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Contents

Introduction

Context of Guidance

The guidance is written for use by class teachers, subject teachers, Sencos, Head Teachers and Senior Management. The aims of the document are as follows: -

- **To enable schools to support learners with Specific Learning Difficulties (Dyscalculia) within a national framework, which includes:**

  - ➢ The SEN code of practice (2001)
  - ➢ The SEN and Disability Act (2001)
  - ➢ The Waves of Intervention within the National Literacy Strategy (NLS) and National Numeracy Strategy (NNS)
  - ➢ Promoting inclusion through establishing Dyslexia Friendly Schools (DfES/BDA 2000)
  - ➢ Supporting children with gaps in their mathematical understanding (DfES 1168-2005G)
  - ➢ Excellence & Enjoyment: learning and teaching in the primary years (DfES 0518-2004G)

- **To provide practical and relevant guidance on:**

  - ➢ Initial identification of SpLD (Dyscalculia) within a school context
  - ➢ Summative, criteria referenced and standardised assessment
  - ➢ Whole school and individual planning for learners with SpLD (Dyscalculia)
  - ➢ Designing interventions, support strategies
  - ➢ Evaluation of support and monitoring progress

- **To suggest useful resources, web links and references**

ALL SECTIONS OF THE GUIDANCE CAN BE PHOTOCOPIED

Advice has been organised as stand alone pages that can be copied individually or collated into packs of relevant information and given to teaching and support staff, governors, parents and other professionals.

Assessment information and details of interventions will be especially useful when schools are working jointly with the Educational Psychology Service and the Education Support Service, including the Learning, Language and Communication Team.

Waves of Intervention

The SEN Code of Practice (2001) describes a “graduated response” to identifying and meeting special educational needs (including Specific Learning Difficulties). At KS1 and KS2 these responses are mapped onto the National Literacy Strategy (NLS) and the National Numeracy Strategy (NNS) in 3 waves.

Three “waves”

Provision for effective mathematics learning and teaching can be described in terms of the three “waves” of intervention

WAVE 1	The effective inclusion of all children in high quality learning and teaching of mathematics in the daily mathematics lesson.
WAVE 2	Additional time-limited provision in the form of small-group intervention to accelerate progress and enable children to work at age-related expectations.
WAVE 3	Additional provision to enhance the progress of identified children where Waves 1 and 2 are not, on their own, having the desired effect. This will involve focused teaching activities which tackle fundamental errors and misconceptions that are preventing process or focus on an alternative learning style.

Definitions

There is increasing interest in the difficulty experienced by some pupils when learning mathematics. Consequently, there is an increase in the amount of information and guidance published.

In 2001, the DfES issued a booklet with guidance on supporting pupils with dyscalculia in the National Numeracy Strategy

DfES definition for Dyscalculia is as follows;

> **Dyscalculia**
> Dyscalculia is a condition that affects the ability to acquire arithmetical skills. Dyscalculic learners may have difficulty understanding simple number concepts, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence.
>
> Very little is known about the prevalence of dyscalculia, its causes, or treatment. Purely dyscalculic learners who have difficulties only with number will have cognitive and language abilities in the normal range, and may excel in non-mathematical subjects. It is more likely that difficulties with numeracy accompany the language difficulties of dyslexia.

The British Dyslexia Association describes Dyscalculia in the following way;

> Dyscalculia
> "Dyscalculia is a learning difficulty involving the most basic aspect of arithmetical skills. The difficulty lies in the reception, comprehension or production of quantitative and spatial information. Students with Dyscalculia may have difficulty in understanding simple number concepts, lack an intuitive grasp of numbers and have difficulties learning number facts and procedures. These can relate to basic concepts such as telling the time, calculating prices, handling change, estimating and measuring such things as temperature and speed."
>
> (http://www.bda-dyslexia.org.uk)

North Somerset is committed to supporting pupils with SpLD (dyscalculia) by promoting the model "the circles of inclusion" (reproduced on P5) used in the Primary National Strategy "Learning and teaching for dyslexic children" DfES (1184-2005 CDI)

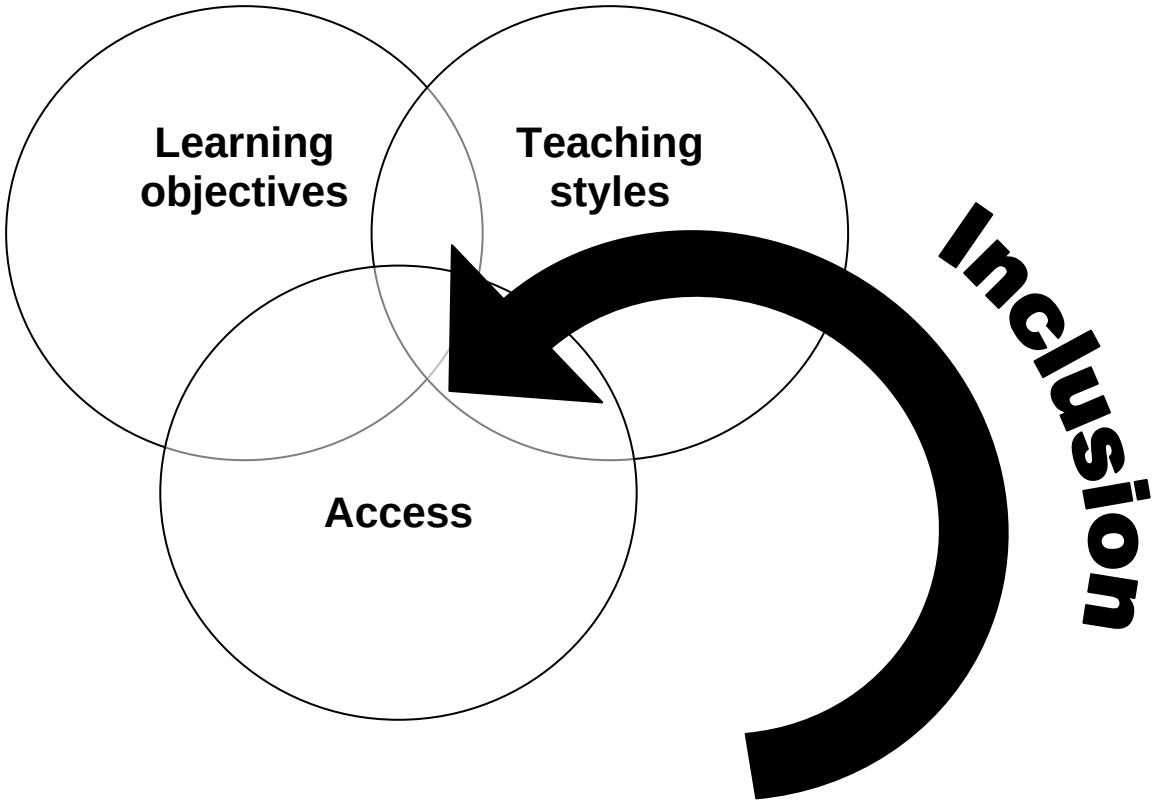
The materials in this publication are intended for teachers of all pupils with difficulty in learning mathematics.

The Circles of inclusion

(North Somerset is committed to supporting those pupils wit SpLD (dyscalculia) by promoting the model "the circles of inclusion" used in the Primary National Strategy "Learning and teaching for dyslexic children" DfES1184-2005 CDI)

Setting suitable learning challenges

Responding to pupils' diverse needs



Overcoming potential barriers to learning

RESEARCH INTO CHILDREN'S MATHEMATICAL DIFFICULTIES AND THEIR COMMON CHARACTERISTICS.

The DfES recently commissioned a research review to identify what works for children with mathematical difficulties (DfES research report 554, What Works for Children with Mathematical Difficulties). This review covers:

- Findings about the incidents of mathematical difficulties and their common characteristics.
- The important fact that arithmetical ability is not a single entity, but is made up of many components with the effect that arithmetical difficulties are varied and heterogeneous.

Children's Mathematical Difficulties and Their Common Characteristics

The review suggests that mathematical difficulties are: -

- Common and often quite specific.
- Equally common in boys and girls
- Children's mathematical difficulties present in different forms
- The causes for such difficulties are varied and include,
  - inadequate or inappropriate teaching,
  - absence from school resulting in gaps within mathematical learning
  - lack of pre-school home experiences in both mathematical activities and the use of language.

Difficulties with calculating

Although mathematics includes much more than arithmetic, most studies of mathematical disabilities and difficulties are focused on problems with number and arithmetic. This is because the ability to calculate is not unitary. It is made up of many components ranging from a knowledge of the counting sequence to estimation, to solving word problems. Moreover, although the different components often correlate with one another, weaknesses in any one of them can occur relatively independently from weaknesses in the others. Several studies have suggested that it is not possible to establish a strict hierarchy, whereby any one component invariably precedes another component. **Interventions that focus on the particular components that an individual child has difficulty with are likely to be more effective than those that assume all children's number and calculation difficulties are similar.**

Difficulties in remembering number facts

Difficulty in remembering number facts is a very common component of arithmetical difficulties, often associated with dyslexia. Not all children with arithmetical difficulties have this problem, however. Some children, for example, can remember many number facts, but seem to lack strategies (including suitable counting strategies) for working out calculations when they do not know the answer. Some children can deal with single digit arithmetic, but have serious difficulty in achieving even a limited understanding of 10s, units and place value.

Mathematical strengths and weaknesses

Children with mathematical difficulties typically combine significant strengths with specific weaknesses.

- Most commonly they have a good informal understanding of number concepts, but have trouble in using written symbols and standard score methods.

- Some have particular difficulties with the language of maths.

- Other common areas of difficulty identified include word problem solving, representation of place value and the ability to solve multi-step arithmetical problems.

Intervention strategies

The review examined a number of intervention strategies, and concluded: -

- Children may require different degrees and types of intervention at various stages of their mathematical development.

- Children's difficulties with calculation are highly susceptible to intervention. These interventions can take place successfully at any time and can make an impact. It is not the case that a large number of children are simply "bad at maths" and that nothing can be done about it.

- Short but regular interventions of individualised work may bring a child to the point where they can profit much better from the whole class teaching that they receive.

- Individualised work with children who are falling behind in number and calculation has a significant impact of their performance. The amount of time given to such individualised work does not, in many cases, need to be very large to be effective.

- A set programme is less likely to be successful.

- Computer based interventions can be effective, but tend to result in less progress than intervention carried out by teachers.

- Streaming and setting, as commonly used, may have deleterious effects on low achievers performance, not because they take too much account of individual differences, but because they lead to taking too little account of individual differences.

- The use of teaching assistants to support children with numeracy difficulties is not a panacea in itself, but may have beneficial effects if assistants are suitably trained and effectively deployed.

Levels in the learning of mathematics

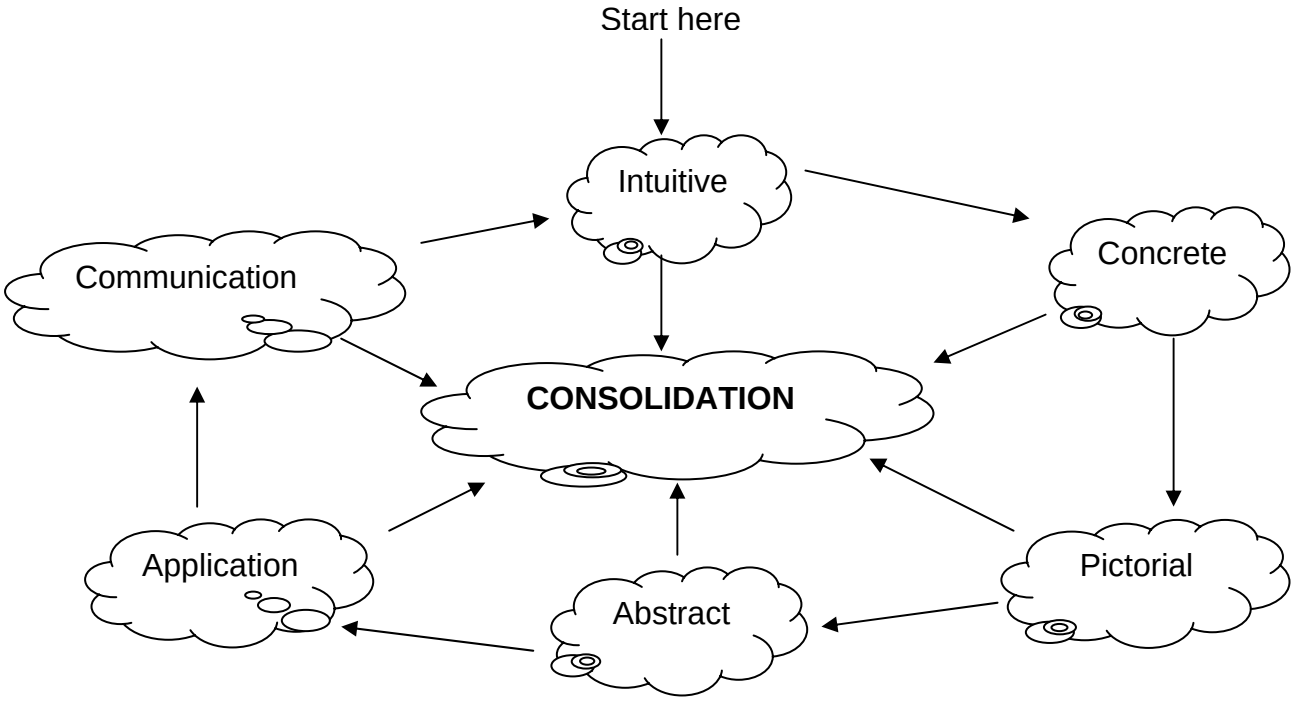
In this section the word "level" is not used in relation to describe the difficulty of the mathematical topic or focus.

Based on the work by Sharma (1990), the term "level" refers to the order that information presented mathematically is processed and learned.

Levels of Learning

This hierarchy of learning can in turn offer a structure for the teacher to follow. Sharma proposes the following order as effective for the teaching of mathematics to pupils with dyslexia:- Intuitive, Concrete, Pictorial/Representational, Abstract, Applications, Communication, which require Consolidation at all levels

Intuitive:	At the intuitive level, new material is connected to already existing knowledge. (The teacher checks out the connection is correct).
Concrete/Experiential:	Apparatus, materials are used to introduce, practise and re-enforce rules, concepts and ideas.
Pictorial/Representational:	Picture, diagram, image is used to solve a problem or prove a theorem.
Abstract:	Pupil is able to process symbols and formulae.
Applications:	Pupil is able to apply a previously learned concept to another topic.
Communication:	The pupil is able to convey knowledge to another pupil reflecting an embedded understanding and the highest level of learning.



Approaches to Maths learning adopted by learners with Specific Learning Difficulties (Dyscalculia)

(Based on work by Steve Chinn, Independent Dyslexia and Dyscalculia Consultant and Julie Key Principal Mark College (see appendix 1)

The National Numeracy Strategy supports the differentiated teaching of mathematics. While using the same strand with the whole class the teacher can "track back" for individual pupils to enable them to work at the appropriate level. The structure of lessons suggested in the Numeracy Strategy allows the teacher to differentiate so that each pupil is working at the appropriate level within each session.

Based on some recent studies, two distinct maths learning styles can be identified for children learning maths. The characteristics of these two styles are often classified by the labels or terms ***"inchworm" or "grasshopper","quantative" or "qualitative"*** and ***"sequential" or "holistic".*** It is helpful for teachers to be familiar with these two distinct learning styles in order to use the teaching style to match the needs of the pupil.

Successful mathematicians are generally those who are skilled at applying and using both approaches.

Learning Style Approaches (Inchworm/Grasshopper) to Numeracy

Pupil

Inchworm Approach	Grasshopper Approach
▪ Prefers to follow a rule	▪ Prefers controlled exploration
▪ Prefers to follow a procedure	▪ May redesign or simplify the problem
▪ Fails to have an overview	▪ Tends to have an holistic overview
▪ Tends to see topics in isolation	▪ Tends to link topics
▪ May have a poor grasp of concepts	▪ More likely to grasp concepts
▪ Tends to have inflexible focus – identifies question only (not in relation to previous learning)	▪ Flexibility of focus – may use a range of methods based on previous learning
▪ Prefers "paper & pencil" methods	▪ Prefers to calculate mentally and dislikes recording in writing
▪ Tends to reproduce procedures by rote (often inaccurately)	▪ Needs to be taught and use standard methods of calculation
▪ Finds checking solutions difficult and generally repeats the original source method	▪ May well use alternative method to check answer

WAVE 3 MATHEMATICAL MATERIALS

(Primary National Strategy, DfES 1165-2005, Wave3 Mathematics/using the pack)

Overview of materials

The Wave 3 mathematics materials are intended to have a broad application for children in KS2 with difficulties in cognition and learning. They focus on a selection of key objectives in addition and subtraction and multiplication and division in the National Numeracy Strategy. These materials, which are available on a CD from Prolog(tel: 0845 6022260) exemplify progression in calculation in Reception, Year 2, Year 4 and Year 6 as milestones.

The progression charts represent the whole primary age range and teachers will need to "track back" to find the error or misconception appropriate for the child irrespective of the year group.

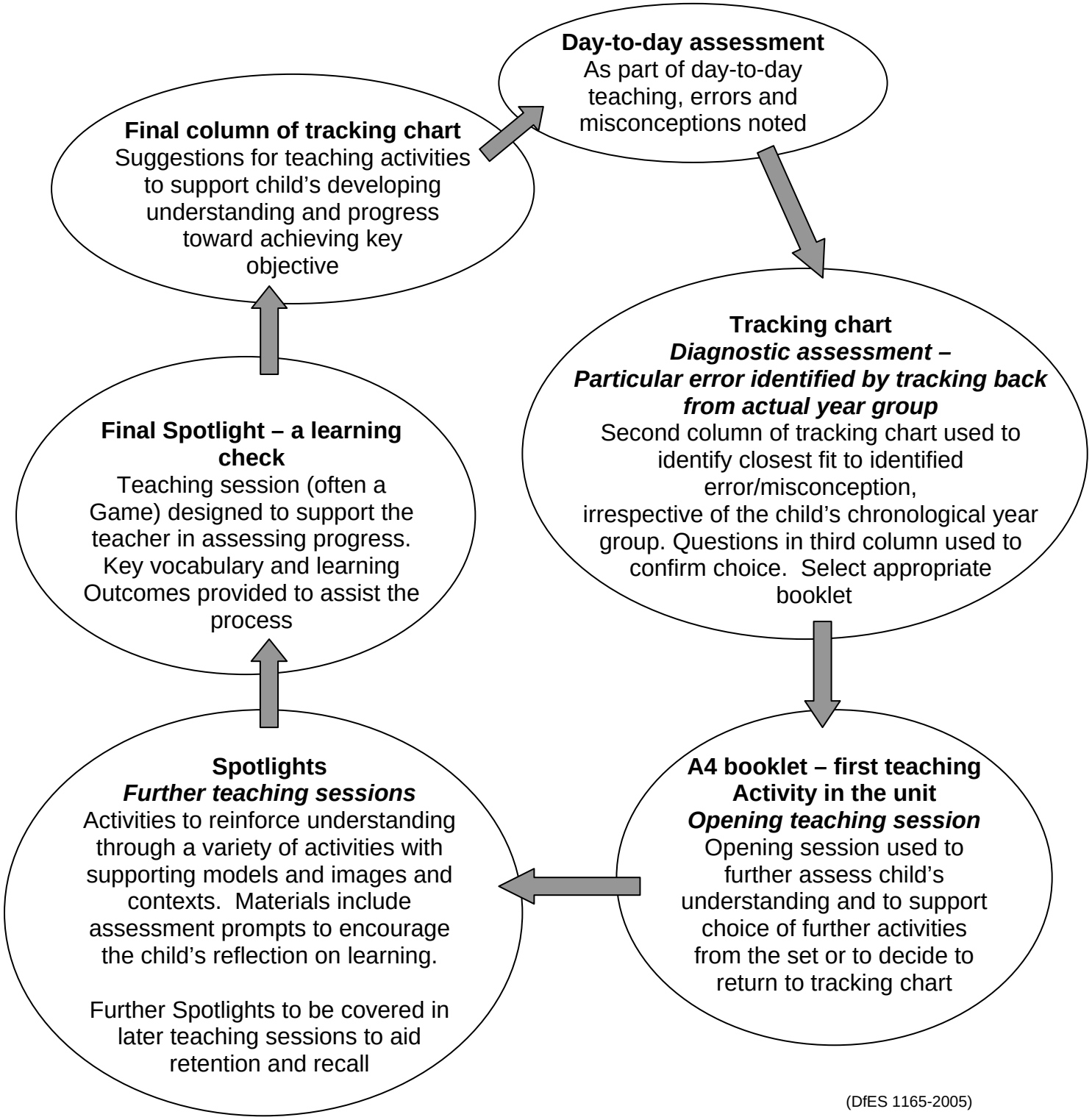
- Each error and misconception refers you to an A4 booklet that, contains resources, key vocabulary and teaching activities in the form of five spotlights.
- These spotlights are short focussed teaching activities. The final one includes assessment opportunities often in the form of a game.
- A wide range of resources are used in the teaching sessions, including links to ICT resources such as ITPs. Teacher's selection of these to suit the needs of their children is an important part of adapting the materials.
- There is a focus on progression in counting to support the development of secure counting skills.
- There is also an emphasis on estimating first, then calculating and then checking

Assessment and planning process

Wave 3 Mathematics

Day-to-day assessment is the starting point. Assessment opportunities are embedded in all the teaching materials.

The following flow chart describes the process assumed in the design of these Primary National Strategy materials.



(DfES 1165-2005)

Addition and subtraction teaching units

Wave 3 Mathematics

Year 6	Error / misconception
1	Has inefficient counting strategies and/or insecure understanding of the number system.
2	Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the number involved.
3	Has difficulty in partitioning numbers with zero place holders and/or numbers less than one, for example the zero partitioning 0.45 as 0.4 and 0.05
4a	Had difficulty in choosing suitable methods for calculations that cross boundaries: addition
4b	Had difficulty in choosing suitable methods for calculations that cross boundaries: subtraction

Year 4	Error / misconception
1	Has insecure understanding of the structure of the number system, resulting in addition and subtraction errors and difficulty with estimating.
2	Has difficulty in partitioning, for example, 208 into 190 and 18, and 31 into 20 and 11
3	Does not make sensible decisions about when to use calculations laid out in columns
4	Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Year 2	Error / misconception
1	Makes mistakes when counting using teen numbers and/or crossing boundaries.
2	Has difficulty in remembering number pairs totalling between ten and twenty, resulting in calculation errors.
3	Counts up unreliably; still counting the smaller number to get one too many in the answer.
4	Does not relate finding a difference and complementary addition to the operation of subtraction
5	Is insecure in making links between addition and subtraction and/or recognising inverses.
6	Does not readily use number patterns to support calculating

Year R	Error / misconception
1	Can only begin counting at one; inaccurately counts objects when rearranged; has no consistent recognition of small numbers of objects; lacks systematic approaches
2	Misunderstands meaning of “one more” and “one less”; does not consistently identify the number before or after a given number.
3	Does not relate the combining of groups of objects to addition and/or does not interpret the counting of all the objects as the answer to the question?
4	Is not confident about when to stop counting when taking away (subtracting) in answer to the question “How many are left?"

Multiplication and division teaching units

Wave 3 Mathematics

Year 6	Error / misconception
1	Misuses half-understood rules about multiplying and dividing by powers of ten and the associative law, for example: 145_30= 145 000
2	Has difficulty, when appropriate, interpreting a remainder as a fraction, for example 16_3= 5
3	Interprets division as sharing but not as grouping (repeated subtraction) so is unable to interpret a calculation such as 12
4	Is not confident in making reasonable estimates for multiplication or division calculations

Year 4	Error/ misconception
1	Is not confident in recalling multiplication facts
2	Is muddled about the correspondence between multiplication and division facts
3	Describes the operation of multiplying by ten as “add a nought”
4	Does not apply partitioning and recombining when multiplying
5	Assumes that the commutative law holds for division also
6a	Writes a remainder; that is larger than the divisor
6b	Discards the remainder; does not understand its significance
6c	Does not recognise when a remainder is significant in the decision about whether to round up or down
7	Continues to subtract twos when calculating twenty divided by two without using knowledge that two multiplied by five equals ten

Year 2	Error / misconception
1	Still counts in ones to find how many there are in a collection of equal groups; does not understand vocabulary
2	Does not link counting up in equal steps to the operation of multiplication; does not use the vocabulary associated with multiplication
3	Does not focus on “rows of” or “column of” but only sees an array as a collection of ones
4a	Has difficulty relating multiplying by two to know facts about doubles; records double four as 4 + 4
4b	Does not use partitioning to find double twelve or double thirty-five
5	Does not use knowledge of doubles to find half of a number
6	Is not systematic when sharing into equal groups; does not use the language of division to describe the process
7	Does not understand that “sets of” or “groups of” need to be subtracted to solve the problem

Year R	Error / misconception
1	Confuses numbers when counting in twos; has difficulty understanding a pair consists of two objects
2	Has difficulty with identifying doubles and adding a small number to itself
3	Makes unequal groups and is unable to compare the groups
4	When sharing, can sometimes make equal groups, but has no strategies to deal with any left over
5	Has difficulty with counting reliably in tens from a Intro Whisper and jump multiple of ten
6	When halving, makes two unequal groups or splits a single object unequally

Identification of Specific Learning Difficulties (Mathematical Difficulties)

Initial Identification

The following descriptors can be used for initial identification of SpLD (dyscalculia) at any key stage. If a pupil has several of the indicators, then further diagnostic assessment should be undertaken.

The checklist is intended as a first response at the School Action Stage. It is for use by classroom practitioners to develop a profile of the mathematical difficulties associated with dyscalculia that the pupil is experiencing.

Other useful information would include: -

- Baseline Assessment
- Foundation Stage Profile
- P Levels
- SAT results
- National Curriculum indicators
- The Primary National Strategy's Wave 3 material

The principles of Assessment for Learning (AfL) underpin all advice in this guidance. It is assumed that learners will be active in their own assessment, target setting and reviewing.

Information on AfL using Wave 3 materials has been included (see page 12) in this guidance.

The materials reflect best practice in assessment for learning as a key tool for raising achievement through:

- Use of questions to elicit information about children's understanding;
- Sharing the purpose of the activity with the learners;
- Encouraging children's reflection on their learning and identification for themselves of possible next steps.

Checklist for initial identification of pupils with SpLD (dyscalculia)

Name: Date of Birth:

Completed by: Date:

Chronological Age:

NC Year:

Indicators Profile (Tick and complete the relevant boxes)

Numbers and the number system

Observed behaviour	✓	Comment
Difficulty counting objects accurately		
Difficulty processing and memorising sequences (counting backwards, counting in 2's)		
Difficulty understanding the structure of the number system (number patterns, grids)		
Difficulty understanding the structure of a number line		
Difficulty understanding place value (spoken/written)		
Finds fractions confusing (1/20 is smaller than ½)		

Further advice is in National Numeracy Strategy Guidance to support pupils with dyslexia and dyscalculia ref: DfES 0512/2001.

Checklist for initial identification of pupils with SpLD (dyscalculia)

Name: Date of Birth:

Completed by: Date:

Chronological Age:

NC Year:

Indicators Profile (Tick and complete the relevant boxes)

Calculations

Observed behaviour	✓	Comment
Has difficulty combining and partitioning number (3+2=5, 2+3=5, 23+2=25)		
Has difficulty learning number facts by rote and recall (number bonds, times tables)		
Has difficulty with mental calculation (confused, slow)		
Not able to remember alternative methods to help when calculating		
Counting difficulties lead to subtraction errors (9 – 7 =)		
Has problems recording calculations on paper (difficulty writing the digits, difficulty remembering the procedures)		
Has problems using calculators (difficulty selecting appropriate digit or operational keys, difficulty between the stages of reading on the page and transferring it to a calculator)		

Further advice is in National Numeracy Strategy Guidance to support pupils with dyslexia and dyscalculia ref: DfES 0512/2001.

Checklist for initial identification of pupils with SpLD (dyscalculia)

Name: Date of Birth:

Completed by: Date:

Chronological Age:

NC Year:

Indicators Profile (Tick and complete the relevant boxes)

Solving Problems

Observed behaviour	✓	Comment
May have significant reading difficulties (poor reading ability, low comprehension levels)		
May have difficulties in understanding and retaining the meaning of abstract mathematical vocabulary (difference, multiply, divide)		
May have difficulty matching which operation to use to solve a word problem (difference /-, the sum of /=)		
May solve word problems holistically but without using to formal operations (can produce answer but unable to sequence)		
Dislikes or unable to use estimation (will avoid this type of activity)		

Further advice is in National Numeracy Strategy Guidance to support pupils with dyslexia and dyscalculia ref: DfES 0512/2001.

Checklist for initial identification of pupils with SpLD (dyscalculia)

Name: Date of Birth:

Completed by: Date:

Chronological Age:

NC Year:

Indicators Profile (Tick and complete the relevant boxes)

Measures, Shape and Space

Observed behaviour	✓	Comment
Unable to sequence days of the week, months of the year		
Unable to tell the time using an analogue clock (other than simple o'clock time)		
Language of time is confusing in relation to the visual image and written word e.g. 7:10 - ten past seven		
May confuse left and right clockwise/anticlockwise		
No sense of setting out written work on paper or in maths book		
May have problems with vocabulary so unable to discriminate between similar sounding words eg triangle/rectangle and/or understanding and learning the properties of these shapes		
May have difficulty reading and spelling some of the associated vocabulary e.g. parallel, isoceles		
Difficulty with spatial imagery when presented with 2D representations of 3D shapes		
May have difficulties reading graphs and charts		
May find difficulty copying/drawing shapes accurately		

Further advice is in National Numeracy Strategy Guidance to support pupils with dyslexia and dyscalculia ref: DfES 0512/2001.

Checklist for initial identification of pupils with SpLD (dyscalculia)

Name: Date of Birth:

Completed by: Date:

Chronological Age:

NC Year:

Indicators Profile (Tick and complete the relevant boxes)

Handling Data

Observed behaviour	✓	Comment
May have difficulties reading graphs and charts		
May have problems understanding the different types of averages		

Further advice is in National Numeracy Strategy Guidance to support pupils with dyslexia and dyscalculia ref: DfES 0512/2001.

Assessment of Specific Learning Difficulties (Dyscalculia)

Overview of Assessment

Why are you testing?

- To further investigate some concerns about the pupil
- To diagnose the pupil's learning strengths, skills and weaknesses
- To plan an appropriate programme of intervention
- To monitor progress

Assessment Materials

Attainment Assessment - A norm-based test will provide:

- A maths age score
- A performance score in relation to other pupils of the same age
- Provide material for initial diagnostic interpretation

Diagnostic Assessment - A criterion referenced test will:

- Provide information on specific areas of difficulty
- Act as an initial diagnostic resource

Individual Diagnostic Assessment
The method of administering the diagnostic test is as important as the choice of the test, provided that it is at a suitable level for the pupil. Working alongside the pupil whilst doing the test is the optimum method to gather information about the pupil's mathematical knowledge, ability and learning style.

Gather information by:

- Talking to pupil
- Offering alternative language and symbols if these appear to be a barrier
- Use of curious questions as to how the pupil answered the question
- Use of curious questions when the pupil omits to answer
- Observations on methods, knowledge, skills, language and speed
- Noting levels of anxiety

Assessment Materials

The following standardised tests can be used for diagnostic purposes but they will also give an approximate mathematics age for each pupil.

Name of test	Aim	Age Range	Time to Administer	Group/ Individual	Supplier
Wide Range Achievement Test (WRAT-3)	To assess arithmetical and algebra skills	5yrs–75yrs	Approx 15mins (limited reading)	Both	Dyslexia Institute
Basic Number Screening Test	To assess basic number skills	7yrs-12yrs	Not timed	Both	Hodder & Stoughton
6-14 Tests of Mathematical attainment	To assess mathematical skills	6yrs-14yrs	Approx 45 mins	Both	Nfer nelson
Profile of Mathematical Skills	To assess mathematical skills	8yrs-15yrs	8x30 min tests	Both	Nfer Nelson
Graded Arithmetic Mathematics Test	Mainly tests number but some other areas	5yrs-12yrs	Approx 30 mins	Both	Hodder & Stoughton
Mathematics Competency Test	Mainly tests number but includes some other areas	11yrs-17yrs	Approx 30 mins	Both	Hodder & Stoughton
Maths Links Tests of Mastery	Questions linked to specific mathematical area	Level 1 7yrs-9yrs Level 2 10yrs-12yrs	Minimum approx 15 mins	Individual	Nasen
The Dyscalculia Screener	ICT	6yrs – 14yrs	Variable	Individual	Nfer Nelson

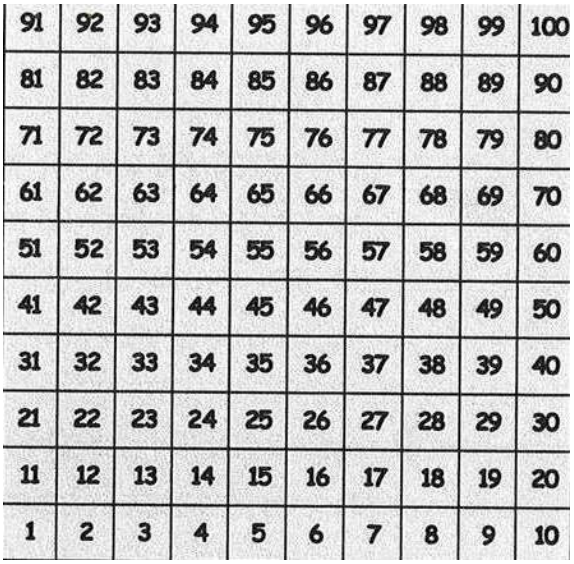
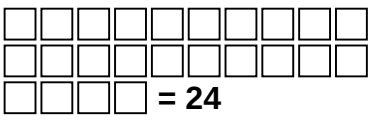
NB You may have other relevant assessment materials, which are in regular use, at your school

Interventions to support pupils with Specific Learning Difficulties (dyscalculia)

Using specific information from the completed checklists, the following suggestions may be useful to support particular individuals or groups of pupils, who are having mathematical difficulties

Strategies to support pupils with Numbers and the number system

Activity	Strategy
Counting objects	▪ Teach pupil to count in an organised and meaningful way ▪ Frequent opportunities to count objects ▪ Touch/move objects when counting ▪ Synchronise counting aloud when moving objects ▪ PAUSE to take in the quantity, at the end of the counting sequence
Processing and memorising sequences	▪ More opportunities to practise a spoken counting sequence ▪ Additional practise in counting difficult sequences e.g., backwards ▪ Oral counting into higher value sequences with visual support images eg. 0.7, 0.8, --, --, 1.1, 1.2 ▪ Use visual patterns e.g. 5, 10, 15, 20 to support problems with memory ▪ Support counting through transitions e.g. 850, 950, 1050, 1150 ▪ Use visual supports for cross counting activities e.g. counting in hundreds giving way to counting in tens ▪ Practise written counting activities based on ideas as above
Understanding the underlying structure of the number system	▪ Use a 100-bead frame, (kinaesthetic), to assist understanding before moving on to the grid (visual) ▪ Use specifically designed materials e.g. Dienes blocks

	▪ Alternative presentation of 100-grids may help with 1-10 across the bottom 
Understanding the interval-based structure of the number line	▪ Use practical versions of “number lines” e.g. a 100-bead string, sumthing beads ▪ Estimated quantities should be counted into structured tracks. This may facilitate “rounding”  ▪ Number lines should highlight number structures e.g. on a 100 line, the decades should be clearly demarcated ▪ “Emptier” lines and “emptier” materials, may help some pupils e.g. counting stacks

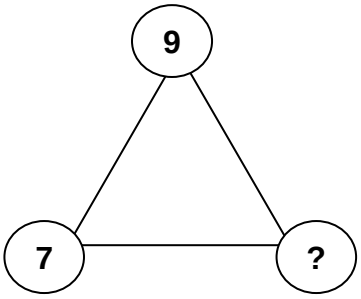
Counting forwards and backwards	▪ Use a clearly labelled number line ▪ Use counters placed in recognisable patterns e.g. dominoes ▪ Teach pupils the difference between the spoken number system and the written number system e.g. inconsistencies of the teen numbers, irregular words and regular patterns ▪ Use Base ten blocks or coins to illustrate which digit remains constant and which changes e.g. 62, 72, 82
Understanding place value	▪ Teach the language structure of a number together with the digit structure of a number. e.g. 96, ninety six ▪ Language uses names to give value to counting e.g. nine hundred and ninety nine. ▪ Numerals show place value e.g. 1058 ▪ Teach pupils the language value system in relation to the written recording system by using concrete, practical materials e.g. base ten materials ▪ Use place Value Cards to demonstrate structure of numbers at a more symbolic/abstract level of learning
	Additional suggestions which may help….

<table>
<tr><th>Activity</th><th>Strategy</th></tr>
<tr><td>Understanding fractions</td><td>

Use a fraction wall to clarify confusions e.g. 1/20 is smaller than ½.
To illustrate equivalents e.g. ½, 2/4, 4/8.
To support the understanding of relationships e.g. 1/3, ¼. 1/5.
Opportunities to participate in practical activities to establish an understanding of fractional parts e.g. cutting, building, shading, paper folding
Use concrete materials to demonstrate/reinforce teaching points e.g. chocolate bars, bread sticks, coins
Teach the relationship between fractions, decimals and percentages using pupil knowledge and experience of everyday expressions and symbols
e.g. ½, 50%, £0.50
Re-enforce knowledge through games e.g pelmanism using equivalent cards
Access to simple conversion charts e.g.

<table>
<tr><th>Fraction</th><th>Decimal</th><th>Percentage</th></tr>
<tr><td>¼
½
¾</td><td>0.25
0.50
0.75</td><td>25%
50%
75%</td></tr>
</table>
and further development of this aide memoir will be helpful
</td></tr>
<tr><td></td><td>Additional suggestions which may help…..</td></tr>
</table>

Calculations

Activity	Strategy
Combining and partitioning numbers	▪ Pupils work with concrete materials ▪ Component parts of all numbers to 10 should be "over learned" in oral and written activities ▪ Pupils taught number patterns which are extensions of earlier knowledge (e.g. 3+2=5, 42+2=45)
Learning number facts	▪ Patterns taught using multi-sensory approaches ▪ Memory hooks relate new facts to learned facts ▪ Visual imagery will help to illustrate links (e.g. 5+5 and 5+6 using coins, numicon) ▪ Use games and other fun activities to practise facts ▪ Encourage learners to maximise the use of key number facts e.g. " x 10" facts can be used to deduce " x 9" facts e.g. 9x7 = (10x7) – 7 ▪ Pupils have access to appropriate ICT programmes to practise facts e.g Numbershark
Mental calculation methods	▪ Teach strategies that can be generalised e.g. partitioning as this skill can be more widely used across a range of calculations
Counting in substraction calculations	▪ "Counting Up" may be helpful e.g. 9-7=☐, 7+☐=9 ▪ Triad method of recording number facts can be helpful  ▪ "Bridging up through ten" may be helpful to work out such calculations as 13-8

<table>
<tr><td>Mental maths</td><td>

- Use careful differentiated questioning
- Encourage learners to use “jottings”
- Use key questions as a prompt e.g. adding 9 as 10-1, could include “Have you remembered to adjust the answer?”

</td></tr>
<tr><td>Recording calculations on paper</td><td>

- Working with the most significant digit first may be the most useful approach for mental and written calculations

<table>
<tr><td>Addition 768</td><td>Subtraction 716</td></tr>
<tr><td>+166</td><td>- 428</td></tr>
<tr><td>Add 100 868</td><td>Subtract 400 316</td></tr>
<tr><td>Add 60 928</td><td>Subtract 70 296</td></tr>
<tr><td>Add 6 934</td><td>Subtract 8 288</td></tr>
</table>

- Use base 10 materials to support the introduction of written calculations
- Use squared paper to model multiplication

</td></tr>
<tr><td>Using calculators</td><td>

- Pupils should be taught how using a calculator will access more mathematics but it will not be a total problem solver
- Design, style, size etc of the calculator may have to be chosen to meet particular needs of the pupil
- Learners may need to be taught strategies to support the stages of reading and interpreting the written calculation and transferring it to the keyboard

</td></tr>
<tr><td></td><td>Additional suggesions which may help…</td></tr>
</table>

Solving Problems

Activity	Strategy
Reading word problems	▪ When reading unusual words or mathematical vocabulary is a problem, read the problem to the pupil ▪ Replace words with simple images or representations ▪ Replace unusual vocabulary with familiar vocabulary drawn from a familiar context to the learner eg linked to hobby ▪ Pre-teach mathematical vocabulary ▪ Vocabulary prompt cards, memory jigs need to be available ▪ Introduce strategies comfortable to the learner to overcome the vocabulary difficulties
Using patterns to solve word problems	▪ Introduce the use of a "problem solving frame" eg, ➢ read the problem ➢ identify the key information ➢ Write it down or draw pictures ➢ Use an appropriate calculation method; mental, written, calculator ➢ Interpret the answer in the context of the question ▪ Use "problem solving" wheel see Appendix – 3 ▪ Pupils invent their own word problems to help understanding of how questions are constructed ▪ Use materials, images etc to interpret word problems
Understanding and retaining abstract mathematical vocabulary	▪ Build an understanding of abstract terminology by using both formal and informal words until concept is understood eg "divide" share, split

Deciding which operations to use to solve a word problem	▪ Use memory cards to support retention ▪ Continue to use concrete materials ▪ Drawing diagrams to support understanding of the problem
Solving word problems without reverting to formal operations	▪ Use a number sentence or story to understand the problem ▪ A calculator may help to show the relevant calculation ▪ Spld learners may devise a personal strategy if it provides opportunities to succeed
Estimation	▪ Visual models will encourage learners to see “closeness” and encourage confidence to take risks
	Additional suggestions which may help…..

Measures, shape and space

Activity	Strategy
Sequencing time	▪ Sequencing the days of the week, months of the year etc may need to be taught in small chunks ▪ Give learners opportunities to practise and revisit sequencing (orally, visually and kinaesthetically etc) ▪ Use an analogue clock face to reduce the confusion arising from the language of time to the written record e.g. 7.10 is said as ten past seven ▪ A set of personal sequencing cards may support the introduction of digital representation
Learning and remembering position, direction and movement	▪ Learners may need to be involved in physical activities e.g. using direction cards, P.E. Games activities ▪ Use a simple mnemonic if appropriate e.g. write with my right hand the one that is left is my left ▪ Use a visual image e.g. for left and right the remaining me being right **Left** **Right**   ▪ Use visual image for clockwise and anti-clockwise e.g. analogue clock face ▪ Use ICT equipment e.g. computer software, programmable toys

Learning and understanding range of vocabulary related to measures, shape and space	▪ Pre-tutoring of specific mathematical vocabulary which may cause confusion in understanding and learning the properties of the shapes e.g. triangle, rectangle ▪ Memory cards/prompts may help to support learner ▪ 3-D shapes to be available when learners are presented with 2-D representations e.g. cube, cuboid ▪ Vocabulary cards to be available to support spelling
Reading graphs	▪ A simple mnemonic may help to clarify reading the x and y axes e.g. alongside the corridor and up the stairs
Drawing shapes	▪ Support drawing through activities eg joining dots, modelling in plasticine etc ▪ Use specialist equipment when drawing e.g. rulers, templates, curves etc
	Additional suggestions which may help….

Handling Data

Using specific information from the completed checklist, the following suggestions may be useful to support particular individuals or groups of pupils

Activity	**Strategy**
Reading graphs and charts	▪ Ensure that diagrams are clearly labelled ▪ Highlight data recorded in different colours
Understanding the different types of averages	▪ Use separate coloured cards to record the words and their meanings to help understanding and discrimination of “terms” e.g. Mode Most frequent Median Middle Mean Average Range “Biggest minus Smallest”
	Additonal suggestions which may help….

Target setting and IEPs for Numeracy

When target setting, it is vital that the specific area of difficulty is identified and **SMART** targets are written. (**S**pecific, **M**easurable, **A**chievable, **R**ealistic and **T**ime limited).

- ➢ Targets should be based on diagnostic assessment which includes individual skills, structures and learning styles

- ➢ Targets should be shared and agreed with learners and parents/carers

- ➢ Target setting for numeracy should consider the widest range of focus areas in order to address progress

- ➢ Evaluation of targets should be based upon the learners response to the teaching methods, approaches and measurable progress made in the specific focus area

Possible areas when considering targets for improvement in numeracy
(based on ideas by Steve Chinn, Independent Dyslexia and Dyscalculia consultant and Julie key Principal Mark College)

1. To improve self-confidence, self-esteem or self-belief by

    - Praise and encouragement
    - Setting of small achievable tasks
    - Involving the pupil in class discussions through differentiated questioning
    - Emphasising pupils' successes against their own previous level of achievement
    - Encouraging the pupil to the best of their own ability

2. To increase mathematics age by

    - Regularly revisiting topics
    - Revising work from the key stage below
    - Plenty of opportunity for over-learning

3. To reach particular overall National Curriculum Level by

    - Returning to the level already achieved and consolidating this work
    - Following the spiral syllabus

4. To improve in any of the NC areas i.e. Ma1, Ma2, Ma3 or Ma4 by

    - Consolidating learning in a particular area
    - Using concrete materials
    - Following the spirally structured syllabus

5. To identify areas of weakness or gaps in their knowledge and address them by

    - Appropriate diagnostic testing and individual discussion with the pupil
    - Taking into account the pupils' individual learning style
    - Teaching the pupils' in a way that they can best understand

6. To encourage extra effort in areas of weakness by

    - Tracking back to a level that the pupil can easily achieve and then building very small steps so that perseverance can be seen to be successful
    - Rewarding efforts
    - Using one to one teaching (for extra input)
    - Building on the successes (of the previous year)

7. To improve speed of working by

    - Identifying the reason for the slow working
    - Encouraging the completion of more questions each lesson
    - Rewarding speed with an enjoyable activity (not more numeracy!)

8. To improve presentation and organisation of work by

    - Encouraging the correct formation of numbers
    - Encouraging the heading of work in order to make revision easier
    - Using specifically designed worksheets in early years to reduce the necessity for written work
    - Encouraging pupils to record Ma1 by organised setting out of diagrams and tables
    - Giving exemplars of good practice and the reasons for such organisation

9. To encourage mathematical communication by

    - Involving pupils in class discussions with open-ended questions wherever possible
    - Asking pupils to explain their method when solving a problem
    - Encouraging pupils to write down as many calculations as necessary to show their answers

10. To encourage self-checking of work by

    - Encouraging pupils to solve a problem in one way and to check using a different method
    - Using a calculator to check a mental calculation and vice versa
    - Using estimating skills to check if an answer is reasonable

11. To improve estimating skills by

    - Using mental arithmetic facts which they find easy to remember i.e. Rounding up or down to 10's or 100's, doubling once or twice etc

12. To encourage application of mathematical knowledge in problem solving by

    - Asking pupils to make up a number story, to check they understand where to use a particular calculation
    - Asking pupils to do a practical task to reinforce a newly learned topic
    - Encouraging the pupils to develop their own strategies for solving problems requiring more than one step
    - Giving pupils frameworks to support their problem solving sequence

13. To improve mental arithmetic skills by

    - Regular practice
    - Group discussion as to how different individuals reached the correct answer so that those who were unable to attempt a question may be able to do so next time
    - Encouraging estimating skills to check an answer is reasonable

14. To improve concentration by

    - Rewarding sustained effort
    - Encouraging slightly longer periods of time on tasks
    - Breaking the lesson up into periods of short activity so that concentration can be sustained for the full length of each small task
    - Placing the pupil within the class to reduce distraction
    - The removal of any superfluous equipment from the desk to reduce distractions

15. To encourage more independence in written work and study by

    - Setting tasks which can be achieved by the pupil without any intervention, especially in homework tasks
    - Making the work accessible to the pupil
    - Encouraging Ma1 work right from the beginning and rewarding them for their efforts regardless of how they reached their answers

16. To improve sequential thinking by

    - Encouraging pupils to attempt a task and then vocalise each step. This helps to break down and reinforce the steps involved
    - Listening to others describing their methods will help them to try and break down their own methods

17. To improve self-organisational skills by

    - Giving out checklists of the correct materials and equipment for a task to encourage self-checking
    - Checking that pupils understand instructions given to them about their work
    - Asking pupils to repeat or reframe instructions if necessary

18. To learn to work co-operatively by

    - Providing opportunities for working in pairs or groups
    - Encouraging them to show consideration for other pupil's ideas and efforts

19. To develop suitable strategies for recalling basic number facts by

    - Frequent mental arithmetic exercises where pupils can assess their own score for signs of improvements
    - Regular revision of basic number work
    - Employing and practising methods that can be quickly implemented before starting

20. To learn to use a calculator appropriately and accurately by

    - Devoting specific teaching time to developing calculator skills
    - Using a calculator to check estimated sums in order to check reasonableness of answers

21. To improve their IT skills and to use them efficiently and effectively to support their mathematics by

    - Having a regular IT lesson which is dedicated to improving their skills

22. To set numeracy targets in other areas of the curriculum by

    - Using the skills and strengths of the learner in other curriculum areas to support numeracy acquisition

Cross Curriculum Links

Numeracy runs across the curriculum. For pupils who have difficulties in the acquisition of numeracy, the following suggestions/strategies may be helpful.

- It is helpful to make explicit these links for pupils with difficulties with numeracy
- Abstract concepts specifically taught in maths become clearer in concrete applications in other subject areas
- Link past learning to new lesson content
- Links provide opportunities for practise leading to over learning and mastery

Science

- ➢ Make explicit shared subject/topic specific vocabulary
- ➢ Make explicit shared symbols/signs
- ➢ Encourage sub-vocalisation for written calculation
- ➢ Allow written “rough” recordings for calculations
- ➢ Provide vocabulary, sign, symbol memory jigs
- ➢ Provide frameworks/supports for sequential processes with calculations
- ➢ Provide squared paper to support spatial difficulties
- ➢ Allow concrete aids for mathematical calculations

PE

- ➢ Provides practical applications to support directionality
- ➢ Provides practical activities to support topics like space, movement, fractions e.g. Team Sports on pitches
- ➢ Provides physical games and activities based on numeracy in the hall or gym

History

- ➢ Time concepts and sequences will need explicit teaching
- ➢ Timelines linked to number lines are useful

Geography

- ➢ Make explicit common signs and symbols
- ➢ Opportunities from practical activities to practise data handling and Interpretation of graphs, charts, maps, tables
- ➢ Technical terms and sequence processes may benefit from prompt cards, prompt frameworks

CDT

- ➢ Food technology incorporates practical opportunities to support a range of topics e.g. weighing, time, doubling, fractions
- ➢ Resistant materials incorporates practical opportunities to support a range of topics e.g. measuring, angles

ICT

- ➢ Use of ICT to present work
- ➢ Opportunities to practice databases, spreadsheets etc

Music

- ➢ Notation is linked to direction
- ➢ Time/timing is a key concept which can be explored in a multi-sensory way

Useful further reading and access to practical suggestions and strategies covering numeracy across the curriculum can be accessed through: -

www.standards.dfes.gov.uk/keystage3

Unit 3 Mathematics through other subjects
Unit 3 Handouts

How Parents/Carers can help

Many parents/carers want to help their children with schoolwork and in particular to help their children with numeracy.

For most children the most successful way for parents/carers to help is to include numeracy activities as part of everyday activities and keep them fun.

- Playing board games and card games. These usually involve counting and often scoring which the child can be encouraged to keep
- Pocket money is a great way for parents to help the child to budget and learn how to spend and check change in the local shop
- Practical activities in the home like cooking, model making, using the washing machine and gardening can all involve maths in a fun way and help link numeracy to everyday activities
- Make sure that the child has a watch that has both an analogue and digital display
- Reading with the child increases language awareness and can help in the relation to the language of maths
- Suggest that the child plays some computer games which encourage reasoning and logical thinking
- A home-school link book can be a useful tool for communication between the teacher. E.g. write down the homework, send home a written example of method, parent/carer to say how long the work took and how the child coped
- Parents/carers may encourage child to make use of calendars, visual time-tables and planners at home to improve organisational skills and independence
- An additional set of mathematics equipment kept for use at home can reduce anxiety and disputes, which may arise. These may be standard resources e.g. ruler, protractor etc or may be “home made” e.g. wipeable boards, memory cards etc
- Parents/carers need to celebrate the successes with their child
- Parents/carers of older children need to liase closely with the mathematics teacher to ensure that they offer support in the most appropriate way

Evaluation of Support for Specific Learning Difficulties (dyscalculia)

School self-evaluation checklist

As part of Wave 3 provision and as part of a commitment to inclusion, schools need to self-evaluate the support they provide for learners with Specific Learning Difficulties (dyscalculia). The following key areas are useful starting points for consideration. This form is linked to the SENCo Self-Evaluation document sent to all North Somerset schools.

The following section focuses on classroom practice in the numeracy hour and is also useful as part of self-evaluation.

Key Areas	Well Developed	Being Developed	To be Developed
Effective responses in place to support SpLD (dyscalculia) at: ▪ School Action ▪ School Action Plus			
Use of North Somerset SpLD Guidance to support: ▪ Identification ▪ Assessment ▪ Interventions ▪ Strategies			
Effective implementation of appropriate programmes and support, including: ▪ Tracking progress ▪ Monitoring and evaluating support			
Continuous Professional Development of staff in supporting SpLD learners (dyscalculia) as part of School Development Plan			
Effective use of DfES linked documents which reflect national priorities and guidance			
Effective on-going partnership with parents which underpins planning delivering and reviewing support			
Other school priorities linked to Wave 3 (e.g. ICT resources etc.)			

Outcomes and Further Actions (from previous page)

Daily mathematics lesson Observation checklist

(Adapted from Including all children in the literacy hour and daily mathematics lessons. Management Guide DfES 2002)

Year group/class	**Date**	**Number of additional adults**
Context (e.g. pupil grouping or set, number of children receiving SEN support at *School Action, School Action Plus* or through a Statement)		

Inclusive teaching strategies (tick if observed)	**Comment**
☐ Access to teacher and any resources used has been planned for (e.g. a number line, grid or text is visible to all, background noise avoided, light source in front of teacher)	
☐ Children's seating purposely planned	
☐ Rules and routine for the lesson taught and displayed; praise for children keeping the rules	
☐ All children clear about objectives of lesson	
☐ All children clear about structure of lesson and day, (e.g. Visual timetables are on display)	
☐ New or difficult vocabulary clarified, written up, displayed, revisited	
☐ Teacher checks for understanding of instructions, (e.g. by asking a child to explain them in their own words)	
☐ Support in place for children who have poor short term memory (e.g. sticky-notes, jottings, individual whiteboards)	
☐ Differentiated questions to challenge all children at all levels (e.g. one child to add 24 to 52, a less able child to then add 25 to 52)	
☐ Use made of alternatives to questions to invite a response, (e.g. making suggestions from which the children can choose, estimating, making a personal contribution from own experience)	
☐ Questions used to ensure the rest of class are listening – "Who has a different question/answer/idea?"	

☐ Children clear about the timescale for the question: “This is one for a quick response”, “This is one which needs several minutes to think about”, or “This is one I want you to work at for 10 minutes”	
☐ Time/support is given before responses are required, (e.g. personal thinking time, partner talk, persisting with progressively more scaffolding until child can answer correctly)	
☐ Children help and support each other with ideas; they give one another space in which to think and respond to questions; the contribution of all children is valued	
☐ Time out (talking in pairs or other groups) used to maintain attention, link to children’s own language or experience	
☐ Buddying used for seating and paired or partner work, (e.g. More settled child paired with a child who finds concentration difficult, more able with less able)	
☐ Interactive strategies used, (e.g. children having cards to hold up or own whiteboards or coming to the front to take a role)	
☐ Visual and tangible aids used, (e.g. real objects, signs/symbols, photographs, pegs on a coathanger, variety of number lines, counting sticks, computer animations)	
☐ Strategies which children can use to be made explicit (e.g. for problem solving)	
☐ Evidence of children being pre-tutored where this would help them access the lesson	
☐ Additional adults, if present, are actively involved throughout in supporting or assessing learning	
☐ Tasks clearly explained or modelled, checks for understanding, task cards or boards as reminders, time available and expected outcomes made clear	

☐ Materials and resources for task available and accessible; expectations about independent persona organisation are clear and routines have been taught	
☐ A distraction-free area has been set up for children who need it to work in	
☐ Children have been taught strategies which mean they can continue to work without direct teacher help if they get stuck; prompts to remind them are on display	
☐ Children are provided with and reminded of resources to use to be independent, (e.g. relevant material from whole-class session kept on display, glossaries, number lines, hundred squares, table squares)	
☐ Tasks link back to earlier (or later) Framework objectives where these are appropriate for child or group	
☐ Tasks simplified or extended, (e.g. numbers to 100 by one group or to 20 by another)	
☐ Tasks made more open or more closed according to children's needs	
☐ Arrangements made where necessary to ensure that children can access written text or instructions (e.g. buddying, adult support, taping)	
☐ Alternatives to paper-and-pencil tasks used where appropriate	
☐ Scaffolding provided where needed (e.g. problem solving grids or clue cards)	
☐ Variety of groupings used so that children are able to draw on each other's strengths and skills	
☐ Children taught how to work together in groups	

☐ Appropriate behaviour is noted and praised or rewarded	
☐ Effective use of additional adult support, (e.g. learning objectives clear, independence rather than dependence promoted, peer interaction encouraged)	
☐ Effective use of ICT	
☐ Strategies reiterated, modelled, practised (e.g. problem-solving)	
☐ Opportunities available to feed back using a variety of media	
☐ Contribution of all children valued by teacher	
☐ Peers helped to give feedback in positive ways, (e.g. “I like the way…”, “One idea for improvement would be….” Cards)	
☐ Questioning designed to assess grasp of particular objectives relevant for each child or group of children	
☐ Teacher draws lesson together to identify key points of learning for all children	
☐ Teacher acknowledges and remedies mistakes and misunderstandings for all children	
☐ Teacher looks forward to next stages in all children’s learning	

APPENDICES

Appendix 1	Wave 3 Tracking Chart
Appendix 2	A blank task analysis form
Appendix 3	A framework for solving word problems (A Problem Solving Spinner)
Appendix 4	Mathematics resource box/bag (DfES 1184-2005 – Primary National Strategy Learning & Teaching for Dyslexic children session 4: Mathematics)
Appendix 5	Useful references, bibliography and websites

Appendix 1

WAVE 3 Tracking Chart

Tracking children's learning through the *NNS Framework for teaching mathematics* (addition and subtraction)

Year 6 key objective Carry out column addition and subtraction of numbers involving decimals (NNS Framework for teaching mathematics, Supplement of Examples, Section 6, pages 49,51)

Associated knowledge and skills	**Errors and misconceptions**	**Questions to identify errors and misconceptions**	**Teaching to address the errors and misconceptions**	**Next steps in moving towards the key objective**
Apply knowledge of the number system to enable efficient counting of a large number of objects. Add and subtract multiples of ten, a hundred and a thousand **1 Y6**	He inefficient counting strategies and/or insecure understanding of the number system. **1 Y6 +/-**	Imagine you have a money box containing 2p and 1p coins. What do you think would be a good way to count these quickly to find out how much money there is? What is 60 + 20? … 60 + 30? … 60 + 40? What changed when you found 60 + 40? What is 40 + 40 … 400 + 400? Which answer is larger? How is the calculation 40 + 400 + 4000 different from the others? What is 60 – 20? .. 600 – 200? … 6000 – 2000? Explain how you worked these out. What is 6000 – 200? … 6000 – 20?	Practical opportunities to develop efficient counting strategies for a range of objects, for example coins, cubes, conkers, collectable cards, stickers. Count forwards and backwards in tens, hundreds and thousands from different starting points, including starting numbers that are not multiples of ten or a hundred. Use an empty number line to support this development. Order multiples of a hundred and a thousand.	Carry out simple calculations that involve crossing the boundary from hundreds to one thousand and vice versa, supported by an empty number line and extending this to a visualised image to develop mental calculation.
Give an estimate by rounding, to determine whether the answer to a calculation is sensible. **2 Y6**	Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved. **2 Y6 +/-**	Is 26 nearer to 20 or 30? Is 271 nearer 270 or 280? Is 1.8 nearer to 1 or 2? Draw a sketch to illustrate your answer and explain how you know.	Use number squares and/or number lines to consider the order and comparative value of numbers to support rounding.	Consider pairs of items from a catalogue and ask child to estimate whether a £10 (or £20, etc.) note would be enough to buy both the items?

1 Key objective

2 This column lists associated knowledge and skills that contribute to understanding of the key objective

3 common errors and misconceptions linked to specific knowledge and skills are listed to support diagnosis of children's difficulties

4 Questions in this column can be used to help the teacher decide where the child's difficulties lie.

5 Examples of the types of teaching activity in the A4 booklets (see below).

6 This column provides ideas to develop when the child has improved their understanding of the identified difficulty. The teacher can make use of these ideas to consolidate understanding and extend thinking

7 Code referencing to an A4 teaching unit

Appendix 2

A blank task analysis form

Complete this template to highlight the difficulties, propose strategies and assist in planning an appropriate intervention or programme to support the pupil

Name of Pupil: **Topic:**		
FACTOR	**PROBLEM**	**SUGGESTION**
Vocabulary and symbols		
Language		
Short term memory		
Long term memory		
Sequences		
Direction		
Organisation Spatial		
Thinking Style		

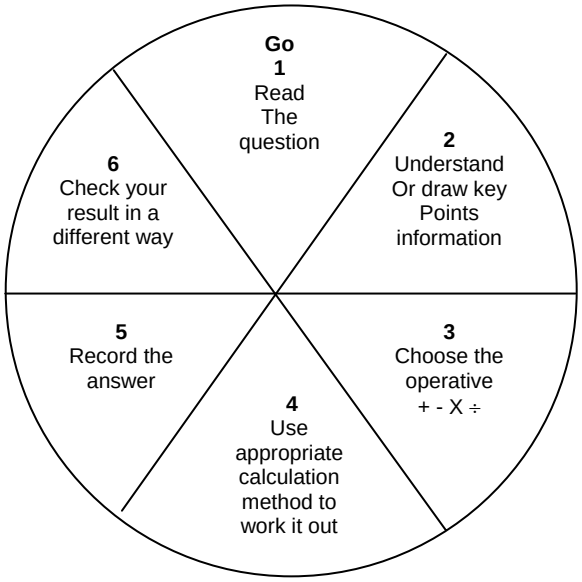
Appendix 3

Problem Solving Spinner – A framework for solving word problems
(Idea adapted from resource seen at St Mary's, Portbury)

This provides a structured, sequential strategy for pupils to use when solving problems.

- Photocopy both templates onto thick card
- Attach Template B on top of Template A using a pin
- This is only an example which the teacher should differentiate to match the needs of the individual pupil
- The learner may need pre-tutoring and practice in order to use this spinner as an "aide memoire"

A



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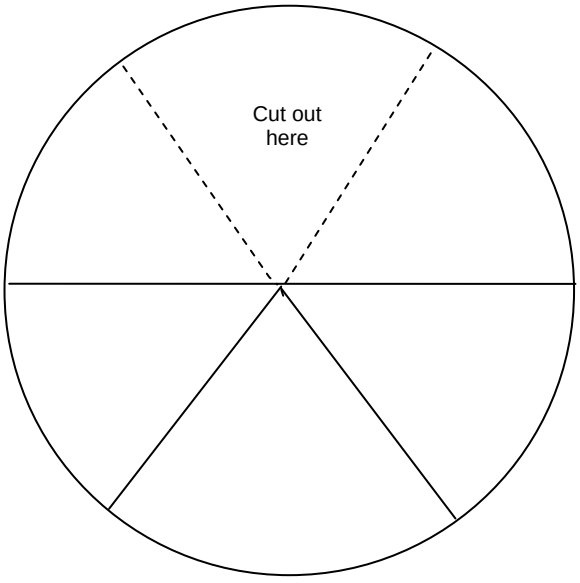

Appendix 4

Mathematics resource box/bag

(DfES 1184-2005 Learning and teaching for dyslexic children Primary National Strategy)

An individually owned resource bag/box, which is added to, and moves on with a child from year to year, ensures easy access to resources and helps develop independence. These resources aid inclusion and are often used very imaginatively by high-achieving pupils. Most schools will have all the resources in school and will probably only need to find the initial outlay for bags or boxes. This cost is offset by the need to replace resources less frequently, as children tend to look after them when they are their own responsibility and for their own use.

Some schools favour bags which are large enough to hold laminated A4 number squares and a whiteboard and ruler; others use a flat box which is durable enough to last through to Year 6 and fits into the child's tray, and keep the number square, ruler and whiteboard separately in the child's tray. This leaves the whiteboard and ruler free for other subjects too.

The following list is suggested. Most of these resources are advocated by the National Numeracy Strategy. Schools should decide what resources the children need regular access to and add them to the box.

- **Whiteboard pen and piece of cloth for eraser**
  When children have their own pen they tend to tell you when it has run out, so this is a good time-saver.

- **A number square**
  Laminated A4 paper makes a good number square. These can be individually labelled and also move with the child from class to class. A reversible square marked from 0-99 on one side and 1-100 on the other is useful for working in pairs exploring different patterns.

- **Number bond cards**
  These are very useful for children with memory difficulties and initially for all children to establish recall of number bonds.

- **Arrow cards for place value work**
  From Year 1 children should work with at least tens and ones. Hundreds can be added through the year or at least at the beginning of Year 2. In year 4 add decimal arrow cards and thousands if you wish to use them.

  Some schools also have money cards, but decimal cards can be used equally well, with children annotating for pounds and pence.

- **Digit cards**
  These should be 0-9 initially for all children, and then 0-20; they are useful for a variety of activities.

- **Number lines**
  There are many number lines available, either commercial or teacher-made. Initially some children need a numbered line to support their calculations. Blank lines can be put on the back. Number tracks with pictures for Reception and Year 1 are also useful before the children make the transition to number lines.

- **Calculator**
  Individual calculators are useful from Year 1 but many children will use them in Reception for play. Children will need an arithmetic, not a scientific, calculator. If overhead calculators are used then it is useful to have the same type. Although calculators should not be used to replace calculation by mental and written methods until Year 5, they are very useful for exploring large numbers and investigating patterns. Children who are familiar with a calculator from a young age are more proficient at using all the facilities later. They can also be a good access strategy for some children who are working below year group expectations. They also promote the reading of large numbers and are very motivating.

- **Counters or cubes**

- **10 or 20 bead string**

- **Die/dice**

- **A protractor**

- **A set square**

- **A compass**

  Some of the early apparatus will become redundant for most children, but as the boxes are named it is easy to discreetly leave some children with apparatus they still need. All children benefit from keeping number squares and arrow cards throughout the primary school and will adapt them for their own use, for example moving all numbers on a number square by one decimal place, or stretching arrow cards to make very high numbers.

Appendix 5

Publications

Suggested further reading:

Butterworth, B. *The Mathematical Brain*, London, Macmillan, 1999

Chinn, Kay. *Worksheets Plus for the Numeracy Strategy, years 4 and 5*, Mark College Publishers, 2001

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Suppliers of ICT Programmes

Cambridge Software House 01487 741223
4Mation Educational Resources, 14 Castle Park Road, Barnstaple, Devon. EX32 9PA

Granada Learning, Granada Television, Quay Street, Manchester, M60 9EA. Tel: 0161 827 2729. Web site: http://www.granada-learning.com/semercindex

Iansyst, Fen House, Fen Road, Cambridge, CB4 1UN
Tel: 01223 420101 Web site: http://www.dyslexic.com

REM, Great Western House, Langport, Somerset, TA10 9YU
Tel: 01458 254700. Web site: http://www.r-e-m.co.uk

White Space, 41 Mall Road, London W6 9DG
Tel: 020 8748 5927. Web site: http://www.wordshark.co.uk

Xavier Educational Software, Tel: 01248 382614
Other materials

Amazing Maths, Cambridgeshire Software House. 01487 741223

Count on your computer D.Hillage http://www.r-e-m.co.uk
Dominoes, other ideas and equipment for numeracy, Taskmaster, Morris Road, Leicester LE2 6BR

Math Magic. Paul Godding, PO Box 260, Newport, South Wales NP20 4XR

Math Notebooks and videotapes. Mahesh Sharma, Berkshire Mathematics, Chazey Bank, The Warren, Reading RG4 7TQ

Maths Circus (1-3) 4mation Educational Resources. Tel: 01271 325253

Mathematics recovery (further information for DfES research report 554)
http://www.dfes.gov.uk/reserach

Memory Cards. Sutton Dyslexia Association, 21 Princes Avenue, Carshalton, Surrey SM5 4NZ

NferNelson, Unit 28, Bramble Road, Techo Trading Centre, Swindon, Wiltshire, SN2 8EZ

NumberShark, WhiteSpace, W6 9DG. Tel: 0208 7485927

Numicon

Numeracy recovery (futher information for DfES research report 554)
http://www.dfes.gov.uk/research

Stile activities and other materials. LDA, Duke Street, Wisbech, Cambridgeshire PE13 2AE

Talking calculators. http://www.rnib.org.uk or http://www.cobolt.co.uk

Time and Fractions. Xavier Educational Software. Tel: 01248 382616

Basic Skills Agency, http://www.basic-skills.co.uk

British Dyslexia Association, http://www.bda-dyslexia.org.uk

Dyslexia Institute, http://www.dyslexia-inst.org.uk

Hornsby International Dyslexia Centre, http://www.hornsby.co.uk

National Association for Special Educational Needs (NASEN),
http://www.nasen.org.uk

National Whiteboard Network, http://www.nwnet.org.uk

http://www.stevechinn.co.uk

Primary National Strategy,
http://www.standards.dfes.gov.uk/primary/teachingresources

The Psychological Corporation, http://www.psychcorp.com

The Resource Room, http://www.resourceroom.net

Springboard files (3,4,5)
Ref. Springboard 3 – DfES 0091/2001
Ref. Springboard 4 – DfES 0092/2001
Ref. Springboard 5 – DfES 0151/2000

Ref. Springboard 6 – DfES 0778/2001 (1st set)
Ref. Springboard 6 – DfES 0778/2001 (2nd set)
Ref. Springboard 6 – DfES 0068/2003 (3rd set)

Senco Training pack
Ref. DfES 1256/2002

Including all children in the daily mathematics lesson
Ref. DfES 0465/2002

Guidance to support pupils with specific needs in the daily mathematics lesson
Ref. DfES 0545/2002

Toolkit to support EAL pupils
Ref. DfES 0267/2003

Models and images Y 1-3
Ref. DfES0508-2003 GCDI

Supporting children with gaps in their mathematical understanding Wave 3 mathematics CDROM
Ref. DfES 1706/2005

Springboard 5 Additional Materials
Ref. DfES 0103/2005G

Learning and teaching for dyslexic children
Ref. DfES1184-2005CDI

Targeting support: Implementing interventions for children with significant difficulties in mathematics
Ref. DfES1083-2005