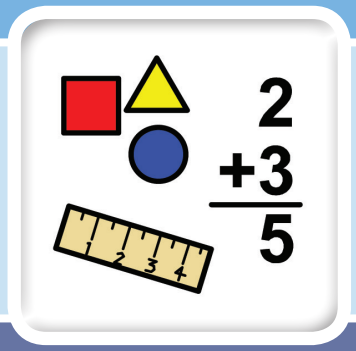
Schemes of Work for the National Curriculum for pupils working below age related expectations



Mathematics

Key Stage 1

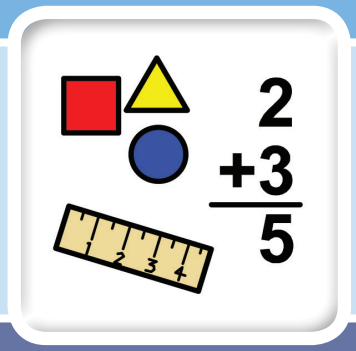
Preview - Maths

Teacher's Guide

- Geometry
- Measurement
- Number
- Statistics

Key Stage 1 - Contents

Schemes of Work for the National Curriculum for pupils working below age related expectations



Mathematics

Key Stage 2

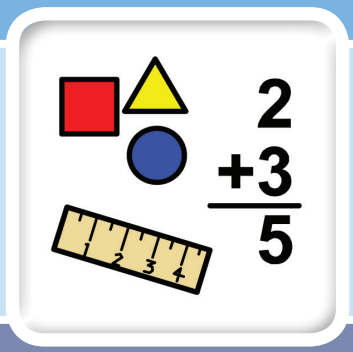
Teacher's Guide

- Measurement
- Number
- Shape
- Statistics

Key Stage 2
Contents

Schemes of Work

EQUALS



Mathematics

Key Stage 1

Schemes of Work for the National Curriculum for pupils working below age related expectations

Preview - First 3 pages from Teacher's Guide

Teacher's Guide

maths skills are based on establishing ‘building blocks’, we can’t move on until the first block is learned.

However, some pupils, especially those who are working consistently and over time at levels below age related expectations, may never become secure within even the first number block (cardinality). And because confidence in number is so crucial to so many areas of Maths, particularly for example, measurement, money and statistics, we often end up teaching the same thing over and over.

Here is an extended quote from the Cockroft Report of 1982. This was written well before the UK National Curriculum came into existence, but it makes for interesting reading.

> *Mathematics is a difficult subject both to teach and to learn. One of the reasons why this is so is that mathematics is a hierarchical subject. This does not mean that there is an absolute order in which it is necessary to study the subject but that ability to proceed to new work is very often dependent on a sufficient understanding of one or more pieces of work which have gone before. Whether or not it is true, as is sometimes suggested, that each person has a 'mathematical ceiling' (and so far as we are aware no research has been undertaken to establish whether or not this is the case), it is certainly true that children, and adults, learn mathematics at greatly differing speeds. A concept which some may comprehend in a single lesson may require days or even weeks of work by others, and be inaccessible, at least for the time being, to those who lack understanding of the concepts on which it depends. This means that there are very great differences in attainment between children of the same age. A small number reach a standard which enables them to study mathematics at degree level but many others have time to advance only a very short distance along the mathematical road during their years at school. Because of the hierarchical nature of mathematics these pupils do not reach a position from which they are able to tackle the more abstract branches of the subject with understanding or hope of success, though some can and do continue their advance after they have left school*. (DES, 1982 pp 67-68)

There has incidentally still not been any research (as far as we are aware) to indicate the ‘mathematical ceiling’ idea, but the points made are salutary.

1. Mathematics is a difficult subject both to teach and to learn.
2. This is because it is a hierarchical subject.
3. Knowledge does not necessarily have to acquired in a set order, but ***understanding*** of, and ***security*** in the current step is necessary ***before*** the child can move to the next step.
4. Children learn at different speeds; there are often very great differences between children of the same age and some may need a considerable amount of repetition and practice to establish learning before moving on.
5. Some pupils might not be able to reach the more abstract elements of mathematics.

This last point, on abstraction, is perhaps one of the key areas of difficulty for many pupils who struggle with even quite basic maths. That is, to be truly competent in and confident with, numeracy for example, pupils must be able to understand number in an abstract way. The number 7 is entirely abstract. A pupil cannot touch, taste, see, smell or hear the number 7. It only becomes concrete when the pupil can hold the 7 toy cars in front of him. Pupils who take readily to number develop very early on, certainly by Year 1, the ability to abstract number so that they can visualise that 7 is say, more than 3, but less than 12. This abstraction allows the child to understand the relationships between numbers in an instant which in turn, allows the movement into the next steps (or building blocks) of addition, subtraction, multiplication, division etc.

Sometimes, and this is especially so for pupils on the autistic spectrum, the ability to rote learn can give the appearance that a pupil has mastered abstraction, when in fact they have merely memorised a particular sequential pattern.

> *'Sometimes, when assessing children's calculation skills, rote learning can mask underlying procedural or conceptual difficulties. A child may **know** that '3+2 is 5', in the same way as they **know** their sister's name is Phoebe. However, it should not be assumed that the child understands **how** to add up, or what is **meant** by the word 'add'. Assessment should therefore consider children's understanding of procedures and principles as well as the ability to recall number facts.'* Gillum (2014) p279/80 author's emphasis

These procedures and principles are well documented when it comes to numeracy, the basic principles of understanding number being established by Gelman and Gallistel in 1978. There are five principles in all, these being:

> **The one-one principle** – one and only one unique number tag must be assigned to each item counted – one is always one and twenty three is always twenty three.
>
> **The stable order principle** – count words must be produced in the same order for each count – four always follows three, seven always precedes eight.
>
> **The cardinality principle** – the final word of a count denotes the total number of items counted – indicating that the concept of a distinct group to be counted has to be established.
>
> **The abstraction principle** – counting can be used on any set of tangible or intangible objects.
>
> **The order irrelevance principle** – the order in which a set of objects is counted is irrelevant. Gelman and Gallistel (1978)

Gelman and Gallistel's theory is insistent on the **cardinality principle** being understood before the concept of number can be fully realised.

Research with **typically** developing children in the UK shows that cardinality **emerges** a few months either side of the fourth birthday (Nye et al, 2001). This fact alone will indicate that it will be very difficult for a good percentage of children working consistently in the P scales (that is, below the beginnings of

the National Curriculum) to fully grasp the concept of number, especially as cardinality will get more problematic once numbers get above two or three (Staves, 2001). Further, using the act of counting and set making to solve problems (how many do I need for this?) will of necessity lay an additional level of complexity onto the already overloaded working memory (Porter, 2015).

This does not mean that cardinality cannot be taught, just that we must move cautiously and individually through the gears. There is no point in moving an individual on to counting sets of 10 if the pupil cannot consistently identify sets of 5.

Staves (2001) suggests that there may be numerous reasons for children failing to count correctly, since they may

- fail to correspond pointing to individual objects;
- fail to correspond the sound to the pointing action;
- miss an object;
- itemise an object more than once;
- miss a number name;
- apply the same name twice;
- confuse the order of names;
- lose track of what has been counted and what remains to be counted;
- fail to stop the verbal sequence at the last object, keeping on because of the rhythm;
- not realise the last number is cardinal;
- miss some objects because they don't think they should be included in the count because their colour, shape, position etc. may be different from the others (p75).

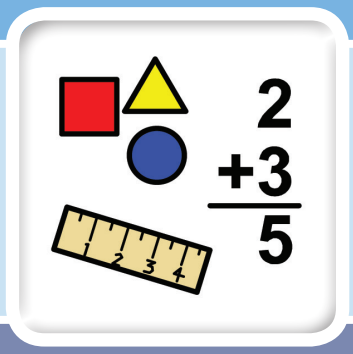
McConkey and McEvoy (1986) make the very pertinent points that some pupils with learning difficulties find number problematic because the multi-dimensional sequence needed to count successfully. Pupils need to

- identify the items making up the set
- recall the number names in the proper order
- give each item in the set one - and only one - number name
- remember the objects which have been counted and those which remain
- realise that the last number named is the total for the set
- and do all if these things simultaneously ***and*** perfectly.

Any mistake in any of these essentials of counting and the whole operation comes tumbling down like a pack of cards. Imray and Colley (in print) suggest that the strains on working memory are just too great for some learners and argue that difficulties with working memory is a particularly problematic and under-explored issue for pupils who struggle with number. This is because the traditional remedies for poor working memory rely exclusively on having certain basic skills which pupils with learning difficulties are also likely to find difficult, particularly reading and writing. Alloway et al (2005) found that the degree of working memory difficulty equates directly with the degree of learning difficulty, so that pupils with a mild learning difficulty are likely to have mild working memory problems, whilst pupils with a severe learning difficulty

SCHEMES of Work

EQUALS



Mathematics
Key Stage 1

Schemes of Work for the National Curriculum for pupils working below age related expectations

Preview - first 3 pages from Measurement

Measurement

Length, size and height

Length

Time

Part one Part two

Weight and volume

Part one Part two

Measurement (KS1)

Time 1

P4

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
To experience working with an adult carrying out activities / performing actions quickly and slowly and starting and stopping abruptly.	Percussion Instruments Teacher demonstrates using a large drum, beating it slowly, getting faster and faster before shouting 'stop'. Children join in playing instruments with adults as above with physical prompts as needed.	Range of percussion instruments.	Children are not expected to respond to specific vocabulary, although teacher can model – slow, fast, stop, go.	Child works with an adult to play instruments quickly, slowly and to start and stop playing.

Measurement (KS1)

Time 1

P5

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
To experience carrying out activities according to simple time vocabulary 'fast / slow, go / stop / wait', with adult support.	Joining in with actions / songs and rhymes. Group joining in with singing action songs / rhymes to taped music e.g. 'Heads, shoulders, knees and toes', teacher 'conducting' the group signing and saying "Stop / go / wait" Teacher 'conducting group to do actions – stamping, clapping, patting knees etc using instructions- "fast / slow, go / stop / wait" Also role reversal with children taking turns to be the conductor.	Tape recorder and taped action rhymes and songs.	**Signs, symbols, words;** Go, stop, wait, fast, slow.	Child joins in starting and stopping action rhymes / doing them quickly and slowly along with an adult.

Measurement (KS1)

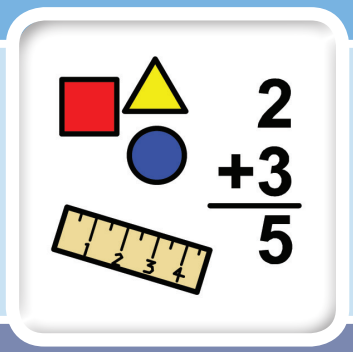
Time 1

P6

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
To experience carrying out activities for a length of time measured by standard /non-standard measures.	Rain Sticks / Pecking bird competitions. Teacher demonstrates turning over the rain stick / setting off the pecking bird and then stacking as many bricks as they can before the rain sound / bird stops. Children work in small group with teacher operating the timer carrying out simple activities e.g. stacking bricks, threading beads, spooning as many counters as they can into a container	Rain sticks, pecking bird toy (bird that is raised up its pole and pecks its way to the bottom) bricks, Duplo, beads etc.	Child is not expected to us any specific vocabulary. Teacher will model vocabulary; Wait, go, stop.	Child waits for rain stick timer to start stacking bricks and stops as timer stops, with adult prompts.

SCHEMES of Work

EQUALS



Mathematics
Key Stage 2

Schemes of Work for the National Curriculum for pupils working below age related expectations

Preview - First three pages from Number

Number

Number system

Part one Part two

Number KS2

Number system 1

P4

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
Pupil can take 'one' in learned situations – e.g. a biscuit.	Break time. At the school tuck shop or break time in the classroom, the pupil when offered more than one biscuit, piece of fruit, chocolate bar etc will take only one. Similarly when offered a drink he/she will take only one.	Appropriate resources for the morning break period.	**Words, signs or symbols**; take one, only one etc.	The pupil takes only one of a particular item, when offered more than one of the same item.
Pupil demonstrates understanding the concept of 'many' and 'few' i.e. chooses many crisps rather than one or two.	The inevitable class party At the many class birthday parties pupils are offered a range of snacks. Some will be on a one per person basis i.e. cake/biscuit and others where they are able to take many and or few i.e. seedless grapes, raisins, crisps, popcorn cheesy shapes etc.	Finger snacks based on the tastes and preferences of the group in question, and an excuse for a party.	**Words, signs or symbols**; Many/few, lots/one, some.	The pupil will take many or a few or one depending on the snack, personal taste and the instruction given by the teacher.

Number KS2

Number system 1

P5

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
Pupil experiences 1:1 correspondence in everyday situations.	Class monitor In giving out paper/books/pencils/pens etc the pupil will distribute one piece of equipment per pupil with some remaining.	Appropriate classroom equipment pens/pencils etc.	**Words, signs or symbols**; One	The pupil will give one item to each class member returning the remainder to the teacher.
With help pupil makes sets with one and with lots of objects.	'Pop Stars' Sort photographs of solo artists and photographs of bands in sets of one and lots.	Appropriate laminated photographs from either magazines or the internet.	**Words, signs or symbols**; One, many, lots, more, or less.	The pupil will sort the photographs into two sets – [A] one/solo artists and [B] bands with more than one member.
Pupil uses number names in everyday situations.	Using the two ideas from above, the activities will be extended to introduce the allocation of number labels to the sets. Labelling the number of band members. This would also be useful in the sports idea. The final score was 3 goals to Manchester United and 2 goals to Arsenal. Football isn't the only sport, which could be used ice hockey, rugby etc all lend themselves equally.	Appropriate laminated photographs from either magazines or the internet. Photographs of football strips and either miniature footballs or pictures of footballs.	**Words, signs or symbols**; One, two, three……... **Words, signs or symbols**; One, two, three……...	The pupil will count the number of band members and allocate a number label. The teacher to allocate footballs etc to the appropriate team colours. The pupil will then count the number of footballs and allocate a number label to the sets.

Number KS2

Number system 1

P6

Teaching Objectives	Suggested Experiences and Activities	Resources	Vocabulary	Indicative Assessment Outcome
Pupil demonstrates an understanding of 1:1 correspondence in every day situations	Baking Cakes. Having mixed a cake mixture, the pupils will place one cake case into the holes of a cake tray. 1:1 with some remaining.	Cake mixture, cake cases, and a baking tray with holes for the cases.	**Words, signs or symbols**; One	The pupil will place one cake case in each of the recesses of the baking tray.
Pupil counts five objects by touching one at a time, arranged in a line and randomly – including 1p coins	Can you find me? The pupil will find and count 5 objects around the environment, i.e. 5 coats, 5 bags, or 5 randomly placed objects around the room.	Objects around the classroom / school.	**Words, signs or symbols**; One, two, three, four and five.	The pupil will count five bags, coats etc hung on the class coat hooks. They will then find and count five similar objects placed around the room.
Pupil demonstrates an awareness of none / zero / nothing / nil.	Count Down. Having been given a number of items i.e. the penny sweets at tuck time or the cakes baked from the examples above. The pupils count the sweets and then eat one. They then count them again, and eat another. This continues until there are none left. Similarly with the cakes they are counted and given out to the class one at a time. After each one is given away they are counted again, until there are none left.	Cakes or penny sweets, from the example above.	**Words, signs or symbols**; None / zero / nothing / nil.	The pupils will communicate none / zero / nothing / nil, once all the cakes/sweets have been eaten.