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Aims

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.

The Planning Process

1. Long Term Plan

We follow the National Curriculum of England, 2015. Progression of units is taken from the White Rose Yearly overview; this will be adapted from September 2018 to the GLOW Maths Scheme of work & adapted for each year group as appropriate. The GLOW Maths Schemes of Work breaks down the Maths Curriculum into 2 or 3 week units and provides the overview of learning for the year as well as detailed Medium Term Plans.

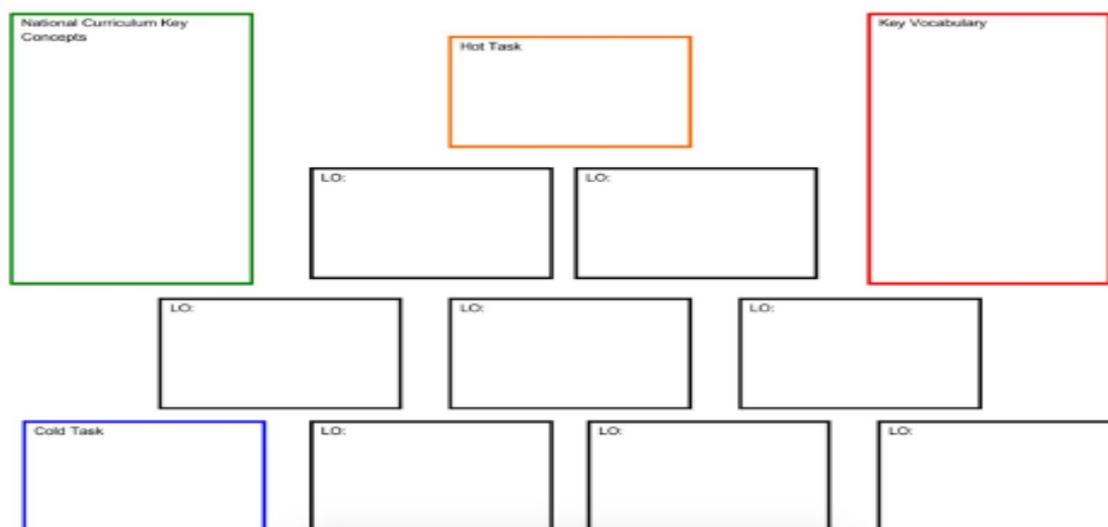
2. Medium Term Plan

This is taken from the White Rose termly overview; this will be adapted from September 2018 to the GLOW Maths Schemes of Work. This is presented as stages rather than year groups with stage 1 being equivalent to year 1 and so on. The Medium Term plans include prerequisites, mathematical language for the unit, pedagogical notes, reasoning opportunities, suggested activities and possible misconceptions.

3. Short Term Planning

Teachers plan in fortnightly 'units' from the Medium-Term Plan. All units follow a sequence of learning from a 'Cold Task', where you elicit a broad picture of what the children should already know (looking back at the previous objectives), through to a 'Hot Task', where children apply the skills they have learnt in a Rich Activity, sometimes linked to real life. Short term planning will also make note of activities which are to be completed during the Maths Meeting.

Developing the Learning Pyramid (Learning Journey)



The front page of the Short Term Planning proforma represents the learning pyramid for the unit that must be displayed on the working wall. LOs are taken directly from the GLOW maths scheme. The LOs should be written in child friendly, accessible language and should be written in the form of - 'I can...'

- they are the skills/'Do its' the children will be taught, that will then be applied both through the lesson in 'Twist Its' & Solve Its' and in the Hot Task.

The Cold and Hot Tasks are the titles of the Tasks the children will complete - these do not follow the same LO format. Both the Learning Overview and Key Vocabulary are taken directly from the GLOW Maths Schemes of Work.

Cold Task

This is an opportunity to hook the children into their new learning. It should be no more than 20 minutes and is planned for the last lesson of the previous week. The idea being that children can 'Show me what you know' against the prerequisite from the GLOW Maths Schemes of Work for the New Unit.

Learning blocks

The learning blocks have an LO that is pitched at the age related expectation (ARE).

The Success Criteria breaks down the learning episodes based on deepening understanding, not going onto new knowledge unless they have 'mastered' that LO already.

'Do it' is the first step and is skill based e.g. *I can use the column method for addition;*

'Twist it' This is where children demonstrate their reasoning skills. Opportunities to further eliminate misconceptions;

'Solve it' is the third learning episode in the lesson, and is based around problem solving - e.g. *Now I know the column method for addition can I use it to go deeper?*

Differentiation

We follow the aims and philosophy of the New National Curriculum as detailed below:

'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. 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.'

When a child has a very specific SEN they should have differentiated planning written by the class teacher and adapted to support their needs. The GLOW Maths Scheme supports the differentiation process enabling teachers to see the previous learning easily and embedding this in weekly planning. This enables the provision for SEN children to be matched to their needs appropriately.

All children at Denham Green E-ACT Primary Academy are entitled to Quality First Teaching and only if this does not meet their needs would an intervention be planned and carefully monitored.

Depth & Challenge

When a child has secured an objective they should be taught to apply their skills through reasoning and solving problems. This should not exclusively be for High Ability Children/Rapid Graspers. There are always plenty of other ways to deepen knowledge through conceptual variation and using standard/non-standard methods.

Hot Task

This is an opportunity for children to 'show off' what they have learnt through an enriching activity. The teacher's role is to facilitate this and support individuals/groups as appropriate. Children should be given opportunities to invent their own problems to solve as well as solve teacher directed ones. (Hot Task Titles in red should be stuck into books before the lesson and are an heading to show the end of the unit).

5. Review of learning - Daily - Formative Assessment

AfL feeds into planning for the next day/s. Over time you will know your children and their rough capabilities, but they may surprise you, especially in a new topic. Will extra time be needed to develop the understanding of an LO? Does it need teaching in a different way? Does the learning need to be extended further through the development of U&A? All books should be marked daily, following the marking policy, with a minimum of 40% developmental comments.

6. Summative Assessment

Every term, data is submitted by teachers to the SLT, using the PUMA assessments to provide a standardised score. This is analysed by SLT and action plans/interventions are created from the outcomes. Teachers also submit data half-termly, using the Sheffield STAT grids, to show the progress children make within their year group. An effective strategy whilst making judgements is to moderate pupils work within your year groups and across phases to ensure consistency and support judgements being made.

Progress against objectives from the Maths Meeting are assessed through an 'Arithmecheck'. These provide teachers with a good opportunity to track progress against those objectives, whilst also forming a good diagnostic analysis of gaps in arithmetical learning.

7. Spiritual, Moral, Social and Cultural Development -SMSC

The teaching of mathematics supports the social development of our children through various projects, mini-investigations and activities built into lessons.

Developing deep thinking and questioning the way in which the world works promotes the spiritual growth of pupils. In Maths lessons pupils are always encouraged to delve deeper into their understanding of Mathematics and how it relates to the world around them.

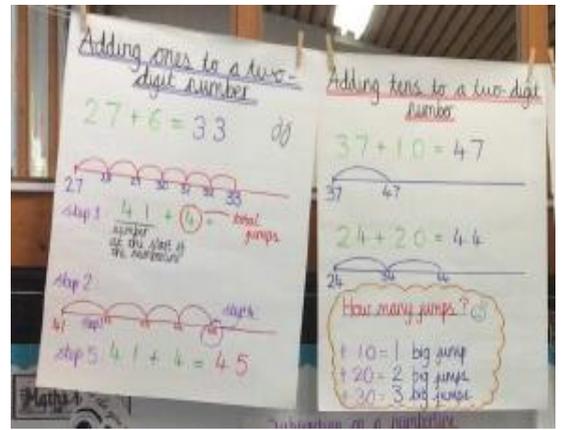
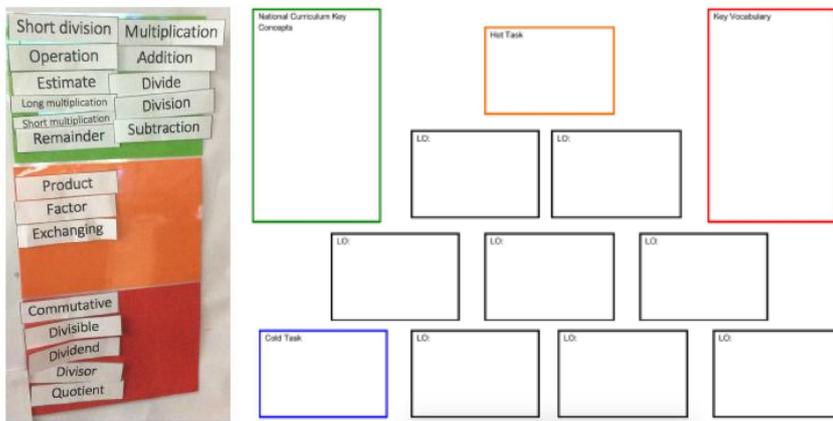
The moral development of pupils is an important thread running through the entire mathematics scheme. Hot Tasks are often linked to how we use Maths in real life contexts, applying and exploring the skills required to solve various problems.

Problem solving skills and teamwork are fundamental to Mathematics, through creative thinking, discussion, explaining and presenting ideas. Pupils are always encouraged to develop their Mathematical reasoning skills, communicating with others and explaining concepts to each other. Self and peer reviewing are very important to enable pupils to have an accurate grasp of where they are and how they need to improve. Working together in pairs or groups and supporting others is a key part of Maths lessons.

Mathematics is a universal language with a myriad of cultural inputs throughout the ages. At Denham Green E-ACT Primary Academy, we encourage the teaching of various approaches to Mathematics. We also explore the Mathematics applied in different cultures such as Rangoli patterns, symmetry, tessellations and Islamic geometric patterns. The ability to use exchange rates for foreign travel is also an important life skill pupils will learn.

Working Walls

1. Key vocabulary (taken from the GLOW maths scheme) **must** be displayed using the RAG system- this gives children the opportunity to recognise which vocabulary they are learning and provides them with the chance to use it in context. Once the large majority of the class have grasped the vocabulary then it is moved to amber or green.
2. The working wall **must** contain the pyramid displaying all of the learning objectives taken from the GLOW maths scheme.
3. A 'toolkit' modelled example, using the success criteria, **should** be displayed for each lesson. If modelling in class, this can go straight up on the Working Wall.



Maths Help Station

All classrooms must contain a maths help station. The helpstation will contain the Maths meeting weekly cycle. It is expected that toolkits from Tuesday and Thursday Maths meetings will be displayed. At the centre of the help station will be the 'ArithmeCycle' for the specific year group; this contains the objectives which will be taught on a Tuesday/Thursday.

There should also be accessible resources for every child which promote the use of concrete, pictorial and abstract methods in maths lessons; these resources will be specifically chosen to support learning in a current unit of work. It is expected that some resources will be universally used across all units, for example: playing cards, place value Diennes, dominoes and counting equipment (KS1 and SEND pupils in KS2).



Delivery of an effective lesson

Teaching Episodes

Daily Setting the Scene - Keep it snappy!

Discuss the LO & S/C for the day and link this to the LO pyramid - Where are we in our learning? What are we aiming to achieve? Re-vist or introduce the 'Hook' for their learning. Consider whether you need to introduce the learning for the day to the whole class or whether it is more appropriate to split the class/set for any direct input, especially for some SEND children?

Teach it

-Intro

- Modelling

- Conceptual understanding

- Questioning

Add key information to the toolkit on the working wall

What could support the learning? key facts/ models/explanations of vocabulary

Success Criteria - Process

Do it

- *Fluency Questions*

Children have a go, in books. Aim for approximately 6 questions (these may get progressively harder), with a non-standard example included.

Within the 'Teach it' and 'Do I't part of the lesson decide - who are the rapid graspers? Can they go straight for a deep/deeper Solve it?

Extend the learning of targeted pupils further through the use of guided group teaching/ support led by you.

Positive Conceptual Variation

Twist it

Thinking about standard conceptual variation this is where we challenge children's perceptions of what they have learnt during the teach it/do it.

- *Misconceptions/Mistakes*

- *Active Argument*

(Yes/No, True/False)

Focus on 'What it's not' (non-standard)

Negative Conceptual Variation

Solve it

- *Solve problems*

- *Empty box/find the symbol*

- *Here's the answer...generate the questions*

- *Probing Questions (Always/Sometimes/Never- Show me)*

- *Apply to different contexts- make connections*

Plenary

- *Key Learning*

- *Key Vocabulary*

A review of learning at the end of the lesson in relation to the Learning pyramid. Where are we now? Are we ready to move on? Are there any misconceptions to address? What key points do we need to remember? (Add them to the working wall) How can they apply/ practise their learning in other areas of the curriculum or at home?

The Role of the TA

Where year groups have teaching assistants assigned to them, they should be deployed based on pupil need, not so every class has one. A good TA won't be a barrier to the child working with other children, and all good ones are aware that the more success the child achieves, the less reliant the child will be on their support.

If a TA is not working with specific SEND children/target children during the start of the lesson then they should act in a 'helicopter' role, scanning and moving to the children who are taking time to grasp the new objective, giving instant feedback to the teacher so they know who will need to be in the guided group and who can move quickly onto the solve it.

During the solve it part of the lesson they should liaise with the teacher, being directed to work with the rapid graspers or to support a targeted/SEND group or 1:1.

Arithmetic Proficiency & Multiplication Tables

Arithmetic Proficiency & Fluency in knowing the multiplication tables is key and a priority at Denham Green E-ACT Primary Academy. To ensure we develop children who are proficient, we teach Arithmetic Proficiency daily as part of our Maths meetings.

Multiplication Tables are taught during Maths meetings, as well as daily through targeted 'Times Tables rock Stars' practise, where teachers can set specific times tables to practise, tailored to the individual needs of each child.

'Can Do 21' are facts displayed in KS2 to promote children's knowledge of key facts which can be manipulated to provide further multiplication and division facts. A KS1 version is also displayed in Year 1 and 2 classrooms which display key facts from the 2, 3, 5 and 10 times tables.



Maths meeting planning comes directly from the 24 'Arithmecycle' statements. A statement is covered on a three-week basis during a Tuesday or Thursday lesson. Resources come directly from the 'Arithmekit' and enable a progressive three week coverage of a statement. It is expected that during the 1st week of a statement that pupils will explore learning through the use of concrete apparatus. This will then be deepened further during the following two weeks. Each statement has a reasoning resource where children have to give an opinion based on what Coco or Colin have said; these will usually be given to pupils in a final week of a statement.

Maths Meeting

All work to be completed or stuck in Maths Meeting books.

Session 1 - Monday

Mathematical Vocab for the unit - Introduction or reminder.

This should include RAG rating the vocab red, amber, green and placing the words on the working wall. If everyone knows a word and its meaning it is green; approximately half the class is amber; and hardly anyone is red. Some words will lend themselves to actions to support recall of meaning. Also within the same session children will contribute to the 'What do we already know...?' mind map.

Alternate weeks - Beat Its/Thats

Guided & Independent Session - 15 mins approximately

This is not a timed activity, but you may want to add a time limit for rapid graspers. Once the children have completed the questions you should mark them together (Unless this would not be purposeful or manageable, say with Year 1 children) and children should identify and have a go at correcting their errors. They should also record their score on the line/bar graph (Again you may need to do this for some children). Once someone has 3 consecutive weeks of getting 100% this should be celebrated and they are then moved to the next level.

There are alternative mental recall activities which have been developed to support children with the layout of the Paper 1 arithmetic test in key stage 1 and 2- these resources can be used instead of Beat its/thats. They are called 'Arithmequiz' and there are KS1 or 2 versions. They are located at <https://candomaths.org/>

Session 2 - Tuesday

Arithmecycle Statement

Over a three-week period, one statement taken from the 'Arithmecycle' will be covered. The statements range from place value, addition and subtraction, multiplication and division and fractions (Year 5/6). Resources are taken directly from the 'Arithmekit' and it is expected that every child will have covered at least 3 of the 4 activities contained in the resource. Resources should be chosen carefully to support children with natural progression towards achieving the statement. The 'Arithmecheck' can be used to assess pupils learning against each statement.

Session 3 - Wednesday

Target Getting - Multiplication Tables - children should be fluent in the previous year's expectation before moving on. They should be able to recall and use multiplication and division facts for their age band.

EYFS - Counting on and back in 1s to 10 and 20.

Year 1 - Counting in 1s, 2s, 5s and 10s

Year 2 - 2, 5 & 10

Year 3 - 3, 4 & 8

Year 4 - 6, 7, 9, 11 & 12

Year 5 - All up to and including 12×12

Year 6 - All up to and including 12×12

Session 4 - Thursday

Arithmecycle Statement

Over a three week period, one statement taken from the 'Arithmecycle' will be covered. The statements range from place value, addition and subtraction, multiplication and division and fractions (Year 5/6). Resources are taken directly from the 'Arithmekit' and it is expected that every child will have covered at least 3 of the 4 activities contained in the resource. Resources should be chosen carefully to support children with natural progression towards achieving the statement. The 'Arithmecheck' can be used to assess pupils learning against each statement.

Session 5 - Friday

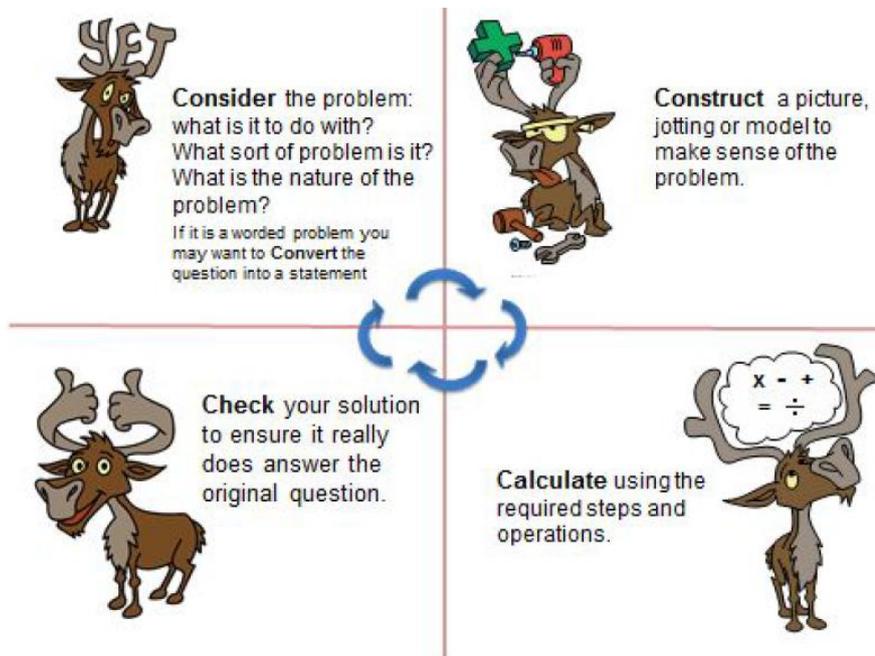
Gap Getting

An opportunity for 1:1 and small group gap getting. Use formative teacher assessment to establish gaps and secure these through guided teaching and fluency activities. The 'Arithmecheck' can act as a good diagnostic tool for checking against current and previous arithmetic statements; these can also be used to identify pupils who need gap-getting for specific statements.

Problem Solving

No more RUCSAC!

Acronyms like RUCSAC can often hinder pupils learning when problem solving. At Denham Green we use Can Do Maths 4 C's approach: This recognises the importance of fully understanding a problem before solving it. The cyclic approach can be seen below:



Growth Mindset

Developing a growth mindset approach to maths is important; this is why we don't put 'glass ceilings' on what they children can/can't do based on prior attainment. We value the importance of this belief and celebrate it as a key component of our principles.

We recognise 5 essential aspects of our 'Can Do Maths' approach:

- C- Convincing, explaining, justifying; the answer is only the beginning.
- A- Apply to different situations and contexts; make connections.
- N- Not; understanding what it's not as well as what it is.
- D- Draw; draw the concept to see 'structures' and relationships.
- O- OK; it's OK to not be able to get it yet, we learn from our mistakes.



Colin the 'Can Do' Caribou is a character which we use in school to support children with this concept. His antlers display a thumbs up/down or the word 'yet', to remind children that they can do maths. Some of Colin's behaviours when doing maths also support children to recognise different ways they can approach a problem. These include: experimenting, pattern sniffing, tinkering, conjecture, visualising, describing, guessing and inventing.

Vocabulary

Vocabulary is an important part of the maths teaching which happens throughout school. If a concept relates to a word then this should be made explicit to children so that they can have the opportunity to use the word in the correct context. Vocabulary which links should also be exposed to children; for example the inverse of addition is subtraction : these words are linked because they do the opposite thing- inverse means the opposite.

Throughout the unit vocabulary should be RAG rated and this provides children with the opportunity to identify which words they need to practise or learn. For some technical vocabulary definitions may be added onto the WW. The definition should be below the word and may contain a pictorial representation to support children in understanding the word.

Marking & Presentation

- The Do it, Twist it, Solve it (on planning) should be highlighted green or yellow depending on achievement.
- All children's work must be marked, with 40% developmental comments, and these addressed each morning during 'bubble time'; these may take the form of modelled corrections; scaffolded examples to complete; challenge and stretch questions; questions to address misconceptions.
- All books should have a 3-square border drawn down the left-hand side of the page; this will need to be taught and reinforced regularly, especially the correct use of a ruler.
- Children should write 1 digit in each square and neat handwriting/presentation is expected at all times. Teachers & teaching Assistants must model these expectations in lessons and when marking books.

EYFS

At Denham Green, we understand that early mathematical thinking is about more than learning facts and calculation techniques, it is about learning how maths is practised and how to 'do' mathematics. We use Numicon resources to support children's developing reasoning in mathematics. We aspire to create an environment where mathematical ideas are used in everyday situations and practitioners continually make links to the real world when thinking mathematically. In EYFS, we give children time to explore mathematical ideas through open-ended-activities and allow time for children to 'mark-make' mathematically and to talk through their thinking and representations.

LO pyramids are displayed in Reception and shared with the children. Maths strategies are modelled throughout EYF. Opportunities for children to embed number are provided daily in the environment. These activities encourage independence and are evidenced weekly. Additionally, there are regular mathematical 'challenges' for children to complete to promote mathematical awareness.

Planning schemes are taken directly from the GLOW maths materials for EYFS; this is adapted for the needs of children of nursery age in-line with the EYFS development matters statements. Weekly adult-led activities should be referenced in planning and should make links to both documents.

Homework

All children should be set homework on a Wednesday. If it is in a written format it should be completed in homework exercise books. The amount should be age appropriate as per the Homework policy. Work should be collected in on a Monday and marked before being handed out again on the Tuesday.

All children from year 1 upwards should be set up with a 'Times Tables Rock Stars' account, and encourages to use this at home as often as possible.

Year 6 students should be set up with a Hegarty Maths account, and homework can be completed online. If children do not have internet access at home, there will be lunchtime provision for Year 6 children to complete their homework.

Online Links & Resources

Links to support Subject Knowledge, Planning, Teaching & Learning.

New Maths Curriculum - Programmes of Study

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335158/PRIMARY_national_curriculum_-_Mathematics_220714.pdf

EYFS

GLOW Maths Scheme

<http://mathsnav.com/>

<http://nrich.maths.org/early-years>

<http://www.bbc.co.uk/schools/websites/eyfs/>

<http://www.thegrid.org.uk/learning/maths/>

Key Stage 1 & 2

<http://nrich.maths.org/teacher-primary>

<http://www.kangaroomaths.com/kenny.php>

<http://www.testbase.co.uk/sec/index.asp>

<http://www.thegrid.org.uk/learning/maths/>

<http://www.mathsframe.co.uk/>

<http://www.mathplayground.com>

<https://ttrockstars.com/login>

<https://hegartymaths.com/>

<https://www.ixl.com/>

<https://www.ixl.com/>

Maths 'no problem'- set in stages

Singapore Maths

Arithmekit- set in stages

Low Threshold, High Ceiling

<http://nrich.maths.org/8769>

Subject Knowledge & Beyond!

<https://www.ncetm.org.uk/join>

<http://www.mrbartonmaths.com/links.htm>

<http://www.amathsdictionaryforkids.com/mathsCharts.html>

<http://www.studyladder.co.uk>

<https://www.hamilton-trust.org.uk/>

Using a Counting Stick

<http://www.youtube.com/watch?v=yXdHGBfoqfw>

Other Maths Teacher Videos for own Subject Knowledge

<http://www.youtube.com/watch?v=59mfAE0TeV0>