

Whole School Plan

For

Mathematics



Scoil Naomh Peadar

Droichead Átha

St. Peter's N.S

Curriculum Policy Document

MATHEMATICS

Content:

- Introductory Statement
- Our Vision for Mathematics
- Aims and Objectives

- Content of the Plan
 - Structure of Mathematics Curriculum
 - Development of Mathematical Skills
 - Mathematical Language
 - Mathematical Equipment

- Methodologies
 - Talk and Discussion
 - Active Learning/Guided Discovery
 - Collaborative/Co-operative Learning
 - Using the Environment
 - Problem Solving
 - Estimation

- Integration
- Assessment and Record Keeping
- Home School Links
- Calculators and ICT
- Mental Maths/Tables
- Differentiation
- Resources
- Success Criteria
- Roles and Responsibilities
- Timeframe for Implementation
- Timeframe for Review
- Responsibility for Review
- Ratification and Communication

- Individual Class Schemes
 - Junior/Senior Infants
 - First/Second Classes
 - Third/Fourth Classes
 - Fifth/Sixth Classes

Introduction:

This Mathematics Policy was formulated and drawn up during the first term of the 2003/04 school year. A number of planning meetings took place in the school following the in-service training provided by the Department of Education and Science. During these school-based planning meetings the teaching staff reviewed what was current good practice in the teaching of mathematics at St. Peter's N.S..

Following this review the staff examined and discussed the aims and objectives of the revised mathematics programme. Other areas to receive attention were approaches, methodologies, equipment, resources, timetabling, language, assessment and record-keeping, homework, storage of mathematics equipment, updating textbooks and changes in the revised mathematics primary school curriculum.

All of the school staff has been instrumental in drawing up this school policy. It is envisaged that the policy will be reviewed and revised at regular intervals.

Our Vision:

By the time our pupils leave St. Peter's N.S. they will be confident that they can communicate effectively through the medium of mathematics. Furthermore they will be enabled to deal effectively with the varied transactions of everyday life and make sense of the mass of information and data available through the media.

Aims and Objectives:

The **Broad Objective** of our Maths Policy is to promote initiative, confidence, creativity, critical thinking, co-operative behaviour and good communication skills.

Aims of the Primary School Mathematics Curriculum

- To develop a positive attitude towards mathematics and an appreciation of both its practical and its aesthetic aspects
- To develop problem-solving abilities and a facility for the application of mathematics to everyday life
- To enable the child to use mathematical language effectively and accurately
- To enable the child to acquire an understanding of mathematical concepts and processes to his/her appropriate level of development and ability
- To enable the child to acquire proficiency in fundamental mathematical skills and in recalling basic number facts.

Skills Development

To enable the child to:-

- Apply mathematical concepts and processes, and plan and implement solutions to problems, in a variety of contexts
- Communicate and express mathematical ideas, processes and results in oral and written form
- Make mathematical connections within mathematics itself, throughout other subjects, and in applications of mathematics in practical everyday contexts
- Reason, investigate and hypothesise with patterns and relationships in mathematics
- Implement suitable standard and non-standard procedures with a variety of tools and manipulatives
- Recall and understand mathematical terminology, facts, definitions and formulae

Number:

To enable the child to:-

- Understand, develop and apply place value in the denary system (including decimals)
- Understand and use the properties of number
- Understand the nature of the four number operations and apply them appropriately
- Approximate, estimate, calculate mentally and recall basic number facts
- Understand the links between fractions, percentages and decimals and state equivalent forms
- Use acquired concepts, skills and processes in problem-solving

Algebra

To enable the child to:-

- Explore, perceive, use and appreciate patterns and relationships in numbers
- Identify positive and negative integers on the number line
- Understand the concept of a variable, and substitute values for variables in simple formulae, expressions and equations
- Translate verbal problems into algebraic expressions
- Acquire an understanding of properties and rules concerning algebraic expressions
- Solve simple linear equations
- Use acquired concepts, skills and processes in problem solving

Shape and Space

To enable the child to:-

- Develop a sense of spatial awareness
- Investigate, recognise, classify and describe the properties of lines, angles and two-dimensional and three-dimensional shapes
- Deduce informally relationships and rules about shapes
- Combine, tessellate and partition two-dimensional shapes and combine and partition three-dimensional shapes
- Draw, construct and manipulate two-dimensional and three-dimensional shapes
- Identify symmetry in shapes and identify shape and symmetry in the environment
- Describe direction and location using body-centred (left/right, forward/back) and simple co-ordinate geometry
- Use acquired concepts, skills and processes in problem-solving

Measures

To enable the child to:-

- Know, select and use appropriate instruments of measurement
- Estimate, measure and calculate length, are, weight, capacity and average speed using non-standard and appropriate metric units of measurement
- Estimate, measure and calculate angles, time, money and scale using non-standard and appropriate units of measurement
- Recognise and appreciate measures in everyday use
- Use acquired concepts, skills and processes in problem-solving

Data

To enable the child to:-

- Collect, classify, organise and represent data using concrete materials and diagrammatic, graphical and pictorial representation
- Read, interpret and analyse tables, diagrams, bar charts, pictograms, line graphs and pie charts
- Appreciate, recognise and express the outcomes of simple random processes
- Estimate and calculate using examples of chance
- Use acquired concepts, skills and processes in problem-solving.

Mathematical Skills to be Developed

The Revised Mathematics Curriculum provides opportunities for each child to explore the nature of mathematics and to acquire the knowledge, concepts and skills required for everyday living and for use in other subject area.

The main skills to be developed are:-

- Applying and problem-solving
- Communicating and expressing
- Integrating and connecting
- Reasoning
- Implementing
- Understanding and recalling

Content of the Plan:

Structure of Mathematics Curriculum

Strands	Infants Strand Units	First/Second Strand Units	Third/Fourth Strand Units	Fifth/Sixth Strand Units
Early Mathematical Activities	<ul style="list-style-type: none"> ▪ Classifying ▪ Matching ▪ Comparing ▪ Ordering 			
Number	<ul style="list-style-type: none"> ▪ Counting ▪ Comparing and Ordering ▪ Analysis of number... (<i>Combining/ Partitioning/ Numeration</i>) 	<ul style="list-style-type: none"> ▪ Counting and Numeration ▪ Comparing and Ordering ▪ Place Value ▪ Operations..... (<i>Addition/ Subtraction</i>) ▪ Fractions 	<ul style="list-style-type: none"> ▪ Place Value ▪ Operations..... (<i>Addition/ Subtraction/ Multiplication/ Division</i>) ▪ Fractions ▪ Decimals 	<ul style="list-style-type: none"> ▪ Place Value ▪ Operations..... (<i>Addition/ Subtraction/ Multiplication/ Division</i>) ▪ Fractions ▪ Decimals ▪ Percentages ▪ Number Theory
Algebra	<ul style="list-style-type: none"> ▪ Extending Patterns 	<ul style="list-style-type: none"> ▪ Exploring and using Patterns 	<ul style="list-style-type: none"> ▪ Number Patterns and Sequences 	<ul style="list-style-type: none"> ▪ Directed Numbers ▪ Rules and Properties ▪ Variables ▪ Equations
Shape and Space	<ul style="list-style-type: none"> ▪ Spatial Awareness ▪ 3-D Shapes ▪ 2-D Shapes 	<ul style="list-style-type: none"> ▪ Spatial Awareness ▪ 2-D Shapes ▪ 3-D Shapes ▪ Symmetry ▪ Angles 	<ul style="list-style-type: none"> ▪ 2-D Shapes ▪ 3-D Shapes ▪ Symmetry ▪ Lines and Angles 	<ul style="list-style-type: none"> ▪ 2-D Shapes ▪ 3-D Shapes ▪ Symmetry ▪ Lines and Angles
Measures	<ul style="list-style-type: none"> ▪ Length ▪ Weight ▪ Capacity ▪ Time ▪ Money 	<ul style="list-style-type: none"> ▪ Length ▪ Weight ▪ Capacity ▪ Time ▪ Money ▪ Area 	<ul style="list-style-type: none"> ▪ Length ▪ Weight ▪ Capacity ▪ Time ▪ Money ▪ Area 	<ul style="list-style-type: none"> ▪ Length ▪ Weight ▪ Capacity ▪ Time ▪ Money ▪ Area
Data	<ul style="list-style-type: none"> ▪ Recognising and Interpreting Data 	<ul style="list-style-type: none"> ▪ Recognising and Interpreting Data 	<ul style="list-style-type: none"> ▪ Recognising and Interpreting Data ▪ Chance 	<ul style="list-style-type: none"> ▪ Recognising and Interpreting Data ▪ Chance

Mathematical Language

It has become clear that there is a great need for an agreed policy in the area of mathematical language. Mathematics can be viewed as a separate language in itself with its own vocabulary and grammar. It must be spoken before being read and read before being written. Poor comprehension of mathematical words and phrases are a widespread problem in this subject area. In an effort to improve comprehension, a greater emphasis will be placed on discussion as this will assist with the acquisition of mathematical language and the development of mathematical concepts.

Concepts will be developed fully before finding expression in written recording. The use of symbols and mathematical expressions will follow extended periods of oral reporting and discussion. Our ultimate aim is to enable each child to use mathematical language effectively and accurately.

Continuity of Language in Number Operations / Tables

➤ Addition/Subtraction/Multiplication/Division.....Left to Right Orientation
e.g. $5+4=9$ $6 \times 5=30$

➤ Addition/Subtraction.....Top Down
e.g. 24 58
 + 13 - 24
 37 34

➤ Subtraction with Regrouping
e.g. 345
 -256

Language Relating to Mathematical Symbols

Infant Classes:-

Addition.....add/and/go on/go forward

Subtraction.....take away/go back/put back

Equals.....is/are/makes/answer is/equals/altogether/how many left?

First/Second Class:-

Addition.....(as above) / addition/plus

Subtraction.....(as above) minus/subtraction/subtract/find the difference/less than/from/fewer

Equals.....(as above) same as

Third/Fourth Class:-

Addition.....(as above) sum of/total/increase
Subtraction.....(as above) decrease
Multiplication.....multiplication/times/multiply/product
Division.....divide/share/division/give/group/split/how many?
Equals.....(as above)

Fifth/Sixth Class:-

Addition.....(as above)
Subtraction.....(as above)
Equals.....(as above)
Multiplication....(as above) squared/to the power of
Division.....(as above) product

General Mathematics Language

Infants:-

Long/short, longer/shorter.....more than/less than/same as... first/last...
over/under/up/down/on/beside/in..... shape/square/circle/triangle/rectangle.....
roll/don't roll.....fit/do not fit.....round/not round.....thick/thin.....wide/narrow/wider
than/narrower than....heavy/light/heavier/lighter/balance/weigh.....full/nearly
full/empty/holds more/holds less/holds as much as.....
morning/evening/night/day/lunchtime/bedtime/early/late.....
days of the week/schooldays/weekends.....
.buy/sell spend/coins/how much/cost/euro/cent.....enough/more/as many as/less

Ordinal number – first/ second/ third/ last/ Above/ below/ near/ far/right/left/ cube/
cuboid/sphere/ cylinder/edge/ corner/ face/straight/ curved/round/ flat/ side/corner
As long as/ as wide as/ longest/shortest/ Yesterday/ today/ tomorrow/ seasons/ soon/
not yet/ birthday
Cost price, cheap/ expensive, change, too much, too little,
Pictogram
Sets- Guess

First and Second Class:-

As Senior Infants plus:

Between, underneath, on top of, around, through, left, right
Semicircle
Half
Length, width, height, measure, nearly a metre, a bit more than/a bit less than a metre
Heavy, heavier, heaviest, light, lighter, lightest, balance
Pour fill, full, empty, holds more, less, or the same amount as
Reading day, date and month using calendar
Hour, half hour, metre, litre, kilogram
As first class plus:
Quarter
Cone, oval, square, rectangle, triangle, circle, semicircle
Metre, centimetre, Euro
Symmetry
Area
Digital clock /time
Block graph
Corners

Third and Fourth Class:-

As First and Second Class plus:

Regular/irregular shapes;
Sphere, triangular sphere, prism, pyramid
Sides, angles, parallel and non-parallel lines
Tessellate
Nets
Symmetry
Vertical, horizontal and parallel lines
Clockwise and anti-clockwise
Gramme, kilogram
Possible, impossible, might, certain, not sure
Roll, toss, spin, chance, random
Tenths
Minute
Equivalent
Bar Chart
Equilateral, Isosceles, scalene triangle, parallelogram, rhombus, pentagon, octagon
Diagonal
Oblique, perpendicular lines
Acute, obtuse and right angles
Perimeter
Hundredths
Chance, likely, unlikely, never, definitely
Bar line graph
Scale

Fifth and Sixth Class:-

As Third and Fourth Class plus:

Thousandths
Prime and composite numbers
Square and rectangular numbers
Factors, multiples
Positive and negative numbers
Equations
Quadrilaterals
Diameter, radius, chord, circumference,
arc, sector, tangent, tetrahedron,
vertices, reflex angle, degrees
Millimetre
Square metres/centimetres
Millilitres
Pie chart, multiple bar chart
Statistics
Likelihood
Rotation

Squarer roots
Quotients
Octahedron
Scale
Ares/ hectares
Trend graph

▪ *Mathematical Equipment*

“ If children are to learn from doing they must do”

The experience of manipulating and using objects and equipment constructively is an essential component in the development of both mathematical concepts and constructive thought throughout the strands of the mathematics programme. With that in mind the school is very much aware of the need to obtain adequate mathematical equipment for pupils and teachers.

Shared equipment will be stored in the staff room and will be organized so that it is easily accessible to all. Equipment that is used on a daily basis will be stored in the classrooms. A detailed list of the mathematical equipment used by each class can be found in the Class Planning Section of this Plan.

Methodologies:

▪ *Talk and Discussion*

In the revised mathematics curriculum there is far greater emphasis on guided discussion. The pupils will be encouraged and enabled to discuss different topics among themselves as well as actively becoming involved in teacher-pupil discussion. In this way the language of mathematics will be developed as will the self-confidence of the pupils in the class.

However pupils will need to be trained in the following discussion skills before they can effectively use them in a group.

- ◆ turn-taking
- ◆ active listening
- ◆ positive response to opinions of others
- ◆ confidence in putting forward an opinion
- ◆ ability to explain clearly their point of view

▪ *Active Learning / Guided Discovery*

A hands-on approach is vital if children are to understand mathematical concepts. The children in our school will have access to a wide range of mathematical equipment so that they can learn by doing rather than learn by watching. Working with equipment will be done individually, in pairs and in groups depending on the situation.

▪ *Collaborative / Co-Operative Learning*

While direct instruction is very important in mathematics, children also need to develop their own learning strategies. We will need to teach pupils to look at **how** they arrived at a result rather than just concentrating on the answer as an end in itself.

Pupils will develop learning strategies by solving problems co-operatively in pairs or in small groups. In these situations pupils will work at their own pace, they will be expected to respect one another's solutions while discussing the train of thought used in the process. The teacher for their part will encourage the groups to complete the allotted tasks.

Consultation, discussion and co-operation are essential in this constructivist approach.

▪ Using the Environment

To make the mathematics programme relevant and interesting for the pupils, every effort will be made to show that mathematics is an integral part of our everyday lives. There will be an emphasis on mathematics in real situations. Maths stories, maths trails and maths puzzles will bring a sense of fun and challenge to the class. The classroom, the school building, the playground and the local neighbourhood will be utilised to the full as resources.

▪ Problem Solving

Problem solving provides a context in which concepts and skills can be learned and in which discussion and co-operative working may be practiced. Problem solving experiences should develop the ability to plan, take risks, learn from trial and error, check and evaluate solutions and think logically. Discussion and acceptance of the points of view of others are central to the development of problem solving strategies. The pupils will need to be taught problem solving skills to give them confidence in their own ability to attempt a solution.

The approach to problem solving in mathematics which is utilised in St. Peter's N.S. is based on the *Westwood Problem Solving Strategy* – **RAVECCC**

- R - Read the problem carefully (more than once)
- A - Attend to key words
- V - Visualise problem (use a picture / diagram)
- E - Estimate answer
- C - Choose numbers to use
- C - Calculate the answer
- C - Check against your estimate

▪ Estimation

In the above Problem Solving Strategy, estimation is an important element. In a wider sense it is an important life skill, e.g. shopping, measuring time and distance, etc. Therefore it is vital that our pupils are equipped with the skills to work out estimates for themselves. The approaches we will adopt to computational estimation are:

1. Clustering Strategy
2. Rounding Off Strategy
3. Special Numbers Strategy

As estimation skills are essential throughout the strands and at all class levels they will form an integral part of each mathematics lesson.

Integration:

Integrating mathematics with other areas of the curriculum enables the pupils to use mathematics in a meaningful way. Most areas of our lives are affected by mathematics in one way or another.

At school mathematics is also an obvious part of many subjects.

SESE

Science	Collecting data for analysis / Recording results of experiments
Geography	Mapping and planning, area, scale, distance, time, graphs
History	Time and chronology

Physical Education

Measuring, scoring, timing.

Music

Notation, rhythm, beats

Visual Arts

Shapes, symmetry, pattern

Assessment and Record Keeping:

It is our agreed policy that assessment will be carried out continuously and informally through questioning, dialogues, homework, teacher observation and structured tests. Results of these assessments will feed back into the teaching and learning process. Assessment will also help identify the kinds of difficulties experienced by pupils in developing mathematics concepts and skills. The teacher will be informed of the strengths and weaknesses of the pupils, their readiness to proceed to another level and the need for revision of certain areas of the curriculum.

Regular teacher-designed class revision tests will be carried out in each class as well as two main assessments, in November and May, which will record the rate of progression in Mathematics at the end of a specific time. Furthermore the school will use the *Sigma-T* standardized test for mathematics (First Class - Sixth Class) in the beginning/middle of May each year.

Diagnostic testing will also be carried out to identify pupils with difficulties in specific areas. The school will make every effort to cater for the needs of pupils with special needs as well as more able pupils within the constraints of the resources available at any given time.

The use of early screening tests at infant level will mean that pupils who are experiencing problems in mathematics will be identified at an early stage and appropriate remediation provided at this point. The results of these tests will also give an indication where the pupil's strengths lie and extension work will be designed based on this information.

Results of assessments in mathematics will be recorded in each pupil's personal file and these results and observations will be accessed and referred to when reporting to parents/guardians, teachers and other education professionals. Work samples may also be used to add to the overview of each child's mathematical development.

Home School Links:

Consultation with parents and the Board of Management is essential in order to successfully implement the *Revised Mathematics Curriculum*. Parents can provide very useful information about the children's early number/mathematical experience. They can also assist their children informally by encouraging the correct use of mathematical language and the use of number, estimation and mental strategies in everyday life.

As homework creates a link between home and school it is important that parents are supportive of the school's homework policy. Homework should be seen as a reinforcement of work previously carried out in class. The school staff will endeavor to communicate with parents about the correct terminology and methods being used by the children and homework assignments will be made as realistic, practical and relevant as possible.

Calculators and ICT

Calculators and computers enhance the implementation of the mathematics curriculum. As the revised curriculum provides for the introduction of calculators in fourth class, it is hoped that by that time each child will have acquired a mastery of basic number facts and a facility to use them.

Calculators help in the development of problem solving skills by allowing the child to focus on the structure of the problem and possible means of solution. Calculators will be used to check estimates, to perform long and complex computations and to provide exact results to difficult problems. However it is important to remember that the child needs a sound understanding of number to make judgments about when it is appropriate to estimate, to calculate mentally, to make a calculation on paper or to use a calculator for an exact result.

A supply of calculators will be retained in the school and will be loaned out to pupils as they need them.

Computer will be utilized in each classroom as a teaching tool. Computers provide an alternative to pen and paper tasks, are stimulating for less able pupils and also provide an extension experiences for all levels of ability. A wide range of mathematics based computers applications are used with each class level. These are primarily drill and practice programmes and adventure programmes. Data-handling packages are used to a more limited extent. As more recommended software becomes available, it will also be introduced to reinforce the content of the mathematics curriculum.

Some examples of computer software currently in use at the school:

- Maths Circus – Act 1
- Maths Circus – Act 2
- Maths Blaster
- Amazing Maths
- Tangram Puzzles
- Millie's Maths House
- Knowsley Woods
- Sammy's Science House
- Matching Pairs – (Thinking Things)
- Trudy's Time and Place

Mental Maths / Tables:

As there is now a greater emphasis on mental calculations, estimation and problem solving skills it is important that the pupils are confident and comfortable when dealing with numbers. Therefore the pupils will continue to learn and practice their tables (addition, subtraction, multiplication, division) right up to and including sixth class. Mental Maths lessons, quizzes, and worksheets will also be used to help develop the arithmetical skills of each pupil. Rapid advances in information technology and the ready availability of calculators does not lessen the need for the basic skills.

Differentiation:

Careful planning will be needed in order to cater fully for pupils of differing ability and stages of development. By teacher observation and testing each child's strengths and weaknesses will be identified and the mathematics programme will be designed and implemented accordingly.

The use of card and dice games will help reinforce number recognition, help in the development of strategies as well as encouraging co-operation and turn-taking.

Where a pupil is experiencing difficulty in their approach to written problems, the possibility that the child has a language or reading deficiency will be investigated. In a case like this the child will be helped by the use of diagrams, pictures and concrete materials to support the words. Alternative strategies will also be utilized for children with memory deficits, poor sense of direction, time and spatial relationships.

Teachers will also attempt to stretch and challenge those pupils who are more able in the subject area of mathematics. This will be done by the use of more difficult and complex extension workcards as well as the use of computer software. Care will need to be taken to ensure that this extension work is not seen as a punishment or penalty, but instead as an extra challenge for any child who is particularly strong in the field of mathematics.

Resources:

An adequate supply of suitable teaching materials will be essential for the development of an investigative approach to the teaching of mathematics in our school. The Board of Management, with the support of the Parent Teacher Association, within the resources available to it, will provide the necessary support for the development and implementation of this school plan for mathematics.

Each classroom will have a variety of mathematics textbooks that the teachers and pupils can use. The “**Action Maths**” scheme is the one currently in use in the school. Each teacher will also have a selection of different mathematics textbooks supported by pockets of graded worksheets and teacher resource books to help in the provision of extension work for pupils who have mastered a concept.

A detailed list of mathematical equipment for each class group can be seen in the Class Planning Section at the end of this document.

Success Criteria:

It is hoped that this plan will have a positive impact on the way mathematics is taught and learned in our school. As the learning needs of our pupils are central to the plan it is important that the plan is assessed on an on-going basis. This will be accomplished by:

- Teacher Observation
- Teacher-designed tests and tasks
- Projects, work samples
- Standardised testing
- Diagnostic testing
- Curriculum profiles
- Parent/pupil/community feedback
- Advice from fellow teachers/education professionals
- In-service training/summer courses
- Inspector's suggestions/reports
- Feedback from second level schools

Roles and Responsibilities:

This Mathematics Plan will be supported, developed and implemented by the teaching staff and the entire school community at St. Peter's N.S.. Each member of staff will be responsible for monitoring and evaluating the effectiveness of the plan in their own classroom. The principal will co-ordinate the progress of the plan, encourage feedback and lead discussions on its effectiveness or otherwise at regular staff meetings.

Timeframe for Implementation:

This plan will be fully implemented in the school year 2004/05. Feedback from staff will be included on the agenda of at least one staff meeting per year. Following discussions an *Action Plan* will be formulated to deal with the areas of the plan that need to be re-examined and revised.

Timeframe for Review:

This mathematics plan will be initially reviewed at the first staff meeting of the 2005/'06 school year.

Responsibility for Review:

Those responsible for the review of the mathematics plan will be the:

- Teaching Staff
- Parents / Parent Teacher Association
- Pupils
- Board of Management

Ratification and Communication:

This plan will be presented to the school's Board of Management for ratification.

A copy of the plan will also be made available to the PTA of St. Peter's N.S.

*Ratified by the
Board of Management of St. Peter's N.S.
on
_____2004.*

Signed: _____
Chairperson – On behalf of the Board

