

Special Educational Needs Inclusion Service
Down syndrome
Improving Numeracy Skills



- Understanding of number, time and money are key areas of numeracy.
- Number work can be difficult for all children but is a particular challenge for children with Down syndrome.
- Understanding number is important for independence in the future.
- There are lots of stages in learning to count and calculate.



Most children with Down syndrome find numeracy difficult, more difficult than literacy. Some of the challenges children face are:

- Difficulties with working memory;
- Difficulties with recognising and remembering patterns in number;
- Difficulties with understanding and expressing mathematical language;
- The abstract nature of number.



Let's start with

Rote Counting

- Rote counting is where children learn to count numbers from memory, either out loud or in their head. They learn that numbers come in the same order.
- They may not have any understanding of what the numbers mean and may not associate them with written numerals, but can say the numbers from memory like a rhyme or a song.
- Children can learn rote counting skills from repetition and nursery rhymes.
- Rote counting is a core skill of number work and accuracy in rote counting forms the foundation of numeracy skills.



How do I work on rote counting?

- Start small. Count up to 3, then 5, then 10
- Count forwards and backwards
- Sing lots of number songs and rhymes like *1, 2, 3, 4, 5 Once I Caught a Fish Alive* or *10, 9, 8, 7, 6, 5, 4, 3, 2, 1... Blast Off!*
- Read lots of stories with numbers in them e.g. *Ten Little Robots* by Mike Brownlow, *The Monster Counting Book* by Kate Daubney, *Ten Terrible Dinosaurs* by Paul Stickland or *Ten Little Ladybugs* by Melanie Gerth.
- Count steps as you climb them together.
- Once your child can rote count backwards and forwards to ten try encouraging them to start from a different number, for example start counting forwards from 4 or backwards from 6.



Let's move on to

Number Recognition

Number recognition is when your child learns to correctly identify numerals (numbers that are written down). Some children will already recognise numerals that are meaningful to them like their age or the number of their house. At primary school they will begin learning to recognise the numerals 1-10 and beyond.



How do I work on number recognition?

- Just like rote counting, start small; begin by looking at the numerals 1 and 2.
- Slowly move up to 10 and then beyond but don't forget to keep revising the small numbers. Overlearning (repetition of a concept until the child's knowledge is really secure) is important.
- Play lots of counting board games like snakes and ladders or Ludo.
- Point out numbers in your child's environment e.g. bus numbers, signs, numbers drawn in sand at the beach, numbers in the shops.
- Let your child play with magnetic numbers on the fridge or foam numbers in the bath.

Let's look at
Sorting

- Being able to classify things is a key aspect of number work.
- Commercial sorting resources are available to buy but it's easy to sort with everyday objects.
- You can sort objects by colour, size, type etc.



For example, Lego bricks could be sorted by colour OR by size.



Fruit and vegetables could be sorted by colour or by type.



How do I work on sorting?

- Bring sorting into everyday life activities like tidying the bedroom. For example have a Lego box, a craft box, a soft toy box etc.
- Older children may struggle with naming categories of objects and should continue to be given practice at sorting and naming groups of objects e.g. vehicles, types of clothing, animals, materials (wood/plastic/paper etc.).

Let's look at
Pattern

Recognising pattern is an important skill in number development because children need to learn to recognise pattern in numbers e.g. $2+2=4$ so $22+2=24$. How do we teach pattern? We can notice them, hear them and physically make them!

How do I work on patterns?

- Use stampers, stickers, felt tips and printing activities with paint to create patterns on paper.
- Initially children can copy patterns. Then ask them to complete a pattern you have started. Work towards them being able to create their own patterns.
- Make patterns with 3D materials such as blocks, pom poms, cutlery, cushions, stationery or food.
- Use natural materials outdoors to make patterns e.g. pine cones, leaves, twigs, daisies etc.
- Look for and point out examples of patterns in everyday life e.g. the skin pattern on a zebra, a spider's web, patterns on clothing or a tiled floor.
- Make a sound or a movement pattern e.g. Bang, tap, tap or Jump, hop, jump, hop.
- For older children, use craft materials like Hama beads or Aqua beads to make repeated patterns of increasing complexity.



Increasing Complexity of Patterns

ABAB (red, blue, red, blue)

ABC ABC (car, bus, plane, car, bus, plane)

AA BB AA BB (crayon, crayon, pencil, pencil, crayon, crayon, pencil, pencil)

AAB AAB (blueberry, blueberry, raisin, blueberry, blueberry, raisin)

ABB ABB (stomp, clap, clap, stomp, clap clap)

Let's look at

Touch Counting

- This is where children have to learn to count a small number of items so that each item is given a number name and only counted once.
- It can be very challenging as it requires persistence and concentration.
- Many children count 1 item as 2 or skip items.

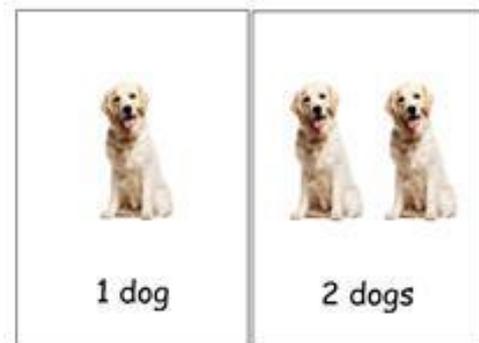


How do I work on touch counting?

- Begin by counting identical items to avoid confusion.
- Start with quantities of 1 or 2 and increase slowly.
- Encourage your child to physically touch each item as they count.
- If a child loses count encourage them to start again.
- Be patient - some children need a long time to master this skill.
- Counting in books can be helpful because the items do not move around.
- Encourage touch counting in your daily activities e.g. counting steps as you climb them together.
- Before counting use the phrase, 'let's count **how many**' and after say, '**how many** have we got?'

Counting Books

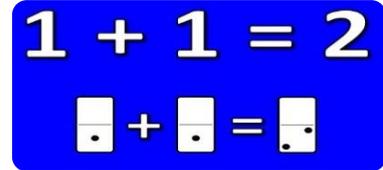
You can make a simple counting book which counts the same thing in increasing quantities e.g. *1 cat, 2 cats, 3 cats etc.* Ensure the only thing that changes is the quantity.



Let's look at

Addition and Subtraction

- Addition is where we take the amounts we count and put them together and subtraction is where we take them away.
- At first teachers use lots of different tangible materials like counters, cubes, Cuisenaire rods, Dienes apparatus and Numicon shapes to add and subtract in a practical way.
- Children need lots of practice and experience of adding and taking away real objects before they can do sums in their head. Children with Down syndrome may rely on practical materials as a visual aid for a long time.



How do I work on adding and subtraction?

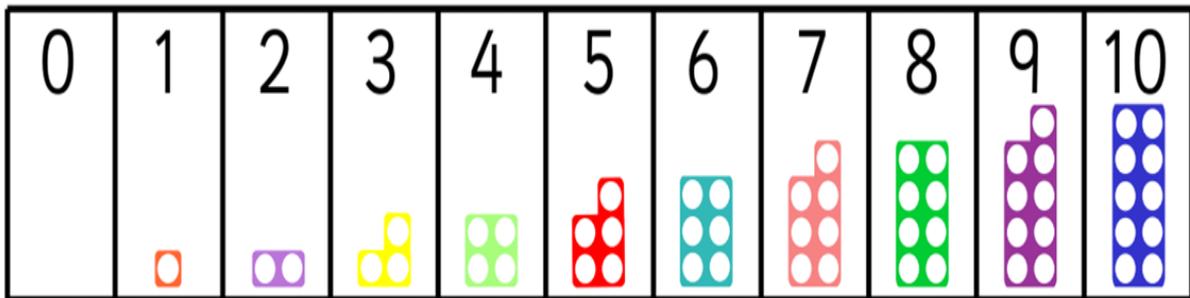
- Help your child to count backwards as well as forwards.
- Try and use lots of visual and practical resources with your child e.g. blocks, cars, Lego, toy cups, counters, an abacus or Numicon.
- Children begin by learning about **more** and **less** – use this language with your children at home (1 more, 2 more, 1 less, 2 less).
- Children need to be very secure with addition and subtraction within 10 before moving beyond this.
- Support the child's memory with visual aids such as a laminated counting frame with Velcro numbers.
- Another way to support your child's memory is the use of numeral cards. For example when adding $5 + 3$ start by counting 5, place a numeral card above the 5th object as a visual reminder to the child that there are 5. Add 3 more objects and then use numeral cards to count on 6, 7, 8.



The use of visuals can be reduced as children become more confident with addition and subtraction.

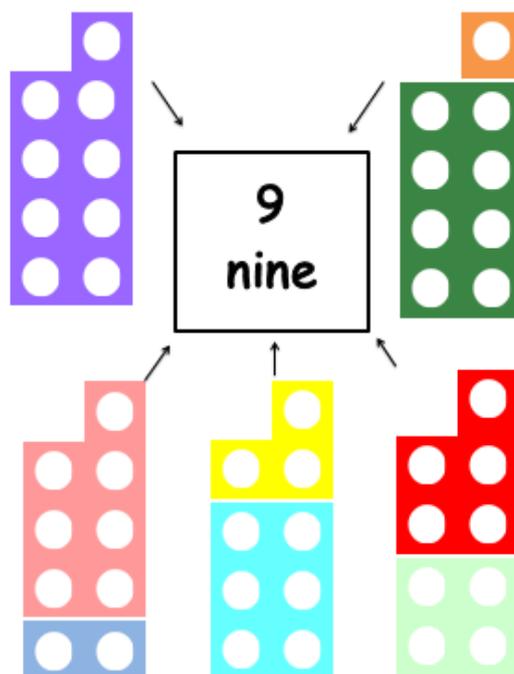
Let's look at
Numicon

- Numicon can be a useful resource to help with numeracy skills.
- It is a multisensory resource, so your child will learn by seeing and feeling.
- Each shape is one bigger than the previous one and so it shows children how numbers get bigger.
- Each number is a different colour.



- Your child will learn to identify each number by colour and by shape.
- Children should have the opportunity to explore Numicon freely before they will be ready or interested in using it in a directed way.
- As your child moves through school, they will be able to see and begin to understand more complex mathematical ideas with Numicon e.g. there are lots of different ways to make 9.

The story of 9



How do I work on adding with Numicon?

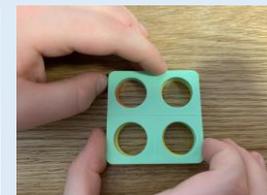
- In order to add with Numicon children must have had lots of experiences exploring the shapes.
- Your child will begin to learn to recognise Numicon by shape rather than just by colour, thus helping them to see the number patterns when two shapes are added together. For example when the 1 shape and the 5 shape are set out as shown here they make the 6 shape.



Encourage your child to identify the shape by touch by getting them to close their eyes and feel the shape, putting the shapes into a feely bag or hiding them in a basin of sand/rice. That way the child has to carefully feel the shape and visualise it in their mind before telling you what it is. This takes lots of practice.



- Start small. Try adding on 1 within 3 or 5 e.g. 1+1, 2+1, 3+1 etc.
- When adding on 1, move two shapes together (e.g. 3+1 to form the pattern of the 4 shape). You can place the new shape on top to 'check the answer'.



- Do not encourage your child to 'count the holes'. We want to encourage children to recognise the pattern by sight rather than counting every time.
- When you begin addition with Numicon, just concentrate on lots of practise with the Numicon shapes; **don't worry at first about keeping a written record of the sums**. If you want to, you can video your child using the Numicon so that they can watch it back later to consolidate their learning.

- Gradually move up to adding 1 within 10.

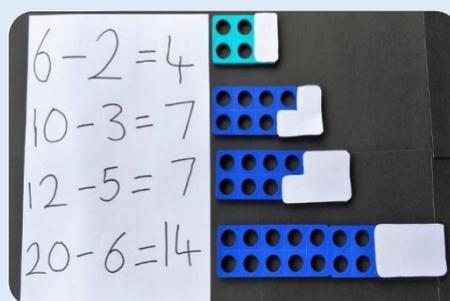


How do I work on subtraction with Numicon?

- Children begin learning about subtraction very early on through songs such as Ten Green Bottles, Five Little Monkeys and Five Little Ducks. They see that as you take away one item the number is reduced. You can begin talking about subtraction with Numicon by using household objects, laid out in Numicon patterns. Take away one each time and show your child how this correlates to the Numicon pattern.



- Take the Numicon shape of your first number i.e. 6. Cover over the shape of the number you are taking away i.e. 2 and help your child to identify the shape that is left. You can use your hand, counters or specific subtraction covers to do this. Printable Numicon subtraction covers are available online; you will find a link to these at the end of the document.



- Start small. Try taking away 1 within 3 or 5 e.g. 2-1, 3-1, 4-1 etc.
- Gradually move towards taking away within 10.
- Work with your child's class teacher to ensure consistency in the language being used.
- It's a good idea to make sure your child is confident with adding and then taking away separately before you mix them up.

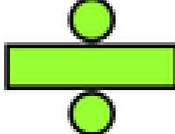
Let's look at

Mathematical Language

Language in maths can be really confusing! Think about the word 'take away' - in maths it means subtract, but to many children it means... a delicious treat from the chip shop!



Just to mean 'add' we use words like 'plus' 'more than' and 'increase' etc. There are many different ways to say the same thing in maths.

<p>Addition</p> 	<p>sum of increase add enlarge plus and more raise altogether</p>	<p>Subtraction</p> 	<p>minus decrease subtract take away fewer less difference</p>
<p>Multiplication</p> 	<p>lots of groups sets of times multiply product of</p>	<p>Division</p> 	<p>divide share goes in to split between distribute</p>

How do I work on language?

- Remember that your child will need time to learn the language of maths and what may seem straightforward to you may be very difficult for them.
- Ask your child's teacher what words he or she is using for adding or taking away so that you can be consistent.
- New mathematical language should be introduced one step at a time, at school and at home.
- Try not to focus too much initially on asking your child to write down their sums using + and - symbols. Children will learn best through lots of practical numeracy activities and talking about what they are doing to demonstrate a full understanding of each concept:

Activity → Language → Pictures → Symbols

Place Value

- Place value is about understanding our number system and how much an individual digit is worth. So, 486 is made up of 400, 80 and 6, rather than 4, 8 and 6.
- The amount an individual digit is worth depends on its position within a number.

For example:

3
The 3 digit is worth 3 units (3)

32
The 3 digit is worth 3 tens (30)

371
The 3 digit is worth 3 hundreds (300)

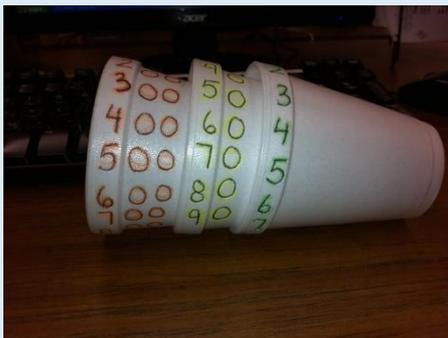
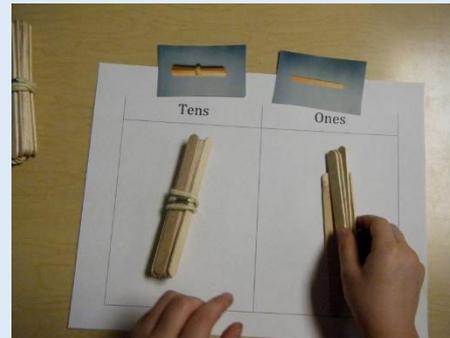
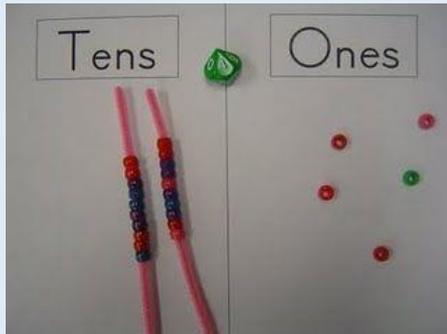
- Our number system is a decimal system; that means that it is based on the number 10.
- We talk about hundreds, tens and units (or ones). Children often use a chart to help them to separate the numbers and understand what each digit represents.

Place Value Chart

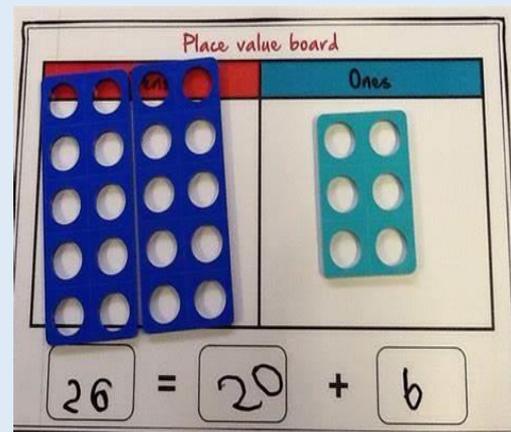
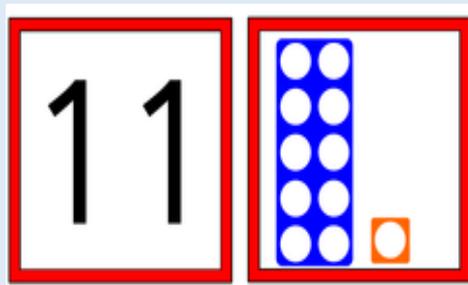
Hundreds	Tens	Ones

How do I work on place value?

The most important thing is that your child has lots of opportunities to SEE place value represented visually. You should try to use a range of multi-sensory maths resources.



Numicon can show us visually the value of a number and can give your child more clues about the size of a number e.g. 11 is **one** ten and **one** unit, 26 is **two** tens (20) and **six** units.



Let's look at

Money

- Understanding money and what each coin represents can be very tricky, especially as the **size** of each coin does not relate to its **value**.
- Lots of young people get better with money as they get older and become more independent and actually use money in real situations.
- Numicon can help with learning about money by giving a visual representation of what each coin is worth.

Tape each coin onto the relevant Numicon shape – this makes it easier to see which is worth more, and that five pennies is the same as a 5p coin, for example.



How do I work on money?

- Where possible, try to give children opportunities to play and work with real coins so that they become familiar with the colour/weight etc.
- Have children match, select and name coins:
 - matching coins to a photo or picture
 - Give me... a penny, a 5p etc.
 - Can you tell me what this coin is?
- Play shops! Make a shop with items from around the house – a toy shop, a grocery shop, a pet shop etc. Attach price labels to each item with simple prices on them. Labels can initially have visual cues, with a picture of the coin, a Numicon shape or even the coin itself taped on for matching. If older children prefer, cut out pictures of food or items of interest to make a café/shop.
- Practise adding coin values once the child has begun to master addition.
- As your child gets older, help them to know the value of activities and possessions they are interested in. Give them opportunities to have and use money e.g. at swimming pool £1 coin for the locker, 20p coin for the hairdryer.
- Plan to buy things for a purpose e.g. Give £5 budget to buy ingredients to make lunch.
- Older children should also be taught how to use a calculator.



Let's look at

Time

- Children will learn about time by talking about times which are *relevant* to them e.g. lunchtime, break time, bed time.
- Time is a very abstract concept, with confusing vocabulary, so children will need visual representations of time.

Time Vocabulary

before after today yesterday tomorrow calendar first
 next then day week month year second minute
 hour o'clock morning afternoon night past future

How do I work on time?

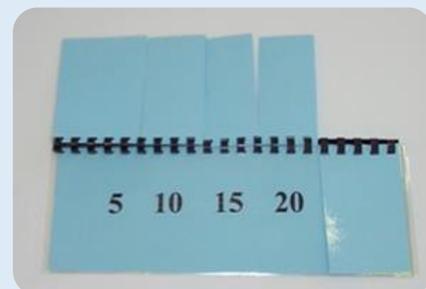
- Talk about time regularly e.g. First we'll go to granny's and then we'll stop at the shop. This afternoon we're going swimming.
- From an early age, keep a calendar with pictures of what is happening each day. Refer to this daily and talk about it using words such as today, tomorrow, yesterday. Count how many days until the weekend etc.
- Once a child becomes competent at understanding and talking about time within one week, add another calendar page for the next week horizontally (so they can see it comes *after* the current week).
- Days of the week and months of the year may be rote learned initially, using songs or rhymes. Older children can learn months of the year using colour coded flashcards – blue for winter months etc. Set them out in a pattern and learn one set at a time, hiding one to see if your child can remember which one is missing.

January	February	March
April	May	June
July	August	September
October	November	December

- Children can begin learning o'clock times once they are familiar with number up to 12.
- Children will need to practise this skill very regularly to retain the knowledge.
- Older children can wear a simple watch to help them.
- Numicon can be used around the clock face as a visual reminder of o'clock times.
- Children should learn about halves and then quarters in other ways before introducing half past and then quarter past (cutting up shapes/fruit, dividing sweets etc.)
- Use real life experiences of time to help children understand WHY they need to know about time. For example, cooking a meal and the pie need to go in the oven for 30 min.
- Children then need to learn to count in 5s (5x tables) up to 60.



Count by 5s



Learning about time takes time! Let your child overlearn each concept before introducing something new. Your child will be working on telling the time throughout their primary school years and beyond.

Top Tips to Remember

- Always try to show how numbers work in real life.
- If you and your child are getting frustrated, leave it and do something else.
- Try to remain positive about Maths.
- Make it fun! Play games that involve numbers e.g. shopping games or games which use dice.
- It's not always about getting the right answer, if your child is using a good thinking process that's more important.
- Focus on any area of maths your child is interested in for example ages of family members or the year their favourite film or toy came out.
- There are some great apps out there that your child can work on independently.

Some Useful Links:

<https://www.twinkl.co.uk/teaching-wiki/numicon>

<https://home.oxfordowl.co.uk/maths/numicon-guide-for-parents>

<https://library.down-syndrome.org/en-gb/research-practice/12/1/teaching-numeracy>

<https://www.twinkl.co.uk/resources/numeracy-maths/numbers-number-system>

Printable Numicon shapes:

<https://cdn.oxfordowl.co.uk/2016/06/24/11/58/55/181/NumiconFFOnlinePCM09.pdf>

Printable Numicon Subtraction Covers:

http://fdslive.oup.com/www.oup.com/oxed/primary/maths/numicon/Numicon_pcms_subtraction_covers.pdf?region=uk

Some Numeracy Apps:

Numbots (may be accessed through a school account)

Special Numbers

Komodo Math

Rocket Math

Doodle Math

IXL Math

Splash Math

Math Learning Centre

Sumaze! Primary

Vegetable Maths Masters

Timeland – Calendar and Clock