The Mathematics National Curriculum

Training for Inspectors

Regional conferences

January 2015

Aims:

To raise inspectors’ expertise and confidence in inspecting schools’ provision in mathematics and in supporting improvement through:

- increasing inspectors’ knowledge and understanding of the mathematics National Curriculum (NC) and the new GCSE
- considering implications for inspection, particularly in relation to:
  - differentiation
  - more able pupils
- exploring the idea of ‘mastery’ – what it means and might look like.

Notes and Implications for inspection:

Ofsted

- This PowerPoint presentation provides key information and activities on the slides with a blue background. Notes and implications for inspection are provided on the slides with a yellow background.
- This training builds on:
  - the brief training on the new national curriculum provided during 2014
  - the 'Must of the moment' activities
- Remember, each time you have a discussion with subject or senior leaders, or feedback to a teacher/teaching assistant, you have the chance to promote improvement.

The mathematics National Curriculum

- Implemented from Sept 2014 in Years 1, 3, 4, 5 and in Key Stage 3 in maintained schools.
- All years will study the mathematics NC from Sept 2015.
- The NC is not statutory in academies/free schools but they will need to prepare for the new GCSE.
- The primary NC is set out as yearly programmes of study, with useful accompanying guidance. Each of the secondary documents is for a key stage, and includes a 'working mathematically' section, which is based on the aims.
- The demand at each key stage is higher than the previous NC. Some content has moved into earlier years and more emphasis is placed on formal calculation methods.
- Unlike the previous NC, the programmes of study have little overlap between successive key stages.

Notes and Implications for inspection:

Ofsted

- The new NC in English, mathematics and science are the only subjects that are not being implemented in Year 6 this school year.
- At the back of the primary NC is an appendix showing some formal written calculation methods.
- The statutory requirement is that the programme of study is taught by the end of the key stage, so primary schools do not have to follow the yearly programmes of study (though most seem to be doing so).

The new mathematics GCSE

- Teaching of the new GCSE starts in September 2015 (the current Year 9 cohort)
- The GCSE specification is based on the KS4 NC and parts of the KS3 NC.
- Unlike KS1-3, the content of the KS4 NC and GCSE specifications is differentiated.
  - The KS4 NC shows topics for higher-attaining pupils in bold font while those for all pupils are in standard font
  - GCSE specifications use three fonts:
    - standard font for topics to be studied by all pupils
    - <u>underlined</u> font for topics for all pupils (but higher attainers are expected to be more secure on them)
    - **bold** font for topics for the highest attainers.

Fonts used in GCSE and KS4 NC

GCSE:

- recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a rational number > 0 **or a surd**) **and other sequences**

KS4 programme of study:

- recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number {**or a surd**}) {**and other sequences**}

Notes and Implications for inspection:

Ofsted

- Information about GCSE is included for completeness.
- At GCSE, all pupils should learn and will be assessed on the topics in standard and underlined font, and the more able all of the material.
- Current Y9 pupils should not be studying the current GCSE unless they are taking it early … Ideally, they should be following the NC, in readiness for the new GCSE.
- In case you are wondering, surds are numbers like $\sqrt{2}$ and $\sqrt{14}$ which cannot be expressed exactly using decimals because the decimal form is never ending and its digits do not have a recurring pattern.

Spend a few minutes looking at the NC programmes of study for each phase. (Links are given on the next slide.)

Note the different:

- styles of presentation
- levels of detail and guidance
- fonts used at KS4

Notes and Implications for inspection:

- The programmes of study for primary, KS3 and KS4 can be found at: https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study
- The list of mathematical content is separate from, and follows after, the NC aims.
- Occasional specific references are made to problem solving within the content list, but all pupils should be solving problems in all areas of mathematics, not just in these restricted instances.
- Remember that academies/free schools/independent schools do not have to follow the NC.

The National Curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Notes and Implications for inspection:

Ofsted

- The development of reasoning is generally the weakest of the three aims in current teaching of mathematics.
- The aims of the NC (fluency including conceptual understanding, reasoning mathematically and problem solving) are very important and should be integral to teaching. When developed effectively, they are key characteristics of good and outstanding practice.
- Teaching that focuses heavily on covering the listed content, such as calculation, fractions, solving equations, geometric properties of shapes, without developing understanding, reasoning and problem solving at the same time is missing the strong drive that the aims represent for improving pupils' mathematical education. Such teaching is likely to require improvement.

The NC: recent inspection evidence

- Recent inspection evidence has shown that:
  - most primary schools are teaching the new programmes of study in Y1, 3, 4, 5
  - secondary schools are more mixed – many academies but also many maintained schools have not made changes to their schemes of work.
- Not all teachers and subject leaders are aware of aims, concentrating instead on the list of content.
- Some textbook schemes do not emphasise the aims strongly enough.
- A few LAs have provided their schools with lists of objectives for each year group, so that teachers' attention is on the detail of resources rather than the big picture.

Notes and Implications for inspection:

- Look out for mention of reasoning and problem solving in schools’ medium-term plans and teachers’ lesson planning. Check for attention to conceptual understanding as well as to developing procedural fluency. Inspectors might do this through drilling down into a recent sample of lesson plans and corresponding work scrutiny.

Mathematics GCSE: subject aims and learning outcomes

GCSE specifications in mathematics should enable students to:

1. develop fluent knowledge, skills and understanding of mathematical methods and concepts
2. acquire, select and apply mathematical techniques to solve problems
3. reason mathematically, make deductions and inferences and draw conclusions
4. comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

These aims align with those of the NC.

Reflect on a mathematics lesson that you observed recently.

To what extent did it develop pupils' fluency, problem solving and reasoning skills?

The NC: a mastery curriculum

- An expectation that all pupils can and will achieve.
- The large majority of pupils progress through the curriculum content at the same pace. Differentiation emphasises deep knowledge and individual support/intervention.
- Teaching is underpinned by methodical curriculum design, with units of work that focus in depth on key topics. Lessons and resources are crafted carefully to foster deep conceptual and procedural knowledge.
- Practice and consolidation play a central role. Well-designed variation builds fluency and understanding of underlying mathematical concepts in tandem.
- Teachers use precise questioning to check conceptual and procedural knowledge. They assess in lessons to identify who requires intervention so that all pupils keep up.

Notes and Implications for inspection:

- These points are taken from the NCETM's paper on Mastery https://www.ncetm.org.uk/public/files/19990433/Developing_mastery_in_mathematics_october_2014.pdf
- A mastery curriculum often involves whole-class teaching, with all pupils being taught the same concepts at the same time. Small-group work typically involves challenge through greater depth for the more able and support with grasping concepts and methods for less-able pupils.
- 'Variation' in exercises set is also known as 'intelligent practice'. Such exercises usually concentrate on the same topic/method/concept but vary in how the questions are presented, often in ways that expose the key underlying concept or mathematical structure, and make pupils think deeply for themselves.

The National Curriculum: expectations

The NC states:

> The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace.
>
> However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage.

Note: if schools teach the programmes of study as written, pupils are likely to have gaps in their pre-requisite knowledge. The best practice has been schools that have identified such gaps and taken them into account in planning and teaching.

Reflect on the expectation that
'the majority of pupils will move through the programmes of study at broadly the same pace'.

How does it contrast with the previous NC?

What inspection evidence might you find that reflects this expectation, for instance in lesson planning, teaching and learning?

Note: this important NC expectation reflects the mastery nature of the curriculum.

Notes and Implications for inspection:

How does it contrast with the previous NC?

- The previous NC had overlapping programmes of study. For example, broadly speaking, KS2 covered Levels 3-5 and KS3 Levels 4-7. It was accepted practice that pupils learnt at different levels. In all key stages, more-able pupils studied materials at a higher level typically than less-able pupils.
- In primary classes, different groups of pupils often learnt different bits of mathematics, with more-able pupils often accelerated to the next year's work, and less-able and SEN pupils learning mathematics from younger year groups.
- In secondary schools, pupils were (and still are) usually taught in sets with different sets studying mathematics topics that span different level/grade ranges.

Notes and Implications for inspection:

What inspection evidence might reflect this expectation for instance in lesson planning, teaching and learning?

- Whole classes taught together, possibly for the whole lesson, on the same concept/method/knowledge.
- The 'pace' may appear to be slow but that could mask development of deep understanding. Key points might be stressed very strongly and repeatedly by teachers.
- Differentiation may not be as overt as previously. For instance, some pupils could receive more adult support or spend longer using practical apparatus in order to grasp the concept or the method being taught. Higher attainers could move relatively quickly to more formal recording or more abstract ideas, or tackle more complex problems or exercises.

Notes and Implications for inspection:

What inspection evidence might reflect this expectation, for instance in lesson planning, teaching and learning? (continued)

- Intervention – within and outside of lessons – is likely to be focused on ensuring pupils are helped to keep up by revisiting concepts or essential prior learning, plugging gaps, or providing additional consolidation.
- Medium-term plans might show longer being spent on each topic to enable greater depth.

The National Curriculum: differentiation?

The NC states:

> Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content.
>
> Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Notes and Implications for inspection:

- The way able pupils should be challenged (and learning deepened) through more complex problem solving rather than accelerated through new material is a key feature of this curriculum, and is a large shift away from well-established practice under the previous NC.
- At this stage, teachers may be finding it difficult to find suitable problems and activities for the more able.
- Beware questions/problems involving harder numbers being given to more-able pupils – the increase in challenge should come from thinking harder about the concept or topic being taught.

Developing fluency … a question for you

… what does good consolidation look like?

Notes and Implications for inspection:

- Good consolidation makes pupils think – about the method, the structure and/or the concept.
- Some examples are shown on the following slides.

Practice makes perfect?

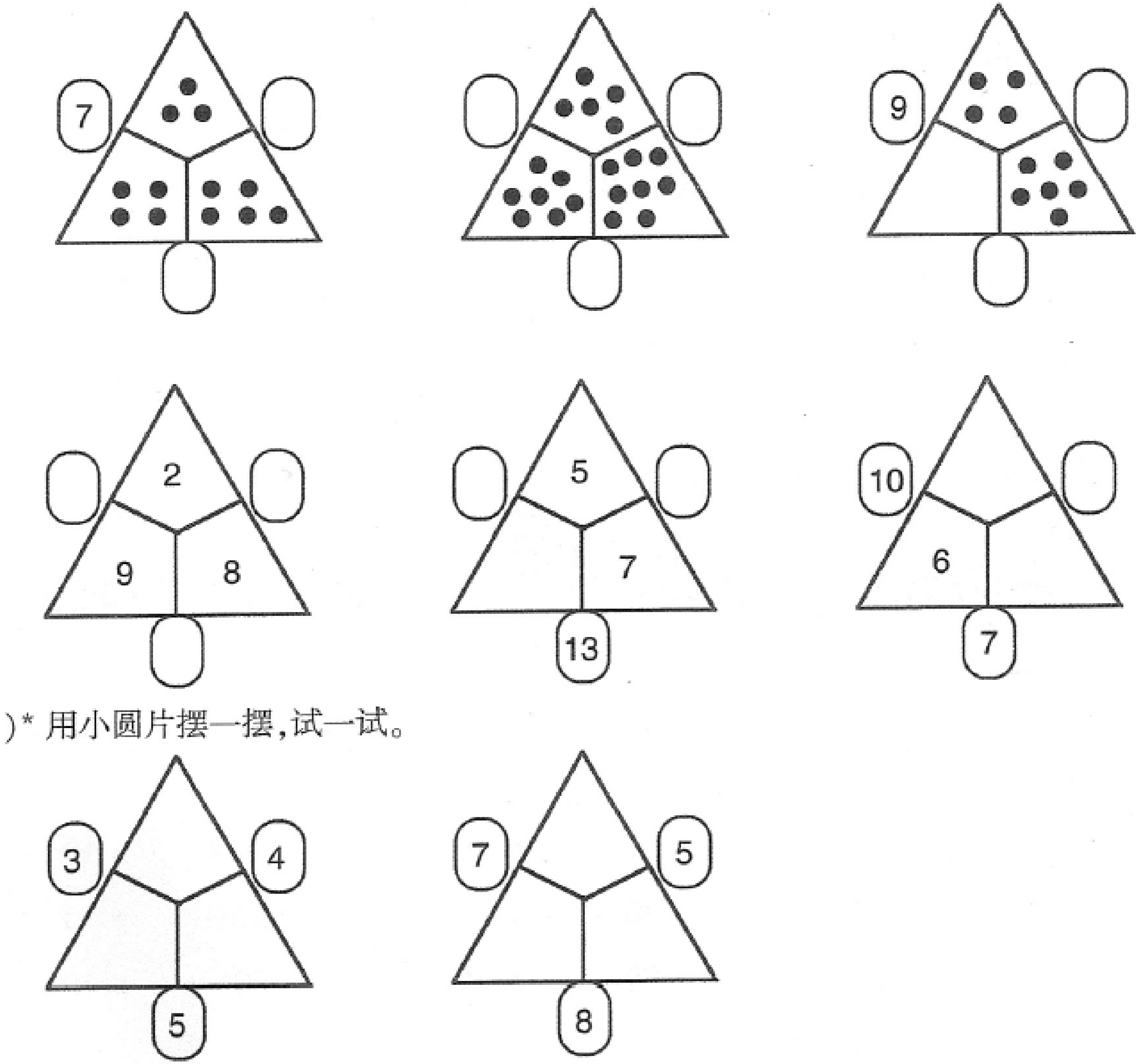
- Compare these two multiplication exercises.
- Which supports the development of fluency better? Why?

8 x 5 =	8 x 3 =	9 x 4 =	9 x 4 =	7 x 9 =	1 x 4 =
2 x 8 =	5 x 2 =	3 x 9 =	6 x 3 =	6 x 8 =	8 x 5 =
1 x 1 =	3 x 8 =	2 x 5 =	9 x 2 =	7 x 7 =	4 x 6 =

$2 \times 3 =$	$6 \times 7 =$	$9 \times 8 =$
$2 \times 30 =$	$6 \times 70 =$	$9 \times 80 =$
$2 \times 300 =$	$6 \times 700 =$	$9 \times 800 =$
$20 \times 3 =$	$60 \times 7 =$	$90 \times 8 =$
$200 \times 3 =$	$600 \times 7 =$	$900 \times 8 =$

Notes and Implications for inspection:

- The first set provides practice in multiplication facts, the variation being the provision of random pairs of numbers. While these might help to keep recall sharp, they do not deepen learning.
- Contrast the first set with the second set which comprises carefully selected groups of questions that relate to each other. The second set emphasises the structure of place value as well as multiplication facts.
- On inspection, look carefully at exercises set for pupils. Consider to what extent they deepen learning, or are unnecessarily repetitive and do not promote thinking.



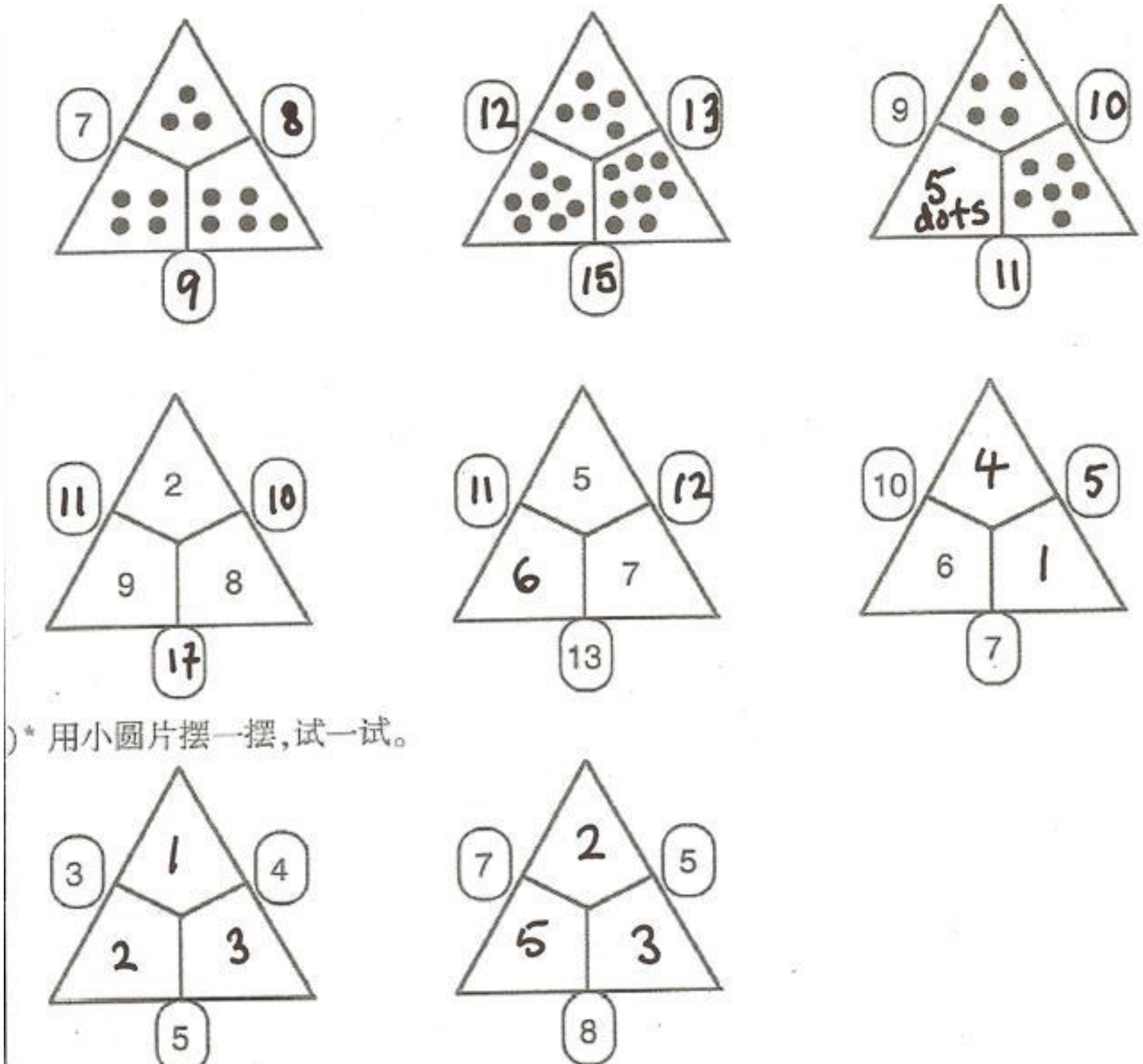
Look at this exercise on simple addition and subtraction (from a Chinese text book).

See how it increases in demand but stays with the same concepts.

Notes and Implications for inspection:

- This exercise shows how apparently similar questions involving simple addition and subtraction move from a presentation that might represent a practical activity, through to a written form, and then a more complex problem. This shows how the whole class might work on a similar idea but at different depths.
- Notice that the need to subtract appears in questions 3, 5 and 6, so all pupils meet an element of problem solving. Less able pupils could also be supported in investigating the last two problems practically.
- The last two questions also lend themselves to the generalisation that the sum of the three missing numbers inside the triangle is half the sum of the external numbers, for example, they sum to 6 in the first of the two questions.

Answers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Developing fluency …

… securing depth of understanding

Models, images and practical apparatus

All of these play an important part in supporting pupils' conceptual understanding and reasoning skills.

Flexibility with different representations is an important element of fluency.

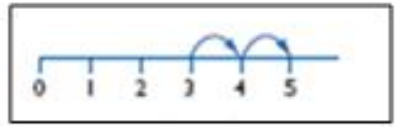
In earlier training, we discussed some useful pieces of practical equipment and images (shown on the next slide but one). More have since appeared, such as place-value counters.

Notes and Implications for inspection:

- Place-value counters can be purchased but also can made using counters and permanent marker pens.
- The second photograph shows some decimal place-value counters too. Strangely, the counters aligned at the front of the photo are arranged in reverse place-value order.
- This is a useful resource for work on place value and in developing formal calculation methods. When observing lessons in which formal calculation methods are introduced, are teachers using practical apparatus such as these place-value counters or base-10 equipment such as Dienes apparatus to help pupils understand the method? When talking with pupils who are performing such calculations, check they can explain how it works by referring to the structure rather than just the steps to carry out.

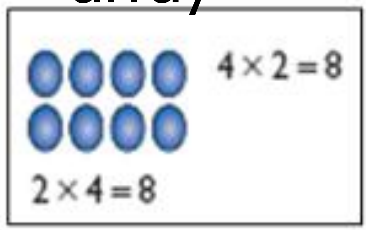
Resources to help build concepts

number line

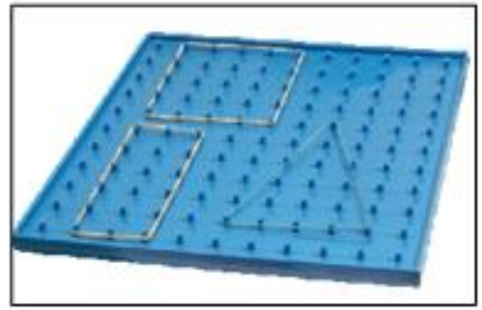


Numicon

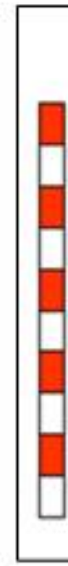
array



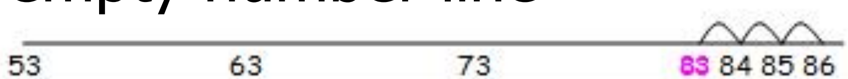
geoboard



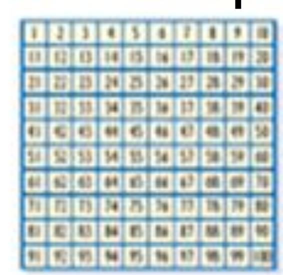
counting stick or metre rule



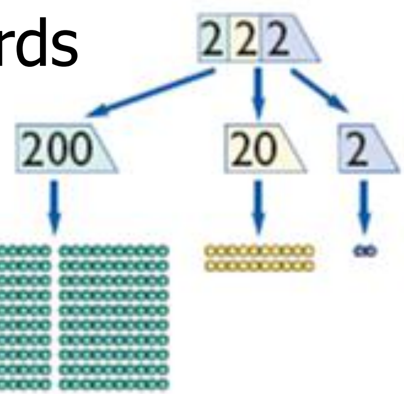
empty number line

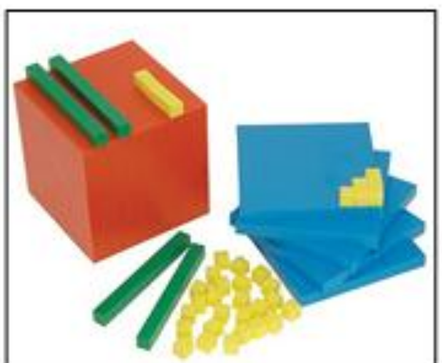


hundred square



place value cards



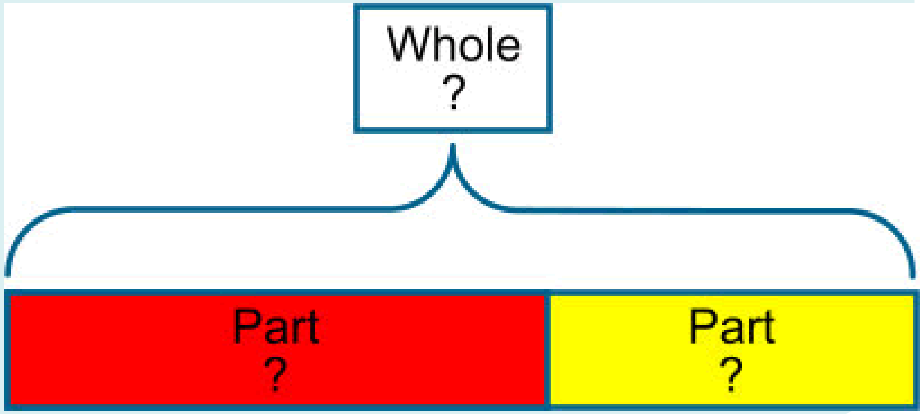


Dienes blocks
base ten blocks

bead string

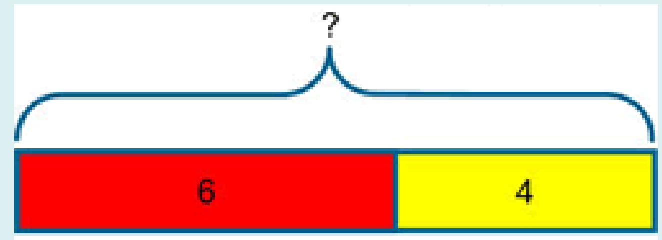
The bar model

- The bar model is a way of revealing the mathematical structure within a problem. It is not a recipe for solving problems.
- It supports the transformation of real-life problems into a mathematical form and can bridge the gap between concrete mathematical experiences and abstract representations.
- It can be used to represent problems involving the four operations, ratio and proportion.
- This diagram shows the image for addition and subtraction using the bar model.



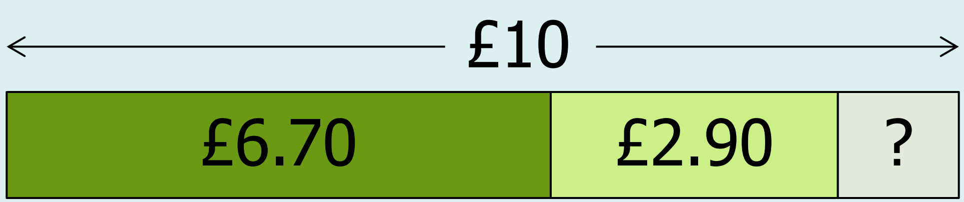
Examples using the bar model

1. I have 6 red pencils and 4 yellow pencils.
   How many pencils do I have?
   $6 + 4 = 10$



Try these two questions, using the bar model.

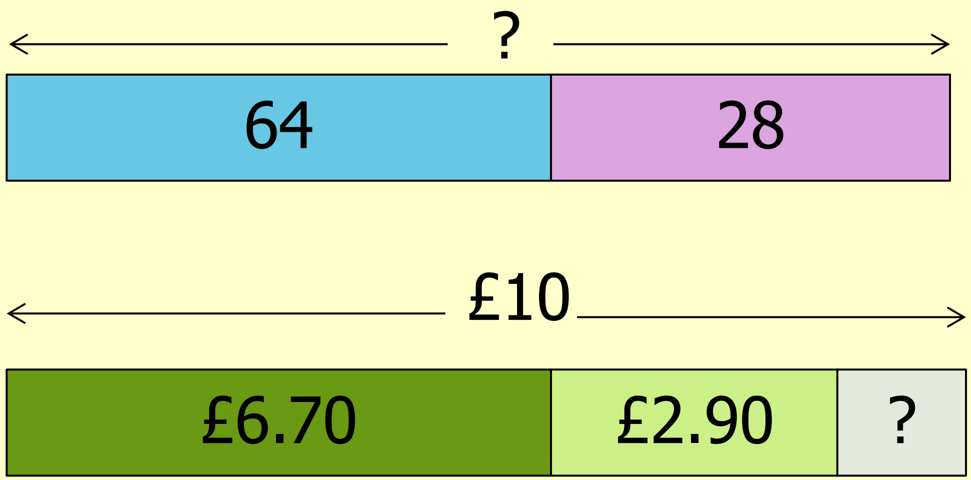
2. Tom has a bag of 64 marbles. His friend gives him 28 more. How many does he have now?
3. Ali had £10. He bought a DVD for £6.70 and a CD for £2.90. How much money did he have left?



£10 – (£6.70+£2.90)
= £0.40

Notes and Implications for inspection:

Solutions:



total $= 64 + 28$
$= 92$ marbles

£10 – (£6.70+£2.90)
= £0.40

Be aware that pupils may be taught how to use the bar model if they are following approaches similar to the Singapore curriculum.

2012 KS2 test question (Level 5)

Solve this KS2 test question.

In a class, 18 of the children are girls.

A quarter of the children in the class are boys.

Altogether, how many children are there in the class?

Show your working

Notes and Implications for inspection:

- Many Y6 pupils were unable to answer this question correctly.
- Many teachers who have been introduced to the bar model have said that they feel that most, or even all, of their Y6 class could solve it using the bar model.
- Bar model solution on the next slide.

- The bar model can be used for multiplication, division, proportion and ratio, as well as addition and subtraction.
- More information on the bar model can be found at www.ncetm.org.uk/resources/44565

2012 KS2 test question solution

- The bar represents the whole class.

The class

- Folding the bar into quarters allows us to represent the boys as a proportion of the whole class.

Boys	Girls	Girls	Girls

- The rest of the class must be girls
- As there are 18 girls, each of the three girls sections must equal 6.
- So the boys section must also be 6.
- $4 \times 6 = 24$, which means that 24 children are in the class.

Videos of lesson extracts

- You are going to watch two videos. Links are provided on the following slides.
- For each video, record evidence on:
  - the mathematics the pupils are learning
  - how the teacher uses practical equipment and/or images to support pupils' learning
  - features of the teaching that support and deepen pupils' conceptual development through the design of the activity, the teacher's explanation and/or questioning.

Make a note of these three points to help you record evidence while watching both videos.

Videos of lesson extracts

Video 1a

- **Year 2, start of lesson**
- **Developing fluency - counting in fractional steps**

https://www.ncetm.org.uk/resources/43609

- Counting in fractions is in the Y2 guidance rather than the statutory part of the new Y2 programme of study.
- Thirds were not emphasised in the previous NC. At the time of filming, this Y2 class had been following the previous national curriculum which concentrated on halves and quarters.

Now watch video 1a

Evidence:

The mathematics the pupils are learning:

- To count up and back in halves and quarters
- To recognise on the number line the position of simple fractions and mixed fractions involving halves and quarters.

How the teacher uses practical equipment and/or images to support pupils' learning:

- The teacher uses a counting stick that has regular intervals but no numbers marked except for the starting numbers that she provides for the pupils. When counting in halves and in quarters, pupils are learning to form an image of the number line in their minds.

Evidence (continued):

- The teacher uses zero and a non-zero starting position for counting in halves and expects children to be able to count backwards as well. This helps build fluency.
- As well as chanting the patterns of fractions, pupils are able to identify fractions positioned on the number line.

Features of the teaching that support and deepen pupils' conceptual development through the design of the activity, the teacher's explanation and/or questioning:

- The use of the number line for counting and for identifying particular fractions helps to build the image of a number line in pupils' minds. They will also understand a fraction as a number (rather than two numbers).

Evidence (continued):

- Counting backwards and from different starting points helps develop pupils' fluency. They have to think harder than when they count from 0.
- The teacher listens carefully to what pupils say. She recognises when some have difficulty counting up in quarters and models the counting before the pupils have another go. Likewise with counting down from 7½.
- The activity is not repetitive – it builds swiftly through related ideas.

Implications for inspection:

Ofsted

- Record mathematical detail, particularly in relation to how well teaching develops fluency (including conceptual understanding), mathematical reasoning and problem solving.
- Consider how use of practical equipment, models and images supports all pupils in developing understanding.

Videos of lesson extracts

Video 1b

- **Year 2, later in same lesson**
- **Reasoning about adding and subtracting with fractions**

https://www.ncetm.org.uk/resources/43609

Now watch video 1b and record evidence relating to the three points that you noted down.

Evidence:

The mathematics the pupils are learning:

- Pupils are learning to add and subtract simple mixed fractions involving halves and quarters.

How the teacher uses practical equipment and/or images to support pupils' learning:

- Pupils use rectangles to represent whole numbers, halves and quarters to perform the additions and subtractions prior to recording.
- They show an early understanding of equivalence through exchanging, for example, two halves for one whole.

Evidence (continued):

Ofsted

- **Features of the teaching that support and deepen pupils' conceptual development through the design of the activity, the teacher's explanation and/or questioning:**
- The teacher observed the pupils working in pairs and uses questioning to check that pupils can explain what they are doing. She also asked about simple equivalences.
- Pupils were adding and subtracting fractions – good to use both operations. One pair of pupils needed to exchange a whole for two halves in order to calculate 2 – 1½ (The teacher seemed to ignore the girl's anticipation of this step!)

Implications for inspection:

- Record mathematical detail, particularly in relation to how well teaching develops fluency (including conceptual understanding), mathematical reasoning and problem solving.
- Consider how use of practical equipment, models and images supports all pupils in understanding.

Developing good problem solving …

… and challenging the more able

Problems and puzzles

- Providing a range of puzzles and other problems helps pupils to reason strategically to:
  - find possible ways into solving a problem
  - sequence an unfolding solution to a problem
  - use recording to help their thinking about the next step.
- It is particularly important that teachers and teaching assistants stress such reasoning, rather than just checking whether the final answer is correct.
- All pupils need to learn how to solve problems from the earliest age – the EYFS early learning goals also include problem solving.

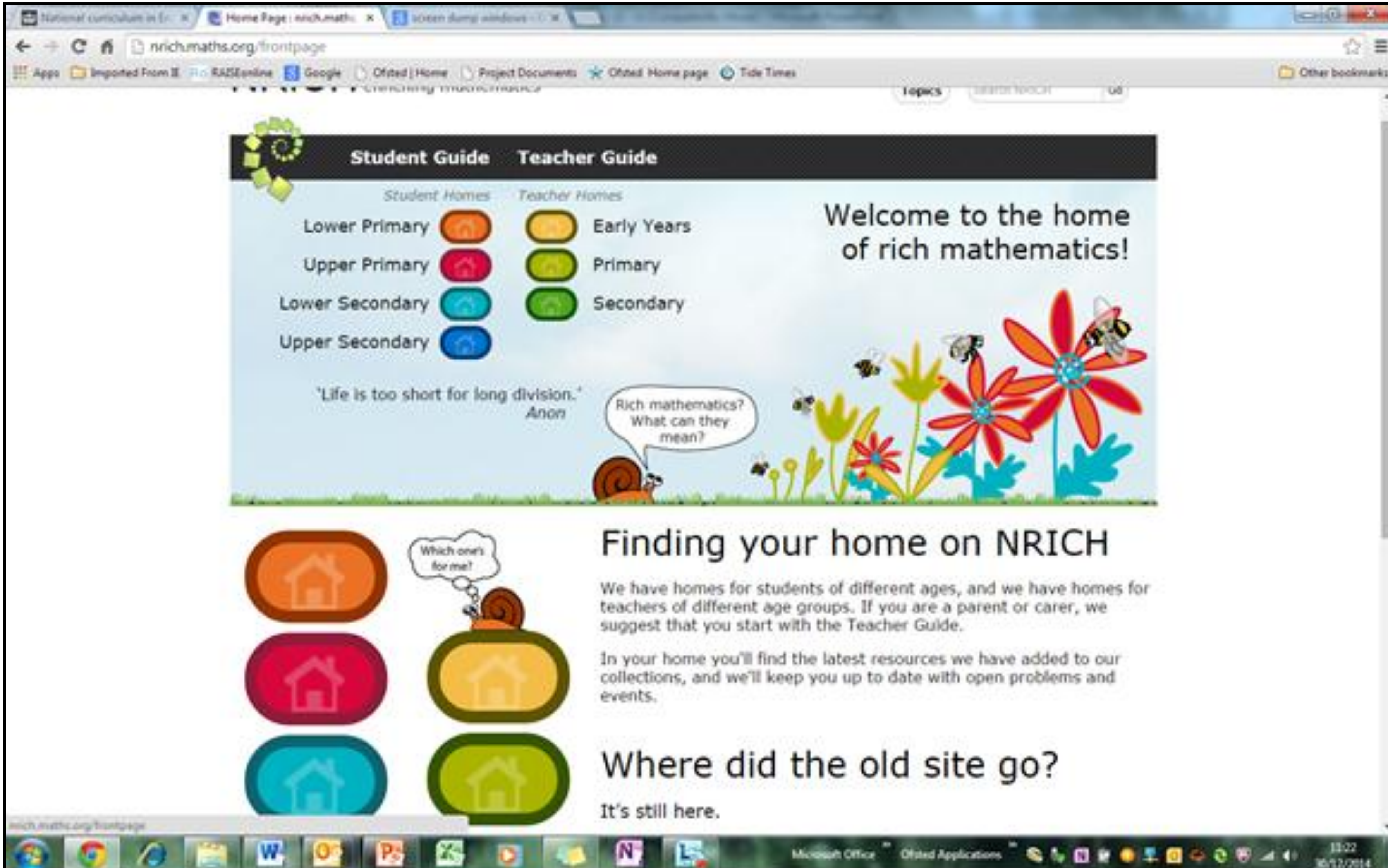
Common weaknesses in teaching problem solving

- Pupils are expected to acquire problem-solving skills without them being made explicit. Lesson objectives and planning tend to focus on content rather than specific problem-solving skills.
- Teachers/TAs are too quick to prompt pupils, focusing on getting 'the answer' – pupils need to build their confidence and skills in solving problems, so that they can apply them naturally in other situations.
- When problems are set, teachers do not use them well enough to discuss with pupils alternative approaches and why one is more elegant than another.
- Problems for high attainers involve harder numbers rather than more demanding reasoning and problem-solving skills.

Notes and Implications for inspection:

- Note that problem solving is wider than short word problems – it includes puzzles and problems that are based on mathematical content, not set in real-life contexts.
- In lessons (and work scrutiny), check for variety in the problems set for pupils.
  - Do the problems make pupils think hard or are they all similar, eg all requiring multiplication?
  - Do teachers discuss ways into the problem and different solutions?
  - Do all pupils get problems to solve?

Problem solving: nrich.maths.org/frontpage



The nrich website

- The nrich website provides a good source of problems – useful support for schools needing to improve problem solving.
- It includes printable resources, notes for teachers and solutions written by pupils.
- Each problem has been mapped against the new NC.

- An example problem from KS3 is shown on the next slide. Spend a few minutes on it.
  - How suitable is it for pupils of differing abilities? Why?

‘Forwards add backwards’

The number 726 can be formed by adding a 3-digit number with its reversal: 462+264=726, for example.

- Can you find the other two ways of making 726 in this way?
- Can you find the three ways to do this for 707 and 766?

Which ten numbers between 700 and 800 can be formed from a number plus its reversal?

- What common property do they have?
  Can you explain why?

How many numbers between 300 and 400 can be formed from a number plus its reversal?

How about between 800 and 900?

Notes and Implications for inspection:

- This is another example of work that is accessible to all the pupils in the class but develops into a more complex problem for the more able. It also provides opportunities for reasoning.
- Answers and explanation at http://nrich.maths.org/11111

Developing reasoning …

… research by Terezinha Nunes (2009) identified the ability to reason mathematically as the most important factor in a pupil's success in mathematics.

Development of Maths Capabilities and Confidence in Primary School
http://dera.ioe.ac.uk/11154/1/DCSF-RR118.pdf

Reasoning

- Reasoning is integral to the development of conceptual understanding and problem-solving skills.
- Of the three National Curriculum aims, it is the least well developed currently.
- Not all classrooms have a positive ethos that encourages learning from mistakes.
- Tasks are not used well enough to develop reasoning.
- Talk often focuses on the 'how' rather than the 'why', 'why not', and 'what if' in:
  - teachers' explanations and questions
  - pupils' responses.

Notes and Implications for inspection:

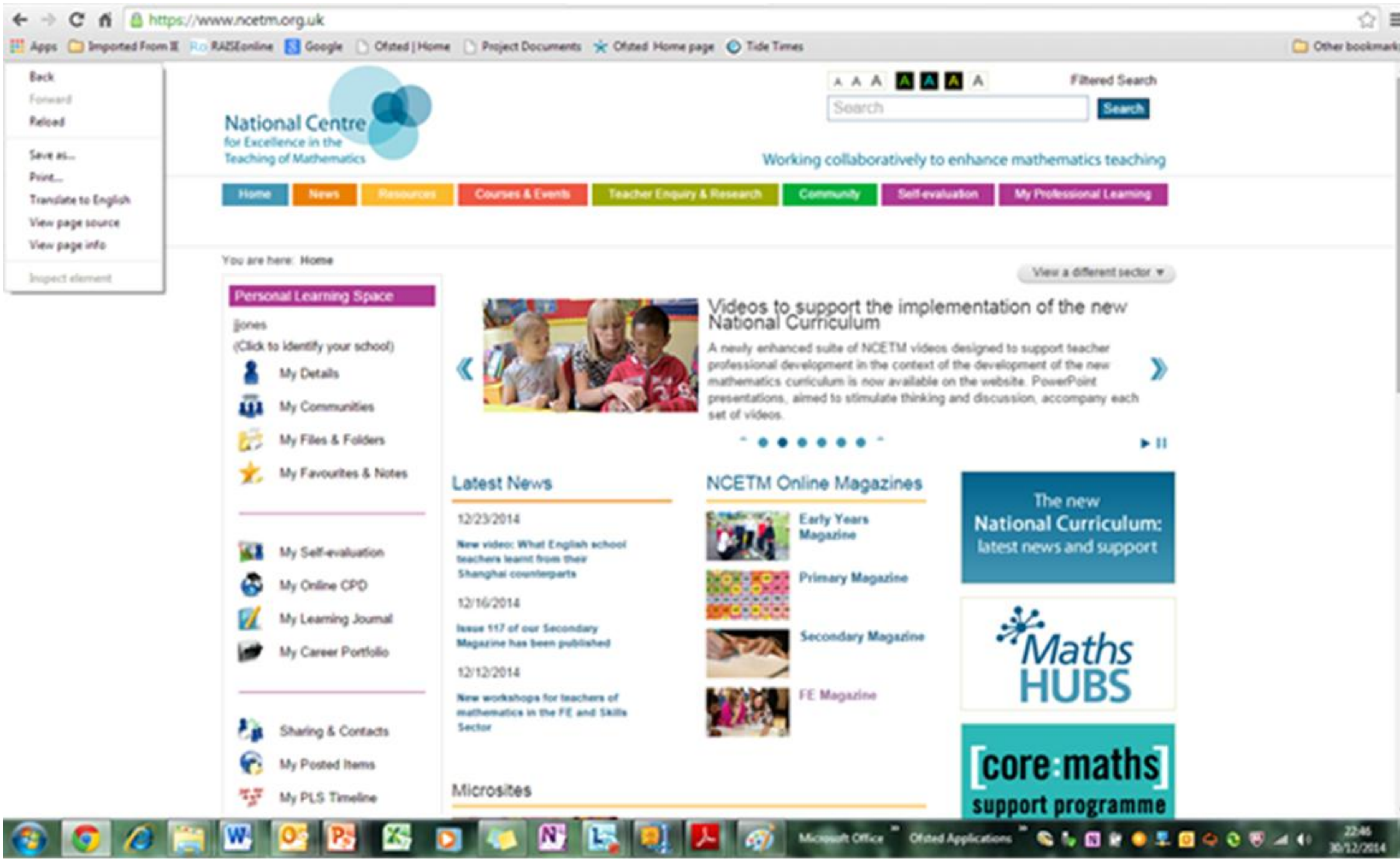
- It’s good to note examples of reasoning on lesson EFs – developed well, reasoning is an important strength in mathematics teaching.

NCETM progression maps

www.ncetm.org.uk/resources/44672

- The National Centre for Excellence in the Teaching of Mathematics (NCETM) has produced progression maps for different strands of mathematics within the NC at KS1-3.
- It has added questions to each section within the strands to encourage discussion and reasoning. These include:
  - what do you notice?
  - true or false?
  - odd one out?
  - do, then explain
  - spot the mistake
  - give an example of …
  - continue the pattern
  - convince me/prove it
- Such questions are useful to encourage all pupils to think and reason, but also good for challenging the more able.
- The website also has a microsite for primary subject leaders on enhancing provision for high-attaining pupils.

The NCETM portal



Notes and Implications for inspection:

- In case you are wondering, core maths is a pilot sixth-form mathematics qualification for those not studying AS/A level but wanting to continue with some mathematics.

Resources

- Good resources and materials that you may see on inspection or wish to point schools towards include:
  - NCETM
  - nrich
  - Websites/membership of subject associations – many of these for mathematics, eg the Association of Teachers of Mathematics (ATM), the Mathematical Association (MA)
  - Website and competitions organised by the United Kingdom Mathematics Trust (UKMT) – good particularly for the more able, with lots of short interesting questions and problems.

Notes and Implications for inspection:

- If schools are not already aware of these websites, point them in their direction.
- You may find it useful to be able to refer schools to specific aspects/resources of the sites; for instance on improving subject leadership through the NCETM materials.

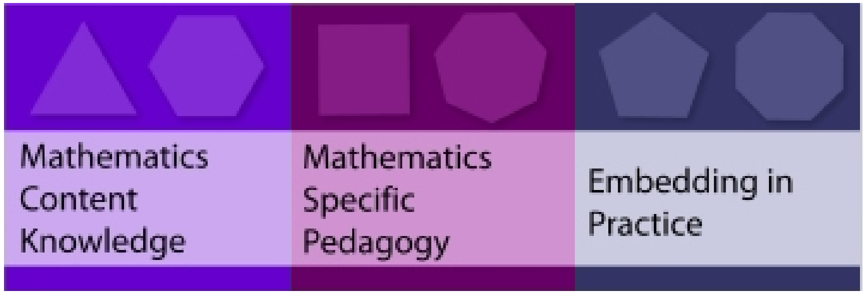
Resources: Textbook schemes

- Textbooks vary enormously in quality, but the ways in which teachers use them are also variable.
- Some popular schemes do not emphasise the aims sufficiently, particularly reasoning. Questions aimed at making pupils think are sometimes not tackled by pupils because they don't finish other work and get on to them.
- Two new schemes are being published currently. They are based on the Singapore mastery model, but have been adapted for the English National Curriculum.
- The NCETM's guidance for textbook writers states that 'a good mathematics textbook should be educative and represent a resource that can be used independently by pupils and also provide both subject knowledge and pedagogy support to teachers of mathematics'.

Some NC challenges for schools/teachers

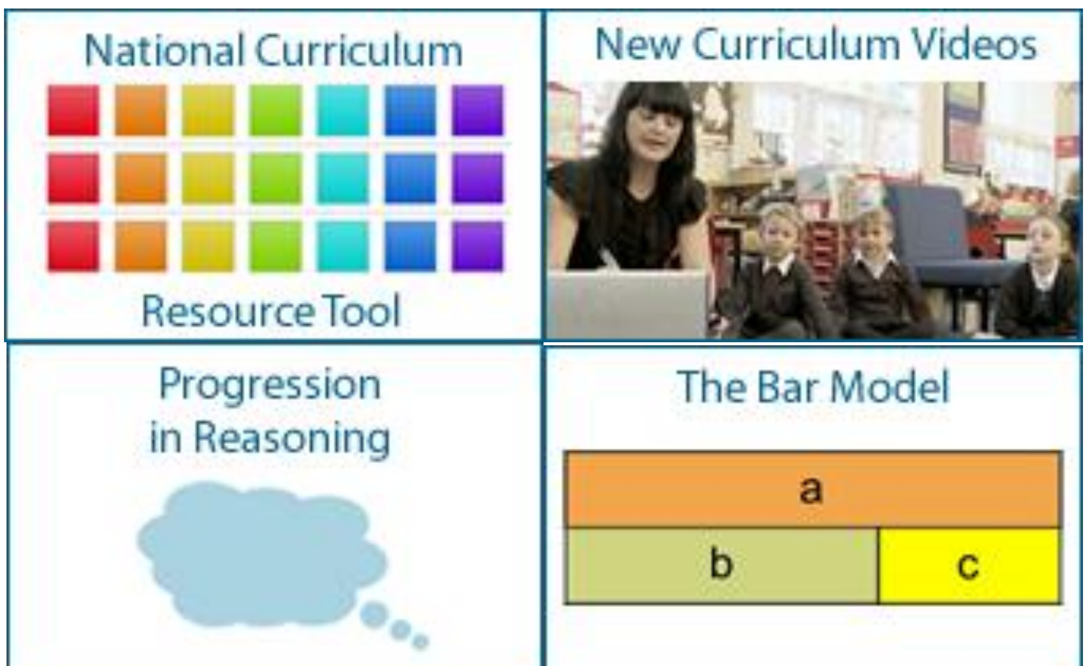
- Teachers’ subject expertise:
  - ‘new’ mathematics content
  - aims: how to teach reasoning, and to challenge the more able through problem solving; the meaning of fluency
- Expectations and progression:
  - gaps between where pupils are now and the programme of study they are learning/are due to learn
  - higher demand, especially for lower attainers and SEN
  - differentiation
- Assessment without NC levels
- Capacity:
  - recruitment and retention of staff
  - availability of local/in-school expert help

Subject expertise and working together



The NCETM's website includes self-evaluation tools for subject knowledge and pedagogy.

And lots on the new National Curriculum …



and 32 new Maths Hubs to support improvement

Notes and Implications for inspection:

- The list of challenges is included to raise inspectors' awareness of the issues. We have explored elements of most of them in this presentation. (Have not explored assessment without NC levels or staffing issues.)
- The final bullet in the list on 'availability of local/in-school expert help' links to the mention of the Maths Hubs on the previous slide.
- The NCETM has a list of mathematics CPD providers who have met the NCETM's CPD standard.
- NAMA (National Association of Mathematics Advisors) also lists members offering CPD services in mathematics.

Pause for thought … finally …

… identify what you might do next to strengthen further your inspection practice in mathematics.

The Mathematics National Curriculum

Training for Inspectors

Regional conferences

January 2015