St Fergal's National School

Whole School Plan for **Mathematics**

Contents

1. Introduction

St. Fergal's National School aims to *cherish, nurture* and *educate* the children in its care.
The development of this plan follows on from the school's ongoing DEIS numeracy plans and the implementation of Maths Recovery/*Mata sa Rang* as an early intervention programme. It draws on the voices of children, parents, teachers and management. It also affords due attention to national trends in mathematics, current best practice, and research findings in mathematics.
The plan was drafted in May 2020 and was implemented in draft format from September 2021. It was ratified in XXXX
Given its concurrent development with the school's DEIS plan for numeracy, some of the school actions are embedded in the current policy

1.1. Ratification and Communication

Section to be completed upon ratification by the Board of Management.

1.2. Rationale

This plan was designed to:
Provide a unified approach to the teaching of mathematics in the school.
Identify and bolster best practice mathematics teaching and learning in the school.
Incorporate our early intervention initiatives of Maths Recovery and *Mata sa Rang* into a whole school approach for teaching arithmetic.
Tie together the class-level planning that has been a feature of mathematics in the school since its establishment.
Ensure appropriate development across classes.
Act as a resource for teachers and parents in planning yearly work in mathematics.
Facilitate the induction of new staff members, as well as ease the movement of teachers between class levels, and the support setting.

1.3. Vision

In line with the school's vision statement, we strive to facilitate each child in reaching their full potential in mathematics. Children are presented with learning experiences that enable them to progress their mathematical understanding and skills at a level that is developmentally appropriate. We endeavour to provide mathematics education that helps children to use mathematics in their everyday lives; to apply and problem-solve, to communicate and express, to integrate and connect and to reason mathematically.

1.4. Aims

The school's aims can be aligned with our mathematical aims as follows:

Mathematics will be taught at a level appropriate for the unique needs of our learners.
Mathematical connections will be made between the home, school and wider community.
Each child's contribution to mathematics will be valued.
A positive attitude towards mathematics will be nurtured; children will see its use in everyday life.
Children's interests, talents and affinities for mathematics will be fostered.
A maths-rich environment will be created.
A variety of learning experiences will be provided to enable children's mathematical progression.
Children will be given every opportunity to reach their maximum mathematical potential.
Children will draw on a range of mathematical skills flexibly and judiciously.
Children will achieve a level of content knowledge and understanding appropriate for their own abilities, talents and class level.

2. Content

2.1. Mathematics Curriculum - Content

St Fergal's implements the full *Primary School Curriculum* (1999), and accordingly, the Mathematics curriculum is taught at each class level. This teaching is characterised by the approaches recommended in this whole school plan, bearing in mind areas of emphasis decided at school level. For the sake of brevity, the entire curriculum is not repeated here. An overview of the content, approaches and language to be taught at each class level can be found in the class yearly plans on the school drive.

2.2. Approaches and Methodologies

All mathematics teaching in the school is guided by the following underlying principles of teaching and general approaches**: (**further information is available in the appendices.)

Children work actively in individual and collaborative settings.

Textbooks are used sparingly, as a resource only.
The teacher serves to elicit, support and extend children's prior and new learning.
Conceptual understanding takes precedence over rote use of procedures.
Early Intervention in numeracy is seen as key to developing strong mental arithmetic skills. Maths Recovery techniques and approaches form the basis of St. Fergal's early intervention programme.
All concepts, at every class level, will be introduced with the use of concrete materials.
These will be followed by the use of appropriate pictorial material.

Children will use abstract representations following success in their use of concrete/pictorial materials.

Mathematical language will be modelled through early intervention, station teaching and explicit teaching for older classes.
Children will be given the opportunity to use mathematical language in a variety of classroom configurations and settings.

Due attention will be given to the skill of communicating and expressing.

The skills of the curriculum are given due attention in teacher preparation and planning.

2.3. Maths-rich Environment

Mathematics and numeracy provide a lens with which to view the world. Accordingly, children need every opportunity to apply their mathematical knowledge to their environment, and to use their environment to further their mathematical knowledge. The following approaches are used in the school to foster this reciprocal link:
Maths noticeboard on general display
Maths displays in every classroom
Display of children's works
Frequent informal maths trails (to find shapes, measurements etc)
More formal maths trails (E.g. Maths Week)
Informal and formal reference to the *Maths Eyes* approach

2.4. Skills Development

Teachers include the skills of the mathematics curriculum in all lessons. The skills through content approach is adopted; this means that children will develop their skills while working on a particular content area of the curriculum. For example, children may reason how to categorise shapes while completing activities in the Shape and Space strand. They may then explain their reasoning to their group, developing their communicating and expressing skills.

2.4.1 Early Intervention and Maths Recovery

St. Fergal's NS recognises the importance of early intervention as a means of addressing any difficulties a child may have in numeracy but also recognises its benefit to the whole school in bolstering numeracy and problem-solving skills from a young age. The school's early intervention policy is based on Maths Recovery teaching, preceded by elements of Ready Set Go Maths in the infant classes. Maths Recovery is an assessment and intervention programme primarily developed for one to one support for children struggling with arithmetic but it has been expanded in St. Fergal's through M*ata sa Rang* to include whole class and station teaching

modes of delivery. Maths Recovery is based on how children learn arithmetic. It is now widely recognised that children develop their arithmetic skills in a constructivist manner, each element providing a foundation for more advanced arithmetic strategies. The key to successful implementation of Maths Recovery is to identify at what stage each child is at in terms of their arithmetic learning and to build on this in micro-stages. This is achieved on a whole school level by continuous assessment and directing teaching at whatever stage of ability a child or group of children may be at. This ability-based approach can be then supported through mixed ability/collaborative games and activities. The Maths Recovery approach adopted by St Fergal's is further outlined in Appendix A.

2.4.2 Applying and Problem Solving

Building on the Maths Recovery intervention programme, problem solving is used as an approach to teaching at all possible opportunities. For that reason, there is no dedicated time of the week during which problems should be taught.

To develop and extend a child's problem solving skills, they should be exposed to a great variety of problem types within and outside strand contexts – word problems, practical task based problems, diagrammatic problems, open-ended discussions, puzzles, games, trails, etc.

Pupils should be encouraged to apply skills to a problem (visualise, work backwards, logical reasoning, conjecture, work systematically, find patterns) to extract the relevant information from it, deduce what exactly is being asked of them and then decide on an appropriate strategy, based on their prior knowledge, experience and understanding, to solve the problem.

Children are encouraged to use their own ideas as a context for problem-solving by talk & discussion, questioning & answering and through creating their own problems orally, graphically and written (e.g. "my mammy bought a 2 litre bottle of orange for the party yesterday – was it cheaper than two 1 litre bottles?").

As the children begin to encounter written maths problems they are encouraged to use the RUCSAC (Read, Understand, Choose, Solve, Answer, Check) approach. While all children should be exposed to this model regularly and be very familiar with it by the time they reach 2nd class, we are aware of a variety of literacy abilities within the class setting.

Other approaches include R.U.D.E. model (Read, Underline the key words, Draw a diagram of the problem, Estimate your answer and then attempt to solve the problem) and BOMDAS (Brackets, Order, Multiplication, Division, Addition & Subtraction)

It is not essential to choose only one but teachers are aware of those in use, particularly those working with children with special needs.

Calculators may be used from 4th class on.

We provide opportunities for all children, Infants to Sixth class and including those with special needs, to have the opportunity to experience problem-solving activities

Each of the types of problems represented in the primary school curriculum should be taught throughout the course of the year at each class level. The frequency for each problem below is a minimum guideline, and should, in most cases, be exceeded. In junior and senior infants, the frequencies may vary.
Types of problems may include:
Written problems provided by the teacher
Problems generated and written by children, for other children to solve
Problems from textbooks Practical Tasks Weekly
Using concrete materials to find the answer to problems.
Problems involving measurement in the school/classroom/home *(e.g. which is the longest corridor in the school?)*
Open-ended investigation and problems that have more than one answer
Samples from www.nrich.maths.org puzzles as appropriate for topic
Tangrams to make pictures (shape and space)
Pattern solving (algebra)
Mathematical riddles
Games As appropriate for topic • Place value games (e.g. from *Mata sa Rang* resources)
Feely bag games (shape and space)
Planning/buying food for a party using prices from an online shopping website
Mathematical Trails: Informally at every opportunity; Formally twice a year.
Maths Week trails
Maths scavenger hunts
Walks to find shapes, angles, lines in the environment.

2.4.3. Communicating and Expressing

The skill of communicating and expressing can be developed by the following guidelines:

- Explicitly modelling and teaching mathematical vocabulary and sentence structures
- Providing regular opportunities for children to work in pairs and groups
- Asking children to explain and justify their answer
- Eliciting many solution methods for one problem/question
- Creating a safe environment for mathematical thinking; valuing effort and not emphasising errors
- Using pupils' explanations for lesson's content

- Probing children's answers and encouraging them to elaborate

The above guidelines can be facilitated further by allowing children to communicate their responses in a variety of ways, including using concrete materials/manipulatives, presenting orally or in written or pictorial format.

2.4.3.1 Guided discussion and discussion skills

At the beginning of a maths lesson, teachers outline the topic and objective that the children are working on during the lesson, in order to allow the children to apply any previous related knowledge to the work. They engage in focused discussion to introduce the lesson.
Teachers actively model mathematical language to be used, particularly when talking through the problem solving process.
Talk and discussion are seen as an integral part of the learning process and opportunities are provided during the Maths class for children to discuss problems with the teacher, other individual children and in groups.
Opportunities are provided for pupils to explain how they got the answer to a problem, discuss alternative ways of approaching a problem and/or give oral descriptions of group solutions.
Discussion skills are enhanced by: turn-taking, active listening, positive response to the opinions of others, confidence in putting forward an opinion, ability to explain clearly their point of view.
Teachers at the end of maths lessons will recap on the initial topic and objective and discuss it with the children, allowing an opportunity to focus on any aspect of the topic/objective that needs to be revisited again.
In the teaching and learning of mathematics in St Fergal's:
There is an agreed emphasis on the language of mathematics in order to allow both children with EAL and with literacy differences to develop their mathematical abilities.
There is a common approach to the language used, including the correct use of symbol names, to ensure continuity and consistency, as the pupils progress through the school (See Appendix B).
There is a conscious effort made to use the children's own ideas and environment as a basis for reinforcing mathematical language (e.g. "you are taller than he is, teacher's table is longer/wider than yours").
In the Infant classes, early intervention in the development of maths language is modelled using elements of the Ready Set Go Maths programme and developed further in Aistear. The Maths Recovery/*Mata sa Rang* programme is similarly used up to Third Class.

2.4.4. Integrating and Connecting

Teachers include curriculum integration and linkage in their plans (see section 5.1 of this plan). Teachers promote integrating and connecting by:
Emphasising the connections between operations; e.g. multiplication is repeated addition, or the inverse of division
Consolidating work in the number strand through work in other strands (e.g. adding money mentally as well as using the formal algorithm).
Incorporating numeracy in other subject areas; e.g. measurement in science, counting time and duration in music, writing capacities/weight in procedures, use of number or other mathematical concepts in Aistear.
Capitalising on incidental references to numeracy during the teaching day, e.g. pointing out parallel lines in the PE hall, counting books in twos.

2.4.5. Reasoning

Children should be enabled, through active learning and guided discovery, to reason mathematically. In this way, teachers in St. Fergal's can scaffold children in forming new mathematical knowledge. Teachers will help promote mathematical reasoning by:
Giving children the opportunity to deduce and induce approaches to mathematics, before directly teaching the strategy.
Discussing problems and topics using probing questions to foster reasoning.
Asking children to explain how they got an answer, and prompting them to fully explain their reasoning.
Transferring known content to new contexts.

2.4.6. Implementing, Understanding and Recalling

The ability to draw on appropriate and accurate mathematical procedures and content knowledge is recognised in the school. In particular, it is recognised that some children with special educational needs may need to rely on known procedures to work mathematically, but not at the expense of conceptual understanding.

2.5. Presentation of Work

Careful presentation is acknowledged as an important feature of accurate and precise mathematical work.

2.5.1. Numeral formation

Children should be able to identify, recognise, sequence and order numerals as presented and written in a variety of forms. However, in order to achieve consistency within and across the different learning settings, a unified approach to the teaching of numeral formation is used in the infant classes. The following numeral formation is taught:

Note that:
Four is not enclosed. The first downwards stroke is vertical, not slanted.
Five is written by making a downward stroke, followed by a loop, and then marking the top horizontal line.
Eight is written by 'starting like an s'.

2.5.2. Copy work

Our Mata sa Rang approach encourages children to use whiteboards as much as possible for informal as well as formal arithmetic. Children begin using squared maths copies in Second Class. The frequency with which these copies are used will increase as children progress through class levels.
As a general rule, work in maths copies should be presented as follows:
Ruled – 'in two squares and down two squares'
Dated – the date written at the top of the page
Titled and numbered – Exercise should be numbered in the ruled column
One numeral/number per square
The page may be split down the middle to fit more work on the page

2.5.3. Other modes of presentation

Where a child needs to present their work, copies and textbooks represent only two ways in which this can be achieved. Other modes of presentation that are actively encouraged include:
Class Dojo and digital records
Charts and posters for project work
Photographing work using school iPads/ Cameras
Presenting work using technology (e.g. presentations, videos)
Oral presentations
Using playdough, rice, sand and other concrete materials to form numerals

2.6. Homework

Homework in mathematics serves three main purposes in St. Fergal's

1. Consolidate work learned in school.
2. Facilitate learning of mathematical facts.
3. Foster home-school connections and extend maths knowledge beyond the classroom.

(the ongoing development of a school Homework Plan provides further detail).

Therefore, the homework set for each child should be at his/her level and differentiated accordingly. This differentiation may take the form of different work or reduced amounts of work.
Bearing the three purposes above in mind, the type of homework set in maths each year is agreed at a class-level by teachers.
Mental or oral maths homework is considered to be of equal or greater importance than written work. This includes the memorisation of maths facts once they have been scaffolded by classroom activities.
Children are encouraged to explain their maths homework to their parents, in order to share the mathematical language with which they are familiar.
Homework compliments and reinforces work done in school and gives parents an opportunity to be involved in their child's maths education. All efforts should be made to ensure that mathematics homework reflects the active learning approach as described in the curriculum.
For younger classes, teachers make recommendations and provide guidance on maths in the home environment e.g. matching socks, sorting cutlery, plans on calendar.
From 1st class, small manageable amounts of maths homework is given nightly.
Mental tasks/tables are given to learn at home in order to support classroom experiences and based on early intervention programmes.
Homework may be differentiated taking into account the range of abilities within the class. In St Fergal's, we ensure that children attending resource/learning-support are not going home with two sets of mathematics homework.
Correction of homework should inform teachers planning in Mathematics.

3. Children with Different Needs

St Fergal's is fortunate to have a diverse community of learners. These include children who:
Need to work at a mathematical level other than their class level.
Need extra support to work at class level.
Need specific support in particular areas of maths.
Demonstrate exceptional mathematical attainment and require further challenges.
This plan takes cognisance of the St Fergal's SEN plan which may be found on the school's Google drive.

3.1. Model of Support Teaching for Mathematics

The primary model of support for mathematics is **in-class support** and **team teaching.** However, this does not entirely preclude withdrawal teaching from occurring, after consultation between class and support teachers regarding the best way to support a child or group of children.
Particular emphasis is placed on targeted maths intervention through programmes like Mata sa Rang where class teachers and support teachers work collaboratively to identify where each child is at in terms of the key domains of numeracy development and target appropriate teaching to help them progress through the learning framework in numeracy.

3.2. In-class differentiation

A combination of approaches for differentiation are employed in all classes, based on the needs of learner:

Extended use of pictorial representations
Variety of mixed and ability groups.
One to one or small group support.
Different mathematical strategies may be emphasised.
Different amount of work to complete.
Different mode of presentation (e.g. number sentence v. picture)
Partial completion of set tasks.
Mathematical content at a different class level, within the same strand unit (where warranted)
Mathematical content at a different difficulty level, or different level of complexity, within the same strand unit.
Different skills emphasis (e.g. implementing versus problem solving)

4. Assessment and Record Keeping

4.1. Self-Assessment

Teachers decide these strategies at their own discretion. Some recommended approaches include:
Mathematical scrapbooks, journals and dictionaries.
Online maths challenges & activities.

4.2. Teacher designed tasks and tests

Teacher designed tasks and tests are used for assessment for and of learning. These tests help to identify areas that require attention in upcoming weeks and terms.

A teacher designed test is carried out at each class level at least once termly (usually towards the end of the term). The result of these tests can be made available for parents to support home-classroom links.
Teachers have discretion in designing these assessments at class level.
Assessments drawn from maths schemes (e.g. Planet Maths) are appropriate.
Teachers may use their own discretion to assess more regularly, for example at the end of a particular topic.
Teachers typically test tables on a weekly basis, though this is not obligatory.
Children's strengths and weaknesses in mathematics are outlined to parents formally at parent-teacher meetings and in summer written reports (May/June). Difficulties that a child may be having are given particular attention.

4.3. Standardised Tests

Standardised tests are used in every class from First upwards. The school uses the SIGMA-T test developed by the CDU in Mary Immaculate College. The test is administered annually during the month of May.
Results are communicated to parents via the school report in the month of June. When necessary, a face-to-face meeting may be arranged after the report has been issued.
Results are also used to inform interventions for maths and planning.

4.4. Maths Recovery/*Mata sa Rang* Assessments

St. Fergal's is fortunate to have several teachers that are trained in Maths Recovery. Maths Recovery based assessments are routinely used to monitor a particular child's progress in numeracy development and to guide classroom and support teaching. The assessments can be undertaken at any stage during the school year and can cover most class levels. However, large scale MR screening assessments are carried out at the beginning and end of *Mata sa Rang* classroom interventions.

4.5. Record Keeping

The following records are kept on mathematical progress:
Information as it relates to specific diagnoses and maths difficulties are noted in children's continuum documents on Aladdin.
Maths Recovery assessments are kept by both the MR teacher and relevant class teachers.
SIGMA-T results are kept on each child's Aladdin profile.
Teachers keep a record of any teacher designed tests run during the year in their assessment folder
Teachers keep a record of tables test results in their assessment folder.
Incidental notes and observations on a child's mathematical development may be recorded in pupil profiles (e.g. learning support profiles passed to new teachers)

5. Planning and Preparation

The planning for teaching and learning in mathematics is informed by the following:
1. The needs of the children in the class
2. This school plan and other pertinent plans (e.g. School DEIS plan)
3. The *Primary School Curriculum* for the class level
4. Programmes being implemented in the school; e.g. *Mata sa Rang.*
5. The consolidation activities available in textbooks; e.g. *Planet Maths*

All teachers are familiar with the strands/strand units/content objectives and skills for their class level(s). Teachers refer to them regularly when planning for their classes, ensuring all aspects of the curriculum are covered and that there is a balance between the strands throughout the year.
Teachers will base their termly and short term plans on the approaches set out in the whole school plan for Mathematics.
Work completed will be recorded using the cúntas míosúil. Class teachers and Learning Support teachers will draw up IPLPs/IEPs for the children who have been identified as requiring learning support.

5.1. Planning Format

5.1.1. Long-term planning

Long-term plans for mathematics are completed yearly for each class level and are kept on the school's google drive. Long term plans will be reviewed by the principal to ensure continuity from one year to the next.

5.1.2. Short-term planning

Short-term plans for mathematics are drawn up through collaboration of teachers at each class level and are completed weekly or fortnightly. They are also kept on the school's drive. Maths Recovery/*Mata sa Rang* plans are overseen by the MR teachers, with copies kept by all of the relevant classes.

5.2. Timetabling

All classes will comply with the minimum times for mathematics set out in Circular 56/2011.
That is: **Infants:** 3 hours 25 minutes per week / 41 minutes daily **First- Sixth Class:** 4 hours 10 minutes per week / 50 minutes daily.
Maths must be taught on a daily basis and should be indicated clearly in each teacher's timetable.
Maths time should include mental maths; oral maths and if necessary correction of homework along with the core lesson.
The process of mathematical learning is also developed through integrated activities or thematic/cross curricular approach.
Classroom timetables are submitted to the principal at the beginning of each school year and revised when necessary.
Class teachers and support teachers work collaboratively throughout the school on timetabling, content, strategies and techniques. A variety of shared and collaborative teaching is in place to provide additional and complimentary support to children who require such support and where school resources are available to meet these needs. When drafting timetables for withdrawal of pupils for supplementary teaching, teachers are including these pupils for as much of the mainstream mathematics programme as possible.

5.3. Reporting

The *cúntas míosúil* will be used to record progress in mathematics. The content, including objectives covered, will be detailed by each teacher, as it applies to their particular class.
Given the centrality of mathematics and numeracy to the curriculum, it is expected that professional reflection on progress in mathematics will be included in the appropriate section of the agreed *cúntas míosúil* format.

6. Resources

Teachers take shared responsibility in maintaining maths equipment. New maths equipment can be ordered at class level. The provision of equipment, as available, is coordinated by the numeracy post holder. Given the developing nature of the school, mathematics equipment is purchased on an ongoing basis. Inventories of equipment are regularly carried out to help match the needs of each class level.
Teaching mathematics developmentally requires a range of materials, including those that are purchased, school-made, or those that are readily available in the everyday classroom.
The OBT have provided each child from Senior Infants to 2nd class with their own individual Maths Recovery pack.
A core stock of counters, dice and cubes are available in every classroom.

Mata sa Rang station teaching equipment for each of the three domains are prepared and kept by the MR Teachers.
Electronic resources will be made available on the shared drive/shared storage.
Internet resources accompany some of the programmes in use in the school (e.g. *Busy at Maths/Planet Maths).*
Textbooks are available as a resource for some class levels (e.g. *Planet Maths/Busy at Maths*).

7. Technology

Technology plays an increasingly important role in real-life mathematics. A variety of technology resources are available for teaching maths in the school, including:
iPads – a variety of apps for different skills are available
PCs/Laptop Computers (in some classrooms)
Interactive Whiteboards
Cameras
Visualisers
Teachers are encouraged to use technology appropriately to enhance children's learning. This includes:
Modelling the use of concrete material
Using iPad apps for drill and practice (tables, practising telling the time)
Using iPads/PCs to access the internet (e.g. to look up timetables, make online shopping lists)
Using the iPad camera app/ cameras for maths trails, recording work
Practising numeral formation using drawing apps
Deploying iPads in stations

8. Staff Development

St Fergal's recognises the need for continuous professional development in Mathematics and encourages and supports teachers to undertake various staff and individual training schemes (e.g. Maths Recovery). Continuing Professional Development courses are encouraged and supported insofar as is possible by the Board of Management and the Principal.
Collaboration and liaison among the staff as a whole is valued and essential to a whole school approach to the teaching of Mathematics.

Staff are given opportunities at staff meetings to share their knowledge with the whole staff. Opportunities for co-teaching will be identified. This will change from term-to-term depending on the needs of the class.
Staff have access to reference books, materials etc which are stored in the school maths resource area.
All professional development notifications and literature that are received by the school, as they relate to mathematics, are relayed to staff by the Principal or post holder This notification will take the form of staff announcements at meetings, and notices on the staff notice whiteboard in the staff rooms.
Time is made available at staff meetings to:
Facilitate professional development from outside agencies (e.g. PDST)
Promote the sharing of professional learning internally
Discuss progress in mathematics (as it relates to this plan or the school's DEIS plan)

9. Parent and Community Links

Given our community focus, parents play an important role in the development of mathematics in the school.
Parent information sessions may be held with each class level annually, in September, during which parents are informed of the new mathematics content and approaches their children will learn during the year.
Information about mathematics in the school is also made available on the school website or HSCL Facebook page.
Parents are encouraged to take an active role in their children's mathematical development through:
Attending class information sessions at the start if the year
Attending parent/teacher meetings
Helping their children with homework
Helping out in classrooms when teachers seek volunteers
Talking to their children about maths that they see in the environment
Fostering a positive attitude towards maths
At IEP meetings, children's strengths and needs are discussed and priority learning needs and targets in mathematics where appropriate are agreed.
Support teachers can meet with parent/s/guardian/s as part of the progress meetings to discuss children's progress, areas of difficulty and plan of work in maths where appropriate.
From time to time members of the wider community may be involved in mathematical work in the school (e.g. Young Achievers Project).

The school recognises that members of the community could make a particular contribution to the mathematics programme e.g. engineers, accountants, bankers etc. They are welcomed into the class to provide assistance. Garda vetting procedures must be followed.
Agencies/organisations that could be of assistance to the mathematics programme e.g. shops credit unions and banks – money, bakery/butchers – weight, train/bus stations/stops – timetables, money.

10. Implementation and Review

10.1. Roles and Responsibilities

The plan will be implemented by all members of the teaching staff. The principal will play a role in overseeing its implementation. Guidance on particular aspects of the plan can be sought from relevant post holders and teachers.

10.2. Timeframe

The plan will be reviewed formally after one year in line with the school's ongoing DEIS plan in numeracy.

Appendix A: Maths Recovery Approaches & Teaching

A.1. Maths Recovery/Mata sa Rang

Maths Recovery is based on research into how children learn arithmetic. This can be broken down into key domains of learning which link together to support arithmetic development. Successful numeracy teaching can be implemented by identifying at what level a child is at in each domain and guiding their learning in micro-stages. This enquiry-based approach allows the child to continuously feel success and provides motivation to learn more complex arithmetic strategies. The key domains are: Number Words and Numerals; Structuring Number; Arithmetic Strategies (from Early Counting to Addition/Subtraction to 100); Conceptual Place Value; Early Multiplication & Division. Each is necessary to support arithmetic development and together provide a child with strong mental arithmetic and problem-solving skills. A glossary of Maths Recovery terminology is presented in Appendix C.

A.2. Number Words & Numerals.

Before children can carry out any additive tasks, subtractive tasks, combine or partition numbers, they need to know the corresponding number word sequences. For example, if a child does not know that 13 comes after 12, they will not be able to complete 8+5=. Early number word sequences concentrate on the range of 1-10. Children need to be proficient in producing the forward number word sequence, backward number word sequence, number word after (e.g. what number comes immediately after 22?) and the number word before (e.g. what comes immediately before 15?). Each of these is important in developing mental arithmetic skills.

It should not be presumed that when a child knows a forward number word sequence, for example 1 to 30, they will automatically know the same sequence in reverse, 30 to 1. In general, children find the backward number word sequences more difficult than the forward sequences but these are essential to gain proficiency in subtractive tasks. When a child knows the word sequence in the range of 1-10, they can progress to 1-20, eventually moving onto 1-100 and 1-1000 etc.

In St. Fergal's,we are aware that the two areas that often prove difficult for children are the teen number sequence (the spoken number is said opposite to how it is written) and crossing the decuples and centuples. Therefore, we focus our in-class support on addressing these difficulties, for example, some children will say 33, 32 ,31, 29 28…..thus omitting the decuple or putting the wrong one in its place. The same problem can exist when crossing 100, some children will say 106, 107, 108, 109, 200, 201…etc.

As regards numerals, i.e. the written form of a number, children need to be able to:

Identify numerals (i.e. say what it is when separated from a sequence)

Recognise numerals (for example, be able to pick out a specific numeral card from a mixed up range)
Sequence numerals (starting with the smallest and working upwards as well as the reverse).
Note, in St. Fergal's we always present numeral sequences ascending from left to right.
Order numerals (e.g. put a random selection of numerals in ascending order).
Finally, children need to be able to build, read and write 2-digit numerals before progressing onto 3-digit and 4-digit etc. Our school uses numeral tracks, numeral rolls and arrow cards in the in-class support in earlier years to establish strong numeral bonds.

A.3. Early Arithmetic Strategies

The Maths Recovery approach to developing early arithmetic is to focus on concrete materials to introduce each micro-stage and level of development before moving on to verbal and written tasks. Children who struggle with early arithmetic need plenty of experience at counting one or two collections of items to establish and consolidate one-to-one coordination of number words and items. They need to count lots of visible items and temporal sequences to establish the numerosity of collections. As children progress from this stage, they need to be able to count screened items in two collections (simple additive tasks). They also need to solve missing addend tasks (8+?=13) as well as screened subtractive tasks and missing subtrahend tasks (13-?=8). The object of posing each of these tasks is to encourage children to count on and count back. Once children can solve addition and subtraction tasks by counting on or counting back, they are ready to progress to more complex, higher addition and subtraction using non count-by-one strategies. Some children struggle in developing the ability to count on and count back. The more variety of materials used in developing each of the four principal stages of arithmetic, the better the foundation of arithmetic learning for these children.

A.4. Structuring Number

As children begin to learn how to add and subtract numbers, they need to be able to combine and partition numbers without having to count them. This structuring number domain starts with finger patterns and dice patterns in the range of 1-10 before progressing to 1-20 and conceptual place value.
In St Fergal's we recognise the importance of younger children being proficient in their ability to use finger patterns to combine and partition numbers to 10 as well as using fingers to learn their smaller doubles and near doubles. This use of fingers supports the development of more complex number combinations that are necessary for arithmetic development. Similarly, the recognition and use of dice patterns encourages pupils to use non-count-by-one strategies to solve simple addition and subtraction tasks.
The principal activities for early structuring number are:

Finger patterns 1-5 (show, build, bunny ears)
Finger patterns 6-10 (show, build, bunny ears)
Finger patterns: Doubles 1-5 (build, show)

Finger patterns: Five-plus patterns
Combinations 1-5 (five-frames, beads)
Partitions of Five (five frames, beads)
Five-plus: Beads
Rekenrek Number pattern 1-10 (top row only, build, screen)
Rekenrek: Number pattern 11-20 (build only)
Rekenrek: Number pattern pair-wise 1-10 (build only)

Once children know their 1-10 combinations, they can move on to 1-20 combinations and partitions. This is a complex process involving a large number of micro-steps, each of which will support the child developing their arithmetic skills. The Maths Recovery approach starts with the child using concrete materials and key pieces of MR equipment to model each micro-stage before progressing to verbal and finally written tasks. It is important that a child can complete a verbal/mental task before introducing written tasks and symbols etc.
There are seven key combinations and partitions in structuring numbers to 20:
Partitions of 5 (e.g. 3+2; 4+1)

Five pluses (5+1; 5+2 etc)

Partitions of 10 (9+1; 8+2; 7+3 etc)

Ten Pluses (10+1; 10+2; 10+3 etc)

Small Doubles (1+1; 2+2; 3+3; 4+4; 5+5)

Big Doubles (6+6; 7+7; 8+8; 9+9; 10+10)

Partitions of 20 (20+0; 19+1; 18+2……2+18; 1+19; 0+20)

These key combinations and partitions are important because they become building blocks for other additions and subtractions in the range of 1-20. For example, a child with sound knowledge of their big doubles can use 8+8 to solve 8+9 etc.
The primary Maths Recovery equipment used is:
Dot cards: Pairs and dice patterns 1-6
Five Frames: Regular 0-5; two colour pattern cards 1-5

Ten Frames: Red 1-10 five-wise; black 1-10 pair wise; two colour combinations of 10
Arithmetic Racks/Rekenreks
10-Bus; 20-Bus & counters
Dot cards: Pairs and dice patterns 1-6
Whiteboards (bare number tasks) & Task Cards
100-bead strings.
Three-in-a-row/Bingo Games (from MR manuals)

A.5. Conceptual Place Value

Conceptual place value refers to learning to increment flexibly by 1s, 10s and 100s. Developing strong conceptual place value supports a child's ability to mentally add and subtract 2- and 3-digit numbers. Children who have not developed a sense of conceptual place value will often revert to counting by ones or require a written algorithm to solve additive or subtractive tasks. For example, when asked to say the number that is 10 less than 306, the child will attempt to count down by keeping track of 10 counts. Conceptual Place Value allows a child to develop a sense of the relative size of numbers. They learn ways of relating multi-digit numbers to each other and they decimalise their approach to numbers, organising them in terms of 1s, 10s, 100s etc. Children also need to develop their Conventional Place Value skills to prepare them for standard written algorithms. Current research into children's numeracy learning recommends that it is best to develop Conceptual Place Value prior to Conventional Place Value. The following breakdown outlines the difference in both place values and summarises why each are necessary:

Conceptual Place Value
Numbers are presented and discussed in their full value: 20 as twenty or two tens; 21 as twenty one or twenty and one.

Tasks involve increments/decrements in sequence. For example, from 611, ten less is 601, ten less is 591, one less is 590.

Solving tasks essentially involves inquiry or problem-solving.

Answering questions might involve using knowledge of the number sequence.

Answers do not involve exchanging units. For example, students solve 195 and ten more as 205, but do not need to explain this by trading 10 tens for 1 hundred.

Attention is on structuring numbers around dynamic relationships of ones, tens and hundreds.

The aim is to cultivate strong mental strategies.

Conventional Place Value
Numbers may be explicitly presented or discussed in terms of digits: 20 has 2 in the tens column; 21 has 1 in the ones column.

Typically, tasks are not presented as a sequence of increments/decrements.

Solving tasks might require following a convention or rehearsing a given procedure.

Answers are unlikely to relate tasks to the number sequence.

Answers involve explicitly exchanging or trading: 10 ones for 1 ten; 10 tens for 1 hundred.

Attention is on manipulating numbers in terms of the formal place value system.

The aim is to prepare students to use the standard algorithms.

Developing Conceptual Place Value follows a similar Maths Recovery approach to the other domains. The child should start with bundles of 10 (usually lollipop sticks) before moving on to 10 strips and eventually bare number and written tasks. The learning path follows five dimensions:

- Progressing from incrementing by 10s to decrementing by 10s.
- Progressing from working on the decuple (10, 20 30….130) to working off the decuple (14, 24, 34……134).
- Progressing from incrementing and decrementing with 10s only to incrementing and decrementing with increasing complexity involving switching, multiple, mixed and missing units.
- Progressing from base-ten materials to bare numbers (formal arithmetic).

Progressing from the range of 1-130 towards four-digit numbers etc.
An example of a more complex progression would be:
256 and 10 more (266); 1 more (267); two 10s more (287); three tens more (317); less 10 and 1 (306), less 10 (296); less two 100s and a 10 (86); finally asking how many more to get to 100? (14).

A.6. Addition and Subtraction to 100

One of the goals of a Maths Recovery-based early intervention programme is to allow a child to develop facile strategies for addition and subtraction of two-digit numbers. The ability to add and subtract two-digit numbers is based on earlier work in Structuring Number and Conceptual Place Value, as well as Higher Decade Addition and Subtraction. Like many of the other domains, the sub-domain of Higher Decade Addition and Subtraction identifies a series of strategies that a child needs to support more complex arithmetic. The best way for a child to develop these strategies is by direct teaching, using materials to explain and demonstrate each strategy before moving on to bare number tasks. Materials, such as 10-frame cards, help the child understand each strategy. The learning progression starts with a two-digit number plus/minus a one-digit number The nine strategies identified are:
Locating the nearest decuple (given a 2-digit number, say next decuple going forward/backward).

Adding on from a decuple (e.g. 50+4).

Subtracting down to a decuple (e.g. 43-?=40).

Adding up to a decuple (firstly range 1-5 e.g. 37+?=40; then range 6-10 e.g. 32+?=40).

Subtracting down from a decuple (for 1-5 e.g. 40-3=? then 6-10 e.g. 40-8=?).

Adding across a decuple (e.g. 37+6=?).

Subtracting across a decuple (e.g. 43-6=?).

Adding within a decade (e.g. 43+5=?).

Subtracting within a decade (e.g. 48-5=?).

Each of the above allows a child to perform more complex arithmetic without having to resort to difficult count-by-one strategies. Once a child is familiar with using these strategies, they are ready to progress to two-digit plus/minus two-digit numbers. Again, materials such as 10-frames are used to model each progression before moving onto bare number tasks. Some children need to use materials for longer periods than others to allow them develop their strategies at their own pace. Too early a move to written algorithms often results in children following procedures that they do not fully understand so scaffolding a child's learning with mirco-stages allows a more meaningful progression. The progression to two-digit addition/subtraction includes:
Adding/Subtracting a decuple (e.g. 43+20=? 63-20=?).
Addition with no regrouping (e.g. 43+25=?).
Addition with regrouping (43+29=?).
Subtraction with no regrouping (e.g. 68-25=?).
Subtraction with regrouping (e.g. 68-29=?).
The continuing development of two-digit mental arithmetic also includes missing addend and subtrahend tasks (43+?=61; 61-?=43) and eventually moves towards more flexible strategies and formal notations. Children need to explore as many different strategies as possible in order to choose a suitable one that allows them to complete more complex arithmetic tasks. These strategies build on the micro-stages outlined above and include:
Jump (37+25= …..37+20=57…….57+5=62)

Split (37+25=…….30+30=50…….7+5=12……..50+12=62)

Jump & Split combined (37+25=…..30+20=50…..+7=57….+5= 62)

Compensation (37+25=…….40+25=65…….65-3=62)

Transformation (37+25=….transform 37 to 40 by taking three from 25 so the child is left with 40+22=62)

Complementary addition (53-39=….think of 39 + ? = 53….i.e. using addition to solve subtractive task)

A.7. Multiplication and Division

The MR approach to multiplication and division mirrors that presented for addition and subtraction, the basic understanding and techniques of multiplication and division are demonstrated and reinforced using concrete materials before moving on to bare number and written tasks. Manipulatives such as counters are used initially to model arranging items in groups so that the child can move from counting the items to counting the groups. The child can then progress to using dot-cards or arrays to habituate and develop

their multiplication and division skills. As with addition and subtraction, the dot-cards facilitate teaching multiplication in micro-stages: The child starts with being able to see all of the dots and the number of cards; by turning over the cards, the child now only sees the number of groups; finally the child is ready to progress to screened items, bare number and written tasks.
The MR approach recognises the interrelationship of multiplication and division and encourages teaching both at the same time. Multiplication is seen as repeated addition and division as repeated subtraction. However, multiplication and division are inverses of each other so that division arises from multiplication. Children's multiplication learning arises from their understanding of addition. An example of this is where 15 counters are placed on a table. They can be arranged into groups of fives or threes. If they are in threes, the child recognises that there are five groups with three in each group. The child can also be asked to divide the 15 counters by sharing (partitive division) or grouping (quotative division). If the child is asked to share the counters among 5 people, they will recognise that each person gets three each. If the child is asked to make groups of three (quota), then they will see that they have made five groups. In this way, the interrelationship of multiplication and division can be taught from the start, eventually leading to the child habituating their multiplication and division facts at the same time.
As with the MR approach to addition, it is necessary that the child learns the number word sequences for the multiples so that they can use their multiplication skills effectively. The development of multiplication can be broken down into five ranges:

Range 1: 2s and 10s. The doubles and decuples are the most familiar multiples and are already key addition facts.

Range 2: Low x Low. Low 3s, 4s 5s already learned via addition. These small products can then be used to derive larger products.

Range 3: Low x High. High 3s, 4s 5s. These now are engaged with developing multiplication strategies.

Range 4: High x High: High 6s, 7s, 8s, 9s. The more demanding multiplication basic facts.

Range 5: Factor > 10: This sees tasks beyond the traditional learned facts/tables but using the latter effectively to solve the more difficult operations.

Appendix B: Mathematical Language & Algorithmic Terminology

B.1. Vocabulary for Core Operations

In addition to the Maths Recovery language introduced above, the following vocabulary is introduced at each class level. The language taught in previous class levels is maintained. Note that the term number sentences or number stories is used to describe mathematical operations. The term **sum** refers to addition only. Note also that abbreviated language such as 'five **into** fifteen is three' should be avoided for division. All language will be explicitly modelled and used orally/aurally before progressing to written from (in First class onwards).

Equals sign = altogether makes*(the formal equals sign is not introduced in JI)* is the same as equals = equivalent

Addition +
____ and ____ altogether makes
more (than)
combine partition add (*for teacher use)*
___ and/ add/ plus ___
is the same as ___
Addition
Plus
Add
And
Sum
Total
Increase
Raise

Subtraction -
Informal use by the teacher. (e.g. *How many are left?)*

____ take away _____ leaves____ ___ subtract ___ leaves
(formal sign not introduced)

Subtraction
Subtract
Minus
Less
Difference -
More than
Decrease
Reduce

Multiplication x
doubles/double
Skip counting- skip counting- 2s, 5s, 3s, 5s, 10s
Repeated addition
Multiply ___ groups of ___ ___times ___
Array
Repeated addition
Triple/treble
X
Product
Multiplicator
Multiplicand

Division ÷
Divide
Share
Fair share
Split
Remainder
Quotient
Divisor
Dividend

B.2. Language and Presentation of Formal Algorithms in the Operations

B.2.1. Addition without renaming

T U
8 2
1 5
----
9 7

I am adding eighty two plus fifteen.
I will start with the units. Two plus five is seven. I will write the seven under the units. Then I will add the tens. Eight tens plus one ten is nine tens. I will write nine under the tens.
So eighty two plus fifteen is ninety seven.
After practice and repetition, the text in italics may be omitted for the sake of efficiency.

11.2.2. Addition with renaming

T U
4 5
3 6

8 1
I am adding forty five plus thirty six. I will start with the units. Five plus six is eleven. I cannot write eleven under the units, so I will put down one unit, and carry the one ten. Then I will add the tens. Four tens plus three tens is seven tens, plus one more ten is eight tens. I will write eight under the tens.
So forty five plus thirty six is seventy one.

B.2.3. Subtraction without renaming

T U
7 8
1 6
6 2

I am subtracting sixteen from seventy eighty. [Check if the number on the bottom is lesser in value] I will start with the units. Eight take away six leaves two. I will write two under the units. Then I will subtract the tens. Seven tens take away one ten leaves six tens.. I will write six under the tens.
So seventy eight subtract sixteen is sixty two.

B.2.4. Subtraction with renaming

T U
3 5
1 8
1 7
I am subtracting eighteen from thirty five. [Check if the number on the bottom is lesser in value] I will start with the units. I cannot subtract eight from five. I exchange a ten to make ten units. I cross out three, and that leaves two tens. When I bring that ten over into the units, I have fifteen. Fifteen take away eight is seven. I will write seven under the units. Then I will

subtract the tens. Two tens take away one ten leaves one ten. I will write one under the tens. 1 7 So thirty five take away eighteen is seventeen.

B.2.5. ‘Short’ Multiplication

1 4
x 5
7 0
I am multiplying fourteen by five.I will start with the units. Four multiplied by five is twenty. I cannot write twenty under the units, so I will put down zero and carry over two tens.
Then I will multiply the tens. One ten multiplied by five is five tens. I will add on the two tens. That gives me seven tens. So fourteen multiplied by five is seventy.

B.2.6. Long Multiplication

43
x16
258
430
688

I am multiplying forty three by sixteen.
I will multiply forty three by six, and then by ten, and add the two together
Three multiplied by six is eighteen. I cannot write eighteen under the units, so I will put down eight and carry over the ten. Four tens multiplied by six is twenty four tens. Add the ten I carried over, and that gives twenty five tens. So six multiplied by forty three is two hundred and fifty eight.

Next, I will multiply forty three by ten. I will put down a zero because I am multiplying by tens. Three multiplied by one is three. Four multiplied by one is four.
So forty three multiplied by ten is three hundred and thirty.
Now I must add up. Eight plus zero is eight. Five plus three is eight. Two plus four is six.
So overall, forty three multiplied by sixteen is six hundred and eighty eight.

B.2.7. Short Division

94÷4=23 r2
I am dividing ninety four by four. I will divide the tens, then the units. Nine tens divided by four is two, with one ten left over. I will write the two in the tens space, and carry over the one ten. That makes fourteen units. Fourteen divided by four is three, with two left over. I will write the three in the unit space. I have a remainder of two that I cannot divide equally. So ninety four divided by four is twenty three remainder two.

B.2.8. Long Division

The traditional algorithm for long division will be replaced by a multiples and repeated subtraction approach, which makes more logical sense.
374÷25=14 r24
I am dividing three hundred and seventy four by twenty five.
I will use multiples of twenty five to see how many times I can take twenty five away from three hundred and seventy four. I will start with ten, and write it down on the right hand side. Ten multiplied by twenty five is two hundred and fifty. I will take two hundred and fifty away from three hundred and seventy four to see how much is left. There are one hundred and twenty four left. I know that four times twenty five is one hundred. I will write four down on the right hand side. I will take away one

hundred from one hundred and twenty four to see how much is left. There are twenty four left.
Twenty four is less than twenty five, so I cannot take away another twenty five. Twenty four is a remainder.
When I add up how many times I can take away twenty five, I have ten plus four, which is fourteen. So three hundred and seventy four divided by twenty five is fourteen remainder twenty four. 25 x 16 = 400
Children may use any combination of multiples to reach an answer. They may be encouraged to write out the multiples of the divisor prior to starting, to ease the process. Use of doubles and near doubles will facilitate this.

B.3. Maths Language for Other Strands

This section can be used as a checklist and reference point to when specific maths language and terminology should be introduced.
All language will be explicitly modelled and used orally/aurally before progressing to written form (in First class on).

B.3.1. Junior Infants

Due attention is given to the mathematical phrases and vocabulary outlined in *Mata sa Rang.* Parts of the Junior Infant yearly plan also use language and terminology from Ready Set Go Maths.

Early Mathematical Activities
Classifying
Matching
Comparing
Ordering
Colours
Big; Bigger; Biggest
Long/tall; Longer/taller
Wide/wider/widest
Heavy/heavier/heaviest
Is the same as/ is not the same as
I like.... / I don't like
Rough
Small / smaller/ smallest
Short / shorter / shortest
Narrow / narrower /narrowest
Light /lighter / lightest
Different to
Things that are ..../ things that are not ...
More than
Enough
As many as
Than (e.g. longer than....)
First
Next
Before
Start
Last
After
Finish

Number Counting Comparing and Ordering
Analysis of Number
One (1) Two (2) Three (3) Four (4) Five (5) Six (6) Seven (7) Eight (8) Nine (9) Ten (10)
None
Number
Count
How many?
Count up to....
More than
Same as
First

Too many
Enough
Less than/ fewer than
As many as
Last
Not enough
About the same as
___ and ____ altogether makes ____
____ and _____ makes _____
Zero (0)
Left
Add
Shape and Space Spatial Awareness 3D Shapes 2D Shapes
Over
Roll/do not roll Square
Whole School Plan for Mathematics Up Corner
Triangle
Fit together/do not
Round
Fit
Thick
Together
Shape
Under
Stack(ed)
Circle
Down
Rectangle
Beside
Not round
Outside
Thin
Moving in...
Corner
Curved lines
Measures Length Weight Capacity Time Money
Long/Longer than
Tall/Taller than
Wide/Wider than
Short/Shorter than
Narrow/Narrower than
Heavy/Heavier than
Full
Morning
Cent
Empty
Evening
1c/ cent
Balance
Holds less than
Night
Day
Light
Nearly full
Lighter
Holds more than
Lunchtime
Buy
Weigh
Holds as much as
Dinnertime
Sell Bedtime
Spend Early
Coins Late
How much?
Monday Tuesday Wednesday Thursday Friday Saturday Sunday

Data Recognising and interpreting data
Sort
Enough
More than
Less than

As many as

B.3.2. Senior Infants

Number, Counting, Comparing and Analysis of Number
Order
Zero – Twenty
Second
Third
How many more?
___ plus ____ is the same as
___ plus ____ equals
count on +
Number line/strip
Count back
____ from ____leaves____
take away

Shape & Space Spatial Awareness 3D Shapes 2D Shapes
Above
Near
Far
Right
Below
Cube
Straight
Cuboid
Curved Sphere
Smaller
Cylinder
Flat Edge
Side
Left
Corner
Larger
Through
Straight
Behind
Curved
Stop
Round
Flat
Roll
Face

Measures Length Weight Capacity Time Money
As long as
As wide as
As high as
High Higher Highest
Longest
Shortest
Guess
Measure
Length
Height
Width
Cent (1- 20)
Change
Cost
Price
Cheap

Expensive
Too much
Too little
Sell
Amount

Data Recognising and Interpreting Data

Groups
Criteria
Criterion
With/without
Choose

B.3.3. First Class

Weight
Capacity
Time
Size
Containers
Yesterday
Shape
Fill
Tomorrow
Balance
Amount
Today
Order
Compare
Week
Check
Guess
Day
O’clock
Record
Birthday
Results
Seasons
Soon
Net
Festivals (Christmas, Back to school...)
Holidays
Day
Fractions
Operations
Recount
Number 0-99
Numeral
Count on / Count back
Number line
Hundred square
Guess
Estimate
Compare
Less than
Half

Comparing and Place Value

How many
Tens
Addition First – tenth
Units
Whole
Number Patterns
Value
Set
Number sentence
Greater
Lower
Number line

Hundred square
Count on Count back
Counting in twos/threes….
Doubles
Near double
Pair
Number stories
More than
Renaming
About the same as
Guess
Estimate
Check
Left
How many do I need?
Fewer
Subtraction
Difference
Symbols
The same as / Equals
Number
Balance
Odd
Even
Record
Count in ....

Shape and Space Spatial Awareness 2D Shapes 3D Shapes

Between
Underneath
On top of
Around
Closed shape / Open shape
Shape
Directions
3-D
Vertices / Vertex
Semicircle
Curved / Not Curved

Measures Length Weight Capacity Time Money

Length
Width
Height
Guess
Compare
Measure
Record
Widest
Metre
Nearly a metre
A bit more than 1m / A bit less than 1m
Standard units
Pour
Measure
Litre (l)
Same length as
Size
1c – 50c
Equal value
Time
Standard units
Calendar
Day
Months
Clock face
Clock hands small / big#
Later / Earlier

Data Representing and interpreting data
Pictograms
Classify
How many more? / How many less?
Guess
Measure
Compare
Record
Holds the same amount as...
Heaviest
Lightest
Kilogram
Half past
Same weight as...

B.3.4. Second Class

Number Counting, Comparing, Place Value, Numeration Ordering, Fractions, Operations.
0-199
Between
Before
After
Greater than, >
Less than, <
Hundreds
Quarter
Ordinal number on the calendar
Equal to =
Count on / Count back
Number patterns
Group(s)

Shape and Space Spatial Awareness 2D Shapes 3D Shapes
Symmetry
Angles
Oval
Cone
Line
Full Turn
Half Turn
Quarter Turn
Forward /Backwards
Corners
Square
Corners
Two-dimensional
Three-dimensional
Symmetrical
Mirror image
Length Area Weight Capacity Time
Centimetre
Trundle Wheel
Tallest
Shortest
Differences
Half
Quarter past
Quarter to
Date
Half-litre
Kilogram
Data Representing and Interpreting Data
Table
Chart
Block

Graph
Cover

B.3.5. Third Class

Number Place Value Operations
Whole numbers
Thousand
Notation board
Base ten
Digit (one digit, two digit, three digit)
Value
Decimal numbers
One place of decimals / one decimal place
Rounding
Repeated addition
Multiplication
Division
Sharing
Remainder
Tenths
Equal Groups
Repeated subtraction
Half
Fractions
Equivalent fractions
Denominator
Numerator
Nett
Algebra Number patterns and sequences, Shape and Space, 2D Shapes, 3D Shapes, Symmetry, Angles
Hexagon
Irregular shapes
Regular shapes
Tessellate
Triangular prism
Pyramid
Vertex / vertices / corners
Symmetrical
Asymmetrical
Angles
Parallel
Perpendicular
Right Angle
Obtuse Angle
Acute Angle
Vertical
Horizontal
Clockwise
Anti-clockwise
Length Area Weight Capacity Time
Centimetre
convert
Gram
Scale / digital scale
Millilitre
Container
Daily
Weekly
Monthly
Annual
A long time ago
Last year / last month
Yesterday
Immediately

In a week's time
five minute intervals past/to analogue digital
Data Representing and Interpreting , Chance

Data
Scale
Possible
Impossible
Might
Certain
Not sure
Likely / Least likely / Most likely
Unlikely
Results

B.3.6. Fourth Class

Number Place Value Decimals/ Fractions
Four digit
One place of decimals
Two places of decimals
Hundredths
Algebra Number patterns and sequences, Shape and Space 2D Shapes, Symmetry, Angles
Equilateral triangle
Isosceles triangle
Scalene triangle
Parallelogram
Rhombus
Pentagon
Octagon
Oblique
Perpendicular
Diagonals
Intersecting lines
Acute angle
Obtuse angle
Right angle

Measure Length Area Weight Capacity Time

Perimeter
Kilometre
Diagonal
Square centimetres
gram
Square metres
Measurement on digital scale
Scale - 1 is to 2/5/10/100
Chance
Likely / Unlikely
Never
Definitely

B.3.7. Fifth Class

Number Operations Fractions Decimals/ Fractions Number Theory
Algorithm
Improper fractions
Mixed fractions
Percent
Prime number
Composite number
Square number Rectangular number
Factor
Multiple
Directed number
Positive number
Negative number
Algebra, Shape and Space 2D Shapes 3D Shapes Lines and Angles
Quadrilateral

Trapezium
Diameter
Radius
Tetrahedron
Reflex angle
Straight angle
Rotation
Degrees
Protractor
Set Square

Measure Length Area Capacity
Metric unit
Millimetre
Breadth
Graduated jug
D**ata Representing and Interpreting Data Chance**
Pie chart
Statistics
Most frequent
Most popular
Outcome
Processes
Frequency table
Frequency chart

B.3.8 Sixth Class

Number Operations Fractions Decimals/ Fractions Number Theory
Compute
Ratio
Natural number
Multiple
Profit
Loss
Discount
VAT
Interest
Decrease (Increase)
Square Root
Exponential
Variable
Directed number
Positive number
Negative number

Algebra Shape and Space
Octahedron
Circumference
Coordinates
Plot
Measure Length Area Capacity Time Money
Surface area
Time zones
Currency
Millimetre
Hectare
Acre
Distance
Convert
Average speed
Exchange rate
Scale
Plan
Data Representing and Interpreting Data
Trend graph
Data set

Appendix C Glossary of Maths Recovery Terminology

(These terms and descriptions are ©Maths Recovery Ireland)

1. Additive task
A generic label for tasks involving what adults would regard as addition. The label ‘additive task’ is used to emphasize that children will construe such tasks idiosyncratically, that is, differently from each other and from the way adults will construe them.

2. Arithmetic rack (Rekenrek)
An abacus-like instructional device consisting of two rows often beads. In each row the beads appear in two groups of five, that is using two different colours for the beads.

3. Aspect
A key element of a part of the Learning Framework in Number.

4. Backward number word sequence (BNWS)
A regular sequence of number words backward, typically but not necessarily by ones, for example, the BNWS from ten to one, the BNWS from eighty-two to seventy-five, the BNWS by tens from eighty-three.

5. Combining
An arithmetical strategy involving combining (that is, adding in a sense) two numbers in the range one to five, without counting, for example, 3 and 2, 4 and 4.

6. Counting-by-ones
Initial or advanced arithmetical strategies which involve counting-by-ones only. Examples of initial counting-by-ones strategies are perceptual and figurative counting, which involve counting-from-one. Examples of advanced counting-by-ones strategies are counting-on, counting-down-from and counting-down-to.

7. Counting-down-from

A strategy used by children who have attained at least Stage 3 and typically used to solve Removed Items tasks, for example, 11 remove 3 — ‘eleven, ten, nine — eight!’ Also referred to as counting-off-from or counting-back-from.

8. Counting-down-to
Regarded as the most advanced of the counting-by-ones strategies and used by children who have attained at least Stage 4. Typically used to solve Missing Subtrahend tasks, for example, have 11, remove some, and there are eight left — ‘eleven, ten, nine — three’. Also referred to as counting-back-to.

9. Counting-on
An advanced counting-by-ones strategy, indicative of having attained Stage 3 on Learning Framework in Number, and used to solve additive tasks or Missing Addend tasks involving two hidden collections. Counting-on can be differentiated into counting-up-from for additive tasks and counting-up-to for subtractive tasks. Counting-on is also referred to as counting-up.

10. Counting-up-from
An advanced counting-by-ones strategy, indicative of having attained Stage 3, and used to solve additive tasks involving two hidden collections, for example, seven and five is solved by counting up five from seven.

11. Counting-up-to
An advanced counting-by-ones strategy, indicative of having attained Stage 3, and used to solve Missing Addend tasks, for example, seven and how many make twelve is solved by counting from seven up to twelve, and keeping track of five counts.

12. Difference
See Minuend.

13. Digit
The digits are the ten basic symbols in the modem numeration system, that is ‘0’, ‘1’

14. Domain
One of the major threads of the Learning Framework In Number, e.g. Number Grouping.

15. Early number

A generic label for the number work in the first three years of school and learned by children around four to eight years of age. Also known as ‘Early Arithmetic’.

16. Facile
Used in the sense of having good facility that is, fluent or dexterous, for example, a facile counting-on strategy, or facile with the backward number word sequence.

17. Figurative
The label for Stage 2. Figurative thought involves re-presentation of a sensory-motor experience, that is, a mental replay of a prior experience involving seeing, hearing, touching, and so on. Figurative counting may be figural, in which visualized items constitute the material which is counted; motor, in which movements constitute the material which is counted; or verbal, in which number words constitute the material which is counted.

18. Forward number word sequence (FNWS)
A regular sequence of number words forward, typically but not necessarily by ones, for example, the FNWS from one to twenty, the FNWS from eighty-one to ninety-three, the FNWS by tens from twenty-four.

19 Learning Framework in Number
A foundational structure for assessment and teaching in early number developed by the Mathematics Recovery Programme.

20. Level
The terms ‘Level’ and ‘Stage’ are used in a technical sense. A ‘Level’ is a point on a continuum, for example Level 3 in knowledge of FNWSs. A ‘Stage’ is like a plateau. Each new stage is characterised by a qualitative advancement in knowledge, that is, a conceptual reorganisation of strategies, and in the way tasks are construed.

21. Minuend
In subtraction of standard form, for example 12 — 3 = 9, 12 is the minuend, 3 is the subtrahend and 9 is the difference. Thus the difference is the answer obtained in subtraction, the subtrahend is the number subtracted and the minuend is the number from which the subtrahend is subtracted.

22. Missing addend
A subtractive task posed in the form of addition with one addend missing, for example, 12 and how many make 15.

23. Non-count-by-ones (also advanced strategies)
A class of strategies which involve aspects other than counting-by-ones and which are used to solve additive and subtractive tasks. Part of the strategy may involve counting- by-ones but the solution also involves a more advanced procedure. For example, 6 + 8 is solved by saying ‘six and six is twelve — thirteen, fourteen. These strategies are characteristic of Stage 5 on Learning Framework in number.

24. Number
A number is the idea or concept associated with, for example, how many items in a collection. We distinguish among the number 24 — that is, the concept, the spoken or heard number word ‘twenty-four’, the numeral ‘24’ and also the read or written number word ‘twenty- four’ These distinctions are important in understanding children’s early numerical strategies.

25. Number word
Number words are names or words for numbers. In most cases in early number the term ‘number word’ refers to the spoken and heard names for numbers rather than the read or written names.

26. Numeral
Numerals are symbols for numbers, for example ‘5’, ‘27’.

27. Numeral identification
Stating the name of a displayed numeral. The term is used similarly to the term ‘letter identification’ in early literacy. When assessing Numeral Identification, numerals are not displayed in numerical sequence.

28. Numeral recognition
Selecting a nominated numeral from a randomly arranged group of numerals.

29. Partitioning

An arithmetical strategy involving partitioning a small number into two parts without counting, typically with both parts in the range Ito 5, for example partitioning 6 into 5 + 1, 4 + 2, and so on.

30. Perceptual
Involving direct sensory input — usually seeing but may also refer to hearing or feeling. Thus perceptual counting involves counting items seen, heard or felt.

31. Procedure
See Strategy.

32. Setting
A physical situation used by a teacher in posing numerical tasks, for example, collections of counters, Numeral Track, Hundreds Chart, Ten Frame.

33. Stages
See Levels.

34. Standard number word sequence (SNWS)
The forward sequence of number words from one onward.

35. Strand
See also Domain. (One of the major threads of the Learning Framework In Number)

36. Strategy
A generic label for a method by which a child solves a task. A strategy consists of one or more constituent procedures. A procedure is the simplest form of a strategy, that is, a strategy that cannot be described in terms of two or more constituent procedures. For example, on an additive task involving two screened collections a child might use the procedure of counting the first collection from one and then use the procedure of continuing to count by ones, in order to count the second collection.

37. Subitizing
The immediate, correct assignment of a number word to a small collection of perceptual items.

38. Subtractive task
A generic label for tasks involving what adults would regard as subtraction. The label ‘subtractive task’ is used to emphasise that children will construe such tasks idiosyncratically, that is, differently from each other and from the way adults will construe them.

39. Subtrahend
See Minuend.

40. Task
A generic label for problems or questions presented to a child.