decimals to fractions e.g. 0.23 = $\frac{23}{100}$
7Nf3	Compare two fractions by using diagrams, or by using a calculator to convert the fractions to decimals, e.g. $\frac{3}{5}$ and $\frac{13}{20}$
7Nf4	Add and subtract two simple fractions e.g. $\frac{1}{8} + \frac{9}{8}$, $\frac{11}{12} - \frac{5}{8}$ Find fractions of quantities (whole number answers); multiply a fraction by an integer.
7Nf5	Understand percentages as the number of parts in every 100; use fractions and percentages to describe parts of shapes, quantities and measures.
7Nf6	Calculate simple percentages of quantities (whole number answers) and express a smaller quantity as a fraction or percentage of a larger one.
7Nf7	Use percentages to represent and compare different quantities.
7Nf8	Use ratio notation, simplify ratios and divide a quantity into two parts in a given ratio.
7Nf9	Recognise the relationship between ratio and proportion.
7Nf10	Use direct proportion in context; solve simple problems involving ratio and direct proportion.

(Continued)

Framework Code	Learning Objective
	Calculations mental
7Nc1	Consolidate the rapid recall of number facts, including positive integer compliments to 100, multiplication facts to 10 × 10 and associated division facts.
7Nc2	Use known facts and place value to multiply and divide two-digit numbers by a single digit number, e.g. 45 × 6, 96 ÷ 6.
7Nc3	Know and apply tests of divisibility by 2, 3, 5, 6, 8, 9, 10 and 100.
7Nc4	Use known facts, place value to multiply simple decimals by one-digit numbers. e.g. 0.8 × 6.
7Nc5	Calculate simple fractions and percentages of quantities, e.g. one quarter of 64, 20% of 50Kg.
7Nc6	Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.
7Nc7	Use the order of operations, including brackets, to work out simple calculations.
7Nc8	Add and subtract integers and decimals, including numbers with different numbers of decimal places.
7Nc9	Multiply and divide decimals with one and/or two places by single digit numbers, e.g. 13.7 × 8, 4.35 ÷ 5.
7Nc10	Know that in any division where the dividend is not a multiple of the divisor; there will be a remainder, e.g. 157 ÷ 25 = 6 remainder 7. The remainder can be expressed as a fraction of the divisor e.g. 157 ÷ 25 = $6\frac{7}{25}$
7Nc11	Know when to round up or down after division when context requires a whole number answer.
Algebra	**Expressions, equations and formulae**
7Ae1	Use letters to represent unknown numbers or variables; know the meanings of the words *term, expression* and *equation*.
7Ae2	Know that algebraic operations follow the same order as arithmetic operations.
7Ae3	Construct simple algebraic expressions by using letters to represent numbers.
7Ae4	Simplify linear expressions e.g. collect like terms; multiply a constant over a bracket.
7Ae5	Derive and use simple formulae e.g. to change hours to minutes.
7Ae6	Substitute positive integers into simple linear expressions/formulae.
7Ae7	Construct and solve simple linear equations with integer coefficients (unknown on one side only) e.g. 2x = 8, 3x + 5 = 14, 9 – 2x = 7

(Continued)

Framework Code	Learning Objective
	Sequences, functions and graphs
7As1	Generate terms of an integer sequence and find a term given its position in the sequence; find simple term-to-term rules.
7As2	Generate sequences from spatial patterns and describe the general term in simple cases.
7As3	Represent simple functions using words, symbols and mappings.
7As4	Generate coordinate pairs that satisfy a linear equation, where y is given explicitly in terms of x, plot the corresponding graphs; recognise straight-line graphs parallel to the x- or y-axis.
Geometry	**Shapes and geometric reasoning**
7Gs1	Identify, describe, visualise and draw 2D shapes in different orientations.
7Gs2	Use the notation and labelling conventions for points, lines, angles and shapes.
7Gs3	Name and identify side, angle and symmetry properties of special quadrilaterals and triangles, and regular polygons with 5, 6 and 8 sides.
7Gs4	Estimate the size of acute, obtuse and reflex angles to the nearest 10 degrees.
7Gs5	Start to recognise the angular connections between parallel lines, perpendicular lines and transversals.
7Gs6	Calculate the sum of angles at a point, on a straight line and in a triangle, and prove that vertically opposite angles are equal; derive and use the property that the angle sum of a quadrilateral is 360°.
7Gs7	Solve simple geometrical problems by using side and angle properties to identify equal lengths or calculate unknown angles, and explain reasoning.
7Gs8	Recognise and describe common solids and some of their properties, e.g. the number of faces, edges and vertices.
7Gs9	Recognise line and rotation symmetry in two-dimensional shapes and patterns; draw lines of symmetry and complete patterns with two lines of symmetry; identify the order of rotational symmetry.
7Gs10	Use a ruler, setsquare and protractor to: Measure and draw straight lines to the nearest millimetre. Measure and draw acute, obtuse and reflex angles to the nearest degree. Draw parallel and perpendicular lines. Construct a triangle given two sides and the included angle (SAS). Construct squares and rectangles. Construct regular polygons, given a side and internal angle.

(Continued)

Framework Code	Learning Objective
	Position and movement
7Gp1	Read and plot coordinates of points determined by geometrical information in all four quadrants.
7Gp2	Transform two-dimensional shapes by; Reflection in a given line, rotation about a given point, translation. Know that shapes remain congruent after these transformations.
Measure	**Length, mass and capacity**
7Ml1	Choose suitable units of measurement to estimate, measure, calculate and solve problems in everyday contexts.
7Ml2	Know and use abbreviations for and relationships between metric units; Kilo-centi-milli-; converting between; Kilometres Km, metres m, centimetres cm, millimetres mm; Tonnes t, kilograms km, and grams g; Litres l, and millilitres ml.
7Ml3	Read the scales on a range of analogue and digital measuring instruments.
	Time and rates of change
7Mt1	Draw and interpret graphs in real life context involving more than one stage e.g. travel graphs.
7Mt2	Know the relationships between units of time; understand and use the 12-hour and 24-hour clock systems; interpreting timetables; calculate time intervals.
	Area, perimeter and volume
7Ma1	Know the abbreviations for and relationships between square metres (m^2) centimetres (cm^2) and millimetres (mm^2).
7Ma2	Derive and use formulae for the area and perimeter of a rectangle; calculate the perimeter and area of compound shapes made from rectangles.
7Ma3	Derive and use formula for the volume of a cuboid; calculate volumes of cuboids.
7Ma4	Calculate the area of cubes and cuboids from their nets.
Handling data	**Planning and collecting data**
7Dc1	Decide which date would be relevant to an inquiry and collect and organise the data.
7Dc2	Design and use a data collection sheet or questionnaire for a simple survey.
7Dc3	Construct and use frequency tables to gather discrete data, grouped where appropriate in equal class intervals.
	Processing and presenting data
7Dp1	Find the mode (or modal class for grouped data), median and range.
7Dp2	Calculate the mean including from a simple frequency table.
7Dp3	Draw and interpret bar line graphs and bar charts, frequency diagrams for grouped discrete data, simple pie charts, pictograms.

(Continued)

Framework Code	Learning Objective
	Interpreting and discussing results
7Di1	Draw conclusions based on the shape of graphs and simple statistics.
7Di2	Compare two simple distributions using the range and the mode, median or mean.
	Probability
7Db1	Use the language of probability to describe and interpret results involving likelihood and chance.
7Db2	Understand and use the probability scale from 0 to 1.
7Db3	Find probabilities based on equally likely outcomes in simple contexts.
7Db4	Identify all the possible mutually exclusive outcomes of a single event.
7Db5	Use experimental data to estimate probabilities.
7Db6	Compare experimental and theoretical probabilities in simple contexts.
Problem solving	**Using techniques and skills in solving mathematical problems**
7Pt1	Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.
7Pt2	Manipulate numbers, algebraic expressions and equations, and apply routine algorithms.
7Pt3	Understand everyday systems of measurement and use them to estimate, measure and calculate.
7Pt4	Recognise and use spatial relationships in 2 and 3 dimensions.
7Pt5	Draw accurate mathematical diagrams, graphs and constructions.
7Pt6	Check results of calculations by using inverse operations.
7Pt7	Estimate, approximate and check their working.
7Pt8	Solve word problems involving whole numbers, percentages, decimals, money or measures, by choosing operations and mental or written methods appropriate to the numbers and the context, including problems with more than one step.
	Using understanding and strategies in solving problems
7Ps1	Identify and represent information or unknown numbers in problems, making use of numbers, symbols, words, diagrams, tables and graphs.
7Ps2	Recognise mathematical properties, patterns and relationships, generalising in simpler cases.
7Ps3	Work logically and draw simple conclusions.
7Ps4	Relate results and findings to the original context and check that they are reasonable.
7Ps5	Record and explain methods results and conclusions.
7Ps6	Discuss and communicate findings effectively, orally and in writing.

Notes:

- 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

A comprehensive set of suggested long-term plans are provided by Cambridge for each stage in the scheme of work on the Cambridge Secondary 1 website.

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.

Step 5. Creating Units and Step 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 and resources to deliver the objectives and resources
- Identified opportunities for ICT
- Created 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 Secondary 1 website.

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 both Bloom's and Gagne's learning models 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 demonstrates to your learners how the learning process works.

The following section is a brief outline of both Gagne and Bloom's ideas that provide a structure for the process of learning that is very helpful in considering the order in which we might teach.

Gagne

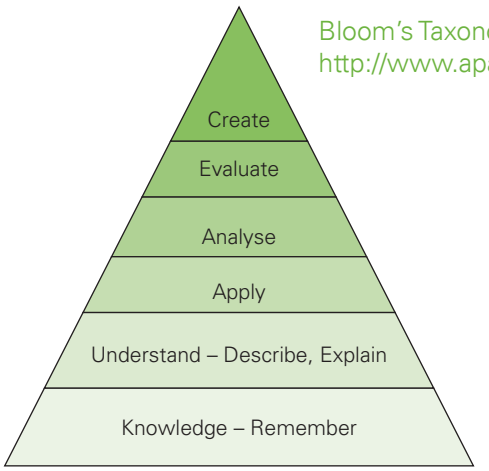
Gagne's theory outlines nine instructional events and corresponding cognitive processes. These events should satisfy or provide the necessary conditions for learning. The following example illustrates a teaching sequence for 'recognising an equilateral triangle' corresponding to the nine instructional events for the objective.

Instructional events	Cognitive processes	Recognise an equilateral triangle
(1) gaining attention	Reception	Show variety of computer generated triangles
(2) informing learners of the objective	Expectancy	Pose question: "What is an equilateral triangle?"
(3) stimulating recall of prior learning	Retrieval	Review definitions of triangles
(4) presenting the stimulus	Selective perception	Give definition of equilateral triangle
(5) providing learning guidance	Semantic encoding	Show example of how to create equilateral triangles
(6) eliciting performance	Responding	Ask students to create 5 different examples
(7) providing feedback	Reinforcement	Check all examples as correct/incorrect
(8) assessing performance	Retrieval	Provide scores and remediation
(9) enhancing retention and transfer	Generalisation	Show pictures of objects and ask students to identify equilaterals

Bloom

The cognitive domain (Bloom, 1956) involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, which are listed in order below, starting from the simplest behaviour to the most complex. The categories can be thought of as degrees of difficulty. That is, the first one must be mastered before the next one can take place, or as stages in the development of learning from play through experimental use to using in context and comprehension and assimilation as a tool that can be used with confidence to solve future problems.

Bloom's Taxonomy



Bloom's Taxonomy (Revised)
http://www.apa.org/ed/new_blooms.html

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

How might this be applied to learning about fractions in Mathematics?

Creating	Drawing diagrams to illustrate fractions-shading 3 squares out of 4
Evaluating	Which fractions are bigger $\frac{2}{3}$ or $\frac{3}{5}$?
Analysing	Why is $\frac{2}{3}$ bigger than $\frac{3}{5}$? How do we know?
Applying	Practice putting fraction in order of size – equivalent fractions
Understanding	Being able to use equivalent fraction to help carry out addition
Remembering	Confident use of fractions in word problems and real life situations

Once you have arranged and ordered your objectives around the 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.

Consider if there is an equal distribution of time in each term or if one term is, for example, much shorter than the others for some reason (say a religious holiday). Can the units be juggled around to make a better fit? Every school, every department even is different and no scheme of work is going to be ideal for every situation. Now you should be able to see which units are to be delivered in which terms.

You will need to think about the structure of the framework. You will notice for example, that there are more learning objectives in the earlier units partly to allow learners to become confident earlier on with some of the more crucial learning objectives, and partly to allow time for review and consolidation. In order to allow some flexibility and to encourage teachers to think about the potential of the spiral grouping of learning objectives, we have put more learning objectives into units A and B of each term and also more into terms 1 and 2 so that as learning progresses there is space built in to review earlier topics.

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

Your answers to the questions on page 28 will enable you to build up a series of activities that you could consider using when you are required to teach a particular learning objective. However, you should consider that the same activity presented by two different teachers can look very different and have very different outcomes depending upon the personality of the teachers and of the learners. Even the time of day and sequence of prior lessons can make a big difference to the eventual outcome. You may want to include in your medium-term plan ideas for how different topics could be assessed or how topics could be differentiated if you are trying to encourage other teachers to increase or improve the level of assessment or differentiation used.

Incorporating Problem Solving objectives into units

You will need to consider how the Problem Solving objectives will be addressed in every unit. Some ways in which they can be introduced into a lesson are;

- As a starter to get the work on a particular topic going
- At the end of a lesson to show how the skills of that lesson can be used in a Problem Solving scenario
- At the end of a unit to show how the skill of that unit can be employed in Problem Solving
- As a lesson in their own right looking at the specific skills required, by breaking the problem down into smaller steps and by being able to extend a found solution to cover other cases

Decisions about units, activities and resources should be recorded as a medium-term plan. Two blank templates are available in the appendices of this guide for you to write your own medium-term plans

Medium-term Planning_1 – has additional columns for comments and time allocations

Medium-term Planning_2 – is without these columns

Cambridge has supplied comprehensive medium-term plans (the Scheme of Work) for each of the nine units at each stage which are available on the Cambridge Secondary 1 website (https://cambridgesecondary1.cie.org.uk). These contain the coded learning objectives for each unit together with suggestions for activities that might develop the objective, and/or notes on any important aspects that might need consideration. You may have your own ideas as to how these objectives can be delivered and you are encouraged to adapt or amend these plans to suit your own needs.

Extracts from the Cambridge scheme of work are included in Appendix B.

A completed example of Medium-term Planning_2 is provided on the following pages.

A completed example of Medium-term Planning_2

This example is from Stage 7: Unit 1A, Number and Calculation

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Nc1	Consolidate the rapid recall of number facts, including positive integer compliments to 100, multiplication facts to 10 × 10 and associated division facts.	Revise multiplication tables from 1 to 10, and addition and subtraction facts for numbers between 0 and 20. Look for patterns that make mental calculations easier, for example what happens when 9 is added to a two digit number, or that 5 + 7 is the same as 6 + 6. Ask questions such as 'which pairs of numbers will add together to make 17?'	Follow me cards Number cards Multiplication Tables	Many aspects of this unit may well be familiar or even prior knowledge for some pupils. How will you find out which? See 'Assessing prior knowledge' section and lesson plans.	
7Np1	Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.	Use a number line with place value headings and moveable cards with single digits on them to discuss place value. Investigate how the digits move in relation to the decimal point when multiplied or divided by the powers of ten. Ensure that the class understands that multiplying by 10, 100 and 1000 makes the number bigger while dividing by these numbers makes the number smaller. Progress to paper and pencil methods.	Search for 'place value' at www.learn.co.uk		

(Continued)

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Np2	Order decimal including measurements, changing these to the same units.	Give each pupil a decimal number then get them to line up in order of size. Select 4 decimal cards for individuals to order explaining strategy to a partner.	Decimal cards		
7Np3	Round whole numbers to the nearest 10, 100 or 1000 and decimals including measurements to the nearest whole number or 1 decimal place.	Use a number line to investigate rounding by placing, for example, a decimal on the line and deciding which whole number it is closest to. Devise rules for rounding.	Headlines that use numbers what do they really mean?		
7Nc2	Use known facts and place value to multiply and divide two-digit numbers by a single digit number, e.g. 45×6, $96 \div 6$.	Partition as $40 \times 6 + 5 \times 6$ or $90 \div 6$ and $6 \div 6$. Link to tables			
7Nc3	Know and apply tests of divisibility by 2, 3, 5, 6, 8, 9, 10 and 100.	Look for Patterns in a multiplication table.	20 questions on what number am I Smart board resources		
7Nc4	Use known facts, place value to multiply simple decimals by one-digit numbers. e.g. 0.8×6.	Use column headings. Link with equivalent FDP to establish known facts eg $0.8 \times 3 = 0.8 + 0.8 + 0.8$			

(Continued)

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Nf1	Recognise the equivalence of simple fractions, decimals and percentages.	Use paper, card and counters. Cut circles ('pies' or 'pizzas') into different numbers of slices to make comparisons between fractions. Use column headings to identify decimals as tenths or hundredths. Identify percentages as parts per 100.	Equivalence dominoes/ cards Equivalence chains $\frac{1}{4} = 0.25 = 25\%$		
7Nf2	Simplify fractions by cancelling common factors and identify equivalent fractions; change an improper fraction to a mixed number, and vice versa. Convert terminating decimals to fractions e.g. 0.23 = $\frac{23}{100}$.	Ensure that the students understand that the denominator of the fraction is the 'name' of the fraction and represents the number of equal parts the whole is divided into, and that the numerator shows how many of these parts are being used. Discover equivalent fractions by further dividing each slice of the pie. Find fractions of counters and paper strips by dividing into equal parts and then selecting the required number of parts.	Find work using fraction pairs at http://www.mymaths.co.uk http://math.rice.edu/~lanius/Patterns/index.html		
7Nf3	Compare two fractions by using diagrams, or by using a calculator to convert the fractions to decimals, e.g. $\frac{3}{5}$ and $\frac{13}{20}$				

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Ni1	Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative numbers in context.	Wall size number line. Give each pupil a +/– number then get them to line up in order of size. Select 4 negative number cards for individuals to order explaining strategy to a partner.	Negative number cards		

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 advanced preparation*
  - *where different assessment strategies may be in place, e.g. opportunities for active assessment (details will be in short term (lesson) plans)*

2.6 Phase 3 – Creating a Lesson Plan (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 creating 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.

When working with a group of teachers delivering the framework to a large number of learners, it can be very helpful to have an agreed format for your short-term planning. Then everybody knows what should be included and all teachers are given the chance to understand why certain parts are considered important. The training activity below suggests a way you can manage this with your colleagues.

Training Activity: Producing a Lesson Plan Format (Appendix 2)

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.

Step 7. Creating your Lesson Plan

The suggested lesson plan format on page 39 contains instructions for filling in each of the sections and can be used as the basis for a discussion of the content of short-term plans generally. You can distribute it at the end of the training activity above, draw your points together and adapt it to your own agreed format.

On page 40 you will find a completed example of a short term plan as an illustration of using this method.

All the teachers should understand what has been included and why it is important. It can be good practice and a very valuable lesson to have two teachers who are prepared to swap lesson plans and teach each other's lessons. Then afterwards they can meet and feedback on how it actually worked out.

They must understand that a different experience is quite likely when the same plan is used by different staff with different learners if that were not true one plan would be all we ever needed.

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

Later Sections (Section 3: Teaching Approaches and Section 4: Assessment) describe other things that strengthen teaching. but it is primarily the teacher delivering the lesson who drives progress, motivates the learners and gets to feel good about it all afterwards.

When constructing your lesson plans you should ensure that their function is clear and that they describe:

- **What** is to be taught
- **When** it is to be taught, and
- **How** it is to be taught

You should consider whether:

- Possible problems and difficulties have been considered
- Each lesson can be seen to take its place in a progression of learning experiences
- It *shows* how learning will take place and how progress can be, and is being made

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

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. The best 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 *in addition to* the intended planning.

Teachers also need to be aware that progression can only take place on solid foundations and that time needs to be spent ensuring that understanding is developing alongside the learning.

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, 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 up0 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.
- Different teachers have different ways and ideas so plans should be shared and discussed
- Good quality questioning doesn't just happen it needs to be considered and prepared
- Time need to be built in for some ongoing assessment before a class is 'moved on'
- Even the best laid plans can go astray so be prepared to be flexible

An example of a short-term plan can be found on page 40.

Further sample lesson plans can be found in Appendix C at the back of this guide.

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.) W: whole class; G: group; I: individual**		**Resources**	**Evidence of Achievement**
				Description	**W/G/I**		
Breaks 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) **Q&A**: question/ answer **D**: discussion **O**: observation **M**: marked work
Organisation: Details of differentiation/groups/adult role (linked to activities)				**Notes/extension opportunities/homework**			
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).				This is 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.			

A completed example of a Short-term Plan for Stage 8: Unit 2A, Algebra and Geometry

Week beginning:			**UNIT:Unit Algebra & Geometry2A lesson 1 of unit**			**CLASS:Year 8 set 1/5**	
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**		
10–15 min 25min 15min 5min	8Ni2	Identify and use multiples, factors, common factors, highest common factors, lowest common multiples and primes; write a number in terms of its prime factors, e.g. $500 = 2^2 \times 5^3$.	I can list all the factors of 20. I can list all the prime factors of 20. I can list all the multiples of 5 up to 50. I can find the HCF & LCM of 24 and 56. I can write 300 as a product of its prime factors i.e. $300 = 2^2 \times 3 \times 5^2$ **All** students can identify Factors and multiples. **Most** students can find HCF and LCMs. **Some** students can write a number as a product of its prime factors.	Make clear definitions: Factors, Multiples, Prime Numbers – maybe prior knowledge. List on board sets of multiples for different numbers draw from the lists Lowest Common Multiples. Similarly create lists of factors of different numbers draw from them Highest Common Factors. Demonstrate a factor tree for each of two numbers and how it can help find HCF & LCM using prime factorisation. i.e. Probably many examples will be needed – encourage students to come out to the board and try some. Students try some HCF & LCM questions on their own. Plenary: what simple HCF and LCMs can the class recall – quick questions.	W W G I W	Venn diagram for factors of 24 and 56 Shows common factors better. Factor tree for 10 shows Prime Factors only 2 ↙ 10 ↘ 5 Prepared text questions or textbook exercise	**Q&A**: question / answer **D**: discuss'n **O**: observ'n **M**: marked work

Organisation: Details of differentiation/groups/adult role (linked to activities)	**Notes/extension opportunities/homework**	
Prepare Venn diagrams and Factor trees for weaker students to complete as scaffolding, more able students need to produce their own. Writing a number as a product of its prime factors should arise from the Factor Tree exercise. This class does not have a teaching assistant.	More able students can be given 3 digit numbers or a set of three 2 digit numbers to find HCF and LCM of. Homework could be used to reinforce the ideas of factors and multiples and /or HCF and LCM depend upon the teachers assessment of progress.	

SECTION 3: TEACHING APPROACHES

In this section we will consider some of the different approaches available to the teacher that you may want to encourage your staff or colleagues to consider or adopt.

Many teachers tend to use a style of teaching which they feel 'comfortable with' but we need to be 'comfortable with' styles that help our learners to learn and succeed and students learn in many different ways. We will look more closely at these in later sections. Some activities tend to fit one style rather than another, some can be adapted to fit a number of learning styles by changing or adding to what can be done. Ideally any activity should produce more questions than answers and will provide a starting point for further student-led inquires.

As a warm up exercise when getting teachers to consider *how* they teach rather than *what* they teach, you might like to try this activity

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 because they are so familiar.

3.1 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. In the short-term plan you 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 objective is needed.

First of all, the word ‘objective’ itself may need to be made easier to understand. 'Learning intention' is an easier phrase.

When objectives, or learning intentions are shared, learners 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.

The Framework makes the objectives clear to the teacher at each stage.

To make objectives clearer to learners the words need to be changed.

The statements can be written as an affirmation

I can draw picture of a fraction
I can write fractions with different denominators
I can add two fractions together

Or presented in a say that most or all of the class will be able to understand as in

All of the class will be able to draw a picture of a fraction
Most of the class will be able to write fractions with different denominators
Some of the class will be able to add two fractions

The table below gives examples of verbs that could be used when re-wording objectives. They are examples *only*, with some alternatives listed too.

'knowledge' = **to know. . .**	*'concepts'* = **to understand. . .**
– to recall – to recognise – to identify	– to explain – to realise
'skills' = **to be able to. . .**	*'attitude'* = **to be aware of. . .**
– to explore – to use – to talk about – to discuss – to know how to	– to identify – to know about

Example:

Objective: To recognise squares of whole numbers to at least 20 × 20 and the corresponding square roots using the notation 7^2 and $\sqrt{49}$ [7Ni3]

Words used: 'squares' and 'square roots'. Learners need to learn the words and also link the squares and square roots together so $3^2 = 9$ **and** $\sqrt{9} = 3$. Many learners will already know squares up to 12 × 12 from earlier work. However some will not know that some mathematical words have a special meaning in this subject.

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. This task is easier if the learning intentions are clear in the medium-term plan. The words used will also relate closely to the 'success criteria' (see below).

Success criteria

Sharing success criteria with pupils helps them to see if they have been successful in meeting the learning intention(s) for that lesson. It can provide them with an example of what they should be able to do at a given point.

They will tend to be more specific than the affirmation statements mentioned above for example the statement 'I can draw a picture of a fraction' could become the success criteria 'I can draw a picture of $\frac{2}{3}$', with the evidence provided by a correct diagram.

'I can write fractions with different denominators' becomes 'I can complete the following':

$$\frac{2}{3} = \frac{?}{6} = \frac{6}{?}$$

'I can add two fractions' could become 'I can work out $\frac{2}{3} + \frac{4}{5} =$'

Success criteria can be shared at the start of the lesson or can be used as a short assessment at the end of a lesson or period of work. They can even be used as a starter for a following lesson, reviewing previous work.

For example

9Np2 ☹ 😐 ☺	Round numbers to a given number of decimal places or significant figures; use to give solutions to problems with an appropriate degree of accuracy.

Evidence :

a) Round 13.56 to 1 decimal place _____ [1]

b) Round 104.6 to 1 sf _____ [1]

c) Round 22 319 to 2 dp _____ [1]

d) Round 0.0379 to 2 significant figures _____ [1]

e) work out $\frac{1.2 \times 3.4}{0.2 \times 1.6}$ give your answer to an appropriate degree of accuracy _____[1]

Where the pupils can record/colour one of the icon faces to indicate their confidence and answer the evidence questions to show what they can do.

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.

Self evaluation:

To help learners become more aware of their own learning teachers can also use self-evaluation techniques such as getting learners to answer a series of questions such as those below.

Thinking about what happens when we are learning

(The teacher should choose one and add the words of the learning intention)

- What really made you think while you were learning to .....?
- What helped you (e.g. a friend, the teacher, equipment, a book, your own thinking) when something got tricky about learning to .....?
- What do you need more help with about learning to .....?
- What are you most pleased with about learning to .....?
- What have you learnt that is new about .....? (quote learning intention)

Planning the wording for learners will need to be done by individual teachers as they know their learners best and can use the most suitable wording for that particular class.

Motivation and Interest

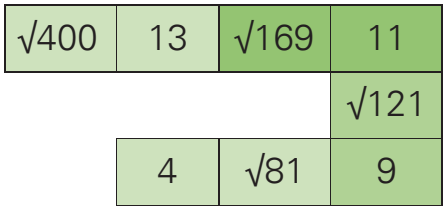
Here are a few ideas for creating activities that can help motivate students to understand and learn particular aspects of mathematics through application. For example, number bonds. Once you have presented learners with the facts you could encourage them to learn them by playing games such as bingo;

Bingo card

√400	√121		2	15
	√361	3	12	49
√16	√25	17	9	
√36		√4	7	16
√196	√64	√169		18

The teacher calls out numbers such as 11. The students cross off or place a counter on √121 or call √81 and the students cross off or place a counter on 9. You could produce graded cards with squares up to 10 × 10 for one group and squares up to 20 × 20 for another.

Or you could make square root dominoes



Bingo cards or dominoes could be produced for almost any topic that requires recall of specific facts. They can be used for a short review with some or all groups at the start or end of a lesson. (Just 4 dominoes are shown.)

3.2 Active Learning

Active or student-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 understanding of the subject as they discover new skills and knowledge through these discussions. In this way they are able to construct their own meaning through talking, listening, writing, solving problems and reflecting on ideas 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 the Cambridge Secondary 1 level 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.

Some of the literature on 'student-centred' or 'Active learning' includes the following helpful tenets:

1.	'the reliance on active rather than passive learning,
2.	an emphasis on deep learning and understanding
3.	increased responsibility and accountability on the part of the student
4.	an increased sense of autonomy in the learner
5.	an interdependence between teacher and learner
6.	mutual respect within the learner teacher relationship
7.	and a reflexive approach to the teaching and learning process on the part of both teacher and learner.'

How might these 7 tenets appear in a lesson?

1.	Students are involved in doing something that requires or practices a certain skill or piece of knowledge
2.	They can explain why something is so or adapt a piece of previous learning to a similar situation
3.	They may make decisions about what to do next to advance their learning
4.	They feel that they have some control over what they do
5.	The teacher is not at the centre of everything that happens in the lesson
6.	students spend less time 'off task'
7.	Students are able to discuss and think about what they have done

What is the impact of teaching in this way?

- The learner has more responsibility for his/her own learning
- The relationship between learners is more equal, promoting growth and development because involvement and participation are necessary for learning and they must learn to respect each other
- The teacher becomes more of a facilitator as learners take more responsibility for their own learning
- The learner experiences learning through many different inputs including thought and emotion
- The learner sees himself differently as a result of the learning experience, s/he is more aware of their own learning and their existence as a member of a particular learning community

Here is one example of how you might act more as a facilitator. Learners need to be aware of their own learning ability on any given issue and as a teacher you can encourage this kind of thinking by providing opportunities for them to consider what they can manage once you have explained a task.

For example, after a 10–15 minute demonstration of the methods of solving equations you could give your class the following exercises to solve.

Ex A	Ex B	Ex C
1. $x + 7 + 13$	1. $3x + 2 = 8$	1. $2(x + 3) = 10$
2. $x – 3 = 12$	2. $3x – 5 = 10$	2. $3(x + 2) = 12$
3. $2x = 16$	3. $2x + 12 = 24$	3. $12 – 3(x + 1) = 0$
4. $5x = 50$	4. $5x – 20 = 70$	4. $2(x + 3) + 7 = 17$
5. $5x + 5 = 50$	5. $20 – 3x = 14$	5. $2(x – 1) + 3(x – 2) = 32$

The class are told that they must attempt 10 questions but they can choose five of the ten questions available. They can do the easier questions in Exercise A or the harder ones in Exercise C or a mixture. Exercise B is carried out by everyone as it covers the middle ground in terms of difficulty. This is also an example of what we call a 'differentiated' task.

3.3 Differentiation

Differentiation is when a teacher reflects on learners' 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 have a chance to progress.

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

- **level of ability**: this is both for supporting the less able as well as challenging the most able – and
- **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 child 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. For example, when learners are working on 'addition of fractions', some might use fraction diagrams whilst others might be able to work directly from a book activity or worksheet. The most able might make up their own sums for others.

By varying the outcome. This is when learners are expected to reach different standards by learning through adapted learning styles or resources. For example, if the class task is to write a short story about a journey from a graph, some learners will produce a basic narrative, some learners with developing skills might draw conclusions from or interpret the graph; others, whose skills are good, might write about the average speed of the journey.

By varying learner support. This is when learners receive additional adult help from the teacher, a classroom assistant or even a more able learner. For example, when a class is undertaking an investigation activity in Mathematics, the teacher might work with the less able group but allow the most able learners to work alone, or in pairs.

There are several ways in which the needs of learners can be met.

- Differentiated group work
- Differentiated open-ended tasks
- Differentiated questioning. This is particularly important when using 'closed' questions (see section 4.4).
- Open questions. These allow all learners to take part. Encourage learners to discuss their answers either in pairs or small groups before giving a response.
- Targeted questions. This is when pairs or small groups are asked specific questions related to the main learning outcome.
- Providing opportunities for learners to select their own questions to solve

It is important that all learners have the opportunity to take part in a discussion, and can respond orally or through number cards, symbols, tactile materials, specially adapted or specialised resources or with the support of an adult. This can require a teacher to deploy different responses to those they normally use. (See section 4.4: Developing Assessment in the Classroom).

Some learners may need extension activities. These should be based around the same learning objective as the rest of the class and need to be higher but with realistic expectations. Learning objectives could be drawn from the next unit or from the list within the framework. 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 learning outcomes.

Written work or homework can be adapted to suit particular needs if a learner needs more help with understanding the written word. Enlarged print, illustrations which provide clues to the meaning of the words or an audio tape can be used. Simplifying the vocabulary or breaking the task down into simpler steps, with more guidance can also help. You would need to provide appropriate, adapted resources in these cases.

Learners who need extra support can be encouraged to choose their own support materials. The most important thing to remember is that each learner is coming to this lesson with an individual learning history and will hear and understand something very different from other learners in the same lesson. So it should not be a surprise that at the end of your lesson different learners will have reached very different levels of understanding, skills and confidence. We can easily fall into the trap of expecting everybody to be at the same level. But if we are building in differentiation for the benefit of our learners we know that the end results will be very different. What they will have in common is that they will all have made progress.

Just as our ideas and approaches change we need to keep amending our plans (the scheme of work) as we go along because what worked well with one class might also work well with another and what worked well at the start of stage 8 might not be quite right for the start of stage 9.

On the following page you will find an example of how differentiation can be introduced into your lesson planning.

Example of a completed lesson plan showing differentiation

Week beginning:			**UNIT: 1C Handling Data & Measure lesson 1**			**CLASS:Year 9 set 5/5 15 students**	
Timing	**Framework Ref:**	**Learning Objectives**	**Success Criteria**	**Activities (see notes below re: differentiation details, etc) W: whole class; G: group; I: individual;** **Description**	**W/G/I**	**Resources**	**Evidence of achievement**
5 min	9Ni1	Add, subtract, multiply and divide directed numbers.	I can work out –5 + 12 = I can work out 5 + –12 = I can work out –5 + –12 = I can work out 5 – 12 = I can work out –5 – 12 = I can work out 5 –12 = I can work out –5 –12 = I can work out –5 × 12 = I can work out –5 × –12 = I can work out 5 × –12 = I can work out 20 ÷ –2 = I can work out –20 ÷ –2 = I can work out –20 ÷ 2 = **All** can multiply and divide simple directed numbers **Most** can add directed numbers **Some** can subtract directed numbers.	Review Times Tables going round the class with quick-question tables check.	W	Tables Square prompt sheet 9Ni1 worksheet (see below) Copies of Number cards for × ÷ **and** + – A classroom (A4) size set of directed numbers 10 to –10 on the wall would be most useful.	**Q&A**: question / answer Can you see a pattern here? **D**: discuss'n What comes next in the pattern **O**: observ'n Does the pattern continue as expected? **M**: marked work Their own 10 sums.
5 min				Work together to complete column 1 then work in pairs/small groups to complete column 2 – check answers.	G I		
10 min				Collect ideas about columns 3 & 4 when agreed complete columns 3 & 4.	W I W		
10 min				Collect ideas for the rules – agree and record them.			
25 min				Use copies of number cards with × and ÷. Make up 10 sums and answer them.	G/I		
5 min				Repeat all of the above for Adding and Subtracting encourage checking on the classroom number line.	W G I		
				At end, students assess themselves by trying the 'I can' statements.	I	Individual copies of success criteria 'I can' statements.	

Organisation: Details of differentiation/groups/adult role (linked to activities)	**Notes/extension opportunities/homework**	
The organisation is very different for this low ability group. Adult support may be targeted on a small number of pupils whose need is greatest or may be used generally around the room. The learning focuses very much on seeing patterns and using them to develop understanding. The work can swap between whole class, small groups and individual work a number of times during the lesson to vary the pace and activity. The Number Card Exercise allows a limited degree of choice and an opportunity to encourage pairs to discuss those choices.	With a lower ability group there is less scope for extensions but they could consider if their rules would work for all numbers (try two and three digit numbers). They will need reinforcement of the learning objectives in the shape of homework tasks and quick ten questions as lesson starters over the rest of the term.	

Notes:

The differentiation in this lesson is in the tasks as well as the outcomes. The weakest learners would not try to resolve the adding and subtracting exercises. instead they would be expected to produce their own questions demonstrating their understanding of the rules for multiplication and division. Task three, the number cards, might be adapted to be used with multiplication and division rather than addition and subtraction. Teachers may adapt this as they progress through the lesson or decide before starting that certain learners will only tackle certain topics. The level of support available for a particular lesson from other adults may also have an impact on planning differentiated tasks and related success criteria here. There would of course be little point in giving the full set of success criteria questions to those learners who had tackled a restricted set of work during the lesson so the outcome would be differentiated for different learners too.

- *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 students determine the criteria. In planning, teachers need to write a broad outline of anticipated suggestions.

The 9Ni1 worksheet referred to in the lesson plan is included below.

Add, subtract, multiply and divide directed numbers.

1. Multiply and divide

3 × 3 =	–3 × 3 =	3 × –3 =	–3 × –3 =
12 ÷ 4 =	–12 ÷ 4 =	12 ÷ –4 =	–12 ÷ –4 =
6 × 8 =	–6 × 8 =	6 × –8 =	–6 × –8 =
20 ÷ 5 =	–20 ÷ 5 =	20 ÷ –5 =	–20 ÷ –5 =
12 × 10 =	–12 × 10 =	12 × –10 =	–12 × –10 =
36 ÷ 6 =	–36 ÷ 6 =	36 ÷ –6 =	–36 ÷ –6 =
14 × 3 =	–14 × 3 =	14 × –3 =	–14 × –3 =
40 ÷ 8 =	–40 ÷ 8 =	40 ÷ –8 =	–40 ÷ –8 =

Column 1 – the numbers are all positive

Column 2 & 3 – only 1 is positive 1 is negative

Column 4 – the numbers are all negative

How does this change the answers from column 1?

Write down two rules to help you work these out. Complete all the columns.

2. Add and Subtract

4 + 3 =	6 + 3 =	4 – 3 =	6 – 3 =	7 + 2 =
4 + 2 =	6 + 2 =	4 – 2 =	6 – 2 =	7 + 1 =
4 + 1 =	6 + 1 =	4 – 1 =	6 – 1 =	7 + 0 =
4 + 0 =	6 + 0 =	4 – 0 =	6 – 0 =	7 + $^{-}$1 =
4 + $^{-}$1 =	6 + $^{-}$1 =	4 – $^{-}$1 =	6 – –1 =	7 + $^{-}$2 =
4 + $^{-}$2 =	6 + $^{-}$2 =	4 – $^{-}$2 =	6 – $^{-}$2 =	7 + $^{-}$3
4 + $^{-}$3 =	6 + $^{-}$3 =	4 – $^{-}$3 =	6 – $^{-}$3 =	7 + $^{-}$4
4 + $^{-}$4 =	6 + $^{-}$4 =	4 – $^{-}$4 =	6 – $^{-}$4 =	7 + $^{-}$5
4 + $^{-}$5 =	6 + $^{-}$5 =	4 – $^{-}$5 =	6 – $^{-}$5 =	7 + $^{-}$6

Complete the columns but remember to look at the patterns

3. Mixed number cards

–	+	=	2	5	–3	–4

Here are 7 cards, use them to make as many sums as you can. The first one has been done for you

1) 5 + –3 =

When you have made up 10 sums write down the answer to each one.

You will see that consideration has been given to the ability level of the class and their past learning history, for example a set of more able learners are expected to address a number of learning objectives in one lesson. Whereas a set of much lower ability may only address part of one learning objective in a lesson. These ideas are offered only as suggestions to get you started or as illustrations of what has been said above. The class teacher is in the best position to know what his or her class need and how they learn best, so feel free to pick and choose and to adapt what you find to suit the learners you teach. For the less able sets, example worksheets for 9Ni1 and 9NP1 are provided to illustrate the activities that have been suggested. In each lesson, ways of adapting the success criteria into easier language are suggested as well as ways in which those success criteria may be assessed.

SECTION 4: ASSESSMENT

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 objectives; 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.

Long-term assessment	–	may be the final certification for a course
Medium-term assessment	–	may be an end of unit test
Short-term assessment	–	may be questions asked during a lesson

Types of assessment

Formative:	to establish whether learners have met the learning objective 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 leaner 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.

The difference between formative and summative assessment is often an area of concern for teachers. A good way of understanding what **formative assessment** is, is to think of it as a learning experience in its own right. For example, when a learner undertakes a class presentation, it can provide evidence of their knowledge as well as their communication, intellectual and organisational skills at the same time as it helps develop all of these in the learner.

In contrast, **summative assessment** is not traditionally regarded as having any intrinsic learning value. It is usually undertaken at the end of a period of learning in order to generate a grade that reflects the learner's performance. The traditional end of unit or end of course examination (that is 'unseen' by the learner until it is sat) is often presented as a typical form of summative assessment.

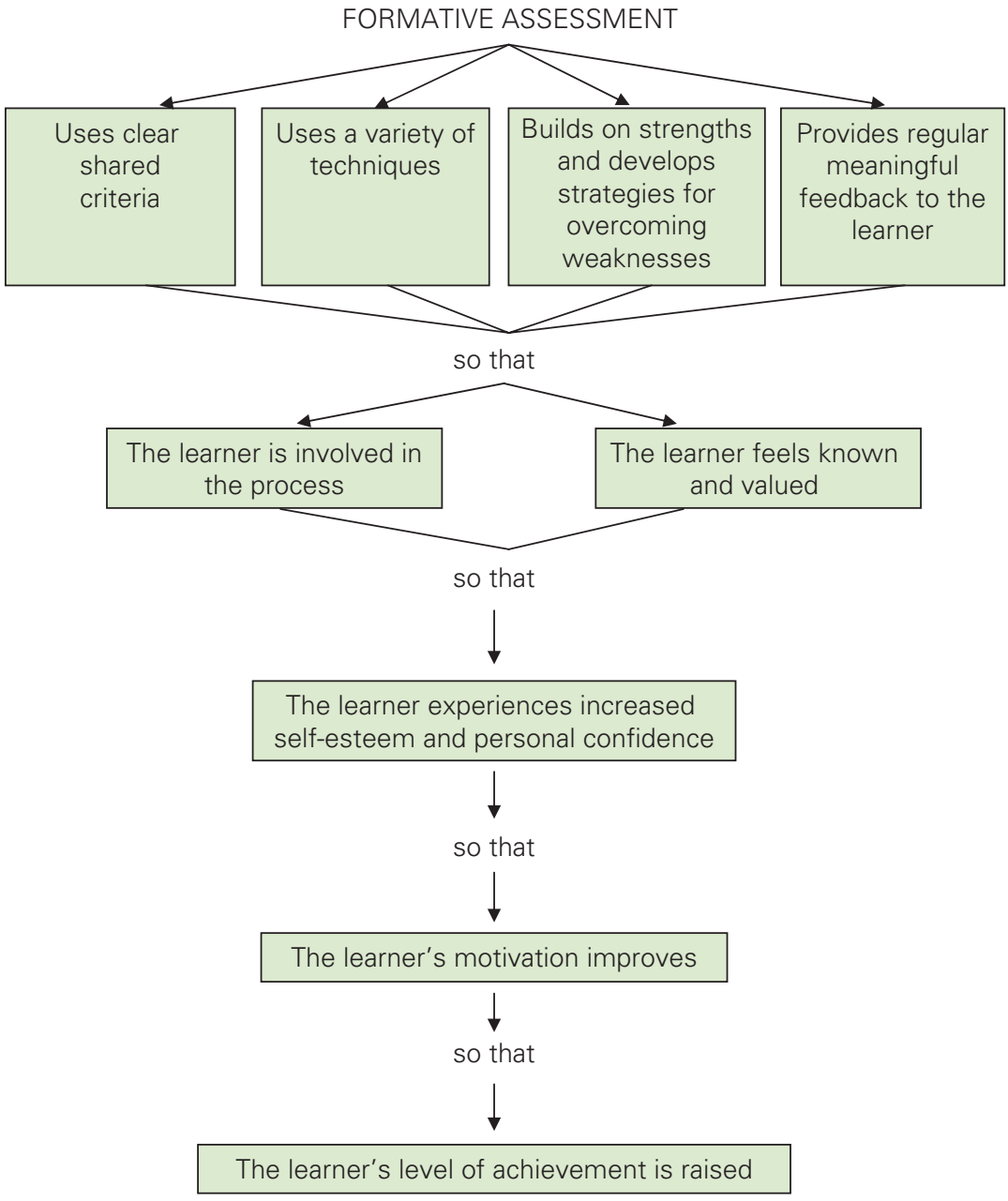
Summative assessment should not be the only element included in any formal grading of learner performance particularly at this level of education. The way that learners demonstrate knowledge during lessons helps their teacher form a far more accurate idea of their understanding and ability. It is therefore perfectly appropriate that elements of formative assessment form part of the final grade.

As pointed out in the introduction to this section, it is the function of formative assessment to provide the information for diagnosis and evaluation. It's main purpose is to guide the teacher on how, for example, to reshape the rest of the lesson if questioning reveals misunderstandings, misconceptions or errors that need to be corrected before further progress can be made. Perhaps it will prompt a change to what happens next or to the planning already undertaken for the next lesson.

A good learner will reflect upon *what* has been learned and *how* it was learned and a good teacher will reflect on what has been taught, how it was taught and how effective that teaching has been. How could it be improved and what changes might be needed for the next step? This whole process enables teachers to provide effective feedback to the learner as we will see in the next section.

4.2 Using Formative Assessment to Raise Achievement

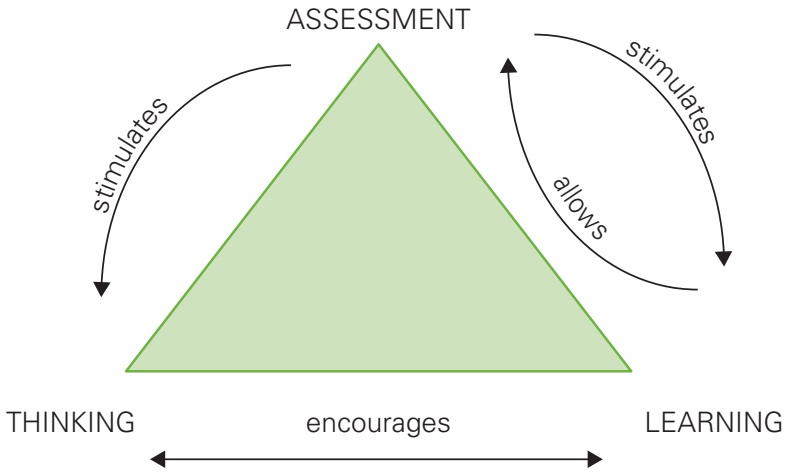
A summary formative assessment as described so far.



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 diagram 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 intentions and creating success criteria, making use of active learning etc. can be combined with the general and informal kinds of assessment you use in the classroom.

- 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: progression tests/achievement tests

Assessment does not have to be by twenty questions which will lead to twenty or less ticks and a total score at the end.

Some alternatives could be:

Asking learners to write their own questions to assess a unit of work – what do they think are the important skills and required knowledge?

Get a small group to create a revision poster on say adding and subtracting fractions will soon show you what they can remember.

Have a team challenge where each team of students tries to ask the other team questions which they think they can/cannot answer. These could be placed in a box and drawn out at random for the contest

Ask learners to write down a list of all they know about fractions for instance and then compare lists

learners work in pairs or small groups to formulate a list of questions that 'I need to be able to answer before I fully understand this topic.'

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.

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 to achieve several objectives over time, assessments 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; that is to say that assessment 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

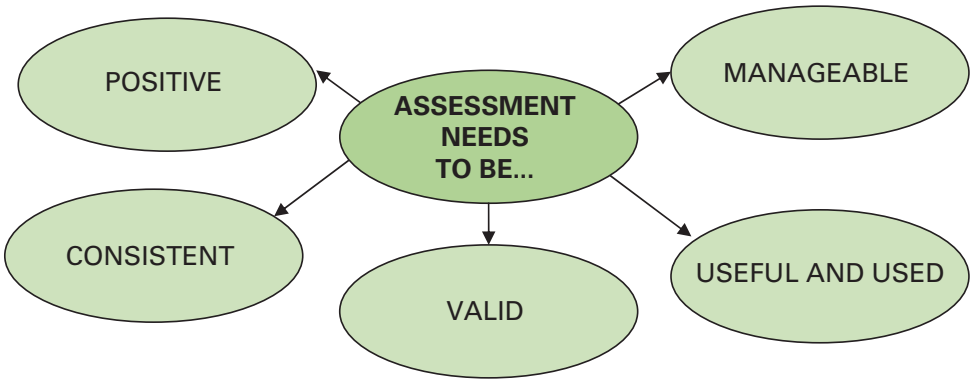
Assessment for Learning

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.



At the end of a unit of work or at some point where an assessment has been made take some time out to consider for each learner in your class how accurate the recent assessment was in predicting or assessing the current level of work. You may find that the cutting edge of the student's learning is in advance of the level that they are confidently working at.

- How could your assessment be altered to try and close down this gap?
- Could you have asked different questions that may have provided different answers?
- Do your learners have some knowledge/skills that your current assessment did not touch upon?
- Are there skills that you have seen in the lessons that are not evidenced from the assessment?
- What changes would you want to make before you ask your learners to attempt a similar assessment?

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 technique for assessing these. Here are some pointers.

1. Question and Answer

Questions and answers used at different points in the lesson can provide different sets of information for the teacher

At the start; you can establish how much has been remembered from the previous lesson's work and therefore how much needs to be reviewed before the next step is taken. The need to establish prior attainment before or at the start of a unit of work has been established by the need to be able to demonstrate progress. You have to know where you are starting before you can establish how far you have improved. It can be carried out via questions on skills that you would expect to be in place. This could be a formal but short written test or a tick list of 'I can do' statements where students can register their confidence with happy neutral or sad faces ☺ 😐 ☹.

In the middle; you can establish whether these learners have understood what they need to, to be ready to move on.

At the end; you can clarify what have been the important learning points and how well have they been understood.

Some important points about effective questioning

There are many types of questions. One dichotomy is the closed vs open question types. Closed questions require only a yes/no or single answer, factual response, while open questions require learners to reflect thoughtfully on the subject.

Another way of understanding question types is in terms of lower vs. higher order questions.

Lower order questions are usually 'what' questions. They typically test the knowledge learners have about definitions or meanings.

Higher order questions tend to be 'why' and 'how' questions which encourage learners to think more deeply about a concept or about the reasons for an answer. Your lessons should include both types of questions, but with an emphasis on higher order questions that challenge your students and make them think.

Effective teachers plan key questions ahead of time. You may do this by jotting down questions or notes before or even during the lesson. These notes will act as prompts to guide your questioning.

Example Questions

Closed-ended memory level questions

This kind of question requires a single, discrete answer. These questions effectively close down the opportunity for any further discussion that might explain processes, functions or relationships etc, such as:

- How did you work that out?
- How do you know that is the only answer?
- Is it the only way to reach that answer?
- Can you explain your method?

For example, here are a few closed questions that could be rephrased to form questions that can stimulate more discussion or thought.

Closed	Open
What do we call a shape with 4 equal sides and 4 right angles?	In what ways are a square and a rectangle different?
What is the area of a rectangle 2cm wide and 4cm long?	How do we work out the area of a rectangle?
	What do we mean by Area?
What is the value of X if X + 5 = 12	What is the value of X if X+5 > 12

Open-ended comprehension questions

These question open up the debate and will lead to deeper consideration of the topic. They may also allow students to express misconceptions that need to be corrected before any further progress can be made.

- Amplify: 'Tell me more about that.'
- Clarify: 'What do you mean when you say such and such? Explain that a bit more.'
- Paraphrase/Summarise: 'Tell me what happened in your own words.'
- Cause/Effect: 'Which happened first? Did that lead to something? Why?

  What were the causes?'
- Compare/Contrast: 'What do these two have in common? How are they different? Have you learned anything like this before? What does this information remind you of?'
- Example: 'Can you give an example of this?'
- Definition: 'How would you define this?'
- Characteristic: 'What's a characteristic of this?'
- Qualification: 'When is this not true? Are there any exceptions to this?'

Whatever type of question you are asking, remember these important points:

1. Don't answer your own questions if a learner gives an incorrect answer don't be judgemental but ask for any other ideas or thoughts, remember to allow the learner 'thinking time' even if it means coming back to them.
2. Another useful technique is not to respond to an answer but to select several responses and ask learners which they think is correct. This shifts the learners' thinking from 'I don't know the answer' to 'what do I think about the answers?'
3. Observation of learners during the lesson allows you to see how groups or individuals are making progress and allows you to take action if an individual is being left out of small groupwork or has become distracted and is off-task. Then suitable actions might include use of the learner's name – ask if they are OK? Or more direct questioning addressed to the small group in order to bring the individual back into the whole. A quick visual check on work written down, methods used, equipment left unused etc. will allow you to assess whether enough is being done for progress to be made.

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 or 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.

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 to be so by the learners. The teacher should provide any intervention necessary to extend explanations etc. Formative assessment is not about creating a threatening situation that may prove intimidating to learners. 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 assessments.

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.

Observation, assessment and planning are all actions that support development and learning.

Observation describes the process of watching the learners, listening to them and taking note of what you see and hear. We assess learners' progress by analysing our observations and making decisions about them.

3. Giving Feedback

Feedback may be oral a 'thank you' or 'well done' or non-verbal – smile, thumbs up, star awarded in passing. Or written in the book at the end of a section of work.

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 progress towards 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 children read your comments?

Can the children understand your comments?

Do you allow them time to read your marking?

Does your comment tell them how to make the next step of improvement?

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 student 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 student'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 it 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. Three 'goods' and a wish

Identify three things that are good about the work and one thing that would have made the work even better.

Telling learners how they can improve in this way needs to be followed up. If for example, the improvement was 'If you had used a ruler for your diagram this would have been even better', you need to check that a ruler is used next time.

g. 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 it 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 help you to make your work better. It can be good to open this up by getting two pairs to join together after the initial discussion and reach a consensus of four then two fours to make eights. This enables a class view to develop where all students have had some input.

h. 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 (demonstrating by doing) by the teacher, learners can be encouraged to mark their own, and each other's work using this approach. This approach can be oral, especially with younger learners, or written.

i. Self and peer assessment

Students 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 a learner's work. Sometimes a frustrating aspect can be when learners keep repeating the same errors all the time. Marking strategies need to make marking 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 straight away 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 points to how plans for the next lesson will be amended.

When marking Mathematics

- A highlighter pen can show where the work has been particularly successful
- Recording the method used and showing the steps taken to find the solution should always be encouraged. It is the *mathematical method* that can be transferred to another learning situation not the answer
- The learning intention/objective should be written. A brief comment can be written against the learning intention to say whether it has been *very well achieved* or *achieved*. Not achieved is a very negative comment. 'Needs more help' or 'partly achieved' sound much better. A system of codes could work just as well. At the same time, a comment directed to the student is important. *e.g.* 'This is a very clear diagram Anna, Thank you
- Where the learning intention is not written down, a marking comment at the end of the work needs to be written that includes the wording of the learning intention, e.g. 'You have managed finding equivalent fractions very well'. If sticky labels are used the statement of the success criteria 'You can work out 1.2×10^3' may be used
- Where the learning intention/objective has not been met (according to your assessment or the students) you must record how the learner needs to improve to meet that learning intention/objective e.g. 'Almost there, you need to be able to do this with decimals as well as integers' or 'Can you multiply a three digit number by a two digit number?'

Homework

The provision of homework has been a problem for teachers and learners for many years. Most homework tends to be revision or practice of the skills learned in the classroom. Sometimes it will be a 'finding out' or a 'learning' type of homework. Usually its main aim is to encourage learners to think about their learning between lessons so that less is forgotten. It can be difficult to set one task that is suitable for the whole ability range of the class and often a number of small tasks which could increase in difficulty can be given to selected learners. As more units of work have been studied there is more scope to review topics from previous units earlier in the year.

4.5 Assessment Available from Cambridge

As part of Cambridge Secondary 1, end of stage tests (Progression Tests) are provided for stages 7–9. These are available from the Cambridge Secondary 1 website.

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 pace, 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.

Progress Checker and Data Analysis

The raw marks for the Progression Tests can be converted into levels that can them be used to compare between groups and between years.

The **Progress Checker** has been developed for Cambridge Secondary 1 to offer teachers an online method of producing informative and analytical reports on the progress of learners. The Analyse Results page on the Progress Checker tab of the Cambridge Secondary 1 website (https://cambridgesecondary1.cie.org.uk) produces a number of comparative reports which enable teachers to compare progress in their subject.

The Progress Checker can be used to:

- Compare the performance of groups of learners within a school
- Identify strengths and weaknesses of individuals and class groups
- Compare performance on different questions or topics

Class Summary Report

The performance of a group of learners is illustrated by three different charts within the Class Summary Report:

Overall Performance:	shows the overall performance of the whole group in all three subjects.
Analysis of Performance:	shows the performance of the whole class within each subject and by strand. Performance is shown as a percentage of the total marks available for each strand.
Results by Gender:	compares the grades achieved by boys and girls in the class.

Subject Summary Report

These reports show an overview of the performance of boys and girls either together or separately for a single subject.

Learner Performance Report

These reports show an individual learner's performance stage by stage against each subject. Individual subject performance for the learner can also be viewed by strand within each subject at each stage.

Subject Analysis Report

Here you will find an **Overview Report** that lists all of the learning objectives, colour-coded to indicate how a class has performed against a test group, better or worse.

Also available are **Question-by-question Reports** comparing subject results for a class and showing how that class has performed in comparison to other learners in the school.

A **Detailed Analysis Report** compares outcomes for each question in the Progression Test. Significant differences from the test group are highlighted to show where they have performed better or worse.

Year-on-year Performance Report

This report looks at the performance of all learners in the class for each subject. It compares grades achieved in tests at the current stage to outcomes in the previous stage. This report is only available where groups have results for a subject or subjects in more than one stage.

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 comparison. 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 they should be Specific, Measurable, Achievable, Realistic and Time-bound (i.e. SMART). They also need to focus upon key priorities.

Cambridge Checkpoint

Cambridge Checkpoint are additional (end of Secondary 1) tests available to Cambridge Secondary 1 centres. These are intended for learners at the end of their final year of lower secondary education, when they are around 14 years old. They provide an assessment of learning objectives from stages 7–9 of the curriculum framework.

They provide a form of detailed, diagnostic feedback that is a central feature of Cambridge Secondary 1.

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 those where it has been less so.

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

Details about Cambridge Checkpoint (including specimen papers) are available from www.cie.org.uk.

SECTION 5: INFORMATION COMMUNICATION TECHNOLOGY (ICT) AND MATHEMATICS

Much as the use of ICT has increased in the last few years the provision across classrooms still tends to vary although the general awareness level of teachers has improved, their skills have not always kept pace. The skills required to run and maintain a school network, write functioning software or to install a suite of programmes are not the same as the ability to navigate the internet or find your way around a spreadsheet and the latter skills are probably more use to today's Mathematics teacher.

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 learning

Here are a few considerations that might help you organise your thoughts on the use of ICT in your school.

Find out what is already available in your school and what is already being used. In some schools specific programs or tasks are assigned to particular year groups either to avoid demand on the system or to avoid work being repeated every year.

Make sure that you know the level of computer provision in your school, what is available, how it is booked, what access you personally, and hence your classes actually have? How many of your lessons are already block-booked by other departments?

Talk to existing staff and make use of online forums where teachers discuss problems and solutions to software issues.

Finance for new software can be expensive and may be controlled by senior staff – you may have to present a good case for whatever you want to use.

There can be problems with engagement when computers are only available to a small number of learners. How will you manage such limited options, in small groups and rotations perhaps? You will need to provide meaningful tasks for those learners who are waiting their turn.

Planning

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.

Does using ICT add any value to the execution of this activity that enhances the learning better than doing it using other, non-ICT resources? Does the use of a computer make the learning better, faster, more wide-ranging? Can some aspects be enhanced so that more progress is made in other ways? For example, drawing pie charts and bar charts by hand is an important part of many examination syllabuses. However if you want fast charts for learners to interpret the shape of, or to display their findings for communication purposes then Excel can produce them in seconds. They can also produce exotic charts that actually hinder understanding of the results so learners need to be taught to be careful how they use them. Beware that the creativity of the activity does not reside in the software rather than in the learning.

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

- How well does it fit with the learning objective?
- How well does it extend the learning/understanding?
- How much will it cost in time, money resources to use ICT?
- How confident am I with the resources?
- Can it be used to support struggling learners?
- Can it be used to extend the experiences of more capable students?
- Will the students learn new skills/knowledge or be practising and securing old skills and knowledge?
- Will the overall learning experience be improved?
- How will the class work, in groups or individually?

Evaluate the session afterwards

- What would it have been good to know before you started?
- What did you find out that you did not know before?
- Did the students in general do more or less work than they might have done in a non-ICT lesson?
- Were the students showing better motivation?
- Did particular students shine who previously had not?
- Overall was the learning experience improved?
- Why is the experience worth repeating?

The internet is a rich source of puzzles and problems, articles on famous mathematicians, revision notes and games but authenticity of sources can be a problem so you will need to check any sites before you give your learners access to them.

Particular favourite sites include:

www.mymaths.co.uk	a subscription site that includes revision packs and both lesson and online homework
www.bbc.co.uk/bitewise	school and GCSE revision supported by TV programmes
www.mathsisfun.com	puzzles and games with a mathematics content
www.mathway.com	a question database with explanations and problems
www.puzzles.com	a collection of all kinds of puzzles and games

http://www.primaryresources.co.uk/online/negnumorder.swf
A great place to practice ordering integers.

http://classroom.jc-schools.net/basic/math-integ.html
Many games about integers are linked on this page.

http://www.bbc.co.uk/skillswise/numbers/wholenumbers/ratioandproportion/ratio/game.shtml
A quick and visual way to work with ratios and proportions

http://www.bbc.co.uk/skillswise/numbers/wholenumbers/ratioandproportion/ratio/game.shtml
This racing game gives you plenty of proportions to solve as you race against your friends or the computer.

http://www.funbrain.com/poly/index.html
This game allows you to practice area and perimeter.

You can always google 'useful Maths sites' and have fun searching.

Search well for ideas and try comparing different sites. Experienced staff will have their favourites but don't be afraid to try something new. Test any new software by trying to make it go wrong. Your students will find all sorts of problems and you need to be prepared.

Consider building up your spreadsheet skills, it can save time if lots of calculations need to be done or data-processed. Multiple worksheets can be produced, stored and used again. These can be adapted for slower or faster workers or to produce individually tailored worksheets with larger fonts for students with poor eyesight for example. Use them for building and completing sequences (Nth terms).

Use a graph plotter for graphs and coordinate work and situations where you want students to think beyond the ordinary restrictions of the current skill levels

Opportunities for ICT in the Cambridge Secondary 1 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 the teacher's personal preference. Different activities require different management styles and different seating styles can encourage new working partnerships or groupings.

Strategies for the effective management of learning

Classroom Organisation	Advantages	Limitations
Whole Class Teaching Discussion Demonstration Watching DVD/TV Interactive boards	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.
Practical Work Learners work in small groups doing similar tasks, or completing a survey or probability experiment. 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 children's abilities. Easy to compare observations between groups. Facilitates easy record-keeping.	Follow-up may prove difficult. Carrying out a survey may have movement implications or restricted participation.

(Continued.)

Classroom Organisation	Advantages	Limitations
Circus of Activities 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. Can monitor one activity closely.	Activities cannot be sequential. Assumes equal time for all activities and all groups. Makes record-keeping more difficult.
Thematic Approach 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 Mathematics. Difficult to ensure coherence. Difficult to ensure that all of the class understand.
Individual Topics Individuals or small groups work on items selected by themselves.	High motivation. First-hand experience. Pupils work to own potential. Good for revision. Good for a Mathematics Club.	Demanding on teacher. Structured framework necessary. Difficult for lower-ability learners. Stretches resources.

Use your judgement to decide 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 the desired outcome. It gives useful organisational ideas.

Once the organisational method has been chosen, it is important for the teacher to then decide how they 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 more-able learners help less-able learners
- Providing appropriate worksheets/recording sheets to facilitate easier recording
- Giving them different activities
- Using any other available adults to work alongside particular individuals/groups
- Moving between groups and act 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 in a group is not easy if learners are used to working individually or are seated in rows.

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 the teacher creates 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

SECTION 7: SUPPORT AND RESOURCES

7.1 Resources from Cambridge

Cambridge Secondary 1 schools receive access to a range of resources when they register. The Cambridge Secondary 1 website (https://cambridgesecondary1.cie.org.uk) is a password protected website that is the source of the majority of Cambridge-produced resources for the programmes. Included on this website are:

- Curriculum frameworks
- Progression Tests (see Section 4: Assessment)
- 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
- Progress Checker to analyse results (see Section 4: Assessment)
- 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 Secondary 1 schools. Details including the enrolment key and instruction, on how to access the course are, sent to the main Cambridge Secondary 1 Administrator at your centre upon registration and are also available from the Cambridge Secondary 1 website. The course is self-study and as such can be completed at any time when you first register for Cambridge Secondary 1. It provides an introduction to the programme, the Cambridge educational philosophy and the services and resources available to registered 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/events 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

You can email Customer Services via international@cie.org.uk or call us on +44 1223 553554 or 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. Face-to-face training can be arranged to meet your individual school requirements. This bespoke training will be tailored to the particular training needs of your staff.

7.3 Support with Administration of Cambridge Checkpoint

There are three key documents that will be sent to your Cambridge Secondary 1 Administrator on an annual basis.

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

These documents are made available electronically on CIE Direct.

CIE Direct https://direct.cie.org.uk is the online tool for Cambridge Examinations Officers and Administrators and can be used to submit and amend Cambridge 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 or go direct to ask.cie.org.uk

Customer Services

You can also email us via international@cie.org.uk or call us on +44 1223 553554 or on 01223 553554 if you are in the UK.

7.5 Resource Recommended by Cambridge

The Cambridge Secondary 1 website 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 Secondary 1 comprehensively in all aspects (or match the framework very closely if they only cover a part of it). 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.

APPENDIX A: TEACHER TRAINING ACTIVITIES

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

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 (Activities)

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 A2: 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 pupils' learning during and after each lesson
- Key questions to be covered/addressed during each activity
- A breakdown of specific tasks in detail (steps the pupils need to go through, rather than the overall activity)
- Differentiation and grouping of the pupils, 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[1]
- 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 pupils' performances or the outcomes of tasks.

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[1] **Example:** Learning objective:

To compare two fractions by using diagrams or by using a calculator to convert the fractions to decimals e.g. $\frac{3}{5}$ and $\frac{13}{5}$ [7Nf3]

Possible **success criteria** that could be used are:

1. Can I draw a simple diagram to show these fractions
2. Can I enter a fraction into a calculator and record the answer
3. Can I give the calculator answer as a rounded answer

They can be written in the first or third person as if the child was asking themselves the question or as if the teacher is asking the question.

Number 3 in the list above is an extension success criteria that could be used with a group of more able students within the class.

Short-term Plan Template

<table>
<tr><td colspan="2">Week beginning:</td><td colspan="3">UNIT:</td><td colspan="2">CLASS:</td></tr>
<tr><td rowspan="2">Timing</td><td rowspan="2">Framework Ref:</td><td rowspan="2">Learning Objectives</td><td rowspan="2">Success Criteria</td><td>Activities (see notes below re: differentiation details, etc.) W: whole class; G: group; I: individual</td><td rowspan="2">Resources</td><td rowspan="2">Evidence of Achievement</td></tr>
<tr><td>Description | W/G/I</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Q&A: question/ answer
D: discussion
O: observation
M: marked work</td></tr>
<tr><td colspan="3">Organisation: details of differentiation/groups/adult role (linked to activities)</td><td colspan="4">Notes/extension opportunities/homework</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td></tr>
</table>

Training Activity A3: Preparing and Delivering a Lesson

Objective:

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

Instructions:

Distribute sticky labels or 'post-it' notes. Ask colleagues to think of all 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 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:

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

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 44 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 44 and 45 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 children 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 (IWB)
- Having a set of pre-printed sticky labels for each student's book – useful for younger students (this can be very useful at the start of a unit so students can see what will be coming up)
- 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 something like those suggested in Handouts 1 and 2 overleaf.

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

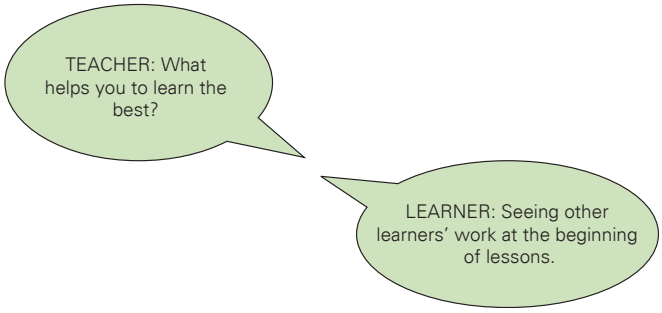
Learning Intention

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 writer 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 worksheets, marked work, homework tasks
- Plan good (open) questions that will get students (in talk partners) thinking and discussing the subject matter of the learning objective and how they can demonstrate that it has been met. (Responses may reveal some misconceptions).

Stage 2: Lesson Delivery

- Introduce lesson
- Give task instructions
- Share learning intention/objective
- 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
- 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 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.				

(Continued)

Desirable Outcomes	Always	Sometimes	Never	Comments
I identify the success criteria for the lesson and share them with the learners.				
The students 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 students in the class.				
I tell the students the reason for doing the activity. (The aside).				

Desirable Outcomes	Always	Sometimes	Never	Comments
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.				

(Continued)

Desirable Outcomes	Always	Sometimes	Never	Comments
Learners are given time to identify their own improvement.				
I give learners specific time to read my marking and respond to it.				
All the learners in my class have writing targets.				
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 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:

APPENDIX B: SAMPLE SCHEMES OF WORK

- Stage 7: Unit 1A, Number and Calculation
- Stage 8: Unit 2B, Algebra and Geometry
- Stage 9: Unit 3C, Handling Data and Geometry

Stage 7: Unit 1A: Number & Calculation

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Nc1	Consolidate the rapid recall of number facts, including positive integer compliments to 100, multiplication facts to 10 × 10 and associated division facts.	Revise multiplication tables from 1 to 10, and addition and subtraction facts for numbers between 0 and 20. Look for patterns that make mental calculations easier, for example what happens when 9 is added to a two digit number, or that 5 + 7 is the same as 6 + 6. Ask questions such as 'which pairs of numbers will add together to make 17?'	Follow me cards Number cards Multiplication Tables	Many aspects of this unit may well be familiar or even prior knowledge for some pupils. How will you find out which, see 'Assessing prior knowledge' section and lesson plans	
7Np1	Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.	Use a number line with place value headings and moveable cards with single digits on them to discuss place value. Investigate how the digits move in relation to the decimal point when multiplied or divided by the powers of ten. Ensure that the class understands that multiplying by 10, 100 and 1000 makes the number bigger while dividing by these numbers makes the number smaller. Progress to paper and pencil methods.	Search for 'place value' at www.learn.co.uk		

(Continued)

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Np2	Order decimal including measurements, changing these to the same units.	Give each pupil a decimal number then get them to line up in order of size. Select 4 decimal cards for individuals to order explaining strategy to a partner.	Decimal cards		
7Np3	Round whole numbers to the nearest 10, 100 or 1000 and decimals including measurements to the nearest whole number or 1 decimal place.	Use a number line to investigate rounding by placing, for example, a decimal on the line and deciding which whole number it is closest to. Devise rules for rounding.	Headlines that use numbers what do they really mean?		
7Nc2	Use known facts and place value to multiply and divide two-digit numbers by a single digit number, e.g. 45 × 6, 96 ÷ 6.	Partition as 40 × 6 + 5 × 6 or 90 ÷ 6 and 6 ÷ 6. Link to tables			
7Nc3	Know and apply tests of divisibility by 2, 3, 5, 6, 8, 9, 10 and 100.	Look for patterns in a multiplication table.	20 questions on what number am I Smart board resources		
7Nc4	Use known facts and place value to multiply simple decimals by one-digit numbers. e.g. 0.8 × 6.	Use column headings. Link with equivalent FDP to establish known facts e.g. 0.8 × 3 = 0.8 + 0.8 + 0.8.			

(Continued)

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
7Nf1	Recognise the equivalence of simple fractions, decimals and percentages.	Use paper, card and counters. Cut circles ('pies' or 'pizzas') into different numbers of slices to make comparisons between fractions. Use column headings to identify decimals as tenths or hundredths. Identify percentages as parts per 100.	Equivalence dominoes/ cards Equivalence chains $\frac{1}{4} = 0.25 = 25\%$		
7Nf2	Simplify fractions by cancelling common factors and identify equivalent fractions; change an improper fraction to a mixed number, and vice versa. Convert terminating decimals to fractions e.g. $0.23 = \frac{23}{100}$.	Ensure that the students understand that the denominator of the fraction is the 'name' of the fraction and represents the number of equal parts the whole is divided into, and that the numerator shows how many of these parts are being used. Discover equivalent fractions by further dividing each slice of the pie. Find fractions of counters and paper strips by dividing into equal parts and then selecting the required number of parts.	Find work using fraction pairs at http://www.mymaths.co.uk http://math.rice.edu/~lanius/Patterns/index.html		
7Nf3	Compare two fractions by using diagrams, or by using a calculator to convert the fractions to decimals, e.g. $\frac{3}{5}$ and $\frac{13}{20}$.				
7Ni1	Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative numbers in context.	Wall size number line. Give each pupil a +/– number then get them to line up in order of size. Select 4 negative number cards for individuals to order explaining strategy to a partner.	Negative number cards		

Stage 8: Unit 2B: Algebra & Geometry

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
8Ae5	Derive and use simple formulae, e.g. to convert degrees Celsius (°C) to degrees Fahrenheit (°F).	Plot given pairs of temperatures and draw lines through data points – develop a formula.			
8Ae6	Substitute positive and negative integers into formulae, linear expressions and expressions involving small powers, e.g. $3x^2 + 4$ or $2x^3$, including examples that lead to an equation to solve.	Check your formula from above with different values, plot them. Do they lie on a straight line? Generate some real life situations that lead to nice formulas.			
8As4	Construct tables of values and use all four quadrants to plot the graphs of linear functions, where y is given explicitly in terms of x; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs.	Draw graphs relating to the above work moving towards an understanding of $y = mx + c$ being always a straight line.			
8Gs7	Draw simple nets of solids, e.g. cuboid, regular tetrahedron, square based pyramid, triangular prism.	Use ruler and compasses to construct the net of each solid, colour and make them into a mobile, which ones balance – why?			
8Gs8	Identify all the symmetries of 2D shapes.	Work by families i.e. all triangles then quadrilaterals etc.	Tracing paper or similar	Line symmetry and rotational	

(Continued)

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
8Gs9	Use a straight edge and compasses to construct: – the midpoint and perpendicular bisector of a line segment – the bisector of an angle	Needs quite a lot of practice to secure these skills.		Will need to be demonstrated carefully	
8Gp2	Transform 2D shapes by rotation, reflection and translation, and simple combinations of these transformations.	Ties in with symmetries above prepare activity sheets or slides depending on the technology available.	Cad package or even word can be used to insert and transform shapes		

Stage 9: Unit 3C: Handling Data & Geometry

Framework Codes	Learning Objective	Activities	Resources	Comments	Time
9Gp7	Use bearings (angles measured clockwise from the north) to solve problems involving distance and direction.	Ships and planes time. Provide a map and ask for a journey from point to point – check routes in pairs.	Old local maps can be useful.		
9Gp8	Make and use scale drawings and interpret maps.	Works well with the above topic.			
9Gp9	Find by reasoning the locus of a point that moves at a given distance from a fixed point, or at a given distance from a fixed straight line.	Understanding and doing are not the same don't forget both side of a line especially when solving problems.	Ruler and compasses.		
9Db1	Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving probability problems.	Find an unknown probability or prove that an answer is incorrect.			
9Db2	Find and record all outcomes for two successive events in a sample space diagram.	Explore outcomes with different sided dice and spinners.	Prepared sample space diagrams for your problems. Poly-dice.		
9Db3	Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments in a range of contexts.	Fits well with the above item.			

APPENDIX C: SAMPLE LESSON PLANS

- Stage 7 Unit 1A, Number and Calculation, lesson 1
- Stage 7 Unit 1A, lesson 2
- Stage 8 Unit 2A, Number and Calculation, lesson 1
- Stage 8 Unit 2A, lesson 2
- Stage 9 Unit 1C, Handling Data and Measure, lesson 1
- Stage 9 Unit 1C, lesson 2

Stage 7: Unit 1A, Number and Calculation, Lesson 1

Week beginning:			**UNIT: Number 1A lesson 1 of 8 1 hour**			**CLASS: Year 7 set 3/5 25 students**	
Timing	**Framework ref:**	**Learning objectives**	**Success criteria**	**Activities (see notes below re: differentiation details, etc) W: whole class; G: group; I: individual;** Description	**W/G/I**	**Resources**	**Evidence of achievement**
5 min	7Np1	Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.	7Np1 I can work; 12 × 10 = 1.3 × 100 = 4.77 × 1000 = 300 ÷ 10 = 80 ÷ 100 = 300000 ÷ 1000 =	Teacher calls out a calculation, students flip or build the answer on their sheets e.g. 13 × 100 = 1300 teacher can see errors and assist. On whiteboards or sheets students write a decimal number – then different groups try to line up in their number order if two numbers match add another decimal.	W G	Commercial number flip charts or column headings draw on a sheet of paper with numbers on cards to move Mini white boards or sheets of card or paper	**Q&A**: question / answer **D**: discuss'n **O**: observ'n **M**: marked work
5 min	7Np2	Order decimal including measurements, changing these to the same units.	7Np2 I can put these in order of size smallest first 15cm, 3m, 2.2m, 2m 3cm,				
25 min	7Np3	Round whole numbers to the nearest 10, 100 or 1000 and decimals including measurements to the nearest whole number or 1 decimal place.	7Np3 I can round 1004 to nearest 1000 10.78 to 1dp 120 .88 to nearest whole number	Individuals answer graded questions on Np1 and Np2.	I	Worksheet on 7Np1 and 7Np2 graded questions or questions from a text book if preferred	
15 min			**All** students can times and divide integers by 10,100,100	Find the number half way between two numbers e.g. 50 and 60 50_____55_____60 If a number is between 50 and 55 it's closer to 50 if between 55 and 60 it's closer to 60. What happens to 55?	I		
5 min			**Most** students can times and divide decimals by 10,100,100 and round to nearest whole number	Extend idea to nearest 10,100,100 and to 1dp only.	I		
5 min			**Some** students can round to 1dp or better	On similar diagram 90 _____95_____100 place the following numbers on the LHs or the RHS 91, 93, 97, 96, 99, 91.5, 98.3. Record these into your books. Review of lesson/progress.	G	prepared diagrams like 90 _____95_____100 each with their own set of numbers	

(Continued)

Organisation: details of differentiation/groups/adult role (linked to activities)	**Notes/extension opportunities/homework**
In this class 6 pupils out of the 25 have been identified as needing extra support. They get to play the lining up game again together when the rest of the class start their written work. This group have an assistant working with them the whole lesson. 8 pupils are keen and quickly pick up most ideas. They will be asked to write and swap some decimal rounding questions. If they feel confident they can extend to 2/3 decimal places with or without diagrams.	Note that what we do with 55 is convention – what we all agree. Some pupils might find this work easy. If this is a new class for you consider giving them a short 5 min 5 question test to see what they can already do – if its seems too hard give it them again at the end to see if/how much they have improved. Newspaper headlines of rounded figure can stimulate an interesting discussion as to what the original numbers could have been and could be collected for homework. Brightest students could begin to think about significant figures and how they might work.

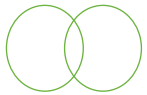
Stage 7: Unit 1A, Lesson 2

Week beginning:			UNIT: Number 1A lesson 2 of 8 1 hour			CLASS: Year 7 set 3/5 25 students	
Timing	Framework ref:	Learning objectives	Success criteria	Activities (see notes below re: differentiation details, etc) W: whole class; G: group; I: individual; Description	W/G/I	Resources	Evidence of achievement
5 min 5 min 25 min 10 min 5 min	7Ni1	Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative numbers in context.	**All** students can order any 10 cards drawn from the pack. **Most** students can add or subtract two positive and negative numbers. **Some** student can add or subtract positive or negative decimals.	Groups of 10 jumbled negative integer cards one per student they must arrange themselves in order, different groups – best time wins. Repeat with decimal negative pack. Pin 10 to –10 cards on the wall in order use a student to act as pointer and work out –5 + 2, 3 + 2 mix in with the temperature is –5 °C it gets 2 degrees warmer. Then work on 7 – 2, –3 –2 getting two degrees colder. Record these results on a suitable board for later reference. Individuals or small groups work on question sheet with temperature change type questions and or simple directed number questions 3 min to mark these built in. Students write a short temperature change question involving negative numbers. Students share problems with the class. Including decimal questions from the small group	G G W I I G	A4 negative integer cards 10 – ⁻10 twenty cards As above but decimals between –1 and –2 (both included in the packs). Question sheets/books with temperature change questions and simple directed number adds and subtracts	**Q&A**: question / answer **E.g. what is five more /less than –6** **D**: discuss'n **O**: observ'n **M**: marked work

(Continued)

Organisation: details of differentiation/groups/adult role (linked to activities)	**Notes/extension opportunities/homework**
In this class 6 pupils out of the 25 have been identified as needing extra support. They get to play the pointer game together when the rest of the class start their written work. This group have an assistant working with them the whole lesson. 8 pupils are keen and quickly pick up most ideas. They will be asked to write and swap some decimal, positive and negative addition questions and subtraction if they feel confident.	Consider the question if $3 \times 2 = 6$ what does $3 \times -2 = ?$ what about -3×-2. Homework could be the next set of questions for each group. Group of six do some simple integer additions. Group of 8 do some decimal problems, the rest solve each others written problems. Given the timing collect the question that they write in and give some out as homework next time.

Stage 8: Unit 2A, Number and Calculation, Lesson 1

Week beginning:			UNIT: Algebra & Geometry 2A lesson 1 of unit			CLASS: Year 8 set 1/5	
Timing	Framework ref:	Learning objectives	Success criteria	Activities (see notes below re: differentiation details, etc) W: whole class; G: group; I: individual; Description	W/G/I	Resources	Evidence of achievement
10–15 min	8Ni2	Identify and use multiples, factors, common factors, highest common factors, lowest common multiples and primes; write a number in terms of its prime factors, e.g. $500 = 2^2 \times 5^3$.	I can list all the factors of 20.	Make clear definitions Factors, Multiples, Prime Number – may be prior knowledge.	W	Venn diagram for factors 24 56  Shows common factors better.	**Q&A**: question / answer **D**: discuss'n **O**: observ'n **M**: marked work
			I can list all the prime factors of 20.	List on board sets of multiples for different numbers draw from the lists Lowest Common Multiples.			
			I can list all the multiples of 5 up to 50.	Similarly create lists of factors of different numbers, draw from them Highest Common Factors.			
25 min			I can find the HCF & LCM of 24 and 56.	Demonstrate a factor tree for each of two numbers and how it can help find HCF & LCM using prime factorisation, (probably many examples will be needed – encourage students to come out to the board and try some).	W	Factor tree for 10 shows Prime Factors only 10 → 2, 5	
			I can write 300 as a product of its prime factors i.e. $300 = 2^2 \times 3 \times 5^2$				
			All students can identify Factors and multiples.		G		
15 min			**Most** students can find HCF and LCMs	Students try some HCF & LCM questions on their own.	I	Prepared text questions or textbook exercise	
5 min			**Some** students can write a number as a product of its prime factors.	Plenary What simple HCF and LCMs can the class recall – quick questions.	W		

Organisation: details of differentiation/groups/adult role (linked to activities)	Notes/extension opportunities/homework
Prepare Venn diagrams and Factor trees for weaker students to complete as scaffolding, more able students need to produce their own. Writing a number as a product of its prime factors should arise from the Factor Tree exercise. This class does not have a teaching assistant.	More able students can be given 3 digit numbers or a set of three 2 digit numbers to find the HCF and LCM of. Homework could be used to reinforce the ideas of factors and multiples and /or HCF and LCM depend upon the teachers assessment of progress.

Stage 8: Unit 2A, Lesson 2

Week beginning:			UNIT: Unit Algebra & Geometry 2A lesson 2 of unit			CLASS: Year 8 set 1/5	
Timing	Framework ref:	Learning objectives	Success criteria	Activities (see notes below re: differentiation details, etc) W: whole class; G: group; I: individual; Description	W/G/I	Resources	Evidence of achievement
5 min 5 min 20 min 20 min 5 min 5 min	8Nf4 8Nf5 8Nf6	Add and subtract fractions and mixed numbers; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction. Calculate and solve problems involving percentages of quantities and percentage increases or decreases; express one given number as a fraction or percentage of another. Use equivalent fractions, decimals and percentages to compare different quantities.	I can work out $\frac{2}{3} + \frac{3}{4} =$ I can work out $\frac{4}{5} - \frac{1}{3} =$ I know how many fifths make 2 whole ones. I can increase any amount by any %. I can decrease any amount by any %. I can find 12m as a percentage of 72m. I can decide which is bigger $\frac{2}{3}$ of 60Kg or 70% of 50Kg.	Quick review of equiv. fractions Write $\frac{2}{3}$ as $\frac{?}{24}$ what is $\frac{3}{4}$ of 20Kg etc. Demonstrate addition and subtraction of fractions. Students work on prepared exercise. Demo finding % increase and decrease using multipliers (1.05 for 5% increase and 0.95 for a 5% decrease). And finding the larger of two amounts. Quick questions from students about today's work. Students complete a copy of the criteria for success sheet ticking I can do list.	W W I	Prepared quick questions Prepared exercise on fractions Prepared exercise Copies of Success List	**Q&A**: question / answer **D**: discuss'n **O**: observ'n **M**: marked work Pupils own estimation
Organisation: details of differentiation/groups/adult role (linked to activities)				Notes/extension opportunities/homework			
This should be revision for most of the class, hence the swift pace and success criteria check at the end.				Prepare a homework sheet that covers all these skills so that students get a second chance to review their learning.			

Stage 9: Unit 1C, Handling Data and Measure, Lesson 1

Week beginning:			UNIT: 1C Handling Data & Measure lesson 1			CLASS:Year 9 set 5/5 15 students	
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		
5 min 5 min 10 min 10 min 25 min 5 min	9Ni1	Add, subtract, multiply and divide directed numbers.	I can work out –5 + 12 = I can work out 5 + –12 = I can work out –5 + –12 = I can work out 5 – 12 = I can work out –5 – 12 = I can work out 5 – –12 = I can work out –5 – –12 = I can work out –5 × 12 = I can work out –5 –x –12 = I can work out 5 –x –12 = I can work out 20 ÷ –2 = I can work out –20 ÷ –2 = I can work out –20 ÷ 2 = **All** can multiple and divide simple directed numbers. **Most** can add directed numbers. **Some** can subtract directed numbers.	Review Times Tables going round the class with quick question tables check. Work together to complete col. 1 then work in pairs / small groups to complete col. 2 – check answers. Collect ideas about col. 3 and 4 when agreed complete cols 3&4. Collect ideas for the rules – agree and record them. Use copies of number cards with × and ÷ make up 10 sums and answer them. Repeat all of the above for Adding and Subtracting encourage checking on the classroom number line. At end students assess themselves by trying the I can statements.	W G I W I W G/I W G I I	Tables Square prompt sheet 9Ni1 worksheet Copies of Number cards for × ÷ **and** + – A classroom (A4) size set of directed numbers 10 –10 on the wall would be most useful Individual copies of success criteria I can statements.	**Q&A**: question / answer Can you see a pattern here? **D**: discuss'n What comes next in the pattern **O**: observ'n Does the pattern continue as expected? **M**: marked work Their own 10 sums.

Organisation: details of differentiation/groups/adult role (linked to activities)	Notes/extension opportunities/homework
The organisation is very different for this low ability group. Adult support may be targeted with a small number of pupils whose need is greatest or may be used generally around the room. The learning focus very much on seeing patterns and using them to develop understanding. The work can swap between whole class, small groups and individual work, a number of times during the lesson to vary the pace and activity. The Number Card Exercise allows a limited degree of choice and an opportunity to encourage pairs to discuss those choices.	With a lower ability group there is less scope for extensions but they could consider if their rules would work for all numbers (try two and three digit numbers). They will need reinforcement of the learning objectives in the shape of homework tasks and quick ten questions as lesson starters over the rest of the term.

Stage 9: Unit 1C, Lesson 2

Week beginning:			UNIT: 1C Handling Data & Measure lesson 2			CLASS:Year 9 set 5/5 15 students	
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		
3 min 10 min 12 min 5 min 20 min 10 min	9Np1	Recognise the equivalence of 0.1, $\frac{1}{10}$ and 10^{-1}, multiply and divide whole numbers and decimals by 10 to the power of any positive or negative integer.	I can write 10,100,1000 as powers of 10. I can work out $12 \times 10^2 =$ I can work out $3000 \div 10^3 =$ I Know that 0.1, $\frac{1}{10}$ and 10^{-1} are different ways of writing the same number. I can use 0.1, $\frac{1}{10}$ and 10^{-1} in a calculation with confidence. **All** students can × and ÷ by 10, 100, 1000. **Most** students can work with positive power of ten. **Some** students can work with negative powers of ten.	Quick review of Number skills from previous lesson. Whole class discussion of equivalence of 0.1 $\frac{1}{10}$ and 10^{-1}, showing 5×0.1, $\frac{1}{10}$ of 5 and $10^{-1} \times 5$ all have the same answer = 0.5. Students produce a table of equivalences for 10^0, 10^1, 10^2, 10^3, 10^{-1}, 10^{-2}, 10^{-3}. Then check in pairs. Students work out sums using which ever equivalence they choose. Final task some students will attempt the last 5 questions sets ABC. Some students can play matching games with the two sets of 9NP1 number cards. This could be using all the cards laid out on a table face down, a student selects two and keeps them if they are a pair or returns them to the table, winner has most at the end or play a game like fish deal $\frac{3}{4}$ cards, each student draws from the remainder and discards a card trying to match pairs. Make up rules.	W W I G W I	Two sets of 9Np1 Number Cards (see separate sheet) per small group of students. Exercise on equivalent calculations 9Np1 sheet. Game rules for matching pairs or fish as needed by students.	**Q&A**: question / answer **D**: discuss'n **O**: observ'n **M**: marked work

Organisation: details of differentiation/groups/adult role (linked to activities)	**Notes/extension opportunities/homework**
Because of the nature of this group they are not expected to be ready to assess their own progress at this stage. Expect to take the books in and mark them – then at the start of the next lesson give out the Success Criteria statements see how they assess themselves and then compare with your assessment from the marking. Class Teachers will need to make decisions about the working groups who works with whom based on shared skills, best with less able, possible adult support, past working history etc	With a lower ability group there is less scope for extension but they could consider if their rules would work for all numbers. They will need reinforcement of the learning objectives in the shape of homework tasks and quick ten questions as lesson starters over the rest of the term.

APPENDIX D: OPPORTUNITIES FOR ICT IN THE CAMBRIDGE SECONDARY 1 MATHEMATICS FRAMEWORK

ICT is a valuable resource which should be used appropriately to help develop students' 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 pupils' computers and used away from the board to support teaching and learning. Even where the physical board is not available, there are often 'lite' or open source 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 and set squares, which can show size of angles and lengths of line measured. There are also likely to be interactive activities including function machines, fraction-makers, graphing tools, multiple dice, interactive

protractors, compasses etc. These are a useful support in teaching, but could also be used by pupils working independently. Teachers are strongly advised to explore these before looking elsewhere.

3. As the software allows hyperlinks to be included, this can be used to guide pupils to a specific website or resource for an activity or further study. Pupils can also use tools within the software to capture any resources they have been using online.
4. As interactive whiteboard software is very simple to use, pupils can develop their own games and activities to support an area of learning and then use these with their peers. As pupils have to understand the teaching point to develop the activity, this can be an excellent approach to help consolidate learning.

Handheld devices/tablets: There are an increasing number of handheld devices and tablets on the market, which either have their own bespoke software or can run applications, which can be downloaded for free, or for a small charge from the internet. There are a huge quantity of applications, some of which provide excellent support for pupils and their learning, although there are many which are not so appropriate and time needs to be taken to ensure quality. The management of handheld devices in a classroom would also need to be considered carefully, with potential issues around charging and syncing the devices.

Class response systems: If the educational setting has class response hardware, it will normally be linked to the interactive whiteboard and the software can be used by teachers and pupils to assess mathematical understanding around a certain topic, as well as in a more open way to support problem solving and investigations. There are now software apps designed to run on inexpensive handheld devices, which could provide an alternative to dedicated hardware.

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

Calculators and graphical calculators: From level 5 upwards, calculators are used to support complex calculation in both number and geometry as well as continuing to develop students' understanding of 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 maths 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. This can be further extended by involving pupils in designing and programming simple robotic systems.

Spreadsheets: This software can be used to support the investigation, modelling and problem solving, developing the use of more complex formulae and functions. The software also includes powerful analysis and graphing tools, which can support several areas of Mathematics.

Databases: This software provides essential support in data handling, enabling pupils to research data, build databases as well as interrogate their own and other sets of data, creating reports and charts to provide a response to queries and investigations.

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 pupils in capturing their ideas and approaches during problem solving and investigative activities.

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

Sound recording: Sound can help those with limited English writing skills, express and share mathematical concepts. Much standard software, Microsoft Windows™, Apple Mac OS™ 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. See resources list for open source sound editing software.

Digital still and film capture: Still and film cameras can be used by pupils to capture their learning, especially in activities involving physical equipment (counters, dice, 3D shape etc.) and in problem solving activities and investigations. Pupils 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 vokis and writing and recording scripts for them provides good opportunities for pupils to rehearse their mathematical understanding around a specific topic.

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 pupils in presenting their learning or sharing ideas as well as being used by both teachers and pupils 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 pupils to use it. Pupils should also be taught to respect others work online, understanding the rules for copyright, ownership and safe and responsible use. Pupils' activity on the site/s should be monitored to ensure the rules for safe and responsible use are being applied.

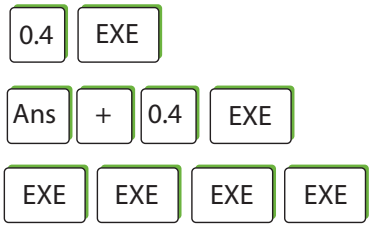
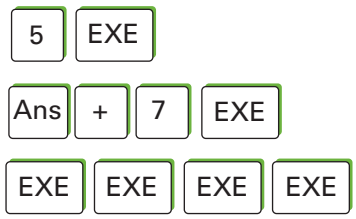
1. Pupils can be encouraged to save and share work online, providing the opportunity to discuss, review and improve their work.
2. Pupils and teachers can create blogs to explore and develop ideas around a topic or theme.
3. Groups of pupils can create wikis around an area of maths learning or to support an investigation or problem-solving activity.
4. Pupils can engage in online discussion around a topic or idea, or use a discussion board to develop an investigation.

Opportunities for ICT in STAGE 7

NUMBER:		Opportunities for ICT:
		Learners should
Stage 7		<u>Numbers and the number system and calculation.</u> 1. Have the following competencies when using a calculator: • select the correct key sequence to carry out calculations involving more than one step, using the bracket keys as appropriate, e.g. 18 × (37 + 58) • key in negative numbers, squares and square roots, using the function keys as appropriate; recognise negative numbers in the display • key into a calculator and interpret in the display whole numbers and decimals representing money or metric measures, e.g. 3.5 representing £3.50; round results to a given degree of accuracy • use the square and square root keys • use the memory key to increase efficiency in carrying out calculations 2. Use a graphical calculator to: • generate some random numbers between –15 and +15; then position these correctly on a number line • generate some numbers lying between 0 and 1 with a maximum of 2 decimal places; then position these correctly on a number line. 3. Use a program which generates number lines with different scales to place and compare decimal numbers to at least 2 decimal places 4. Use a calculator without the % key to work out percentages of numbers knowing that there is more than one method and discussing which method is most efficient e.g. find: • 18% of 24 • 0.18 × 24 • $\frac{12}{100} \times 24$ 5. Use online and electronic activities and games, number ITPs, electronic dice and interactive whiteboard resources to: • practise recognising negative numbers on number lines and scales • identify multiples, factors, common factors and primes • practise calculating squares of whole number to at least 20 × 20 and the corresponding square roots • calculate whole number percentages of quantities, using these to compare different quantities • practise number facts including integer complements to 100 and multiplication facts to 10 × 10 with the related division facts • use rapid recall and known number facts to solve number problems
Stage 7	7Ni2	<u>Recognise multiples, factors, common factors, primes (all less than 100), making use of simple tests of divisibility; find the lowest common multiple in simple cases; use the 'sieve' for generating primes developed by Eratosthenes.</u> 1. Use online simulations and other interactive resources to explore and identify multiples, common factor and primes 2. Use spreadsheets to try out and develop test of divisibility and to create converters for multiples and common factors

(Continued)

NUMBER:		**Opportunities for ICT:**
		Learners should
Stage 7	7Nf1	Recognise the equivalence of simple fractions, decimals and percentages. – Use spreadsheets and fraction ITPs to compare fractions, decimals and percentages

ALGEBRA:		**Opportunities for ICT:**
		Learners should
Stage 7		1. Use a *graphics calculator* to generate the terms of an integer sequence: e.g. enter:  Describe the sequence that is generated; how many terms to get to 100 . . . . 2. Use a graphics calculator to generate the terms of a sequence with decimal increments : e.g. enter: 

(Continued)

<table>
<tr><th colspan="2">ALGEBRA:</th><th>Opportunities for ICT:</th></tr>
<tr><td colspan="2"></td><td>Learners should</td></tr>
<tr><td></td><td></td><td>Predict what term comes next; recognise whether 3.6 is in the sequence . . .
3. Use spreadsheet software to demonstrate that any sequence of multiples (e.g. multiples of 7) can be generated in two ways:
• A term-to-term rule of repeat addition of the number: 7, 7 + 7, 7 + 7 +. . .
<table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr><tr><td>1</td><td>Position</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>2</td><td>Term</td><td>=B1*7</td><td>=C1*7</td><td>=D1*7</td><td>=E1*7</td><td>=F1*7</td><td>=G1*7</td></tr></table>
• A position to term rule: each term is the position × 7: 1 × 7, 2 × 7, 3 × 7.
<table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr><tr><td>1</td><td>Position</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>2</td><td>Term</td><td>7</td><td>=B2+7</td><td>=C2+7</td><td>=D2+7</td><td>=E2+*7</td><td>=FV2+*7</td></tr></table>
4. Use graphing software or graphics calculator to plot the graphs of linear functions where y is given explicitly in terms of x, e.g.
• $y = x$, $y = x$, $2y = 3x$ . . . .
• $y = x + 1$, $y = x + 2$, $y = x + 3$ . . . .
• and recognise straight line graphs parallel to the two axis
• $y = 3$, $y = 4$, $y = 9$ . . . .
• $x = 1$, $x = 2$, $x = 3$ . . . .</td></tr>
<tr><td>Stage 7</td><td>7Ae3

7Ae4</td><td><u>Construct simple algebraic expressions by using letters to represent numbers.</u>
<u>Simplify linear expressions, e.g. collect like terms; multiply a constant over a bracket.</u>
1. Use interactive whiteboard software to create and simplify algebraic and linear expressions, using drag and drop to collect like terms.
2. Use online simulations to explore linear expressions.</td></tr>
<tr><td>Stage 7</td><td>7As4</td><td><u>Generate coordinate pairs that satisfy a linear equation, where y is given explicitly in terms of x; plot the corresponding graphs.</u>
<u>Recognise straight-line graphs parallel to the x- or y-axis.</u>
Use graphing software to generate graphs from equations. Explore simple variations.</td></tr>
</table>

(Continued)

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 7	7Gs1	Identify, describe, visualise and draw 2D shapes in different orientations. 1. Use Logo software to create different 2D shapes and to change their orientations e.g. parallelogram, equilateral triangle 2. Use branching database software to classify 2D shapes using high level questions to draw in their properties 3. Use online or interactive software to draw 2D shapes in different orientations e.g. • Draw a square and put in both of its diagonals. Remove one of the triangles. Name the remaining shape and list some of its properties. • Draw a rectangle and put in both of its diagonals. Remove one of the triangles. Name the type of triangle removed and list some of its properties. 4. Draw a square and join adjacent mid-points of each side. Name the new shape that is formed and list some of its properties. 5. Use *plot* and *line* on a graphical calculator to draw given shapes using coordinates.
Stage 7	7Gs4	Estimate the size of acute, obtuse and reflex angles to the nearest 10°. – Use Logo software to create different angles of turn and to increase accuracy in estimating the size of different angles.
Stage 7	7Gs11	Use a ruler, set square and protractor to measure and draw straight, parallel and perpendicular lines, angles and polygons. – Use Maths tools within interactive whiteboard software or ITPs to draw and measure lines, angles and 2D shapes.
Stage 7	7Gp1	Read and plot coordinates of points determined by geometric information in all four quadrants. – Use graphing software to support plotting and reading of coordinates in all four quadrants.
Stage 7	7Gp2	Transform 2D points and shapes 1. Use shape ITPs to create and transform 2D shapes. 2. Use interactive whiteboard software with a grid background to rotate, reflect and translate 2D shapes.

MEASURE:		Opportunities for ICT:
		Learners should
Stage 7	7Ml1 7Ml2	Choose suitable units of measurement to estimate, measure, calculate and solve problems in everyday contexts. Know abbreviations for and relationships between metric units and convert between them. – Create converters for different metric measures and use these to support problem solving related to measure.
Stage 7	7Ml1	Draw and interpret graphs in real life contexts involving more than one stage. – Interpret data in online dynamic spreadsheet graphs.

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HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 7		Plan, collect, analyse and present data. 1. Use database software to create a planned database. 2. Design a questionnaire to collect the data and/or collect the data from environmental monitoring; add the data to the database. 3. Use websites or CD-ROMs as possible sources of data when deciding which data would be relevant to particular enquiries. 4. Use the database for detailed analysis, including creating graphs to answer queries and pursue lines of enquiry. 5. Use ICT appropriately to communicate findings/results.
Stage 7	7Dp2	Calculate the mean, including from a simple frequency table. – Use a calculator to work out the mean for a large set of items.
Stage 7	7Dp3	Draw and interpret different graphs types. – Use spreadsheet software or a graphing program, to draw different graphs from data, identifying which is the most suitable to present the data.
Stage 7	7Db3	Find probabilities based on equally likely outcomes in simple contexts. – Use interactive whiteboard or other software or the random facility on a graphics calculator to simulate simple experiments requiring random events e.g. throwing a dice or flipping a coin.

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 7	7Pt3	Understand everyday systems of measurement and use them to estimate, measure and calculate. – Use dataloggers to collect a range of environmental data (e.g. light/sound levels, temperature etc.) and use this to answer questions, carry out calculations and make estimates and predictions.
Stage 7	7Ps1	Identify and represent information or unknown numbers in problems, making correct use of numbers, symbols, words, diagrams, tables and graphs. – Find at least two solutions to 'broken calculator' problems such as: • The 9 key doesn't work. Make your calculator display 959 • None of the odd number keys work. Make your calculator display 173
Stage 7	7Ps2	Recognise mathematical properties, patterns and relationships, generalising in simple cases. – Use a calculator to enter these calculations 1×1 11×11 111×111 1111×1111 Predict what the next term would be, predict the result of $111\ 111 \times 111\ 111$ Investigate similar patterns.
Stage 7	7Ps6	Discuss and communicate findings effectively, orally and in writing. Use presentation/multimedia software to support communication of findings.

Opportunities for ICT in STAGE 8

NUMBER:		**Opportunities for ICT**:
		Learners should
Stage 8		Numbers and the number system and calculation. 1. Have the following competencies when using a calculator: • Be able to select the correct key sequence for multi-step calculations, using brackets or the memory as appropriate. • Key in fractions and percentages, using the function keys effectively where appropriate. • Key into a calculator and interpret in the display whole numbers and decimals representing money, metric measures or time, e.g. 2.5 representing 2 h 30 min; round results to a suitable degree of accuracy. • Use the sign change key, +/– in calculations involving positive/ negative numbers. • Use the cube and cube root keys. • Use the p key. 2. Use a calculator to explore divisibility e.g. Is 2011 a prime number? 2011/7 287.2857143 2011/11 182.8181818 2011/13 154.6923077 2011/17 118.2941176 3. Use a calculator to work out cubes, squares and estimate square roots e.g. Find the square root of 17. • 4^2 = 16 (4 squared) • 5^2 = 25 So the square root of 17 lies between 4 and 5. Try 4.5 and so on. 4. Use software that generates number lines with different scales to place and compare decimal numbers (to at least 3 decimal places). 5. Use a calculator to convert fractions such as $\frac{9}{57}$ $\frac{6}{53}$ . . . to decimals. 6. Use a calculator to do calculations such as: 2 ÷ 3 2 ÷ 7 5 ÷ 9 5 ÷ 16 17 ÷ 9 9 ÷ 17 . . . Relate these divisions to their equivalent fraction or mixed number. Round the answers to 2 decimal places. 7. Use a graphical calculator to multiply a number repeatedly by a fraction and observe the effect. 8. Use a graphical calculator to divide a number repeatedly by a fraction and observe the effect. 9. Use a calculator or spreadsheet to investigate the effect of multiplying and dividing numbers by 0.1 and 0.01. Describe the effects and recognise how numbers are increased or decreased by these operations. 10. Use a calculator without the % key to work out percentages of numbers by using an equivalent decimal calculation. 11. Use a spreadsheet to explore direct proportion.

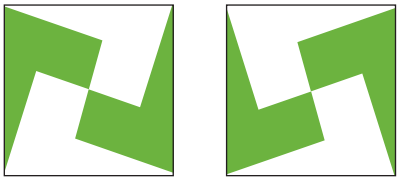
(Continued)

NUMBER:		Opportunities for ICT:
		Learners should
		<table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td>$</td><td>£</td></tr><tr><td>2</td><td>1</td><td>= 0.65*A2</td></tr><tr><td>3</td><td>2</td><td>= 0.65*A3</td></tr><tr><td>4</td><td>3</td><td>= 0.65*A4</td></tr><tr><td>5</td><td>4</td><td>= 0.65*A5</td></tr></table> 12. Use online and electronic activities and games, number ITPs, electronic dice and interactive whiteboard resources to: • Practise a range of calculations including those involving identifying multiples, factors, common factors and primes. • Practise squares, positive and negative square roots, cubes and cube roots of numbers. • Multiply and divide integers and decimals by 0.1 and 0.01. • Round numbers to a positive integer power of 10. • Find equivalent fractions, decimals and percentages by conversion between them. • Carry out calculations on fractions using common denominators and/or converting to decimals.

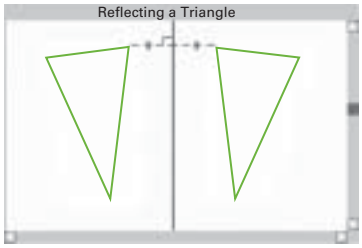
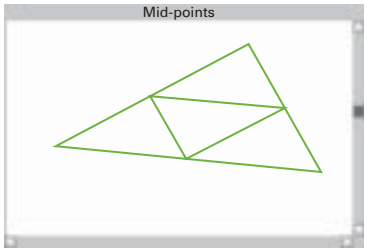
ALGEBRA:		Opportunities for ICT:
		Learners should
Stage 8		1. Use a spreadsheet to demonstrate the effect of multiplying a single term over a bracket e.g. Show that $4(x + y) = 4x + 4$. <table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>1</td><td></td><td>5</td><td>=4*A1+4 *A2</td><td>=4*(A1+A2)</td></tr><tr><td>2</td><td></td><td></td><td></td><td></td></tr></table> <table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>1</td><td>3</td><td>5</td><td>32</td><td>32</td></tr><tr><td>2</td><td></td><td></td><td></td><td></td></tr></table> Enter different pairs of numbers in columns A and B including decimals and integers. 2. Use a spreadsheet to demonstrate the effect of substituting different values into an expression e.g. substitute different values for x and y in $2x^2 + y$. <table><tr><th></th><th>A</th><th>B</th><th>C</th></tr><tr><td>1</td><td>–2</td><td>7</td><td>= 2*A1*A1+B1</td></tr><tr><td>2</td><td>–1</td><td>3</td><td>= 2*A2*A2+B2</td></tr><tr><td>3</td><td>0</td><td>–2</td><td>= 2*A3*A3+B3</td></tr><tr><td>4</td><td>3</td><td>3</td><td>= 2*A4*A4+B4</td></tr><tr><td>5</td><td>4</td><td>5</td><td>= 2*A5*A5+B5</td></tr><tr><td>6</td><td>6</td><td>1</td><td>= 2*A6*A6+B6</td></tr></table> 3. Use a spreadsheet to explore term-to-term and position-to-term linear relationships.

(Continued)

ALGEBRA:		Opportunities for ICT:
		Learners should
		<table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td>Position</td><td>Term</td></tr><tr><td>2</td><td>1</td><td>=A2*2+5</td></tr><tr><td>3</td><td>=A2+1</td><td>=A3*2+5</td></tr><tr><td>4</td><td>=A3+1</td><td>=A4*2+5</td></tr><tr><td>5</td><td>=A4+1</td><td>=A5*2+5</td></tr><tr><td>6</td><td>=A5+1</td><td>=A6*2+5</td></tr><tr><td>7</td><td>=A6*1</td><td>=A7*2+5</td></tr><tr><td>8</td><td>=A7+1</td><td>=A8*2+5</td></tr></table> <table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td>Position</td><td>Term</td></tr><tr><td>2</td><td>1</td><td>7</td></tr><tr><td>3</td><td>2</td><td>9</td></tr><tr><td>4</td><td>3</td><td>11</td></tr><tr><td>5</td><td>4</td><td>13</td></tr><tr><td>6</td><td>5</td><td>15</td></tr><tr><td>7</td><td>6</td><td>17</td></tr><tr><td>8</td><td>7</td><td>19</td></tr></table> 4. Use graphing software or a graphics calculator to plot the graphs of linear functions of the form $y = mx + c$ and investigate the effect of changing the values of m and c.
Stage 8	8Ae5	Derive and use simple formulae, e.g. to convert degrees Celsius (°C) to degrees Fahrenheit (°F). Use spreadsheets to explore temperature data in Celsius and Fahrenheit and derive conversion formulas. <table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td>°C</td><td>°F</td></tr><tr><td>2</td><td>–10</td><td>=A2*9/5+32</td></tr><tr><td>3</td><td>0</td><td>=A2*9/5+32</td></tr><tr><td>4</td><td>38</td><td>=A2*9/5+32</td></tr><tr><td>5</td><td>4</td><td>=A2*9/5+32</td></tr><tr><td>6</td><td>100</td><td>=A2*9/5+32</td></tr></table>

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 8	8Gs6	1. Use a computer tiling program to solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and special quadrilaterals, explaining reasoning with diagrams and text e.g. Investigate this tiling pattern found in the Alhambra Palace in Granada, Spain.  This pattern can be made from these two tiles.  Reproduce the tiles and the pattern. Investigate other patterns which can be made from these two tiles. Investigate tessellations with other tiles.

(Continued)

GEOMETRY:		Opportunities for ICT:
		Learners should
		2. Use interactive whiteboard or dynamic software to draw a triangle and a line to act as a mirror line.  Construct the image of one vertex of the triangle by drawing a perpendicular line to the mirror and finding an equidistant point on the opposite side. Repeat for the other vertices Change the shape of the original triangle by dragging each vertex in turn. Note the effect on the new triangle. Note the effect when the original triangle crosses the mirror line 3. Use interactive whiteboard or dynamic software to draw a triangle and join the mid-points of each side.  Change the shape of the original triangle by dragging each vertex in turn. Note the effect on the new triangle. Understand that the new triangle undergoes an enlargement (both positive and negative). Observe that with an enlargement, angles are invariant but lengths are not. Observe that the centre of enlargement can be both inside and outside the original shape. Observe that the centre of enlargement is the only point not to change its position after the enlargement.
Stage 8	8Gs1	Know that if two 2D shapes are congruent, corresponding sides and angles are equal. – Use an online /electronic activity to explore the properties of congruent 2D shapes.
Stage 8	8Gs5	Understand proofs of the angle sum of triangles and quadrilaterals. 1. Use Logo software to support the proofs for angle sums for triangles and quadrilaterals. 2. Use interactive whiteboard or dynamic software to draw a triangle. Draw a line through the top vertex parallel to the base. Observe the relationship between the angles as the shape of the triangle is changed by dragging any one of the vertices. Use the diagram to explain a proof that the angle sum of a triangle is 180^0.

(Continued)

GEOMETRY:		**Opportunities for ICT**:
		Learners should
Stage 8	8Gs7	Draw simple nets of solids, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism. – Use Logo to draw 2D nets of 3D solids e.g. cuboid, regular tetrahedron, square-based pyramid and triangular prism.
Stage 8	8Gs7 8Gs8 8Gp2	Follow and give instructions involving position, direction and movement. Recognise whole, half and quarter turns, both clockwise and anti-clockwise. Recognise that a right angle is a quarter turn. 1. Give sets of instructions to control onscreen and/or floor turtles. 2. Explore angles of turn using the turtles, beginning to use the repeat function to increase efficiency of instructions.

MEASURE:		**Opportunities for ICT:**
		Learners should
Stage 8		Measure 1. Use online and electronic activities, simulation and games, including measurement ITPs and interactive whiteboard resources to explore different types of measurement. 2. Select from available digital and analogue devices to measure time, length, mass and capacity using standard metric units. 3. Use an online/electronic clock simulation, which displays analogue and digital times, to start reading time to the nearest half hour.

HANDLING DATA:		**Opportunities for ICT**:
		Learners should
Stage 8	8Dc1	Answer a question by collecting and recording data in lists and tables, and representing it as block graphs and pictograms to show results. 1. Use a simple database to sort and organise data and display block graphs and pictograms using the results to help answer questions. 2. Use websites CD-ROMs or data-loggers as possible sources of data when deciding which data would be relevant to a particular enquiry. 3. Use a calculator or spreadsheet to work out the mean for a large set of items. 4. Use spreadsheet software or a graphing program to construct graphs and diagrams from collected data. 5. Use spreadsheet software or a graphing program to construct different charts, understand which are most suited to displaying data in categories. 6. Use ICT appropriately to aid communicating results and drawing conclusions from enquiries. 7. Use specific computer software or the random facility on a graphics calculator to simulate throwing two dice. Collect the different outcomes in a frequency diagram. Observe the shape of the distribution of results as larger samples are taken.

(Continued)

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 8		Identify simple relationships between numbers e.g., this number is double . . .; . – Use a simple spreadsheet to show the simple relationship between two sets of numbers e.g.

	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

Describe the relationship between the numbers in each row
Describe the relationship between the numbers in each column

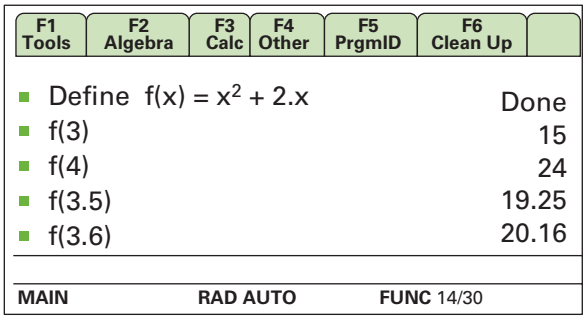
Opportunities for ICT in STAGE 9

NUMBER:		Opportunities for ICT:
		Learners should
Stage 9		Numbers and the number system and calculation. 1. Have the following competencies when using a calculator: • Use a calculator efficiently to carry out multi-step calculations with numbers of any size, using brackets or the memory as appropriate. • Extend use of the function keys to p, powers and roots (yx, $\sqrt{(x\&)}$) reciprocal key ($1/x$). • Know not to round during intermediate steps of a calculation; interpret the display and give results rounded to a suitable degree of accuracy. • Understand how a scientific calculator displays large and small number using standard form. 2. Use a calculator to explore inverse operations e.g. • Enter a number and square it. Understand what operation (key) to use to get back to the starting number. • Enter a number and cube it. Understand what operation (key) to use to get back to the starting number. 3. Use spreadsheet software to test whether two sets of numbers are proportional to each other e.g.

	A	B	C	D	E	F	G	H
1	No. of litres	1	2	3	4	5	6	7
2	Price ($)	1.38	2.76	4.14	5.52	6.90	8.28	9.66
3	Price/litre	=B2/B3	=C2/C3	=D2/D3	=E2/E3	=F2/F3	=G2/G3	=H2/H3

(Continued)

NUMBER:		Opportunities for ICT:
		Learners should
		– Use the software to plot the graph of price against price/litre to see whether they are directly proportional to each other (straight line through the origin). 4. Use a graphical calculator to work out the increase in depth of water in a swimming pool 5.4 metres wide and 10.24 metres long when 5530 litres of water are added. 5. Use a graphical calculator to enter these calculations: • 3 × 9 • 3 × 99 • 3 × 999 • 3 × 9999 • Predict the answer to 3 × 9 999 999. Find a general rule. 6. Use a calculator to find two consecutive numbers with a product of 8372. 7. Use online and electronic activities and games, including the number ITPs, electronic dice and interactive whiteboard resources to: • Help recognise multiples of 2, 3, 4, 5 and 10. • Model and support understanding of mental calculation strategies. • Help develop an understanding of partitioning of three digit numbers. • Practise placing three digit numbers. • Help develop a variety of mental strategies relating to addition, subtraction, multiplication or division. • Understand the effect of multiplying a two digit number by 10. 8. Use spreadsheets to explore number relationships and patterns.

ALGEBRA:		Opportunities for ICT:
		Learners should
Stage 9		1. Use a graphical calculator and trial and improvement methods to find an approximate solution to equations e.g. $x^2 + 2x = 20$,  2. Use spreadsheet software to determine the smallest value you can get for quadratics such as: $x^2 - 2x$.

(Continued)

ALGEBRA:	Opportunities for ICT:
	Learners should

	A	B
1	x	x2 – 2x
2	0	=A2*A2-2*A2
3	1	=A3*A3-2*A3
4	2	=A4*A4-2*A4
5	0.5	=A5*A5-2*A5
6	1.5	=A6*A6-2*A6

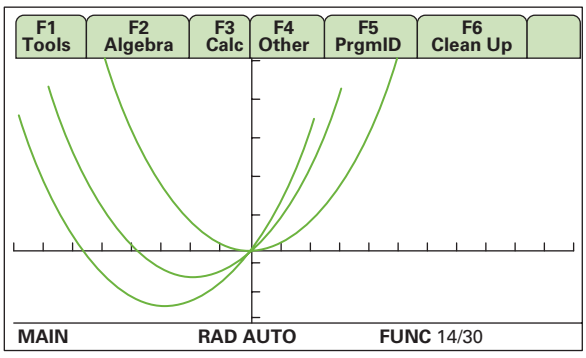
	A	B
1	x	x2 – 2x
2	0	0
3	1	–1
4	2	0
5	0.5	–0.75
6	1.5	–0.75

3. Use spreadsheet or graphing software to solve a pair of simultaneous linear equations graphically (drawing the graph of each equation and finding the point of intersection)
4. Use spreadsheet software or a graphical calculator with trial and improvement methods to solve simple cubic equations e.g. $a^3 = 20$, $b^3 - b = 50$, $c^3 + c = 20$ . . . . . .
5. Use spreadsheet software to construct formulae to model practical situations e.g. the height of successive bounces when a rubber ball is dropped:

	A	B	B	B
1	Drop Height	First Bounce	Second Bounce	Third Bounce
2	50	=A2*(2/3)	=A2*(2/3)^2	=A2*(2/3)^3
3	100	=A3*(2/3)	=A3*(2/3)^2	=A3*(2/3)^3
4	150	=A4*(2/3)	=A4*(2/3)^2	=A4*(2/3)^3
5	200	=A5*(2/3)	=A5*(2/3)^2	=A5*(2/3)^3

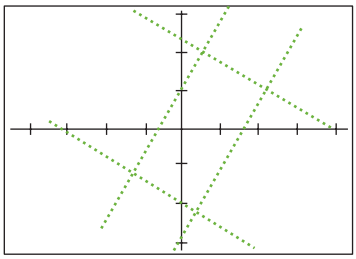
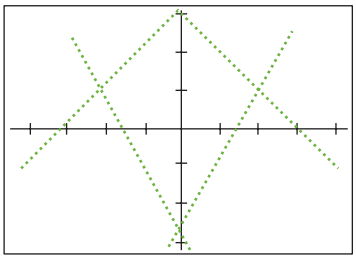
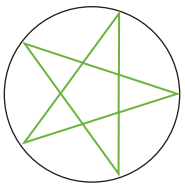
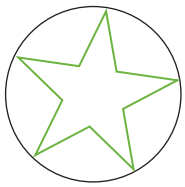
6. Use a graphics calculator to enter the sequence $x \rightarrow \frac{x}{3} + 3$
   - 1
   - Ans/3+3
   - 3.33333333
   - 4.11111111
   - 4.37037037
   - 4.45670123
   - 4.485596708
   - 4.495198903
   - 4.498399634
   - 4.499822182

   Note the apparent limiting value of 4.5 and link this to the solution to the equation $x = \frac{x}{3} + 3$
   Plot the graphs of $y = x$ and $y = \frac{x}{3} + 3$ and link their intersection to the solution for $x = \frac{x}{3} + 3$
7. Use a graphics calculator to plot and interpret graphs of simple quadratic functions e.g. investigate families of quadratics such as: $y = x^2$ $y = x^2 + x$ $y = x^2 + 2x$ etc



(Continued)

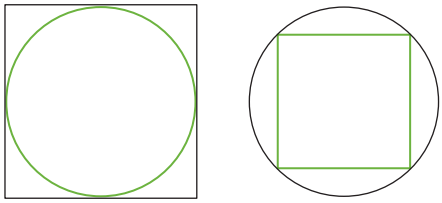
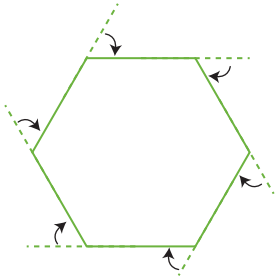
ALGEBRA:		Opportunities for ICT:
		Learners should
		8. Use graphing software or graphics calculator to plot the graphs of linear functions of the form $y = mx + c$ and know that m gives the gradient of the line and c the intersection of the line on the y-axis.

GEOMETRY:		Opportunities for ICT:
		Learners should
Stage 9		1. Use a graphical calculator to draw the following quadrilaterals:   2. Use a spreadsheet or calculator to explore Pythagorean triples. 3. Use a computer dynamic geometry software program to draw the locus of a point that moves so that it is equidistant from two fixed points, or equidistant from two intersecting straight lines. 4. Use geometry software to explore the equivalence of combinations of transformations: i.e. show that an even number of reflections can be equivalent to a rotation and show that two half turns about centres C1 and C2 are equivalent to a translation of magnitude double the distance C1 C2 in a direction parallel to C1 C2. 5. Use a computer e.g. a Logo to draw shapes based on equal divisions of a circle, e.g.  
		6. Use spreadsheet or geometry software program to explore the ratios of sides in a number of right angled triangles with an angle of e.g. 300. Use the software to highlight that where A = side adjacent to 300, O = side opposite to 300, H = hypotenuse: the longest side): • O/H is (allowing for measuring errors) the same as the Sine of 300. • A/H is (allowing for measuring errors) the same as the Cosine of 300. • O/A is (allowing for measuring errors) is the same as the Tangent of 300. 7. Use a scientific calculator to use trigonometric ratios to solve problems in two dimensions.

(Continued)

MEASURE:		Opportunities for ICT:
		Learners should
Stage 9		– Use a calculator based ranger linked to a graphical calculator to generate a distance-time graph and interpret its meaning.

HANDLING DATA:		Opportunities for ICT:
		Learners should
Stage 9		1. Use the online sources, prepared computer databases or dataloggers as possible sources of data when deciding which data would be relevant to a particular enquiry. 2. Use a calculator or spreadsheet to calculate an estimate of the mean of a large set of grouped data. 3. Use a graphical calculator or spreadsheet to draw a line of best fit on a scatter graph. 4. Use ICT appropriately to aid communicating results and drawing conclusions from enquiries. 5. Appreciate that graphs used in advertising and often those produced by ICT packages, can suffer from the following faults: • graphs are incomplete • scales are inappropriate or even misleading • discrete data is treated as continuous data and vice-versa • conclusions are drawn from very small samples • lines of best fit on scatter diagrams are misinterpreted.

PROBLEM SOLVING:		Opportunities for ICT:
		Learners should
Stage 9		1. Use Logo or a graphical calculator to draw a circle inside a square, a square inside a circle:  Find the ratio of the areas of the two squares if the circles have the same diameter 2. Use Logo to demonstrate a complete traverse of a regular polygon and use this to explain the sums of the interior and exterior angles 

APPENDIX E: PLANNING TEMPLATES

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*[1]
- *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*[2]
- *Detail of the ongoing objectives may be given in an outline plan*[3]

[1] See audit tool.
[2] See table of ongoing objectives.
[3] See table of ongoing work.

Long-term Planning Template 2

Learning Objectives – An Audit Tool

Framework Code	Learning Objective	Ongoing (O) Term ref (1A, 2B etc)

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.*

Long-term Planning Template 3

Learning Objectives – An Overview

Framework Code	Learning Objective

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 – <u>once only</u> 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:			UNIT:			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		
							Q&A: question/ answer **D**: discussion **O**: observation **M**: marked work
Organisation: details of differentiation/groups/adult role (linked to activities)				**Notes/extension opportunities/homework**			

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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