

Key Stage 3 Mathematics planning handbook

Summer 2008

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How to use this planning handbook

This planning handbook is designed to support subject leaders as they work with their departments to develop an effective scheme of work in mathematics at Key Stage 3. It consists of a collection of linked tasks, to help subject leaders prioritise, plan and implement a manageable development programme that involves the department working collaboratively.

The handbook is designed to:

- help subject leaders launch the revised National Curriculum programmes of study at Key Stage 3 with their departments and plan for phased implementation during the period 2008 to 2011;
- support the ongoing process of collaborative planning.

The handbook draws on the *Framework for secondary mathematics* and introduces the Key Stage 3 materials of the *Secondary mathematics planning toolkit* through a sequence of 'bite-sized' tasks. It addresses the heart of the planning process:

- planning for progression in teaching units so that:
 - pupils are given opportunities to consider concepts, interconnections and applications of mathematics;
 - teachers can plan to link objectives together and build effectively on pupils' existing knowledge;
- incorporating rich classroom tasks that:
 - engage pupils actively in learning mathematics and developing their skills in mathematical processes and applications;
 - assist teachers' planning, for example, by providing contexts that develop pupils' creativity or make links with other subjects and aspects of their lives.

The handbook addresses the interplay between planning for progression and selecting rich tasks that is the key to developing effective units of work. It encourages departments to take a realistic view of developments, moving between the 'big picture' and the detail of particular units, built up gradually over time. The planning toolkit is flexible enough to allow further elements to be added at a later stage, as schemes of work are developed in more detail. This might include, for example, key lesson plans, more peer and self-assessment or units that draw on historical or cultural perspectives.

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Launching the new programme of study (2008)

The importance of mathematics

Mathematical thinking is important for all members of a modern society as a habit of mind, for its use in the workplace, business and finance; and for personal decision-making. Mathematics is fundamental to national prosperity in providing tools for understanding science, engineering, technology and economics. It is essential in public decision-making and for participation in the knowledge economy.

Mathematics equips pupils with uniquely powerful ways to describe, analyse and change the world. It can stimulate moments of pleasure and wonder for all pupils when they solve a problem for the first time, discover a more elegant solution, or notice hidden connections. Pupils who are functional in mathematics and financially capable are able to think independently in applied and abstract ways, and can reason, solve problems and assess risk.

Mathematics is a creative discipline. The language of mathematics is international. The subject transcends cultural boundaries and its importance is universally recognised. Mathematics has developed over time as a means of solving problems and also for its own sake.

QCA mathematics 2007

Introduction

These notes are designed to help you launch the new mathematics programme of study at Key Stage 3 with your department and to set out initial thoughts for a longer-term plan. The new secondary curriculum (phased in from September 2008) is based on some overarching principles, including those described below.

Greater flexibility and coherence

The curriculum is focused on the key concepts and processes that underlie each subject, with less detailed prescription of content. This makes it easier to see links between subjects and increase the coherence for pupils across the curriculum and school activities.

New focus on aims and skills

The curriculum includes a framework for personal, learning and thinking skills (and functional skills for English, mathematics and ICT), embedded in the programmes of study. The key processes highlight the essential skills that learners need in order to make progress and achieve in each subject.

Emphasis on assessment for learning

Greater flexibility in the curriculum will give teachers more time to focus on assessment for learning strategies and to provide more targeted assessments to meet individual learners' needs.

In order to appreciate the scope for flexibility, it is first essential to recognise the impact that the key concepts and processes can have on pupils' learning in mathematics. Also, it is important to recognise how engaging pupils explicitly in the key processes will strengthen their skills in solving problems, and in applying their mathematical knowledge, much more effectively than over-emphasis on coverage of content.

So the first requirement is for your department to become familiar with the key processes in mathematics and how they expand on 'using and applying' mathematics. The first five tasks, **NC1–NC5**, will help you to launch the new curriculum with your department. They are best completed in a short sequence, preferably in a departmental half-day or several shorter meetings not too far apart.

The tasks have specific, practical outcomes and should leave you in a good position to assess your current practice, particularly how you address the key processes in your teaching. You can then plan for evolutionary change in your Key Stage 3 scheme of work over the period 2008–11. Do not be tempted to go for a superficial rewrite of your existing scheme of work. More effectively, establish a collaborative approach to planning with a measured and sustained programme of revising and updating units of work.

The documents needed for the launch tasks are included in a folder, **Launching the new KS3 curriculum (2008)**, on the CD-ROM. It also includes a briefing note for an administrative assistant or technician, to help with preparation of resources. One of the launch tasks involves reviewing and revising an early algebra unit and it would be helpful to bear this in mind in your preparatory work.

Suggested pre-reading for you and preferably all members of the mathematics department is:

- **NC programme of study for Key Stage 3 (2008);**
- extracts from guidance in the *Framework for secondary mathematics*:
 - **Mathematical processes and applications;**
 - **Key processes in algebra;**
 - **Teaching and learning approaches.**

You will need copies of the above for each colleague at your launch meeting.

Launching the new programme of study

First, prepare the classifying task, which is designed to begin to familiarise everyone with the key processes in mathematics. You will need to print copies of the document **Key processes classifying task**. Cut up sheets of the key process headings and statements so that each statement is on a separate slip of paper, one set per two teachers. You will also need, for each colleague:

- **Mathematical processes and applications**

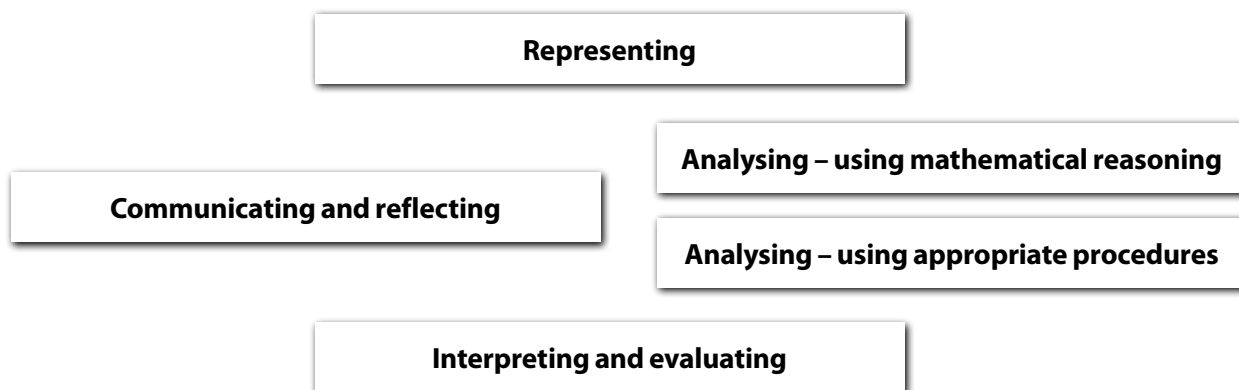
Note: This and the following four tasks are suitable for a half-day departmental meeting, or an equivalent sequence of shorter meetings.

Task NC1 – Introducing the key mathematical processes

Use your pre-reading, the notes above and your knowledge of your department, to explain to colleagues:

- the aims of the new National Curriculum programmes of study;
- how you are proposing to respond as a first step.

Introduce the task, a card sort designed to familiarise everyone with the key processes in mathematics. Working in pairs, lay the five key process headings on the table:



Ask pairs to discuss each of the process statements in turn and assign them to each of the process headings. Anticipate a healthy debate – there is no right answer! It is a first step towards becoming familiar with the new curriculum.

Allow time for classifying, then pose a couple of questions to the group:

- Which cards were difficult to place? Why?
- Can you find a set of three linked cards and explain the link?

Point out that the National Curriculum programme of study offers a categorisation, as a helpful prompt to thinking. However, there will always be room for debate about any description of processes.

The key processes are important when considering how pupils should engage with mathematics. You will consider this next, in the context of a particular example. Round off by asking colleagues to read (or re-read) the document ***Mathematical processes and applications***, drawn from the guidance in the *Framework for secondary mathematics* (available from summer 2008).

To get to grips properly with the key processes it helps to think about a mathematical task that is sufficiently rich and open. Exploring patterns and relationships on a hundred square, familiar to many, is an accessible context for algebraic generalisation and problems can be posed in many ways. You might find the ***'Hundred square' prompt sheet*** useful when setting the task for colleagues. For personal preparation in leading the task you might also find it helpful to read ***Case study 'Matchstick shapes'*** before the meeting. This gives an example of how a group of teachers built up a simple process map for themselves. For the meeting you will need, for each colleague:

- ***highlighter pens;***

and, as paper copies:

- ***Key processes in algebra;***

for pairs of colleagues:

- ***100 number grid*** (for 'Hundred square' task);
- ***Key processes adaptable template*** (Guidance on downloading software for interactive process maps is available in [Adaptable templates](#).);

for the whole group:

- **Key processes blank template** – a large hand-drawn version or the adaptable software version of the map to use on an interactive whiteboard or projector.

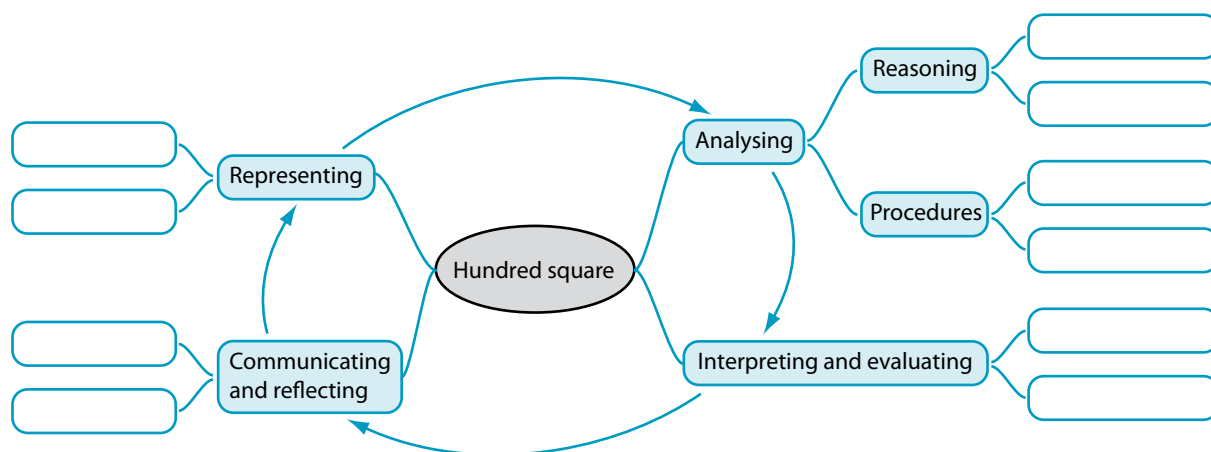
Task NC2 – Exploring the key processes

Provide pairs with a hundred square and give them about 10 minutes to explore the problem posed. The context may be familiar, but it is helpful to explore the mathematics in order to identify the potential for engaging pupils with the key processes. Provide direction, if needed.

Following their previous reading, remind everyone that the key processes describe how pupils should engage with their learning, at all levels of mathematics. Allow time for individuals to read the document **Key processes in algebra**, having in mind particularly the task they have just been doing. It may be helpful to highlight particular sentences or sections which relate closely to the way pupils could be learning through this task.

Next draw everyone's attention to the map **Key processes adaptable template** and allow a couple of minutes for pairs to peruse it. Perhaps refer back to the classification task, comparing and noting differences and similarities. Emphasise that there is no perfect map or classification but that you and your colleagues need to have a shared vocabulary if you are to discuss the processes productively.

Explain that the adaptable map provides a graphic way of detailing general aspects of the processes. Mapping can provide a mechanism for you to get to know the processes by constructing your own version based on a specific context. It is possible to start from the adaptable template; however, your map will be considerably smaller and therefore it is probably easier to begin from the blank template and create a few simple branches. Use a flipchart, board or interactive whiteboard, putting the title 'Hundred square' in the centre of the map, as shown.



- Working together as a department, add some key processes that could be developed through this task, drawing on ideas from the classifying task, from exploring the mathematics and from reading.
- Begin to discuss and note the range of opportunities that could emerge for introducing algebra through using this as an extended task across a number of lessons in Year 7.

The next task links very closely to **task NC2** and is best completed at the same time or very soon afterwards. You are beginning to consider the potential of this task as part of an early algebra unit in Year 7. The aim is to work with your department to design one or two objectives relating to mathematical processes and application. The renewed secondary *Framework* includes objectives adapted from the previous 'using and applying' objectives better to reflect the focus of the new programmes of study. Keeping the focus of the discussion on one specific example (the hundred square), the aim of **task NC3** is to provide a light-touch

introduction to ways of working with these objectives. Process is crucially affected by the context and task so you will need to tailor the objectives with the learning in mind. A possible objective could be:

Pupils should learn to:

use symbols and expressions to represent '100 square' patterns and work logically to produce and explain generalisations; compare different approaches and recognise where they are equivalent.

Task NC3 sets out the stages of thinking, to help your colleagues design a similar objective based on your earlier work with the key processes. Don't be tempted to skimp on this thinking or align too closely to the example above.

You will need, for pairs of colleagues:

- **Key processes map 'hundred square'** (your agreed version from NC2);
- **Year 7 mathematical processes and applications objectives;**
- **Year 7 algebra objectives.**

Task NC3 – Tailoring the mathematical process and application objectives

Remind colleagues about the last task. In particular, mention the map of the cycle of key processes that you produced after exploring the algebra of the hundred square and the interrelated elements of the map, which you noted as possible foci for an algebra unit plan in Year 7.

Introduce the table of 'Mathematical process and application' (MPA) objectives and explain that these have been adapted from the 'using and applying' objectives better to reflect the focus of the new programmes of study. Say that you will work in more detail on these objectives at a later stage; for now you are simply 'getting to know them'.

- Ask pairs of colleagues to highlight phrases in the **Year 7 MPA objectives** that seem appropriate to the 'hundred square' task. They may find that working from your 'key process' map (from **task NC2**) helps them to do this.
- Discuss the highlighted phrases, reach some consensus and design one or two composite objectives that are simple enough to describe the learning opportunity presented by the 'hundred square' problem.

It is important to see the MPA objectives as part of a collection of objectives in a unit. To complete this picture you need to consider which 'range and content' objectives you would select if you were to include the 'hundred square' as a major part of an algebra unit in Year 7.

- Working as a group, consider the **Year 7 algebra objectives** and select a small collection that would be suitable, alongside the MPA objective, for a Year 7 algebra unit plan.

Summarise **tasks NC2** and **NC3** and emphasise that an extended and rich task of this kind can help to ensure that pupils learn through the key processes and understand the range and content in a more connected way.

The fourth task prepares you for a 'stocktake' on your approach to algebra in Year 7. For departments whose approach is well-aligned with the new curriculum, the main outcomes will be to introduce the language of key processes and to refine existing units. Departments that need to make a greater level of change might start by revising one or two units in Year 7, before setting out a manageable plan for the longer term. Think about how to draw in all members of the department; enlarged or projected documents may help to do this. You will need:

- **copies of one or more algebra units from early in Year 7, including any resources and textbooks that you use;**
- **a unit planning template, either the one you use in school, or chosen from the three provided in the folder on the CD-ROM.**

Each colleague will also need a copy of:

- ***Teaching and learning approaches***

Task NC4 – Revising a Year 7 algebra unit

Explain that the purpose of this task is to review an early algebra unit in Year 7. The ***Teaching and learning approaches*** document synthesises and interprets the aims, key concepts, key processes and curriculum opportunities in the new curriculum. It can help you reach a consensus on priorities for planning and teaching.

Ask everyone to read just the six sub-sections of ‘Some principles for effective learning’ (first main section of the document only). They should have in mind the context of teaching algebra to pupils in the first term of Year 7 and highlight text that they think is important when reviewing early algebra units.

Discuss individual suggestions and agree two or three priorities.

Now introduce the main task, which is to review and revise a Year 7 algebra unit. In order to address priorities in the new curriculum, your plan is likely to include a rich task developed over several lessons to:

- engage pupils in particular aspects of the key processes;
- develop other aspects of effective learning.

Your unit might include a new task (e.g. ‘hundred square’) or an adaptation of an existing task. You might choose:

either to adapt an existing unit;

or to drop notes into a unit planning template, if you want to start afresh.

Spend most of your time exploring how the task should be developed and incorporated in the unit, including:

- how you might present the task to pupils who had not encountered algebraic representation or used algebraic procedures before;
- ways in which pupils could develop or extend the problem and become more autonomous in using the key processes.

Finally, identify what needs to be completed beyond this meeting in order to prepare for teaching the unit. This will include new objectives adapted from the mathematical process and application strand and renewed objectives drawn from the algebra strand.

The final task in this sequence looks ahead to when you teach the unit. It will be essential to evaluate the unit, how you have adapted your teaching and the impact on pupils’ learning. It would be helpful if you could project the templates or work on enlarged paper versions of:

- ***Teaching and learning review template: lessons/unit;***
- ***Teaching and learning review template: pupils’ views***

Task NC5 – Preparing to review teaching and learning

Explain that the final task is to give further consideration to how you will teach the revised Year 7 unit and to identify points to note, to help you review the impact of the changes made.

From the **Teaching and learning approaches** guidance, ask colleagues to read 'Some principles for effective teaching'. Individually, highlight points in the text that are particularly relevant to teaching this unit. (You are not trying to cover everything!) Then discuss and agree priorities for the department, identifying important aspects to develop, without being over-ambitious at this stage.

Together, adapt the **Teaching and learning review template: lessons/unit** so that it is suitable as an observation and reflection sheet to help you review the unit later. On the basis of your agreed priorities, decide which sections of the template are relevant to copy and adapt as part of the agreed review prompt. Without being over-ambitious, your template should include:

- the particular key processes with which you expect pupils to engage;
- other aspects of pupil learning you are seeking to develop;
- the particular teaching principles you are seeking to improve.

Having designed this review template you may wish to select matching prompts for gathering pupils' views through small-group discussions based on the same priorities. To do this, use the adaptable template **Teaching and learning review template: pupils' views**. Copy, paste and adapt the suggested questions for your chosen developments, and agree when and how pupils' views will be gathered.

Discuss how the adapted teaching and learning review sheet and the results of pupil discussions can be used in preparation for a departmental review meeting:

- by all teachers as self-reflection on their lessons;
- for any lesson observations that may be possible;
- to inform discussions with small groups of pupils about their experiences in the lessons.

Agree when the unit will be taught and set a date for a review meeting.

Conclude by noting that starting on a small scale to establish the key processes in selected units of work will help all staff to move forward with the new curriculum and will inform the department's long-term development plan.

Drafting a plan for the longer term

It would be appropriate to allow time to reflect on the outcomes of your launch meeting before setting out a longer-term plan. The timing of this next task will depend on such factors as whole-school planning for the new curriculum and whether you feel ready to set out a plan, or whether you would prefer to allow time for some trialling of one or two units of work, say in Year 7, before thinking ahead to the longer term.

For this task you will need:

- the chart **A timeline for change**.

Task NC6 – Drafting a development plan

This task is for the subject leader working with a colleague, such as the second in department or teacher with responsibility for Key Stage 3.

Reflect on and discuss:

- the 'big picture' in the school and plans or points for consideration from the senior leadership team as they seek to implement the new curriculum;
- issues arising from the launch with your colleagues (and subsequent classroom trialling), related to implementing the new mathematics curriculum, particularly the incorporation of key processes.

Your discussion should help you to address questions about priorities and phasing. Use the chart **A timeline for change** to consider which year groups are most affected by the changes to the curriculum. In the light of this, consider whether you will:

- *work on the planning and teaching for a particular year group or the whole key stage;*
- *review the whole curriculum by working on critical units in all strands or review a larger number of units in a selected strand.*

When you have formulated your thoughts, it would be appropriate to discuss plans with a senior leader. This provides an opportunity to set out what you see as the challenges for your department and possible ways forward. Further work may be needed to arrive at an agreed plan that can lead to sustained, phased development towards a scheme of work that fully reflects the new programmes of study.

Having launched the new programme of study with your department and considered some of the implications for your teaching, set out early thoughts on a development plan and discussed them with a school senior leader and the department, you should be ready to clarify your plans, identify priorities and start working on them.

The remainder of this planning handbook is structured in the same way as the previously published *Mathematics at Key Stage 4: developing your scheme of work*, but does not assume familiarity with it. It draws on the resources in the *Secondary mathematics planning toolkit*, which, as explained in the next section, is an expansion of the *Mathematics planning toolkit: Key Stage 4*.

Making a start with the planning toolkit

After the launch training, this section will enable you to step back and look more broadly at the issues of developing your scheme of work. It reminds you of what constitutes a scheme of work and the aspects that need to be attended to over time. It will help you to become familiar with the *Framework for secondary mathematics* (**task MS1**) and supporting resources in the *Secondary mathematics planning toolkit* (**task MS2**) and finally to prioritise and firm up your plans (**task MS3**). You are then in a position to move to the appropriate sections of the planning handbook that are designed to support the ongoing process of collaborative planning, to implement the new curriculum at Key Stage 3.

A scheme of work

Features of an effective scheme of work

An effective scheme of work supports teachers' planning and helps to ensure that pupils have positive experiences of mathematics and make good progress in the subject. A good scheme of work will:

- set out a teaching programme that embraces the aims of the National Curriculum and the vision of the school, ensures balanced coverage of the curriculum and a clear progression, taking account of the opportunities and constraints of the school calendar and resources;
- outline the intended development within each unit of work, helping teachers to plan and to manage the transition from lesson to lesson, keeping the need for lesson notes to a minimum;
- incorporate a variety of rich learning tasks that:
 - involve pupils in their learning through the mathematical processes and promote mathematical talk for deeper understanding;
 - assist teachers in building on pupils' prior learning, differentiating according to need.

Leading the development of the department's scheme of work is central to the role of the subject leader. Typically the strategic planning would be done in partnership with other curriculum leaders in the department, such as the Key Stage 3 coordinator or the second in the department.

The whole department will become involved at the stage of detailed planning. This can be a rewarding, collaborative activity, providing a context for talking about teaching and learning mathematics, sharing good practice and enhancing the professional expertise of all teachers. Time spent developing the scheme of work together as part of a long-term development plan supports the planning of all colleagues, reducing time spent in individual preparation and making it more effective. Such departmental discussions offer longer-term advantages, with a positive impact on teaching and learning more generally.

Capturing the planning is an important strategic task for a curriculum leader, so that successful experiences are recorded and more easily repeated on another occasion.

Components of a scheme of work

There is a commonly accepted pattern to a teaching programme.

- The *programme of study* is divided into teaching units in such a way that related mathematical concepts and skills can be taught coherently over a sequence of lessons. Units are usually sequenced so that all strands of the subject are kept moving forward and concepts are revisited over time.
- Each *unit* is structured to achieve progression in learning within the identified area of mathematics, aiming to build on what pupils already know and to lead to observable progress. Often a unit is planned at more than one level in order to meet the needs of different pupils within a year group.
- Individual *lessons* are sequenced within the overall unit plan, working towards the intended outcomes of the unit. Teachers work to a common unit plan, but lessons may unfold differently in each classroom as teachers adapt to the responses and needs of their classes.

An effective scheme of work will address the first two of the aspects listed above, dividing the curriculum into teaching units and outlining the objectives and activities in each unit (perhaps occasionally including a key lesson plan). Lesson planning is made very much easier for individual teachers when the structure and content of a unit has been discussed and agreed.

Most subject leaders organise planning in an electronic form, some of which will be more accessible on screen and some they choose to have in hard copy. In summary, the key elements of your scheme of work are as follows.

- The curriculum map and teaching calendar

The map shows how the curriculum will be divided and sequenced into teaching units and the calendar shows how units will be fitted into the school year. The map is likely to be revised as you develop units in more detail and the calendar will change according to the schedule of school events.

- Unit plans

Plans for each unit of work set out the sequence and content of the unit to support teachers' day-to-day planning. As a minimum, the unit plan will include the objectives for the unit and indicate tasks and key resources that will be used. More detailed plans, perhaps starting with one or two key units, will set out the structure of the unit in phases and provide more information and advice on key activities.

Support for planning

The Framework for secondary mathematics

The tasks in this handbook use resources in the *Secondary mathematics planning toolkit* on the CD-ROM, to help you build up your scheme of work electronically. A crucial element of the toolkit is the *Framework for secondary mathematics*. (A copy of the *Framework*, made at the time of publication of these materials, is also provided on a separate CD-ROM.) It will be useful to explore both the *Framework* and the planning toolkit, before turning to the appropriate sections of this handbook for your identified priorities.

Task MS1 – Getting to know the Framework

This task is initially for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Project the **Framework for secondary mathematics** and navigate through the introductory screens. The *Framework* includes objectives, as well as guidance on planning for the new curriculum in the form of screens and downloads. You should recognise some of the guidance from the work you did as part of the launch of the new curriculum. The intention is that, as the *Framework* evolves, other resources will migrate to the website. In the meantime, the toolkit ensures that a range of resources are readily accessible.

Work through some of the connections so that you get a sense of how much is available at this phase of developments. If you are working from the disk, remember that it may be outdated so it is worth looking at the live website to check for recent additions. The aim is gradually to link many more of the Strategy resources through this site.

Read a selection of the introductory guidance on screens such as 'Introduction to the learning objectives' or 'Revisions to objectives in Years 7, 8 and 9'. Use the guidance to clarify points such as the progression across the columns, pitch for each year group, extension to Years 10 and 11 and the rationale for the small number of Year 9 extension objectives.

Note the guidance relating to 'Mathematical processes and applications'. These objectives are significantly different and tailoring them for units of work forms an important part of planning for the new curriculum (as introduced in **task NC3**).

Overall the range and content objectives should look very similar to those in your scheme; the pitch and expectation in each column is unchanged and the objectives have been adjusted only where progression required some clarification, for example by reducing repetition.

Look carefully at the layout of the objectives and the facility for scrolling across and down to see progression and range. Try linking to assessment criteria and note that these relate to the attainment targets not the objectives. They are fewer in number and should be used to inform periodic assessment and curricular targets. Updated links to the full range of *Assessing Pupils' Progress* (APP) guidance are planned to be available from spring 2009.

The planning toolkit

You will also need to spend a few minutes becoming familiar with the planning toolkit. If you have used the *Mathematics planning toolkit: Key Stage 4* you will be familiar with the structure but will find it helpful to see how it has been expanded.

The planning toolkit aims to make it easier to develop, record and revise your scheme of work over time. It consists of a collection of files grouped into folders. You can copy and paste from different files into adaptable templates, to build up the different components of your scheme of work: curriculum map, calendar and unit plans. You can also add files, from other sources, that will be useful in your planning.

Task MS2 – Getting to know the planning toolkit

This task is initially for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

On the initial screen, note the following two documents. You might find it helpful to print and study these first.

Introduction to the planning toolkit – Note the advice regarding saving folders to your hard drive, particularly where you have previously used the *Mathematics planning toolkit: Key Stage 4*.


Contents of the toolkit folders – The toolkit is an expansion of the earlier Key Stage 4 toolkit. Some documents are filed separately in Key Stage 3 and Key Stage 4 sub-folders. The structure will become clear as you explore the disk.


Next, go to the folder **Guidance on planning**, sub-folder Key Stage 3, noting that it contains:

- this planning handbook and each of its sections as separate documents;
- resources to support 'Launching the new programme of study';
- a set of *Guidance papers* and other resources.

Now explore the contents of the other folders and sub-folders, selecting Key Stage 3 where appropriate.

 **Adaptable templates** – for your scheme of work

 **Curriculum information** – the mathematics to be taught

 **Ideas for rich tasks** – activities for the classroom

 **Pedagogy and subject knowledge** – teaching approaches, guidance and self-study

 **Developing scheme of work** – filing system for completed templates

After a few minutes' exploration, you should have a good idea of the purpose and content of each folder of the planning toolkit.

All teachers need to know what support is available to guide planning for the new curriculum. Think about when and how it would be most effective to take the department through the structure of the toolkit and the *Framework*.

Developing your scheme of work

The cycle of planning tasks

This planning handbook sets out manageable tasks to help you and your colleagues develop or revise your Key Stage 3 scheme of work in mathematics, particularly to meet the requirements of the revised National Curriculum programme of study (from 2008). This should be a phased implementation, aiming towards first national testing in 2011.

There is no suggestion that the scheme of work is a 'product' to be completed by a certain date. It is better to see the sections of the handbook as support for the ongoing process of improving teaching and learning in the department. In that way you establish a practice of collaborating that allows your scheme of work to evolve in response to changing needs.

Your starting point should emerge from the tasks set out in the previous section 'Launching the new programme of study'. Following this section on 'Making a start with the planning toolkit', five main sections of the planning handbook are outlined below. They are **not** intended to be tackled sequentially. This section helps you to think about moving around the cycle of planning tasks, revisiting them to make adjustments or additions as your scheme of work develops.

- Rich tasks
 - exploring rich mathematical tasks and their potential for improving pupils' learning;
- Unit planning
 - considering different ways of structuring a unit and using rich tasks to develop a unit in phases;
- Capturing planning
 - administrative tasks of adapting the curriculum map, developing a teaching calendar and filing unit plans and associated teaching resources;
- Planning for progression
 - gaining an overview of progression in key mathematical processes and identifying critical units for development;
- Ongoing developments
 - reviewing and refocusing your development plan.

It may be useful to skim through one or two of the sections at this point and to note that they are illustrated by particular examples, such as algebra or the 'matchstick shapes' problem. The examples help to clarify the purpose of each departmental task but they are for illustration only. Each section is designed to provide a structured way of working that can easily be adapted to other strands of the curriculum and to ideas generated from your department.

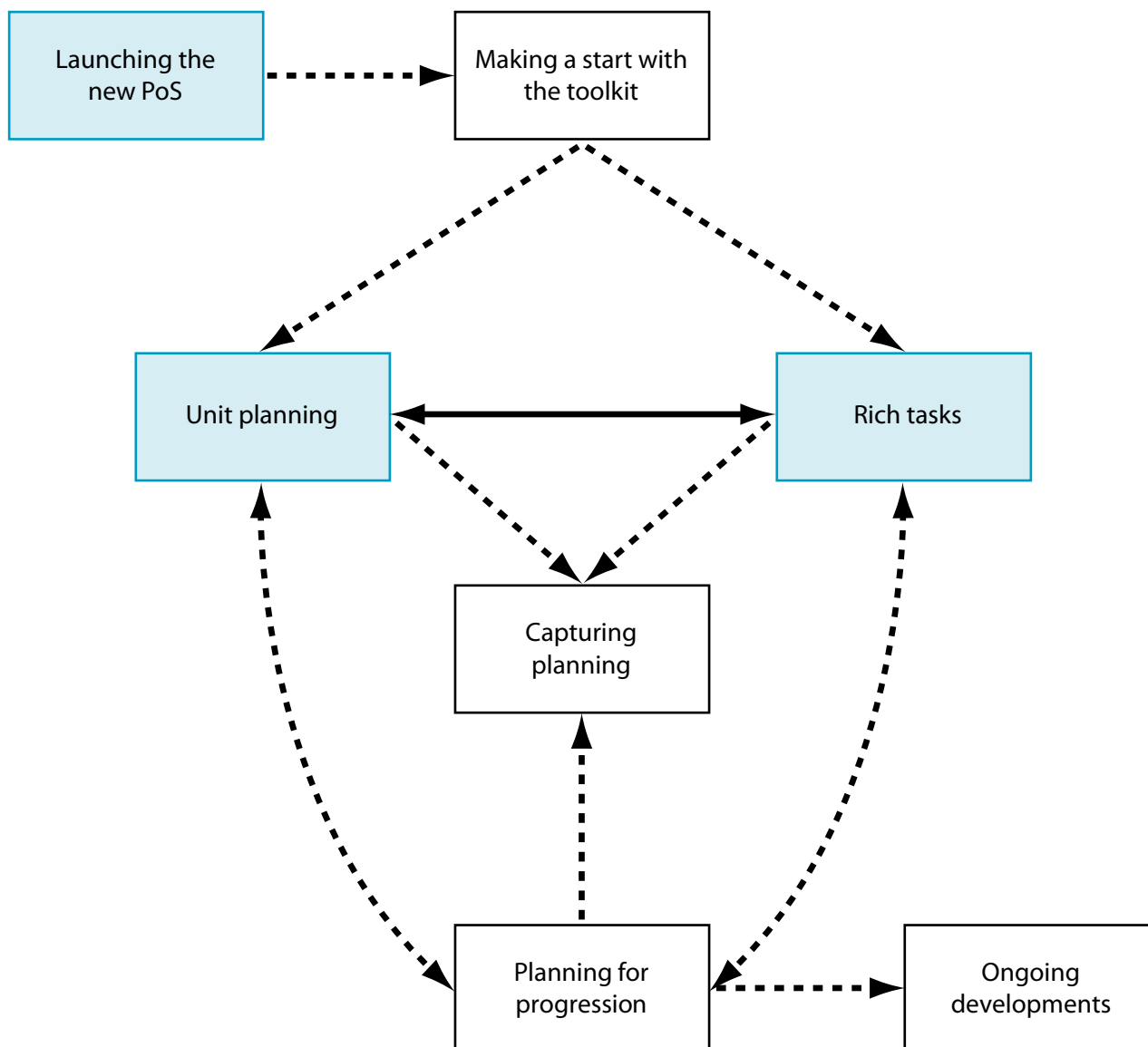


Diagram 1: An evolving scheme of work

The tasks on this diagram fall into two broad categories:

- tasks for you as subject leader, working with one or two colleagues, such as the second in department or teacher with responsibility for Key Stage 3 (unshaded);
- tasks that should involve all Key Stage 3 mathematics teachers (shaded). Careful preparatory work will ensure that you maximise the use of precious departmental meeting time.

The diagram represents the way in which a scheme of work evolves. The section on **Rich tasks** and **Unit planning** are revisited regularly, with teachers working together on a cycle of *'plan-teach-review'*. Periodically, an effective subject leader also pays attention to the practicalities of **Capturing planning** such as storing the new units, adjusting related units, planning timing of units and storing resources electronically and physically.

From time to time the departmental leadership team may also need to consider the 'big picture' of **Planning for progression** across a year or the whole key stage. In this way the scheme of work gradually builds up and, at some point, it is appropriate to reset priorities for **Ongoing developments**.

Deciding priorities

The first section of this handbook helped you to launch the new programme of study with your department and to consider some of the implications for your teaching. **Task NC6** suggested that you set out early thoughts on a development plan and discussed them with a school senior leader and the department. This next task picks up from that point and should help you to clarify your plans, identify priorities and decide how to start working on them.

Task MS3 – Clarifying the next steps in your development plan

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Refer to **Diagram 1, An evolving scheme of work**, which shows the various sections of this booklet, identifying those aimed at full departmental collaboration (shaded) and those that are for strategic leaders (unshaded).

Discussion prompts

- **Unit planning** – Think about the impact of developments from **task NC4**. Have the successful ideas been properly captured in the unit plan? Do you need to work on other sections of that unit plan? Should you develop ‘surrounding’ units to capitalise on the changes you have made?
- **Rich tasks** – Think about the impact of the rich mathematical task you worked on as part of the launch. Could a similar task be developed to use elsewhere in the scheme of work? Did ideas for other rich tasks emerge from within the department? Could you follow these up in Year 7 and Year 8? Is there a type of rich task that could be trialled in all three years?
- **Capturing the planning** – How will you record successful changes to your scheme of work as you move between unit planning and rich tasks? Who will follow this through? When do you need to meet as a small group of curriculum leaders so that whole-department meetings are sharply focused and productive?
- **Planning for progression** – How many units will you study before you step back and look at the ‘big picture’ and consider planning for progression in a year and across the key stage? How will you keep track of pupils’ progress so that the changes to the scheme of work meet the aims of the new curriculum and improve rates of progress?

An important first step is to ask the right questions, in order to identify your priorities. However, you need a fairly detailed plan so that developments do not slip in the hurly burly of a school year. The plan to develop your scheme of work should be a significant and integrated section of your departmental development plan. To be sure you get the maximum support for this work it is important to involve the senior leader who has oversight of the department.

Phasing developments

Crucial aspects of developing a plan are setting out priorities on a realistic timescale, establishing a collaborative way of working and building up an electronic filing system that can evolve as your scheme of work develops in response to the new programmes of study at Key Stage 3.

It is important to recognise that the process is ongoing and to plan a manageable development schedule. Set out a plan over time, outlining what you want to achieve in the next term, the next year and beyond to 2011, when the new programme of study needs to be fully in place. (See **A timeline for change**, from the launch section.) Keep abreast of the change and respond positively:

- See the revised curriculum as an opportunity for the department, not a threat;
- Manage change through the developmental work that you initiate.

Forward-planning helps you to pace developments and manage change. If members of the department are aware of the plan, then work moves ahead with a sense of direction and purpose, often with less conscious effort. The inevitable changes of plan can then take place in a more considered way, rather than as a reaction to events.

Securing support

Think about when and how a small group of curriculum leaders should meet so that whole-departmental meetings are carefully planned and used to their maximum effect. Discuss with a senior leader what administrative or technician support could be provided to support your work. Clarify which tasks require collaborative work as a whole department, or perhaps the teachers teaching a particular year group, and which can be followed up by pairs of teachers, or individuals, reporting back later.

Make sure that you keep senior leaders informed and discuss the details of your plans with them. Their support will be invaluable. For example, they can help to facilitate arrangements for departmental planning time. The monitoring role that you jointly exercise will be better supported if they understand the role of unit plans in your scheme of work and how those plans inform the preparation of individual lessons. Consider how senior leaders might use the **Teaching and learning review templates (lessons/unit and pupil's views**, referenced in other sections) to assist you in evaluating progress against the priorities you have set for development.

Establishing new routines

In some departments, establishing a collaborative way of working may be the highest priority and you should consider this when deciding where to begin. From small beginnings, the process is established and benefits are felt. It should then be possible to plan a rolling programme with an increasing pace of change.

It is important that developments are captured for the long term and become embedded in your scheme of work. The most flexible way of doing this is to set up an electronic filing system for your scheme of work and associated resources, thereby making it easier to incorporate changes and additions. Keep sufficient written notes to act as reminders for colleagues teaching the unit of work; these may be used in subsequent years and revised or expanded when appropriate. Do not take on every task; delegate to key members in the department and, most importantly, ask for and use administrative or technician support to help keep your files and resources up to date.

Rich tasks

Key concepts

There are a number of key concepts that underpin the study of mathematics. Pupils need to understand these concepts in order to deepen and broaden their knowledge, skills and understanding.

Competence

- Applying suitable mathematics accurately within the classroom and beyond.
- Communicating mathematics effectively.
- Selecting appropriate mathematical tools and methods, including ICT.

Creativity

- Combining understanding, experiences, imagination and reasoning to construct new knowledge.
- Using existing mathematical knowledge to create solutions to unfamiliar problems.
- Posing questions and developing convincing arguments.

Applications and implications of mathematics

- Knowing that mathematics is a rigorous, coherent discipline.
- Understanding that mathematics is used as a tool in a wide range of contexts.
- Recognising the rich historical and cultural roots of mathematics.
- Engaging in mathematics as an interesting and worthwhile activity.

Critical understanding

- Knowing that mathematics is essentially abstract and can be used to model, interpret or represent situations.
- Recognising the limitations and scope of a model or representation.

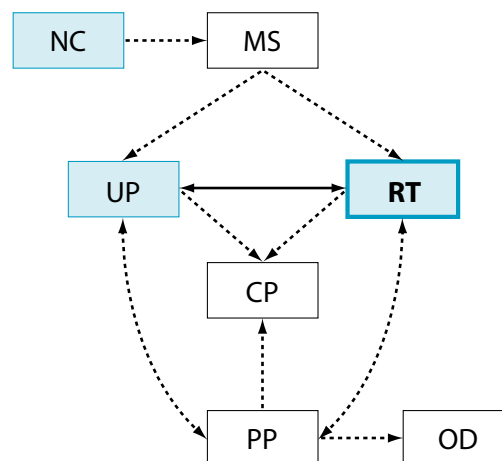
QCA mathematics 2007

This section helps you to examine the nature of mathematical tasks that you use in the classroom, with a view to engaging pupils with the key concepts (listed above) and the key processes of representing, analysing, interpreting and communicating, thereby enriching the activities included in your unit plans.

Departmental **tasks RT1, RT2 and RT3** are a closely related sequence involving exploring the potential of a rich mathematical task, tailoring appropriate objectives and preparing to trial the task in the classroom.

Task RT4 sets out a process for reviewing the trials. **Task RT5** steps back to look more broadly at types of rich task, with a view to helping teachers to recognise their power and devise examples of their own.


Note that the algebra example of developing a rich task is for illustrative purposes only. The departmental tasks in this section provide a framework, so that the process can be repeated with other tasks across the range and content of mathematics.



Developing a rich task

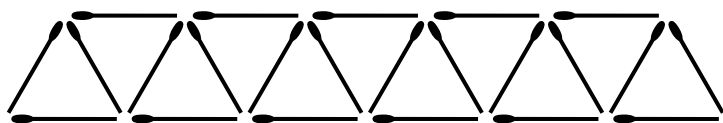
Working together on a rich mathematical task

To engage pupils with the key concepts and key processes, it is important to find new ways to stimulate mathematical thinking and talk in the classroom. This can be initiated by working together, as a department, on a piece of mathematics. It is too easy to assume that all teachers understand and explain concepts in mathematics in a similar way; this can affect the way they help pupils to learn mathematics. One way of opening up this discussion is to work together on a mathematical task, before trialling it in the classroom. You can then reflect on the richness of the task and its potential for promoting mathematical talk and enhancing pupils' learning through the key processes.


To prepare for this session, you need to identify a rich mathematical task and how you will work on it together. The folder  **Ideas for rich tasks** contains many sources, for example, the *Interacting with mathematics at Key Stage 3* materials. You will also find examples in textbooks and on the web. (As the collection of Strategy resources is updated to reflect the new curriculum, more of them will be linked electronically through the *Framework*.)

Some sources give just the germ of an idea and how it might develop. In other sources the rich task is described in more detail. In either case, you need to identify the starting point and consider ways of opening up the development from there. This is necessary in order to engage pupils in a deeper and more extended way as you would, for example, in a mathematical investigation or project.


To illustrate the approach, consider an example based on the image 'Matchstick shapes', referenced on page 32 of the *Supplement of examples (2001 version)*. This activity can be used to introduce Year 7 pupils to the power of algebraic symbolisation.



It involves pupils working in pairs; one draws the match design and the other watches how they do it. This leads to different ways of systematically counting the matches and generalising the result.

Case study 'Matchstick shapes' ( **Guidance on planning**) describes a department exploring this mathematical task. You might like to use this as a prompt for working with your department (but don't copy it and distribute it to them at the outset). To stimulate a discussion in the department it may be useful to work with 'a map' of the key processes. If you have the software, project these adaptable templates onto a screen:

- **Key processes adaptable template** ( **Adaptable templates**);
- **Key processes blank template.**

Guidance on downloading software for interactive process maps is available in  **Adaptable templates**. If you do not have access to the software, you could work with a large flipchart version of the blank template, as shown in the task below.

It will be helpful, particularly in the early stages of implementing the new programme of study, to increase colleagues' familiarity with the key processes if they have copies of the guidance paper for the relevant strand to which they can refer. In this case:

- **Key processes in algebra** ( **Guidance on planning**).

Task RT1 – Exploring a rich collaborative task

This task is for a mathematics department to work on together.

Explain the purpose of the activity, which is for colleagues to work together on a rich mathematical task in order to identify its potential to engage pupils in the key processes of representing, analysing, interpreting and communicating. You will then consider how to develop the task and trial it with pupils. So, as a first step, you are going to focus on the task itself.

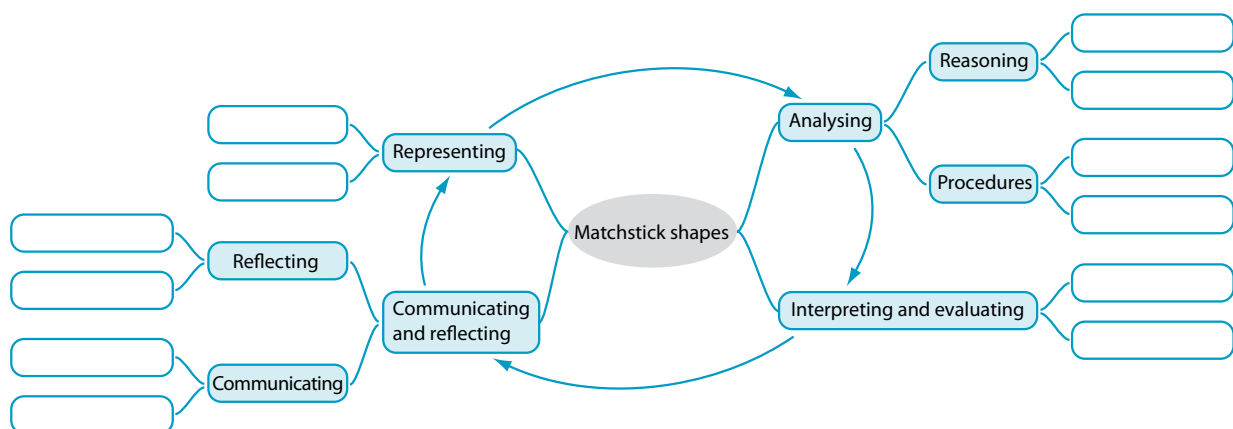
Model the 'Matchstick shapes' task, with colleagues acting as pupil pairs (as described in the case study). Work on the wording of your questions and press colleagues for precise and carefully worded responses. Allow sufficient time to explore the approaches of different pairs. Encourage them to consider their thinking carefully at various points during the task.

When you have explored the task in some depth, move the discussion on to:

- the power of approaching the task in this manner;
- how you might present the task to pupils who had not encountered algebraic representation or used algebraic procedures before;
- ways in which pupils could develop or extend the problem and become more autonomous in using the key processes.

At a suitable moment, break off from your discussions to map key processes for this task. First, allow time for individuals to read the document **Key processes in algebra**, having in mind particularly the task they have just been doing. It may be helpful to highlight particular sentences or sections that relate closely to the way in which pupils could be learning through this task.

Then, if they are not already familiar with it, draw everyone's attention to the map **Key processes adaptable template**, which is a graphical way of detailing aspects of the processes. However, what can be more illuminating is constructing your own simpler map related to the particular context of matchstick shapes. Put the title 'Matchstick shapes' in the centre of the **Key processes blank template** (or flipchart sketch):



Working together, map the task against the key processes, noting the range of opportunities that the task offers. As you build up the map, reconsider how you might present and develop the task, perhaps over several lessons, and which aspects of processes you will emphasise when you trial the task.

The next departmental task links very closely to **task RT1** and is best completed at the same time or very soon afterwards. You are beginning to consider the potential of a rich mathematical task as part of an early algebra unit in Year 7. Working with your department, the aim is to design one or two objectives relating to mathematical processes and application. The *Framework for secondary mathematics* includes objectives adapted from the previous 'using and applying' objectives, better to reflect the focus of the new programmes

of study. Keeping the focus of the discussion on one specific example (the 'Matchstick shapes' problem), the aim of **task RT2** is to tailor the objectives with the learning in mind. Possible objectives could be:

Pupils should learn to:

- visualise 'matchstick' patterns, generalise simple cases by working logically, explain reasoning by relating symbols and expressions to the original context;
- discuss and compare approaches, taking account of feedback and recognising when conclusions are equivalent.

Task RT2 sets out the stages of thinking required to help your colleagues design a similar objective, based on your earlier work with the key processes. Don't be tempted to skimp on this thinking or align too closely to the example above.

You will need, for each pair of colleagues:

- **Key processes map 'Matchstick shapes'** (your agreed version from RT1);
- from the *Framework for secondary mathematics*:
 - **Year 7 mathematical processes and applications objectives**;
 - **Year 7 algebra objectives** (or strand relevant to the chosen task).

Task RT2 – Tailoring the mathematical process and application objectives

This task is for a mathematics department to work on together.

Remind colleagues about the last departmental task. In particular, mention the map of the cycle of key processes that you produced after exploring the algebra of the 'Matchstick shapes' problem and the interrelated elements of the map that you noted as possible foci for an algebra unit plan in Year 7.

Introduce the 'Mathematical process and application' (MPA) objectives in the *Framework* and explain that these have been adapted from the 'using and applying' objectives, better to reflect the focus of the new programmes of study.

- Ask pairs of colleagues to pick out phrases in the **Year 7 MPA objectives** that seem appropriate to the 'Matchstick shapes' task. They may find that working from your key process map (from **task RT1**) helps them to do this.
- Discuss the highlighted phrases, reach some consensus and design one or two composite objectives that are simple enough to describe the learning opportunity presented by the 'Matchstick shapes' problem.

It is important to see the MPA objectives as part of a collection of objectives in a unit. To complete this picture you need to consider which 'range and content' objectives you would select if you were to include the 'Matchstick shapes' problem as a major part of an algebra unit in Year 7.

- Working as a group, consider the **Year 7 algebra objectives** and select a small collection that would be suitable, alongside the MPA objective, for a Year 7 algebra unit plan.

Summarise **tasks RT1** and **RT2** and emphasise that an extended rich task of this kind can help to ensure that pupils learn through the key processes and understand the range and content in a more connected way.

Task RT3 follows immediately from **task RT2** and prepares you for trialling your chosen rich mathematical task in the classroom. You will need, for each pair of colleagues:

- **Teaching and learning approaches** (📁 **Guidance on planning**);

and also, from 📁 **Adaptable templates**, projected versions of:

- **Teaching and learning review template: lessons/unit;**
- **Teaching and learning review template: pupils' views.**

Task RT3 – Preparing to trial the task with pupils

This task follows immediately from the previous task.

From the previous discussion, it should be apparent that the rich task you are considering has the potential to address several objectives at the same time. The key processes help you to consider how pupils should engage with the objectives.

Refer everyone to two key paragraphs from **Teaching and learning approaches**:

- Some principles for effective learning:
'Pupils work on sequences of tasks';
- Some principles for effective teaching:
'Use rich collaborative tasks'.

Allow time to read and discuss each paragraph in turn, in relation to the development of the 'Matchstick shapes' task.

Identify some classes with whom it would be suitable to trial the task. Sketch out a plan for the first lesson. If the task is to be extended over two or three lessons, clarify how it might evolve, but keep plans flexible to allow for different responses among the various classes. (It might be helpful to drop some brief notes into part of a unit planning template.)

Explain that the final task is to adapt the **Teaching and learning review template: lesson/unit** as a suitable observation/reflection sheet to help in your review after the trials. If colleagues are not very familiar with the **Teaching and learning approaches** section you could give them a few minutes to read it through and highlight key points relevant to the 'Matchstick shapes' task. Agree some priorities, decide which section of each sheet is relevant and copy them into the review template. Your template should not be over-ambitious but should include:

- the particular key processes with which you expect pupils to engage;
- other aspects of effective learning you are seeking to develop;
- the particular teaching principles you are seeking to improve.

Discuss how the adapted teaching and learning review sheet can be used in preparation for a departmental review meeting:

- by all teachers as self-reflection on their lessons;
- for any lesson observations that may be possible;
- to inform discussions with small groups of pupils about their experiences in the lessons.

Agree dates and deadlines. Prepare resources and trial the lessons. If there is an opportunity, it would be advantageous to team-teach a lesson.

Finally, if you are in a position to gather some pupil views, following the trials and in preparation for the review meeting, then use the **Teaching and learning review template: pupil views** to copy and adapt questions corresponding to your agreed priorities.

Reviewing trials of the rich task

Once you have explored the mathematics of a task and trialled an approach in the classroom, it is important to reflect on the response of the pupils and on the learning outcomes. You might then consider how the presentation of the task could be developed further, with a view to incorporating it in a unit of work.

For the following departmental task you will need to ask colleagues to bring to the meeting:

- their **Teaching and learning review: lessons/unit** sheets and any points they have noted from the trials;
- any notes from pupil discussions gathered on **Teaching and learning review: pupils' views** sheets.

Task RT4 – Review of the rich task

This task is for a mathematics department to work on together.

Refer everyone to the completed teaching and learning review sheets.

Which of the identified features were evident when you trialled the example of a rich task with pupils?

Discuss each point in turn, first those relating to pupils' learning (particularly engagement with the key processes) and then those relating to teaching approaches. Draw out differences between classes in how the task was developed and how the pupils responded. This can help you to:

- gain insights into what is most effective in engaging pupils and developing their learning;
- appreciate the richness of outcomes that can emerge from a more open starting point.


Next, consider whether you could develop the task further by:

- adapting or opening it up to incorporate more aspects of key processes;
- developing aspects of teaching and learning.

Finally, discuss how you might incorporate the task in a unit of work and note any points for consideration when you next explore a rich task together.

In conclusion, it is worth noting that teachers spend a lot of time engaging pupils in doing mathematics, but perhaps more rarely spend time doing it themselves! Rather than regarding it as an indulgence, departments that have worked together on some mathematics have found that it stimulates discussion about the subject and the pooling of ideas about how it might be taught. It is a very effective way of focusing attention on mathematical processes and is worth doing whenever you are looking at rich starting points for units of work.

Types of rich task

You will find many starting points in  **Ideas for rich tasks**. (The aim is to link an increasing range of such resources directly to the *Framework* objectives). However, it is also worth being aware of different activity types, which can suggest ways of developing your own ideas. Descriptions of some activity types that are very effective for engaging pupils in the key processes can be found in a number of places. Here are some examples.

- The subject exemplification for *Leading in Learning: developing pupils' thinking skills in secondary schools* illustrates ten teaching strategies that can be used in a range of subjects to develop thinking and learning skills. They are: *advance organisers, analogies, audience and purpose, classifying, collective memory, living graphs and fortune lines, mysteries, reading images, relational diagrams* and *summarising*.
- The planning guides in the *Teaching mental mathematics from level 5* series describe types of task for each of the strands of mathematics, for example, visualisations, always/sometimes/never true, classifying, matching representations.

- Chapter 4 of *Improving learning in mathematics: challenges and strategies* (SU Success for All materials) describes and illustrates similar types of activity (page 16 *et al*): classifying mathematical objects, interpreting multiple representations, evaluating mathematical statements, creating problems, analysing reasoning and solutions.
- Section 2 of *Teaching and learning functional mathematics* describes and illustrates some problem-solving approaches that require learners to think for themselves: asking questions, adapting questions to other contexts, creating a story, looking for the mathematics, what is the same?, what is different?, justifying decisions, classifying, ordering and sorting, analysing solutions, and language problems.

It would be worth drawing colleagues' attention to these and other sources to stimulate their thinking. Adapting an idea to suit their own purposes can be a creative and rewarding process for many teachers.

On a suitable occasion, as part of a long-term plan, consider engaging your department in **task RT5**.

Task RT5 – Types of rich task

This task is for a mathematics department to work on together.

Choose a **type** of task from whatever source is familiar to you. It might be:

- one of the *Teaching mental mathematics from level 5* booklets;
- *Leading in Learning: subject exemplification for mathematics*;
- *Standards Unit Success for All* materials;
- *Teaching and learning functional mathematics*.

Discuss examples of the chosen type of task that are given in the source, to clarify features of the type of task and what it has to offer. In particular:

- what aspect or aspects of the key processes (representing, analysing, interpreting and communicating) it will help to develop;
- which agreed priorities, from ***Teaching and Learning Approaches***, it helps to strengthen.

Sketch out ideas for examples of your own, with teachers perhaps working in pairs for a few minutes. Share ideas and perhaps select one example to develop and trial in the classroom before building it into a unit plan.

Draw attention to other types of task illustrated in the source. These might be revisited on a future occasion when you are looking to develop fresh ideas.

Revisiting rich tasks

A good unit plan will include one or more rich tasks, often developed over more than one lesson. As suggested earlier, it is worthwhile identifying suitable tasks and exploring their mathematical potential whenever you are seeking to enhance, revise or develop a unit plan.

Unit planning

Curriculum opportunities

During the key stage pupils should be offered the following opportunities that are integral to their learning and enhance their engagement with the concepts, processes and content of the subject. The curriculum should provide opportunities for pupils to:

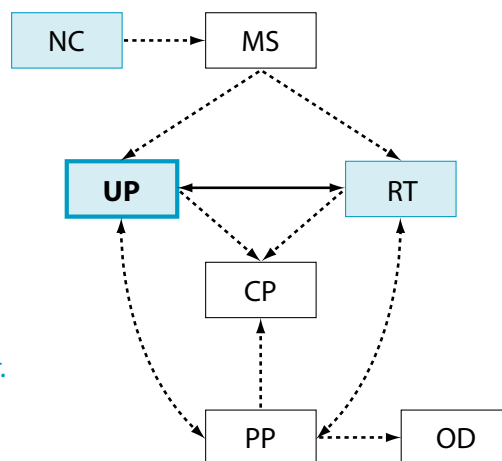
- develop confidence in an increasing range of methods and techniques;
- work on sequences of tasks that involve using the same mathematics in increasingly difficult or unfamiliar contexts, or increasingly demanding mathematics in similar contexts;
- work on open and closed tasks in a variety of real and abstract contexts that allow them to select the mathematics to use;
- work on problems that arise in other subjects and in contexts beyond the school;
- work on tasks that bring together different aspects of concepts, processes and mathematical content;
- work collaboratively as well as independently in a range of contexts;
- become familiar with a range of resources, including ICT, so that they can select appropriately.

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It is good practice to teach mathematics in units of work lasting two to three weeks or longer. Lessons planned from well-structured units are sharper and clearer, and pupil progression can be more easily recognised. Also, the lessons are more easily planned. As part of whole-school implementation of the new curriculum, you may be given the opportunity to plan with colleagues from other subjects or to plan units that contribute a curricular theme such as *healthy lifestyles* or *creativity and critical thinking*. Whatever the type of unit, developing effective plans is an ongoing process that strengthens the work of the department, supports teachers' professional development and builds up a range of curriculum opportunities for pupils.

As a preliminary, **task UP1** looks at different ways in which a unit can be structured and reshaped to make for effective learning. **Task UP2** describes how to use rich tasks that address the key processes as building blocks for structuring a unit of work into distinct phases or sequences of lessons. **Task UP3** describes the process of evaluating and revising a unit plan and embedding it in your scheme of work. The final section considers ongoing unit planning and integrating key processes in the scheme of work (**task UP4**).

As for the section on 'Rich tasks', note that the algebra example linked to unit planning is for illustrative purposes only. The departmental tasks in this section provide a framework, so that the process can be repeated with other units across the range and content of mathematics.



Structures for a unit plan

Working together on the 'story' of a unit

Before starting to develop a particular unit, it helps to take an overview of the possible structures of a unit plan in order to build variety into the units making up the Key Stage 3 scheme of work. It is important to remember that the structure of units can be very different, depending on various factors such as pedagogic style, available resources and the topic to be taught. A scheme of work should contain examples of different unit structures, as this will help to ensure a variety of teaching methods to engage pupils, sustain interest and secure their learning.

Increasingly, pupil interviews are motivating and inspiring subject leaders to reconsider aspects of the scheme of work. To establish how to prioritise changes pupils could be asked to comment on their existing experience, answering suggested questions on the **Teaching and learning review template: pupil views**. Considering the 'story' of the mathematics in a unit of work, and finding ways of describing these general structures, can enable colleagues to identify how mathematical topics are commonly taught and whether introducing a different structure for some aspects would develop the learning in a more engaging way.

For the following task you will need to provide copies of **Examples of the story of a unit** (📁 **Guidance on planning**) and some example units chosen from your scheme of work or a textbook that you use.

Task UP1 – The structure or 'story' of a unit of work

This task is for a mathematics department to work on together.

Talk about **Examples of the story of a unit**, so that colleagues have some idea about what is different about each of the types suggested. You may notice that the 'prepare–consolidate–apply' example is the story of the *Year 9 Geometric reasoning mini-pack*, which is a unit of work with supporting resources and guidance notes aimed at developing visualisation and proof with Year 9 pupils (DfES 0588/2002 G).

The structures on the handout are not the only ways of developing mathematical learning across a number of lessons.

- Ask colleagues to work in pairs, to consider a topic that is taught as a unit in your present scheme of work and to summarise how the mathematics is developed over several lessons. One possibility would be to look at a unit developed as part of the launch chapter of this handbook.
- Alternatively, they could look at a chapter or chapters from a textbook and do the same.

Allow time for each pair to give feedback and then consider what variety is emerging. Here are some questions you might consider.

- *Do effective units in your scheme of work have a clear structure (not necessarily one of the three types you considered earlier)?*
- *Are some units limited, for example, in building up skills by simple, step-by-step approaches that do not pay sufficient attention to key processes and are not always effective for long-term learning?*
- *Would there be merit in developing a greater variety of units?*

Use the questions to gain perspective on the structure of units in your scheme of work and identify how this might help you when developing units in more detail, as suggested in the next task.

Task UP1, above, is essentially a preliminary or introductory task for the ongoing one of developing unit plans as described below. However, it is important to step back from the detail and consider the structure of any unit of work that you are developing or evaluating. You may find it helpful to return to the task at some future date in order to reconsider the variety of structures you are offering.

Developing a unit of work

The first step in planning a unit of work might be to examine objectives or choose a rich teaching activity. (See the section on 'Rich tasks'.) Whichever comes first, the other follows closely behind. Effective planning involves constant interplay between the two. As an activity is worked up and the teaching sequence becomes clearer, it is possible to review which key processes are being developed and thus review, refine and tailor the objectives. As the objectives are checked and the level of challenge becomes clearer, the teaching activity is adjusted to strengthen the key processes. So, for example, a unit plan may pay attention to strategies such as clearer roles in group work, the use of dynamic visual images, structuring pupil talk or modelling, scaffolding and questioning. This applies whether you are reshaping an existing unit or building up a new unit from scratch.



A very effective approach is to start by working together as a department on a rich mathematical task and then building a unit around it. This can help to ensure that the key processes are properly addressed. The intention at this stage is to identify the main activities and sequences of teaching through the unit, not to produce a series of detailed lesson plans. A good starting point could be to choose to develop a unit on an aspect of mathematics that is thought to be 'difficult' or 'dull'. Initially, you might have in mind a particular aspect of mathematics (or aspects that you want to link) and only a general idea about the broad range of objectives that will be included.

There is no universal template for recording a unit plan. If you have an established structure in your school or department, use it. If not, you will need to devise one or adapt an example from the planning toolkit. Keep it simple to start with. Some elements are essential for providing a clear overview from which teachers can plan their lessons: the objectives, the activities and how these are sequenced and organised in terms of teaching approaches and resources. Other elements are helpful and can make the unit more effective but may need to evolve over time, perhaps following an initial '*plan-teach-review*' cycle. These could include more detailed and differentiated outcomes, perhaps in terms of the key processes, guidance notes on particular features, assessment prompts including probing questions, key words, suggestions for extension and support.

As a way of gaining experience of this approach to unit planning, **task UP2** is set up to stimulate the development of a Year 7 unit that addresses a collection of algebra objectives in a new way to satisfy your departmental priorities. These priorities may be ongoing from your work on the launch chapter (**task NC4**). For example, you may be developing a stronger focus on key processes and more pupil talk through group work in each unit plan. **Task UP2** provides the support for a departmental discussion that could be used to sequence rich tasks, other activities and exercises into the unit.

Preparing for task UP2

The notes to help to prepare for this task assume you are following the chosen example. Adjust for your own choice, as appropriate.

- Choose a planning template, perhaps adapted from one of those provided in the planning toolkit ( **Adaptable templates**) *Unit planning template 1*, *Unit planning template 2* or *Unit planning template 3*.
- Choose a rich task such as the one described in **Case study 'Matchstick shapes'** ( **Guidance on planning**).
- From the *Framework for secondary mathematics* you will also need **Year 7 Mathematical processes and applications objectives** and the appropriate strand objectives, in this example, **Year 7 algebra**.
- Make available other tasks and resources used within the department to teach algebra in Year 7. These ideas can be built around the rich activity and inform other phases of the unit, which together produce a coherent teaching sequence informing perhaps two or three weeks of teaching.

Task UP2 – Developing a unit plan

This task is for a mathematics department to work on together.

- Use your chosen rich task (for example, **'Matchstick shapes'**) to stimulate ideas for a unit plan in which this task would be a key part, forming a phase of the unit. Discuss where you might locate it in the unit and what the other activities and exercises might be.
- Pay careful attention to clustering objectives that the sequence of teaching activities and resources could help to develop, tailoring the objectives where appropriate. Draw these objectives from the relevant strand or strands (for example, **Year 7 algebra** and **Year 7 Mathematical processes and applications**). The outcome of these discussions should begin to form the first few essential elements of a unit plan, namely, teaching approaches centred on rich tasks and the associated objectives.
- Next, discuss and agree how you will ensure that pupils are engaged in each phase of the unit, through the key processes. Share and agree a few strategies you will all use, for example, how to group the pupils, how to stimulate the thinking through visual images, how to increase focused mathematical talk.
- Agree a template into which to drop the key elements: the objectives, the activities and how these are sequenced and organised in terms of teaching and learning approaches and resources.

Having agreed the outline of the unit, identify:

- who will type up the details on the unit plan template, which should include as a minimum:
 - agreed objectives;
 - the sequence of activities;
 - teaching and learning approaches;
 - resources and references;
- which teachers and classes will trial the unit;
- when you will meet to review the outcomes and make revisions (including how you will use the template **Teaching and learning review: lesson/unit** – see below).


Evaluating and revising your unit plan

Good developments are sometimes wasted because of the pressures of time and the need to move on. It is important to guard against this by building in time to review your unit not too long after it has been trialled. This time will have been well spent if you are able to make changes in the light of experience and then embed the unit in your scheme of work.

For the first one or two units that you develop, keep the evaluation process simple. Teachers need to know, well before the meeting, that they will be discussing how the unit developed in the classroom, any adaptations they made and how the pupils responded. The review could be informed by a range of evidence of impact, which becomes sharper as the process is repeated.

You could use the **Teaching and learning review: lesson/unit** (📁 **Adaptable templates**) to capture this evidence. You may still be working on the priorities identified as part of the launch chapter of this handbook. Alternatively, read **Teaching and learning approaches** (📁 **Guidance on planning**) and drop new priorities into the template, ensuring it includes some check against:

- the particular key processes with which you expect pupils to engage;
- the other aspects of effective learning you are seeking to develop;
- the particular teaching principles that you are aiming to improve.

You may wish to interview a sample group of pupils, asking questions about the same priorities to gauge the impact of your developments. **Teaching and learning review: pupil views** ( **Adaptable templates**) aims to support this process.

Unit plans vary from one school to another and, again, if this is new territory for the department, it is important to keep things simple. When you decide to involve your department in refining and improving the unit plan template, then examples of complete units may be helpful to illustrate the approach. You may gain access to local examples of unit plans, developed and shared through subject leader network meetings. However, remember that they represent the way in which different departments chose to shape the unit, based on their current practice and ideas. Use them to generate discussion and to stimulate ideas of your own.

Task UP3 – Evaluating and revising your unit plan

This is a task for a mathematics department to work on together.

Allow time for overall reactions to how trials of the unit went, and then review each phase of the unit in turn. Ask teachers to use points from the **Teaching and learning review sheet** as a focus for the discussion.

Anecdotes should be supported by some evaluation of what provoked the reaction from pupils. This may, perhaps, stimulate the need to add a few guidance notes to the unit plan.

Consider:

- any changes that you judge to be needed to the structure, objectives, content or emphasis of the unit;
- any helpful additions to the notes and, if appropriate at this stage, any additional sections you want to complete on the unit plan;
- any adaptations needed to create a unit that would be suitable for pupils with different levels of prior attainment.

Decide how the detailed notes will be revised and how you will ensure that the unit is embedded in your scheme of work and will be used in the future.

Finally, reflect on the extent to which:

- the unit plan made lesson-planning simpler;
- the lessons were better sequenced and the learning was developed in a more coherent way;
- teachers and pupils had a better sense of how the mathematics was developing and connecting, through the key processes.


Ongoing unit planning

The aims of a first run-through of **tasks UP2** and **UP3** are to familiarise members of the department with the process of collaborative planning, to iron out some of the practical issues and to start to appreciate the benefits for teaching and learning. At an early stage, you will want the department to become comfortable with the process; the choice of topic can be made with that in mind. In the longer term, it will be valuable to repeat the unit planning process on a regular basis, perhaps each half-term.

When you have established a way of working together, it would be helpful to sharpen the review process and aim to capture more detail of the emerging good practice on the unit plans.

As you discuss and refine the ongoing process of developing unit plans, consider the extent to which your scheme of work is helping to draw out pupils' process skills. You can do this by:

- reviewing the rich tasks against key processes – see 'Rich tasks', **tasks RT1–3**;
- reviewing the way that the key processes are integrated into unit plans – see **task UP4**.


In preparation for **task UP4** you may wish to read *Case study 'Square shuffles'* ( **Guidance on planning**), which describes how one department worked on a similar development task.

This task provides a starting point from which you could begin to develop and integrate coverage of key processes in your scheme of work. It assumes that members of the department are not yet at a point where they are ready to integrate processes fully into everyday classroom practice. Consequently the starting point is simple and works on how to draw out pupils' process skills. Capturing the discussion in note form on unit plans helps to share and embed the practice and encourages all the members of the department to try out ways of working with mathematical processes.

Task UP4 – Integrating the key processes


This task begins with members of the department working in pairs to prepare a contribution to the full group. The feedback from each pair may need to be accommodated across a few meetings.

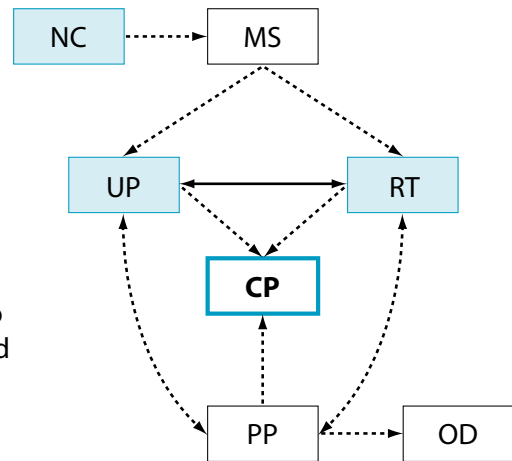
Ask each pair to:

- choose one unit, in Year 7 say, and identify at least one opportunity where they could place a particular emphasis on process;
- expand some of the detail of the key processes – if they are familiar with the **Key process adaptable templates** they could use one to create a mapping diagram ( **Adaptable templates** also contains 'Guidance on downloading software for interactive process maps');
- note a few bullet points to describe some specific teaching strategies to draw out pupils' process skills;
- note a few bullet points to describe what they would want to see the pupils doing as a result of these strategies.

As each pair offers feedback to the group you may wish to summarise the points and, when these are agreed, ask someone to add the notes into the relevant section of the unit plan. For example, you may find that the notes made against the final bullet point are a useful description of learning outcomes for a phase of the unit.

Capturing planning

This section addresses organisational aspects of your scheme of work: curriculum map, teaching calendar, unit plans and associated resources. These administrative tasks are necessary to ensure that your teaching programmes are clearly structured and that resources are readily accessible to all teachers. Templates to help you with the tasks can be found in  **Adaptable templates.**



Curriculum map

The section 'Planning for progression' supports 'big picture' planning across a year or the key stage. The details of a scheme of work can be summarised on a curriculum map, showing teaching units for each year group. This enables you to incorporate and interlink all the strands of mathematics. Typically, a map would provide space in each box for a unit code, a short descriptive title and an indication of the teaching time required. **Diagram 2** illustrates the kind of arrangement that is involved.

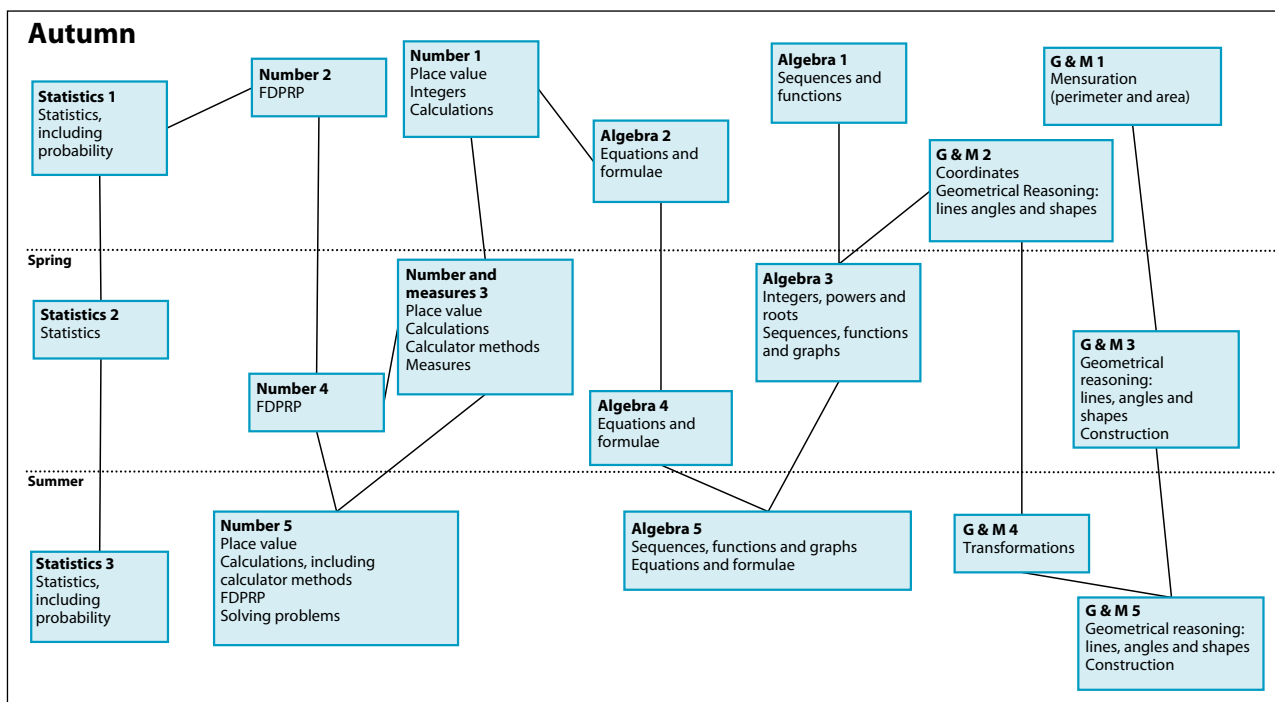



Diagram 2: A curriculum map

Task CP1 – Adjusting the curriculum map

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

The aim of this task is to locate new planning, such as new or restructured units, in the overview of the curriculum. Work with your own departmental scheme of work overview, which may be in the form of a curriculum map. If your overview is adapted from the sample medium-term plans (SMTP) then your curriculum map may look similar to that in **diagram 2**. The template provided in  **Adaptable templates**, the **Curriculum map template (KS3)**, replicates the structure of the SMTP for Years 7, 8 and 9. This may give you a useful point from which to start deleting, combining, reordering and renaming units.

As you do this, it is important to think about these questions:

- What do the new units replace? Are some units deleted or combined?
- Where in the sequence of units should new units be positioned?
- Are there any consequences for changes to other units?

Adjust unit codes, titles and time allocations as appropriate.

The evolving curriculum map

As your scheme of work develops to address the aims of the new curriculum, a quite different curriculum structure is likely to emerge. This will involve changes to the number of units in the various strands; there will be more cross-strand units and increasingly cross-curricular units. This is a gradual process and the map will evolve. The purpose of the *Framework for secondary mathematics* is to ensure that progression is maintained as new opportunities are created for engaging learning.

Teaching calendar

The calendar is developed from the curriculum map and shows how teaching units will be sequenced and how they fit around school dates and events. The order of units will take account of interdependencies in the units, across as well as within strands, and the need for progression.

The **Adaptable templates** folder includes **Teaching calendar template (KS3, Year X)**, with the following column headings.

Half-term	Week beginning	Notes	Unit code	Mathematical content overview

The 'Notes' column provides space for recording significant events and the 'Mathematical content overview' column gives an 'at-a-glance' view of the content covered in each term. Before engaging with **task CP2**, you might find it helpful to refer to the **Teaching calendar example (Year 7 term 2)**, which is partially completed. Then adapt the blank template for your chosen year group.

Task CP2 – Constructing or revising a yearly calendar

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Starting the calendar: school events

Record important school dates and events in the 'Notes' column of the teaching calendar. Points to consider include:

- events that need to be interwoven with the teaching sequence, such as focused assessments and tests, including active test preparation and feedback, targeted intervention, projects linked to other subjects; also non-mathematical events such as excursions;
- events that affect scheduling or departmental organisation, such as access to resources, test entry deadlines, analysis of test papers, departmental meetings and parents' evenings.

Completing the calendar: sequencing the units

Use the teaching order indicated in the curriculum map to determine how you will weave topics from different strands together in a sequence that will fit the calendar. Other factors to consider at this stage include:

- the balance of topics in a term or half-term to ensure stimulus and variety;
- points that you have identified in the 'Notes' column, such as scheduling of assessments or availability of computer resources;
- other factors, such as most suitable time of year to liaise with another department on a joint project.

Reconsider the length of each unit, as you consider the time available in each term and the units that need to be covered, and record any changes onto the curriculum map.


From the curriculum map, copy information about each unit (code, title and time allocation) onto the calendar. For completed units, drop brief details from the unit plan into the 'Mathematical content overview' column. Save the completed calendar with an appropriate title, such as *Year 7 calendar 2008/09*.


Revisiting the calendar

As well as moving on to consider the teaching calendar for a different year group (for example, Year 8), you will need to revisit existing calendars on occasions:

- as you develop your teaching units in greater detail (for example, to incorporate key processes) and want to restructure or resequence them;
- to take account of in-school changes from year to year.

Organising unit plans and resources

Developing units of work is supported in detail in 'Unit planning'. Details of each unit are kept in a unit plan template, perhaps adapted from one of those provided in  **Adaptable templates, Unit plan template 1, Unit plan template 2 or Unit plan template 3.**

As well as unit plans, you will have some associated resources – schemes of work are inevitably rather complicated collections of documents. It is important to make sure that you organise all electronic resources in such a way that they are easy to search and navigate, with a consistent policy for naming and filing documents. **Diagram 3** shows one way in which current files might be organised. A suggested set of blank folders is provided in the folder  **The developing scheme of work.** These will need to be adjusted as new structures emerge in the curriculum map.

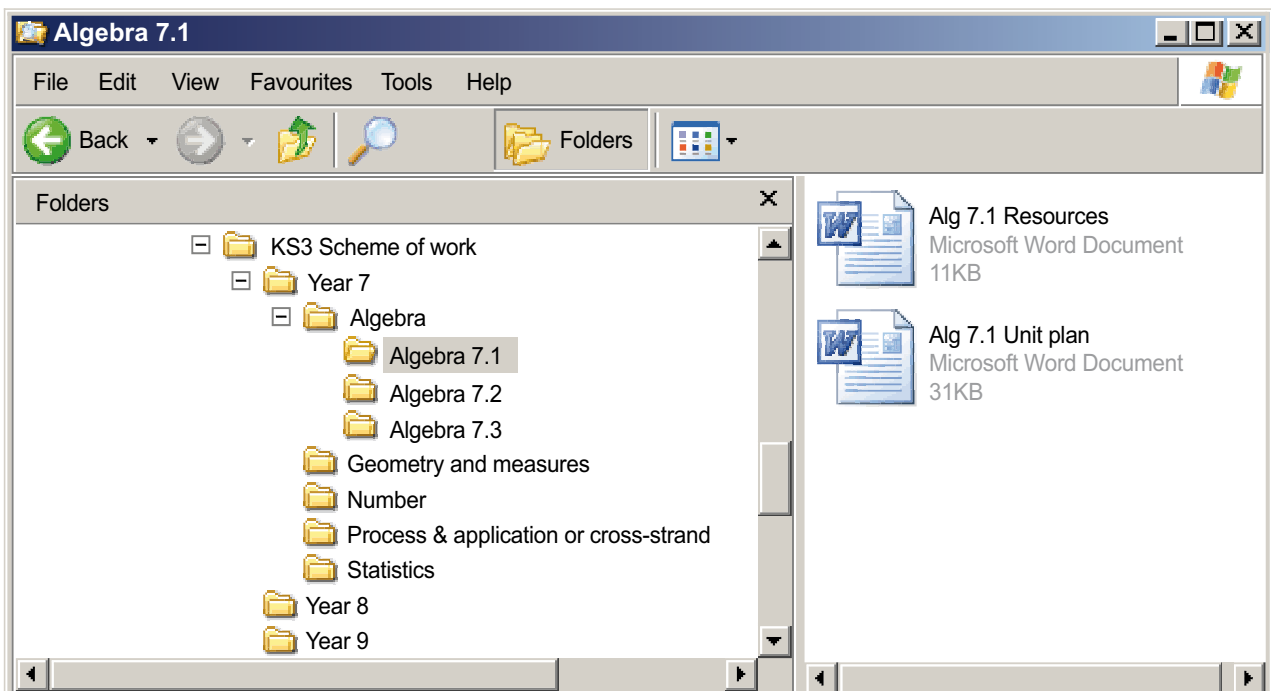


Diagram 3: How files might be organised

To ensure that all files are kept up to date and properly organised, **task CP3** will be ongoing. You may be starting with a set of units and teaching resources that need to be organised more clearly; alternatively, your task might be a sequel to adapting or planning new units.

Task CP3 – Organising unit plans and other resources

This task is for the person responsible for filing the scheme of work.

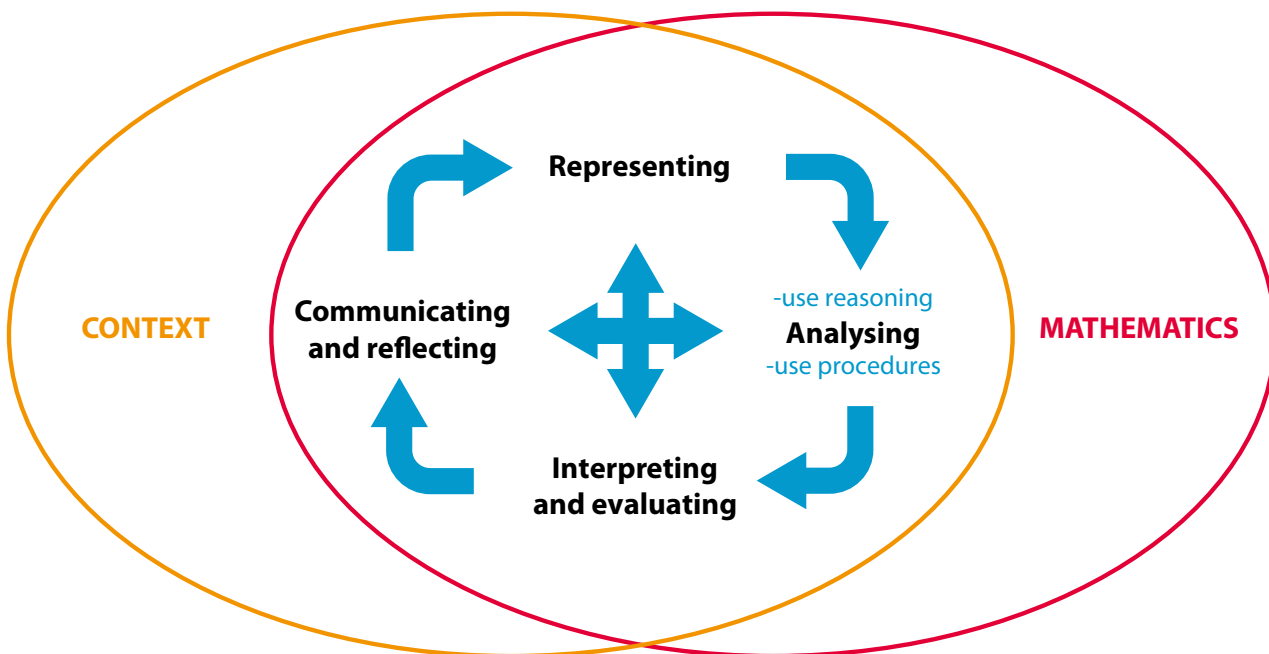
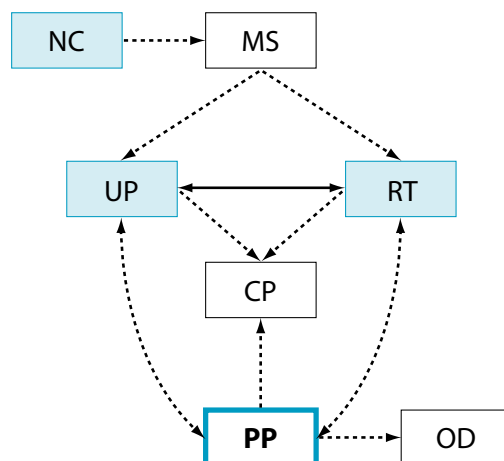
Review the suggested structure for **The developing scheme of work**. Decide on the structure you will use and consider practical arrangements for organising resources:

- Make sure that there is a secure place on the school network where your scheme of work will be stored.
- Issue permissions or passwords to teachers, teaching assistants and anyone providing administrative support to the department.

An ongoing task will be to:

- save each unit plan in a folder, sorted by year, strand and coding, to match a curriculum map or equivalent overview document, for example, *Y7 G&M 7.3* is saved in a folder *KS3 SoW/Year7/Geometry*;
- discuss with colleagues any related electronic files, such as teacher and pupil resources, and add agreed documents to the folder for the appropriate unit.

Planning for progression



This section guides you through a series of tasks that will help you to ‘stocktake’ your approach to the progression of key mathematical processes in the scheme of work. At the end of the section you should have come to a decision about how to develop a set of critical units across the three years, so that pupils experience variety in their learning and make progress in the key processes through a particular strand of the curriculum. For simplicity, this section describes the tasks based on a stocktake of the approach to algebra. This is presented for illustration only and the tasks will work equally well for other strands of the curriculum.

Many schemes of work set out progression in terms of the range and content for each strand and this is often done with little reference to the process skills. The suggestions that follow take you through a set of structured tasks to help you reflect on how algebra is developed from unit to unit and from year to year.

The intention is that curriculum leaders will work together on the tasks, for example, the subject leader, the second in department or teacher with responsibility for Key Stage 3. As you work through the tasks and discuss the issues, you will begin to determine necessary changes to planning and teaching. In preparation, you may want to refresh your memory about the series of algebra units in the current scheme of work, perhaps shown on a curriculum map.

- How many units are there? Where do they occur in the terms and the years?
- How are they similar? How are they different? How do they change?
- Which units develop similar aspects of the strand? Is this done in the same way each term or each year?

Once you have done this you are ready to think about this suite of units in the light of the new curriculum. You can consider how the units address the full range of key processes in algebra, **task PP1**, and decide which aspects are omitted or underdeveloped. This will give you reasons for making some adjustments to your planning and begin to narrow down the set of units that need attention.

Next you can consider the variety of learning available, **task PP2**, and decide where changes need to be made to engage the pupils better. This will further focus the changes to your planning, gradually defining a set of critical units and how they need to change. Complete the scrutiny of this set of units by ensuring that the changes you are considering build progression, using objectives in the *Framework for secondary mathematics* drawn from mathematical processes and applications, **task PP3**, and algebra, **task PP4**.

It is possible to be economical in your efforts by making similar changes in each year group, so a unit in Year 7 can have the same overall shape as one in Year 8 and Year 9. You should end the process with an outline plan for a small set of critical units, which then require some detailed work. Do not be too ambitious, a small number of well-developed, critical units spread across the key stage can have more effect than a large number of shallow changes.

The tasks help to provide a rationale and a focus for the changes, but the planning itself is supported in the sections on 'Rich tasks' and 'Unit planning' and should involve more members of the department.

Reviewing current provision

Reviewing the key processes

The outcome of this task is a better understanding of what the key processes in algebra can look like, which areas of algebra need to be better developed in the current scheme of work and where to draw on resources to support changes to planning and teaching.

You will need:

- the algebra units of your current scheme of work;
- **Key processes in algebra** (📁 Guidance on planning);
- **Key processes adaptable template** (📁 Adaptable templates).

Task PP1 – Key processes in algebra

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Think about whether you would find a mapping diagram helpful to stimulate or capture your thoughts. If you have developed a process map based on algebra, this could start your discussions. Alternatively, you could work with the **Key processes adaptable template** to capture or highlight your thoughts.

Distribute copies of the document **Key processes in algebra**, which describes how each of the key processes is important in the context of algebra and offers some references to resources. As you read this together, you need to draw out the important points in order to reconsider the extent to which key processes are developed in your algebra units. To engage actively with the messages in this document you could use one of the ideas below. Choose from:

- reading and annotating significant parts of the text – your annotations may include specific references to year groups, terms, units or tasks;
- traffic-lighting the text so that you code aspects that are well developed and those that are underdeveloped in the current scheme of work;
- building up a key process map by placing algebra at the centre and adding or editing branches to capture your thoughts as you discuss the paper.

The outcome of the activity should be that you have a better understanding of the key processes in algebra and some emerging thoughts about how these need to be developed across the key stage.

Make sure you have noted:

- the units and tasks that help to develop key processes in algebra;
- those aspects of process that are underdeveloped and could be a priority for some fresh planning;
- one or two of the resources suggested in **Key processes in algebra**, or from elsewhere, that could help you address this priority. The resources specifically referenced are located in 📁 **Ideas for rich tasks**.

Reviewing learning experiences

This task is based on your discussions about key processes from **task PP1**. The aim is to establish priorities for changes to the algebra units you have selected for attention across the key stage. You will do this by considering the current variety of learning approaches in algebra and deciding how the set of critical units needs to change so that pupils are better engaged and make more progress.

You will need:

- the algebra units of your current scheme of work;
- copies of **Teaching and learning approaches** (📁 **Guidance on planning**).

You may need:

- electronic copies of **Teaching and learning functional mathematics** (📁 **Ideas for rich tasks**);
- access to the internet.

Task PP2 – Ensuring variety in learning

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

First remind yourselves of the range of learning opportunities in the algebra units in your current scheme. With these in mind, read the section 'Some principles for effective learning' from the document **Teaching and learning approaches**.

Discuss the meaning of each section, and assess the extent to which pupils experience variety in the algebra units within a year or across the years.

You may wish to extend this discussion by visiting the QCA website www.QCA.org.uk and looking at the case studies of how some teachers have developed their curriculum to broaden the range of opportunities for pupils, for example, creativity in algebra.

You may wish to refer to the document **Teaching and learning functional mathematics**, which contains guidance on teaching through a problem-solving approach and support for writing your own contextualised and cross-curricular activities.

At the end of this task you should have ideas for a small set of critical units that could be reviewed to develop the key processes better and to ensure greater variety of learning. Here are some important points to consider.

- Where are the units in each of the years?
- Are they algebra units or units where algebra is combined with another mathematical strand such as number or geometry?
- Could they be cross-curricular units or contain a cross-curricular element?
- Will they be longer units?

Remember that, to make planning easier and progression clearer, the units could have a common structure for Years 7, 8 and 9.

Securing progression

The next step is to think about an outline plan for the revised suite of units in such a way that progression is secure. The tasks focus first on the 'Mathematical processes and applications' (MPA) objectives, **task PP3**, and then move on to algebra, **task PP4**. At the end of these tasks you should have made a preliminary selection of the objectives from MPA and algebra that will be used in the critical units.

For both tasks you will need to project, on a computer screen or interactive whiteboard, the **Framework for secondary mathematics**. It may be helpful to use the introductory screens to remind yourselves of the features of the *Framework*, before turning to the objectives for the strand or sub-strand that you wish to consider. Note that all colleagues in the department need to be familiar with the *Framework* and so it is helpful to demonstrate and discuss features of the *Framework* at your planning meetings with the department.

You will need:

- selected units from your scheme of work and your notes from **tasks PP1** and **PP2**, which may include the annotated version of **Key processes in algebra**;
- a copy of the **Framework for secondary mathematics** website.

You may need:

- **Mathematical processes and applications** (📁 **Guidance on planning**) if you are less familiar with the MPA objectives.

Task PP3 – Progression in mathematical processes and applications

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Project the **Framework for secondary mathematics** and navigate to the objectives for the strand 'Mathematical processes and applications'. As a reminder, read the guidance note **Mathematical processes and applications** or visit suitable guidance screens in the *Framework*.

Refer to your annotations or highlights on **Key processes in algebra** and any other notes or process maps you may have created for algebra. Read across the screen and note the progression from one column to the next. Think especially about the skills described and how they could be built, applied and transferred within a year and across the key stage. Consider:

- how current units in algebra create opportunities for pupils to make progress from Year 7 to Year 9 or beyond. How could these be strengthened?
- how your selected units will include objectives for mathematical processes and applications. These objectives can be tailored specifically to reflect the progression and the context of the learning experience. (If the idea of tailoring objectives is new to you then work on this when you develop the units in more detail, using the sections 'Rich tasks' and 'Unit planning'.)

Record the collection of objectives that will inform the critical units. These will need adjusting as you do more detailed planning but they represent a strong starting point.

Draw together ideas and approaches decided so far and think about how these will develop across the set of units. Keep things manageable, for example, it should be possible to use the same unit plan structure and similar kinds of task across equivalent units in each year. This can be done by increasing the challenge and building progression, as described in the first row of the mathematical processes and applications objectives, namely:

- increasing the **complexity** of the application, for example, non-routine, multi-step problems, extended enquiries;
- reducing the **familiarity** of the context, for example, new context in mathematics, context drawn from other subjects, other aspects of pupils' lives;
- increasing the **technical demand** of the mathematics required, for example, more advanced concepts, more difficult procedures;
- increasing the degree of **independence** and autonomy in problem-solving and investigation.

For the final task you will need, additionally:

- **Making connections in mathematics** (📁 **Guidance on planning**);
- **Supplement of examples** (📁 **Curriculum information**).

Task PP4 – Progression in range and content

This task is for the subject leader and one or two other colleagues, such as the second in department or teacher with responsibility for Key Stage 3.

Project the **Framework for secondary mathematics** and select a screen to show the algebra objectives for Years 7, 8 and 9.

- Note how the strand is divided into sub-strands – scroll down and across to gain an overview of this organisation.
- Discuss the advantages of seeing the objectives aligned in this way and think about how it helps you to get a ‘big picture’ of progression.
- Discuss how some groups of objectives are aligned horizontally into ‘threads’ of progression through the key stage.
- How would you summarise some of the big ideas in these threads – what do you want the majority of your pupils to be able to do by the end of Year 9?

If pupils are to make sense of mathematics and make good progress in the subject then units of work need to be constructed so that you teach objectives in an interconnected way and not in isolation.

- Read and reflect on **Making connections in mathematics**, noting any points of particular relevance to your current discussions.
- Reflect together on a few typical units in algebra – can you identify and describe ways in which objectives are linked in a purposeful way, e.g. through the use of rich tasks or by phasing the unit to address related ideas?

Finally, consider the changes you are planning in order to create revised critical units. A key factor in the planning will be to build the challenge across the years. Look through suitable sections of the **Supplement of examples** and make sure that the units you have selected secure the progression described through the algebra objectives and illustrated in the examples.

In the renewed **Framework for secondary mathematics** the new descriptions of objectives make progression clearer, so use the updated algebra objectives in your revisions to the selected units. Record the collection of objectives that will inform these units. These may need adjusting as you do more detailed planning but they represent a strong starting point.

Your next step is to work up the teaching ideas and to plan the units. This is the stage at which more members of the department should become involved. The sections ‘Rich tasks’ and ‘Unit planning’ describe ways in which you can productively engage a number of teachers in this kind of development. Collaborative planning is more productive and efficient if a lead person has had time to think through the key points and to prepare some resources to stimulate thinking.

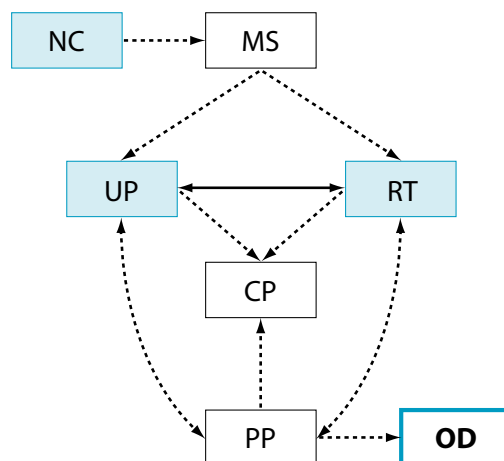
Finally, you may need to refer back to your curriculum map (see ‘Capturing planning’) and make adjustments that take account of the revised suite of units and how they will fit into the ‘big picture’ of your scheme of work for Key Stage 3.

Ongoing developments

Curriculum aims

Learning and undertaking activities in mathematics contribute to achievement of the curriculum aims for all young people to become:

- *successful learners who enjoy learning, make progress and achieve;*
- *confident individuals who are able to live safe, healthy and fulfilling lives;*
- *responsible citizens who make a positive contribution to society.*



QCA mathematics 2007

When you have tackled tasks set out in previous sections, then it is time to take stock, reflect on what has been achieved and think about where to go next. Your work has been geared towards the curriculum aims set out above. So, do not think just about the tasks completed but consider their impact on pupils and on the effectiveness of your department. You might notice:

- a better response from pupils and more pace to the learning;
- a changing departmental culture with more discussion and collaboration;
- a more consistent approach to learning through units of work developed collaboratively.

It will be reassuring if you can see that small steps can make a big difference. The main ongoing task is likely to be the development of more detailed unit plans, creating a dynamic scheme of work that continues to evolve through core tasks set out in **UP2 Developing a unit plan** and **UP3 Evaluating and revising your unit plan**. Best practice in the department starts to surface and spread to other colleagues' lessons. This provides motivation for continuing a collaborative approach and, at appropriate times, adjusting your curriculum map.

The tasks outlined in the various sections of the handbook should provide a sound basis from which to work, as you review and reshape your development plan to meet the requirements of the programmes of study or to respond to issues raised through self-evaluation. This may lead you to be strategic in choosing units to redevelop by focusing, for example, on the big concepts and interconnections in mathematics or functional skills and applications.

As well as the judgements of colleagues, take account of rates of progress and engagement of pupils. This may lead you to step back from the scheme of work or the mathematics and evaluate your next steps, according to evidence of impact so far.

From time to time, you will need to consider how to refocus ongoing developments of your scheme of work. In this discussion it is always worth giving attention to aspects of the subject itself. Many teachers become motivated by discussions about mathematics. Keeping this interest alive in the way the department works together can spill over into the enthusiasm teachers show in the classroom.

Such discussions can begin from a number of directions such as those listed below.

- Analysing big ideas and interconnections in mathematics. *Where are these represented in your scheme of work? Are there cross-strand units that pull together some of the key mathematical concepts such as proportionality?*

- Examining the way pupils are developing their mathematical process skills. *Where, and how often, do pupils experience the whole cycle of processes? Are there units dedicated to learning about particular aspects of process? Should there be more units dedicated to challenge around application of mathematical processes, perhaps even free of new content?*
- Considering developing pupils' ability to apply their mathematics to other subjects in the curriculum and to contexts outside of school. *Are there units that help pupils to develop competence in what they know and understand so that they become functional in mathematics? Is the range of applications sufficient to build towards functional skills at Key Stage 4?*

Task OD1 – Reviewing the development plan

This task is for the subject leader working with a colleague, such as the second in department or teacher with responsibility for Key Stage 3, together with a senior leader or line manager.

Keeping in mind the **Timeline for change** (📁 **Guidance on planning**), reflect on and discuss:

- how your departmental developments are aligning with the 'big picture' in the school and the phased implementation of the new curriculum;
- issues arising from the collaborative work in other sections of this handbook, related to implementing the new mathematics curriculum.

You may wish to adjust your regular routines of evaluation to reflect the foci of your developments, for example, new questions to prompt pupil interviews or lesson reviews.

Your discussion should help you to address questions about priorities and phasing, and decide which sections of this planning handbook are suitable as next steps.

Remember to involve the senior leader who has some oversight of your department. It can be helpful to have an objective view on the impact of your collaborative work. This could be done by sharing the review prompts you have used in other sections of this handbook. Overall involvement of a senior leader can lead to stronger support for your ongoing developments.

This handbook will continue to provide a sound basis from which to refine your scheme of work. Aim for a scheme that captures your best practice, continues to evolve as an integral part of departmental collaboration and works towards the aims of the new curriculum.

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Textphone 0845 60 555 60
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