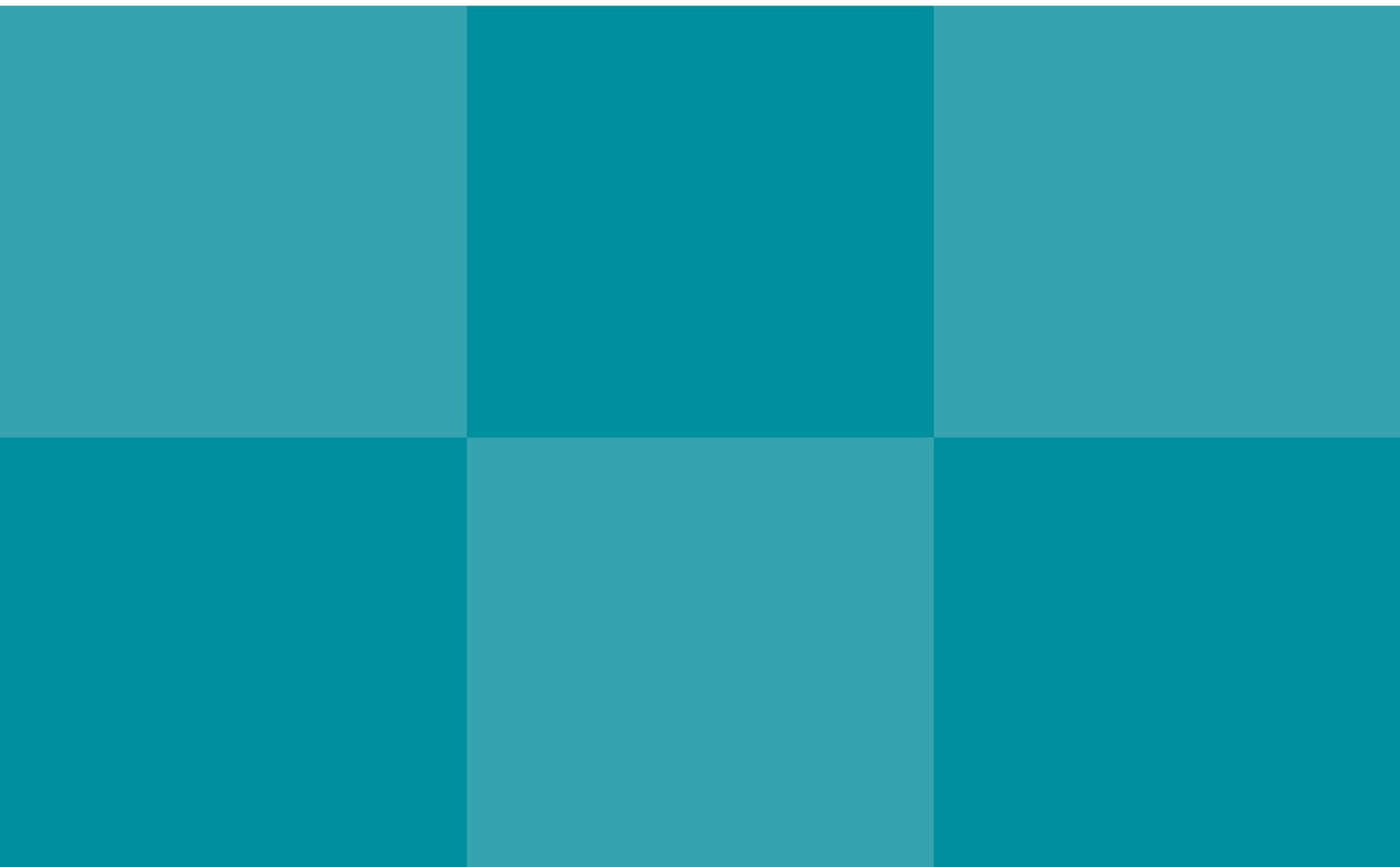




Primary School
Curriculum

Curaclam na
Bunscoile

Mathematics



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Mathematics

Curriculum

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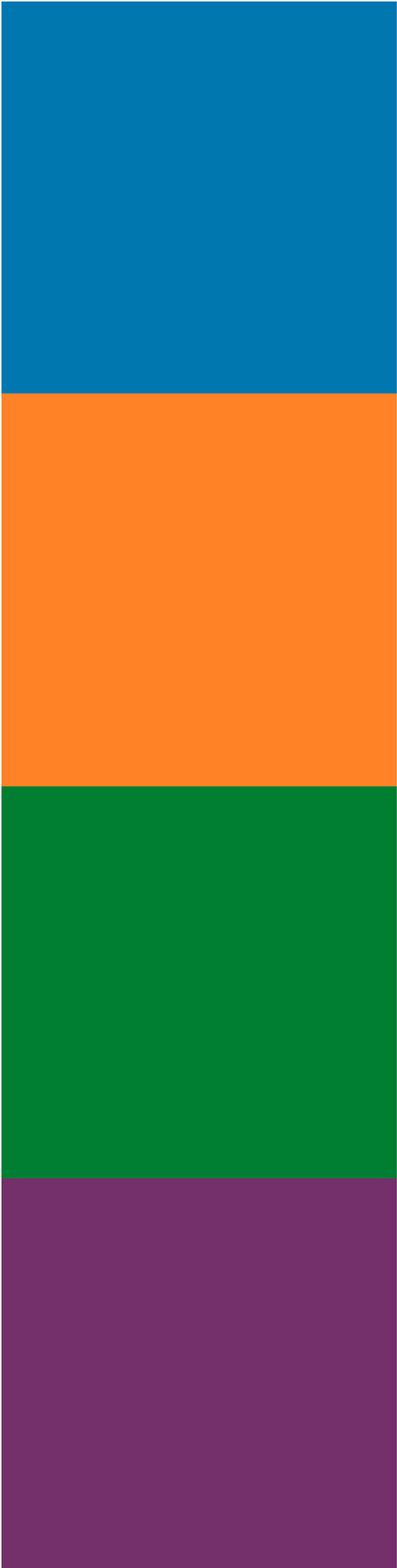
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Introduction

Mathematics

Mathematics may be seen as the science of magnitude, number, shape, space, and their relationships and also as a universal language based on symbols and diagrams. It involves the handling (arrangement, analysis, manipulation and communication) of information, the making of predictions and the solving of problems through the use of a language that is both concise and accurate.

Mathematics education provides the child with a wide range of knowledge, skills and related activities that help him/her to develop an understanding of the physical world and social interactions. It gives the child a language and a system through which he/she may analyse, describe and explain a wide range of experiences, make predictions, and solve problems. Mathematics education fosters creative and aesthetic development, and enhances the growth of reasoning through the use of investigative techniques in a mathematical context. It is also concerned with encouraging the child to be confident and to communicate effectively through the medium of mathematics.

The mathematics curriculum

Mathematics encompasses a body of knowledge, skills and procedures that can be used in a rich variety of ways: to describe, illustrate and interpret; to predict; and to explain patterns and relationships in *Number, Algebra, Shape and space, Measures* and *Data*. Mathematics helps to convey and clarify meaning. Its language provides a powerful and concise means by which information may be organised, manipulated, and communicated.

These characteristics make mathematics an essential tool for the child and adult. The application of mathematics in a variety of contexts gives people the ability to explain, predict and record aspects of their physical environments and social interactions. It thus enriches their understanding of the world in which they live. Indeed the application of increasingly sophisticated mathematics in a growing range of economic, technical, scientific, social and other contexts has had a profound influence on the development of contemporary society.

Mathematics education should seek, therefore, to enable the child to think and communicate quantitatively and spatially, solve problems, recognise situations where mathematics can be applied, and use appropriate technology to support such applications. If the child is to become an informed and confident member of society he/she must 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.

It should be recognised that mathematics is an intellectual pursuit in its own right, a source of fascination, challenge, and enjoyment. The exploration of patterns and relationships, the satisfaction of solving problems, the appreciation of designs and shapes and an awareness of the historical and cultural influences that have shaped modern mathematics can contribute to the child's enthusiasm for the subject.

This curriculum seeks to provide the child with a mathematical education that is developmentally appropriate as well as socially relevant. The mathematics programme in each school should be sufficiently flexible to accommodate children of differing levels of ability and should reflect their needs. These will include the need for interesting and meaningful mathematical experiences, the need to apply mathematics in other areas of learning, the need to continue studying mathematics at post-primary level, and the need to become mathematically literate members of society. Integration with all the other subjects will add another valuable perspective to the mathematics curriculum.

The structure of the curriculum

The curriculum comprises five strands:

- *Number*
- *Algebra*
- *Shape and space*
- *Measures*
- *Data.*

These strands, although presented in separate sections, are not isolated areas. They should be seen and taught as interrelated units in which understanding in one area is dependent on, and supportive of, ideas and concepts in other strands. Such linkage within the subject is essential. While number is essential as the medium for mathematical calculation, the other strands should receive a corresponding degree of emphasis.

The strands are divided into strand units, which give additional structure to the curriculum.

Number starts with a section called *Early mathematical activities*, in which there are four strand units: Classifying, Matching, Comparing and Ordering. These units develop at infant level to include counting and analysis of number. In first and second classes the development includes place value, operations and fractions. Decimals are introduced in third class and percentages in fifth class.

Algebra is formally recognised at all levels and covers patterns, sequences, number sentences, directed numbers, rules and properties, variables and equations.

Shape and space as a strand explores spatial awareness and its application in real-life situations. It includes units dealing with two-dimensional and three-dimensional shapes, symmetry, lines and angles.

Measures consists of six strand units: Length, Area, Weight, Capacity, Time and Money.

Data includes interpreting and understanding visual representation. Chance promotes thinking, discussion and decision-making and is familiar to children in the form of games and sporting activities.

Spanning the content are the skills that the child should develop:

- applying and problem-solving
- communicating and expressing
- integrating and connecting
- reasoning
- implementing
- understanding and recalling.

This mathematics curriculum provides opportunities for the 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 areas.

Providing for individual difference

Children in any one class will show a wide range of ability, attainment and learning styles, and it is difficult to cater for all their needs if a common programme is followed. Children acquire an understanding of mathematical ideas in an uneven and individual way. The issue of readiness is therefore crucial when planning, teaching and assessing the mathematics programme. It is important to build on the child's previously acquired knowledge, and periods of frequent revision are essential.

Assessment

Continuous assessment is particularly useful for diagnosis and planning in mathematics. It should focus on the identification of the child's existing knowledge, misconceptions and strategies. It should provide information that will enable the teacher to cater for individual differences in ability, previous learning and learning style, and to resist pressure to push the child to premature mechanical mastery of computational facts and procedures. It will be important that a learning environment is created to enable both boys and girls to learn all aspects of mathematics effectively and to provide opportunities for extension work for more able children.

Constructivism and guided-discovery methods

A constructivist approach to mathematics learning involves the child as an active participant in the learning process. Existing ideas are used to make sense of new experiences and situations. Information acquired is interpreted by the learners themselves, who construct meaning by making links between new and existing knowledge. Experimentation, together with discussion among peers and between the teacher and the child, may lead to general agreement or to the re-evaluation of ideas and mathematical relationships. New ideas or concepts may then be constructed. The importance of providing the child with structured opportunities to engage in exploratory activity in the context of mathematics cannot be overemphasised. The teacher has a crucial role to play in guiding the child to construct meaning, to develop mathematical strategies for solving problems, and to develop self-motivation in mathematical activities.

Mathematical language

An important aim of the mathematics programme is to enable the child to use mathematical language effectively and accurately. This includes the ability to listen, question and discuss as well as to read and record.

Expressing mathematical ideas plays an important part in the development of mathematical concepts. One of the causes of failure in mathematics is poor comprehension of the words and phrases used. Some of the language will be encountered only in the mathematics lesson, and children will need many opportunities to use it before it becomes part of their vocabulary. In other cases, everyday words will be used in mathematics but will take on new meanings, which may be confusing for the learner.

Discussion plays a significant role in the acquisition of mathematical language and in the development of mathematical concepts. The child may be helped to clarify ideas and reduce dependence on the teacher by discussing concepts and processes with other children. Discussion with the teacher is also essential. As the need arises, the teacher will supply appropriate mathematical language to help the child to clarify ideas or to express them more accurately.

In view of the complexity of mathematical symbols, it is recommended that children should not be required to record mathematical ideas prematurely. Concepts should be adequately developed before finding expression in written recording. The use of symbols and mathematical expressions should follow extended periods of oral reporting and discussion.

The use of mathematical equipment

The child's mathematical development requires a substantial amount of practical experience to establish and to reinforce concepts and to develop a facility for their everyday use. He/she develops a system of mathematics based on experiences and interactions with the environment. 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.

Mental calculations

The development of arithmetical skills, i.e. those concerned with numerical calculations and their application, is an important part of the child's mathematical education. This mathematics curriculum places less emphasis than heretofore on long, complex pen-and-paper calculations and a greater emphasis on mental calculations, estimation, and problem-solving skills. Rapid advances in information technology and the ready availability of calculators have not lessened the need for basic skills.

The role of the calculator

An understanding of the structure of number can be enhanced by the exploration of patterns, sequences and relationships with a calculator. Calculators help in the development of problem-solving skills by allowing the child to focus on the structure of a problem and possible means of solution. Calculators can be used to check estimates, to perform long and complex computations, and to provide exact results to difficult problems. However, the calculator cannot be a substitute for practical activity with materials. Moreover, it must be remembered that the child needs a sound understanding of number to make judgements 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. For these reasons, this curriculum provides for the use of calculators in mathematics from fourth to sixth classes, by which time the child should have acquired a mastery of basic number facts and a facility in their use.

Information and communication technologies

Computers have a place in the mathematics curriculum but must be seen as another tool to be used by the teacher and the child. They do not take the place of good teaching and extensive use of manipulatives. Computers provide an alternative to pen-and-paper tasks, are stimulating for less able children, and provide interesting extension work for all levels of ability. There is a wide variety of computer applications available. Adventure-type programs, which require the child to solve specific mathematical problems in

a meaningful context, offer opportunities for the development of problem-solving skills. Paired or group activities encourage discussion and collaborative problem-solving. Data-handling programs allow children to manipulate and interpret data they have collected. The emphasis must always be on the process, for example collecting information, deciding on the relevance of questions, and interpreting results.

Problem-solving

Developing the ability to solve problems is an important factor in the study of mathematics. Problem-solving also provides a context in which concepts and skills can be learned and in which discussion and co-operative working may be practised. Moreover, problem-solving is a major means of developing higher-order thinking skills. These include the ability to analyse mathematical situations; to plan, monitor and evaluate solutions; to apply strategies; and to demonstrate creativity and self-reliance in using mathematics. Success helps the child to develop confidence in his/her mathematical ability and encourages curiosity and perseverance. Solving problems based on the environment of the child can highlight the uses of mathematics in a constructive and enjoyable way.

Integration in mathematics

Mathematics pervades most areas of children's lives, whether they are looking at and responding to structural forms in the visual arts curriculum or calculating how to spend their pocket money. For children to really understand mathematics they must see it in context, and this can be done through drawing attention to the various ways in which we use mathematics within other subjects in the curriculum.

SESE provides ample opportunities for using mathematics, for example recording results of experiments in science or creating maps in geography, while a sense of time and chronology is essential in history. Collecting data for analysis is also an important feature of SESE and provides the child with real-life examples of data with which to work. Physical education offers myriad opportunities for measurement as a natural part of the activities, for

example timing races or measuring the length of jumps. Creating symmetrical and asymmetrical shapes in a gymnastics lesson can also offer real use of mathematical concepts. Mathematical language occurs in all areas of the curriculum, for example in long and short notes in music or using the correct words to describe shapes in visual art activities. Many teachers make use of rhymes, songs and games to reinforce concepts of number and shape, and this can be achieved in English, Irish or using a modern European language where appropriate.

Overview

infant to second classes

Skills development

Skills	<ul style="list-style-type: none">• Applying and problem-solving• Communicating and expressing• Integrating and connecting• Reasoning• Implementing• Understanding and recalling
--------	---

<i>Strands</i>	Infant classes <i>Strand units</i>	First and second classes <i>Strand units</i>
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<ul style="list-style-type: none"><i>Combining</i><i>Partitioning</i><i>Numeration</i>	<ul style="list-style-type: none">• Counting and numeration• Comparing and ordering• Place value• Operations<ul style="list-style-type: none"><i>Addition</i><i>Subtraction</i>• Fractions
Algebra	<ul style="list-style-type: none">• Extending patterns	<ul style="list-style-type: none">• Exploring and using patterns
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
Measures	<ul style="list-style-type: none">• Length• Weight• Capacity• Time• Money	<ul style="list-style-type: none">• Length• Area• Weight• Capacity• Time• Money
Data	<ul style="list-style-type: none">• Recognising and interpreting data	<ul style="list-style-type: none">• Representing and interpreting data

Overview

third to sixth classes

Skills development

Skills

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

Strands

Third and fourth classes *Strand units*

Fifth and sixth classes *Strand units*

Number

- Place value
- Operations
Addition and subtraction
Multiplication
Division
- Fractions
- Decimals

- Place value
 - Operations
Addition and subtraction
Multiplication
Division
 - Fractions
 - Decimals and percentages
 - Number theory
-

Algebra

- Number patterns and sequences
- Number sentences

- Directed numbers
 - Rules and properties
 - Variables
 - Equations
-

Shape and space

- 2-D shapes
- 3-D shapes
- Symmetry
- Lines and angles

- 2-D shapes
 - 3-D shapes
 - Symmetry
 - Lines and angles
-

Measures

- Length
- Area
- Weight
- Capacity
- Time
- Money

- Length
 - Area
 - Weight
 - Capacity
 - Time
 - Money
-

Data

- Representing and interpreting data
- Chance

- Representing and interpreting data
- Chance

Aims

The aims of the primary mathematics curriculum are

- 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.

Broad objectives

When due account is taken of intrinsic abilities and varying circumstances, the mathematics curriculum should enable the child to

Skills development

- 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

- 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

- 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

- 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 shape
- 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

- know, select and use appropriate instruments of measurement
- estimate, measure and calculate length, area, 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

- 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.

Planning in mathematics

The content of the mathematics curriculum is presented in a number of strands and strand units. Exemplars are shown in italic type throughout each strand. These are only limited suggestions. The treatment of content as suggested in the exemplars is common to both classes.

Teachers, when planning, should consider the following:

- the *strands* of the programme are not isolated areas. They should be seen and taught as interrelated units in which understanding in one area is dependent on, and supportive of, ideas and concepts in other strands
- children will use their knowledge of one area of mathematics to explore another. They may practise their knowledge of number facts when undertaking measurement activities, and geometrical concepts may be required in the presentation of data. This is called *linkage*.
- further opportunities should be identified to *integrate* mathematical concepts and skills with other areas of the curriculum, as those indicated in the content are merely suggestions
- there should be an appropriate *balance* between the different aspects of mathematics. While the area of number is important, its treatment should not be at the expense of the other strands, and the programme should ensure *continuity and progression*
- the *revision* of concepts and skills should be thoroughly undertaken before exploring new material
- the exploration of mathematical concepts and ideas using a wide variety of *equipment* should precede any form of written recording in mathematics
- emphasis should be placed on *discussion*, child with child and teacher with child. It should be an integral part of the work in each strand
- planning should consider *individual difference* in ability, attainment and learning style
- *assessment* should be seen as an integral part of the teaching and learning process
- it is important that children come to see mathematics as *practical and relevant*. Opportunities should be provided for them to construct and apply their mathematical understanding and skills in contexts drawn from their own experiences and environments.

Infant classes

Overview

infant classes

Skills development

Skills

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

Strands

Strand units

Early mathematical activities

- Classifying
 - Matching
 - Comparing
 - Ordering
-

Number

- Counting
 - Comparing and ordering
 - Analysis of number
 - Combining*
 - Partitioning*
 - Numeration*
-

Algebra

- Extending patterns
-

Shape and space

- Spatial awareness
 - 3-D shapes
 - 2-D shapes
-

Measures

- Length
 - Weight
 - Capacity
 - Time
 - Money
-

Data

- Recognising and interpreting data

Skills development for infant classes

Through completing the strand units of the mathematics curriculum the child should be enabled to

Applying and problem-solving

- select appropriate materials and processes for mathematical tasks
- select and apply appropriate strategies for completing a task or solving a problem
- recognise solutions to problems

Communicating and expressing

- discuss and explain mathematical activities
- record the results of mathematical activities concretely and using diagrams, pictures and numbers
- discuss problems presented concretely, pictorially or orally

Integrating and connecting

- connect informally acquired mathematical ideas with formal mathematical ideas
- recognise mathematics in the environment
- recognise the relationship between verbal, concrete, pictorial and symbolic modes of representing numbers
- carry out mathematical activities that involve other areas of the curriculum

Reasoning

- classify objects into logical categories
- recognise and create sensory patterns
- justify the processes or results of activities

Implementing

- devise and use mental strategies and procedures for carrying out mathematical tasks
- use appropriate manipulatives to carry out mathematical tasks and procedures

Understanding and recalling

- recall and understand terminology.

Strand: Early mathematical activities

Content for junior infant class

Strand unit **Classifying**

The child should be enabled to

- classify objects on the basis of one attribute, such as colour, shape, texture or size
 - sort collections of objects*
 - add similar objects to a clearly defined set*
- identify the complement of a set (i.e. elements not in a set)
 - categorise objects such as things I like/don't like,*
 - red things/things that are not red.*

Strand unit **Matching**

The child should be enabled to

- match equivalent and non-equivalent sets using one-to-one correspondence
 - match pairs of identical objects in one-to-one correspondence:*
lollipop sticks, Unifix cubes
 - match pairs of related objects in one-to-one correspondence:*
putting out knives and forks, buttoning coats, putting lids on pans
 - match equivalent and non-equivalent sets to establish the concept of more than, less than, enough, as many as.*

Strand unit

Comparing

The child should be enabled to

- compare objects according to length, width, height, weight, quantity, thickness or size
 - compare pairs of identical objects that differ in length, noting the need for a baseline or common starting point*
 - compare pairs of pencils*
 - how does each differ from the next?*
 - long/short, longer/shorter**
- compare sets without counting
 - more than and less than.**

Strand unit

Ordering

The child should be enabled to

- order objects according to length or height
 - examine three objects and describe how each object differs from the preceding one*
 - order objects by length or height, starting with a different object each time*
 - order new objects to make a set like a given one*
- order sets without counting.

Strand: Number

Content for junior infant classes

Content for senior infant classes

Strand unit

Counting

The child should be enabled to

- count the number of objects in a set, 1–10
*count objects, pushing them aside while counting
count regular arrays or rows before random groups
use number rhymes and stories.*

The child should be enabled to

- count the number of objects in a set, 0–20
*count the same set several times, starting with a
different object each time
present different patterns and arrays of the same
number.*

Strand unit

Comparing and ordering

The child should be enabled to

- compare equivalent and non-equivalent sets 1–5 by matching without using symbols
*use one-to-one matching to determine equality and inequality (more than/less than/same as)
record by drawing*
- order sets of objects by number, 1–5
*arrange sets of objects in ascending order
order rods and number strips by length
order number cards; match them with sets and number patterns*
- use the language of ordinal number: first, last
*who is first/last in the line?
the first colour is red, the last colour is blue.*

The child should be enabled to

- compare equivalent and non-equivalent sets 0–10 by matching
*name the inequality: I have 2 more than you;
3 is less than 5*
- order sets of objects by number, 0–10
- use the language of ordinal number: first, second, third, last
*use ordinal numbers to describe position in a line
use this language when ordering numbers.*

The child should be enabled to

Combining

- explore the components of number, 1–5
 - identify the ways in which the numbers can be modelled using concrete objects:
4 and 1, 2 and 2, 1 and 2 and 1*
 - identify pairs of related facts: 1 and 2 is the same as 2 and 1*
- combine sets of objects, totals to 5
 - add one more to a given set*
 - combine two sets, state total*
 - record pictorially*

Partitioning

- partition sets of objects, 1–5
 - partition sets of objects with a pencil or straw to show component parts*
 - record pictorially.*

The child should be enabled to

Combining

- explore the components of number, 1–10
- combine sets of objects, totals to 10
 - use appropriate strategies: counting all, counting on*
 - counting on on the number strip*
 - start at 5, count on 3, where am I?*
 - oral counting without the number strip*
 - combine two or more sets, state total*
 - record*

Partitioning

- partition sets of objects, 0–10
 - 8 people are on my team. 6 are girls, how many are boys?*
 - record pictorially*
- use the symbols + and = to construct word sentences involving addition
 - formal introduction of the symbols should occur only after sufficient oral and exploratory work has been completed*
 - the meaning of the symbols will have to be discussed frequently*
 - the equals sign does not signal ‘the answer comes next’: equals means ‘the same’ or equivalent; explore using a number balance.*

The treatment of content as suggested in the exemplars is common to both classes.

Content for junior infant class

Numeration

- develop an understanding of the conservation of number, 1–5
 - count rearranged number arrays and observe that the number does not change*
- read, write and order numerals, 1–5
 - present sets to match a numeral and vice versa*
 - use counters or objects to form number patterns*
 - trace numerals cut out of sandpaper or carpet*
 - draw numerals in sand or with thick crayon*
- identify the empty set and the numeral zero
 - show an empty basket; how many apples in it?*
 - remove pencils from a jar until none is left*
 - show the numeral*
 - count down to zero*
 - counting back number rhymes*
- subitise (tell at a glance) the number of objects in a set, 1–5
 - tell at a glance how many objects are in a set*
 - estimate using a known set*
 - without counting, classify the other sets as less than/about the same as/more than the given set*

Content for senior infant class

Numeration

- develop an understanding of the conservation of number, 0–10
- read, write and order numerals, 0–10
- identify the empty set and the numeral zero
- estimate the number of objects in a set, 2–10
 - check estimate by counting*

- solve simple oral problems, 0–5

*you have 3 sandwiches for lunch, you eat 2,
how many are left? Zero can be used when there are
none left.*

*Joan has 2 crayons, Seán has 3 crayons,
how many altogether?*

*teacher presents a problem orally, pupils use counters to
solve it.*

- solve simple oral and pictorial problems, 0–10

*problems can include story problems and open-ended
exploratory questions*

*how many different ways can you make a pattern with
6 counters?*

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Algebra

Content for junior infant class

Content for senior infant class

Strand unit

Extending patterns

The child should be enabled to

- identify, copy and extend patterns in colour, shape and size

*using a range of objects, e.g. cubes or threading beads
continue the pattern, what comes next?*

*pupils make their own patterns using gummed
paper shapes; two colours, two shapes, two sizes
computer software can be used where appropriate
discuss results.*

The child should be enabled to

- identify, copy and extend patterns in colour, shape, size and number (3–4 elements)

*copy and extend patterns using beads and blocks, by
drawing and colouring*

*e.g. 2 blue, 3 red; 3 circles, 1 square;
2 big beads, 1 small bead; red, blue, yellow
discuss*

- discover different arrays of the same number

*teacher makes a pattern (array) using a number of
counters; child creates a different array using the same
number of counters*

*how many different patterns of 10 can you make?
how many numbers can you arrange in pairs?*

- recognise patterns and predict subsequent numbers

*find the missing numbers: 2, 3, 4, □, 6, 7
10, 9, □, □, 6, 5, 4, 3, □, □.*

Integration

Visual arts: Making prints

Integration

Visual arts: Making prints

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Shape and space

Content for junior infant class

Content for senior infant class

Strand unit

Spatial awareness

The child should be enabled to

- explore, discuss, develop and use the vocabulary of spatial relations

position: over, under, up, down, on, beside, in
directions: moving in straight/curved lines, in a circle,
finding own space.

The child should be enabled to

- explore, discuss, develop and use the vocabulary of spatial relations

position: above, below, near, far, right, left
stop and state your position
direction: through the hoop, behind the mat
stop and describe your action.

Strand unit

3-D shapes

The child should be enabled to

- sort 3-D shapes, regular and irregular
things that do/do not roll, do/do not fit together
make constructions with 3-D shapes and discuss them

- solve tasks and problems involving shape.

The child should be enabled to

- sort, describe and name 3-D shapes: cube, cuboid, sphere and cylinder
edge, corner, face, straight, curved, round and flat
sort shapes according to rules, e.g. objects with four sides, objects that roll
- combine 3-D shapes to make other shapes
- solve tasks and problems involving shape.

The child should be enabled to

- sort and name 2-D shapes: square, circle, triangle, rectangle

directed sorting of 2-D shapes with different criteria, e.g. round/not round, thick/thin

- use suitable structured materials to create pictures

- solve problems involving shape

which two shapes go together to cover a square?

Integration

Physical education: Dance; Gymnastics;
Outdoor and adventure activities

Visual arts: Construction

The child should be enabled to

- sort, describe and name 2-D shapes: square, circle, triangle, rectangle

collect and sort different shapes

e.g. straight, curved, flat, side, corner

make shapes with art straws, on geoboard

draw shapes found in the environment

- combine and divide 2-D shapes to make larger or smaller shapes

cut paper shapes into 2 or 4 pieces and discuss the results

- solve problems involving shape and space

make a shape with 7 blocks

how many different shapes can you make with 5 blocks?

- give simple moving and turning directions.

Integration

Physical education: Dance; Gymnastics;
Outdoor and adventure activities

Visual arts: Construction

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Measures

Content for junior infant class

Content for senior infant class

Strand unit

Length

The child should be enabled to

- develop an understanding of the concept of length through exploration, discussion, and use of appropriate vocabulary

*discuss objects in the environment: long/short, tall/short, wide/narrow, longer, shorter, wider than
sort objects according to length*

- compare and order objects according to length or height.

The child should be enabled to

- develop an understanding of the concept of length through exploration, discussion, and use of appropriate vocabulary

- compare and order objects according to length or height

identify: as long as/as wide as/longest/shortest

- estimate and measure length in non-standard units

estimate, and check by measuring

how many lollipop sticks do you think will fit along the length of the table? Guess, check and discuss

- select and use appropriate non-standard units to measure length, width or height. Discuss reasons for choice.

present simple problems:

How can we find out which is wider, the door or the table? Which unit will we use (stick or pencil)?

Integration

Music:Developing a sense of duration; Early literacy

Integration

Music:Developing a sense of duration; Early literacy

The child should be enabled to

- develop an understanding of the concept of weight through exploration, handling of objects, and use of appropriate vocabulary

heavy/light, heavier/lighter, balance, weigh

sort objects into heavy or light sets

handle and describe objects using the vocabulary of weight

- compare objects according to weight

present simple problems, e.g. pupils estimate (guess) by handling

which object is heavier or lighter?

check using balance; discuss

compare pairs of objects that look alike but are different in weight, e.g. golf ball and plastic squash ball.

The child should be enabled to

- develop an understanding of the concept of weight through exploration, handling of objects and use of appropriate vocabulary

- compare and order objects according to weight

compare objects that differ in size, shape and weight by handling

check using balance; discuss

compare an object with a collection of objects

compare a collection of objects with another collection of objects

order three objects according to weight by handling; check using balance; discuss

- estimate and weigh in non-standard units

check using balance

present simple problems:

how many apples do you think will balance your lunchbox?

- select and use appropriate non-standard units to weigh objects

present simple problems:

How can we find the weight of a stone?

Which unit will we use (matchsticks or conkers)?

discuss reasons for choice.

Integration

Geography: Human environments

The treatment of content as suggested in the exemplars is common to both classes.

Content for junior infant class

Content for senior infant class

Strand unit

Capacity

The child should be enabled to

- develop an understanding of the concept of capacity through exploration and the use of appropriate vocabulary

full/nearly full/empty/holds more/holds less/holds as much as

fill and empty containers of various sizes, discuss use smaller containers to fill larger containers

- compare containers according to capacity

use a variety of containers; discuss

emphasise that full means full to the top

present simple problems:

do you think the jar holds more sand than the cup?

will all the water from the jug go into the glass?

The child should be enabled to

- develop an understanding of the concept of capacity through exploration and the use of appropriate vocabulary

- compare and order containers according to capacity

fill one container and pour contents into another

compare the capacity of two very different containers,

noting that both can hold the same amount

compare three containers; arrange in order of capacity;

label, e.g. holds more/holds most

- estimate and measure capacity in non-standard units

present simple problems:

estimate (guess) how many spoons or egg-cups of sand or dried peas will fill the cup

how many jugs of water will fill the bucket?

use the same unit to fill two different containers; check by measuring

record results using one counter for each cup or jug

poured children work in pairs

- select and use appropriate non-standard units to measure capacity

present simple problems

How can we find the capacity of the bucket?

Which unit will we use (teaspoons or cups)?

discuss reasons for choice.

The child should be enabled to

- develop an understanding of the concept of time through the use of appropriate vocabulary
morning/evening, night/day, lunchtime, bedtime, early/late, days of the week, school days, weekends
use the language of time to discuss events
record weather for each day on a chart
- sequence daily events or stages in a story
pupils state the order of familiar events
order pictures in correct time sequence
sequence events in familiar stories and rhymes.

Integration

History: Myself and my family

Geography: The physical world

The child should be enabled to

- develop an understanding of the concept of time through the use of appropriate vocabulary
yesterday/today/tomorrow/seasons/soon/not yet/birthday
significant events, festivals, holidays
- sequence daily and weekly events or stages in a story
discuss significant times in the day
record orally and pictorially the time sequence of four events in the school day
make scrapbooks of 'My Day'
sequence pictures representing stages of development
pupils identify errors in a sequence; discuss
- read time in one-hour intervals.

Integration

History: Myself and my family

Geography: The physical world

The treatment of content as suggested in the exemplars is common to both classes.

Content for junior infant class

Content for senior infant class

Strand unit Money (use up to introduction of the euro)

The child should be enabled to

- recognise and use coins (up to 5p)
 - sort and name 1p, 2p and 5p coins*
 - select appropriate coins in simple shopping activities,*
 - use correct vocabulary: buy, sell, spend, coins, pence, how much?*
- solve practical tasks and problems using money.

The child should be enabled to

- recognise coins up to 20p and use coins up to 10p
 - exchange a number of coins for a single coin of equal value and vice versa*
 - use coins in shopping activities, tender appropriate coins, calculate change*
 - use correct vocabulary: cost, price, cheap/expensive, change, too much/too little*
- solve practical tasks and problems using money
 - which items can be bought with a given coin?*
 - spend the same amount of money in two different ways.*

Strand unit Money—euro

The child should be enabled to

- recognise and use coins (up to 5 cents)
 - sort and name coins up to 5 cents*
 - select appropriate coins in simple shopping activities,*
 - use correct vocabulary: buy, sell, spend, coins, cents, how much?*
- solve practical tasks and problems using money.

The child should be enabled to

- recognise coins up to 20 cents and use coins up to 10 cents
 - exchange a number of coins for a single coin of equal value and vice versa*
 - use coins in shopping activities, tender appropriate coins, calculate change*
 - use correct vocabulary: cost, price, cheap/expensive, change, too much/too little*
- solve practical tasks and problems using money
 - which items can be bought with a given coin?*
 - spend the same amount of money in two different ways.*

Strand: Data

Content for junior infant class

Content for senior infant class

Strand unit

Recognising and interpreting data

The child should be enabled to

- sort and classify sets of objects by one criterion
sort collections on the basis of colour, shape, size, texture and function
- match sets, equal and unequal
enough/more/as many as/less
- represent and interpret a set of simple mathematical data using real objects, models and pictures
children represent the chosen set concretely and pictorially
children identify the numerical correspondence between the pictures and the objects, e.g. the set of children who had an apple for lunch.

The child should be enabled to

- sort and classify sets of objects by one and two criteria
sort into two groups by one criterion: with/without wheels, red/not red shapes
sort by two criteria: red toys with wheels
- represent and interpret data in two rows or columns using real objects, models and pictures
pupils choose between two types of pet
pupil is given picture or model of a pet
pictures or models are arranged in columns or rows in one-to-one correspondence
discuss and compare results
discuss the need for a common baseline.

The treatment of content as suggested in the exemplars is common to both classes.

First
and second
classes

Overview

first and second classes

Skills development

Skills

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

Strands

Strand units

Number

- Counting and numeration
 - Comparing and ordering
 - Place value
 - Operations
 - Addition*
 - Subtraction*
 - Fractions
-

Algebra

- Extending and using patterns
-

Shape and space

- Spatial awareness
 - 2-D shapes
 - 3-D shapes
 - Symmetry
 - Angles
-

Measures

- Length
 - Area
 - Weight
 - Capacity
 - Time
 - Money
-

Data

- Representing and interpreting data

Skills development for first and second classes

Through completing the strand units of the mathematics curriculum the child should be enabled to

Applying and problem-solving

- select appropriate materials and processes for mathematical tasks and applications
- apply concepts and processes in a variety of contexts
- select and apply appropriate strategies for completing a task or solving a problem
- recognise solutions to problems

Communicating and expressing

- listen to and discuss other children's mathematical descriptions and explanations
- discuss and explain mathematical activities
- discuss and record the results of mathematical activities using diagrams, pictures and symbols
- discuss problems presented pictorially or orally

Integrating and connecting

- connect informally acquired mathematical ideas with formal mathematical ideas
- recognise mathematics in the environment
- recognise the relationship between verbal, concrete, pictorial and symbolic modes of representing numbers
- carry out mathematical activities that involve other areas of the curriculum
- understand the mathematical ideas behind the procedures he/she uses

Reasoning

- classify objects into logical categories
- make guesses and carry out experiments to test them
- recognise and create mathematical patterns and relationships
- justify the processes and results of mathematical activities

Implementing

- devise and use mental strategies and procedures for carrying out mathematical tasks
- use appropriate manipulatives to carry out mathematical tasks and procedures
- execute procedures efficiently

Understanding and recalling

- understand and recall terminology and facts.

Strand: Number

Content for first class

Content for second class

Strand unit

Counting and numeration

The child should be enabled to

- count the number of objects in a set
*count the same set several times, starting with a different object each time (regular and random arrays)
re-count rearranged sets and arrays to determine that number does not change*
- read, write and order numerals, 0–99
*match a numeral to a set and vice versa
write numerals to correspond to sets
count on and back from a given number, using concrete materials, number line and hundred square
state the number that follows or precedes a number*
- estimate the number of objects in a set 0–20
*compare a known set with other sets, check by counting
describe different sets of cubes as less than, more than or about the same as the known set.*

The child should be enabled to

- count the number of objects in a set
*estimate first and check by counting
e.g. the number of marbles in a jar*
- read, write and order numerals 0–199
*state the number that comes before and after a random number
fill in missing numbers on the hundred square*
- estimate the number of objects in a set 0–20.

Strand unit

Comparing and ordering

The child should be enabled to

- compare equivalent and non-equivalent sets 0–20
name the inequality
I have 5 more than you; 7 is less than 10
6 is less than 9 by how many?
- order sets of objects by number
- use the language of ordinal number, first to tenth
when ordering sets and numbers, describing patterns,
taking turns.

The child should be enabled to

- compare equivalent and non-equivalent sets
record using < > and =
- use the language of ordinal number
e.g. using the calendar.

Strand unit

Place value

The child should be enabled to

- explore, identify and record place value 0–99
group and count in tens and units using cubes, counters,
lollipop sticks and coins (1p and 10p, 1 cent and
10 cents), base ten materials and notation boards
express groups of counters as units or as tens and units
record pictorially and on the abacus.

The child should be enabled to

- explore, identify and record place value 0–199
extend grouping and renaming activities to include the
hundred, in tens
rename numbers as one hundred, tens and units
represent numbers using place value material: coins,
number cards, word cards, number line.

The treatment of content as suggested in the exemplars is common to both classes.

Content for first class

Content for second class

Strand unit

Operations

The child should be enabled to

Addition

- develop an understanding of addition by combining or partitioning sets, use concrete materials 0–20

find all the addition combinations to make up a given number: $11 + 1 = 12$, $2 + 6 + 4 = 12$

record addition: orally, pictorially, in number sentences, in jumps on the number line

- explore, develop and apply the commutative, associative and zero properties of addition

commutative property: $6 + 2 = 8$, $2 + 6 = 8$

associative property: $(2 + 3) + 5 = 10$, $2 + (3 + 5) = 10$

zero property: $7 + 0 = 7$

- develop and/or recall mental strategies for addition facts within 20

use concrete materials to count on using commutative property, zero property, counting in twos, doubles and near doubles, pairs of numbers that total 10 ($6 + 4 = 10$); complement numbers to 10 ($3 + \square = 10$); orally memorise addition facts using strategies

The child should be enabled to

Addition

- develop an understanding of addition by combining or partitioning sets

- explore, develop and apply the commutative, associative and zero properties of addition

- develop and recall mental strategies for addition facts within 20

*discuss different strategies for combining numbers:
 $9 + 8 = 10 + 8 - 1$ or $8 + 8 + 1$ or $9 + 9 - 1$
memorise and record addition facts using strategies*

- construct number sentences and number stories;
solve problems involving addition within 20
*construct and tell a number story,
record pictorially, as a number sentence or as a written
story
solve written problems; pupils can also devise problems
for each other*
- add numbers without and with renaming within 99
*estimate sum by adding the tens,
check estimates using manipulatives
add numbers using concrete materials, notation boards,
number lines and hundred squares
use mental calculations
record using number lines, number sentences and
algorithm*
- explore and discuss repeated addition and
group counting
*counting in twos, fives, tens
count children in the line, 2, 4, 6, 8*
- construct number sentences and number stories;
solve problems involving addition within 99
- add numbers without and with renaming within 99
*estimate simple sums within 99
use mental calculations
record using notation boards, number lines, number
sentences and algorithm
emphasise addition of 10 to multiples of 10, to other
numbers (36 + 10)
add multiples of 10 to numbers (45 + 20)*
- explore and discuss repeated addition and group
counting
*in practical situations, e.g. buying a number of
identical articles
10 sweets in a packet; how many in 5 packets?
 $10 + 10 + 10 + 10 + 10 = 50$ sweets*

The treatment of content as suggested in the exemplars is common to both classes.

Content for first class

Subtraction

- develop an understanding of subtraction as deducting, as complementing and as difference 0–20

deducting:

I had 10 sweets, I ate 3. How many have I left?

complementing:

There are 10 stickers in a set. I have 4. How many more do I need to make a full set?

difference:

I have 12 crayons. Mary has 6 crayons. How many more have I? How many fewer has Mary?

focus on subtraction as the inverse of addition

record subtraction: concretely, orally, pictorially, in number sentences, in jumps on the number line, and on notation boards

- develop and/or recall mental strategies for subtraction 0–20
counting back/on, using doubles/near doubles, using zero, using knowledge of 10 facts, add to check results
- construct number sentences and number stories; solve problems involving subtraction 0–20
construct and tell a number story; record pictorially, as a number sentence, or as a written story
solve written problems; pupils can also devise problems for each other

Content for second class

Subtraction

- develop an understanding of subtraction as deducting, as complementing and as difference

- develop and recall mental strategies for subtraction 0–20
discuss different strategies for subtracting numbers
- construct number sentences involving subtraction of whole numbers; solve problems involving subtraction

- estimate differences within 99
by subtracting the tens
check estimates using manipulatives
- subtract numbers without renaming within 99
estimate difference
use concrete materials, number lines and hundred squares
use mental calculations
record using number lines, number sentences and algorithms
- use the symbols $+$, $-$, $=$
formal introduction of the symbols should occur only after sufficient oral and exploratory work has been completed
the meaning of the symbols will have to be discussed frequently
*the equals sign does not signal ‘the answer comes next’:
equals means ‘the same’ or equivalent*
explore using a number balance
- solve one-step problems involving addition or subtraction.
- estimate differences within 99
use rounding strategies
- subtract numbers without and with renaming within 99
estimate difference using tens
written calculations after plenty of practical and mental calculations
check answers using hundred square, number line or addition
- use the symbols $+$, $-$, $=$, $<$, $>$
- solve one-step and two-step problems involving addition and subtraction.

Strand unit

Fractions

The child should be enabled to

- establish and identify half of sets to 20
share sets of objects equally between two people
record pictorially.

Linkage

Shape and space: 2-D shapes

The child should be enabled to

- establish and identify halves and quarters of sets to 20
discuss relationship between a half and a quarter.

Linkage

Shape and space: 2-D shapes

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Algebra

Content for first class

Content for second class

Strand unit

Extending and using patterns

The child should be enabled to

- recognise pattern, including odd and even numbers

count in twos on the hundred square; colour each number you stop at

construct sets that increment in twos, starting with 0 (0, 2, 4, 6 ...), starting with 1 (1, 3, 5, 7 ...)

discuss and record pictorially

use two colours to identify odd and even numbers on the hundred square; discuss results

extend activities to group counting with fives and tens

- explore and use patterns in addition facts

notice patterns that make up tens

($9 + 1 = 10$, $2 + 8 = 10$, $18 + 2 = 20$) and the effect of adding 10 to a given number:

$3 + 10 = 13$, $13 + 10 = 23$

- understand the use of a frame to show the presence of an unknown number

$$3 + 5 = \square \quad 2 + \square = 6.$$

The child should be enabled to

- recognise patterns and predict subsequent numbers

counting on the hundred square:

start on 2, count on 5 $2 + 5 = 7$

start on 12, count on 5 $12 + 5 = 17$

explore other number patterns, including odd and even number patterns, on the hundred square

group count in threes, fours and sixes

discuss the results

- explore and use patterns in addition facts

- understand the use of a frame to show the presence of an unknown number

$$24 + 6 = \square \quad 14 + \square = 20, \quad 2 + 4 + \square = 12.$$

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Shape and space

Content for first class

Content for second class

Strand unit

Spatial awareness

The child should be enabled to

- explore, discuss, develop and use the vocabulary of spatial relations

between, underneath, on top of, around, through, left, right

explore closed shapes (e.g. circle), so that one walks from one point back to the same point without having to turn around

*explore open shapes (e.g. V-shape), where one has to turn around to get back to the starting point
make body shapes*

- give and follow simple directions within classroom and school settings

from desk to window

from classroom to school hall

from classroom to school yard

explore and solve practical problems.

Integration

Physical education: Dance; Gymnastics;
Outdoor and adventure activities

The child should be enabled to

- explore, discuss, develop and use the vocabulary of spatial relations

- give and follow simple directions within classroom and school settings, including turning directions using half and quarter turns

turning on the spot to face in different directions

take 2 steps forward, do a half turn, take 3 steps forward

pupils give instructions to other pupils

use mazes, grids, board games, computer

explore and solve practical problems.

Integration

Physical education: Dance; Gymnastics;
Outdoor and adventure activities

The child should be enabled to

- sort, describe, compare and name 2-D shapes: square, rectangle, triangle, circle, semicircle
describe shapes, referring to size, corners, number and length of sides
sort shapes: 4-sided/not 4-sided, curved/not curved
- construct and draw 2-D shapes
use templates, stencils, geostrips, geoboards
- combine and partition 2-D shapes
combine shapes to make new shapes and patterns
make pictures and mosaic patterns by combining shapes
fit many examples of identical shapes together to cover surface
- identify halves of 2-D shapes
fold paper shapes in half and cut to make new shapes
- identify and discuss the use of 2-D shapes in the environment
in furniture, classroom objects, own possessions.

Linkage

Fractions

Integration

Music: Performing—Literacy

The child should be enabled to

- sort, describe, compare and name 2-D shapes: square, rectangle, triangle, circle, semicircle, oval
note similarities and differences between shapes
- construct and draw 2-D shapes
- combine and partition 2-D shapes
- identify half and quarter of shapes
discuss the relationship between halves and quarters
- identify and discuss the use of 2-D shapes in the environment
look for examples of tiling in the environment.

Linkage

Fractions

Integration

Music: Performing—Literacy

The treatment of content as suggested in the exemplars is common to both classes.

Content for first class

Content for second class

Strand unit

3-D shapes

The child should be enabled to

- describe, compare and name 3-D shapes, including cube, cuboid, cylinder and sphere
 - collect, sort and describe shapes, referring to number and shapes of faces, edges, vertices (corners on 3-D shape)*
 - identify shapes that stack, roll or slide*
- discuss the use of 3-D shapes in the environment
 - boxes, packets, containers, fish-tank*
- solve and complete practical tasks and problems involving 2-D and 3-D shapes
 - use boxes, cardboard packs or containers in construction activities*
- explore the relationship between 2-D and 3-D shapes.

Integration:

Visual arts: Construction

The child should be enabled to

- describe, compare and name 3-D shapes, including cube, cuboid, cylinder, sphere and cone
 - make prints with the surfaces of 3-D shapes and discuss results*
 - dismantle boxes and examine constituent shapes*
- discuss the use of 3-D shapes in the environment
- solve and complete practical tasks and problems involving 2-D and 3-D shapes
- explore the relationship between 2-D and 3-D shapes.

Integration:

Visual arts: Construction

Strand unit Symmetry

The child should be enabled to

- identify line symmetry in shapes and in the environment

*fold shapes in half, blob and fold paintings
complete shapes or pictures symmetrically
collect and sort objects on the basis of symmetry.*

Strand unit Angles

The child should be enabled to

- explore and recognise angles in the environment

*investigate things that turn: door handles, wheels
make full, half and quarter turns in yard or hall
investigate angles as corners; use a right angle made
from card to 'measure' corners on 2-D shapes; discuss
relate square corner to quarter turn.*

Integration

Visual arts: Print

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Measures

Content for first class

Content for second class

Strand unit

Length

The child should be enabled to

- estimate, compare, measure and record length using non-standard units

lollipop sticks, pencils, spans, strides

- select and use appropriate non-standard measuring units and instruments

choose a measuring unit from a selection available in the classroom (e.g. selecting either a cube, lollipop stick or a stride to measure the room)

discuss which units are best for measuring long objects and which are best for measuring short objects

- estimate, measure and record length using standard unit (the metre)

length, width, height, measure, metre, nearly a metre, a bit more than/a bit less than a metre

discuss the need for standard units

collect sets of objects longer than, shorter than or the same length as a metre

The child should be enabled to

- estimate, compare, measure and record length using non-standard units

- select and use appropriate non-standard measuring units/instruments

*select and use units/instruments for measuring tasks
discuss which instrument is best for short objects and which is best for long objects*

- estimate, measure and record length using metre and centimetre

through counting and recording, explore relationship between metre and centimetre

measure using 10 cm rods, half-metre stick, metre stick, and trundle wheel

Integration:

Physical education: Athletics

- solve and complete practical tasks and problems involving length
 - suggest ways of measuring around a tree-trunk or other irregular object*
 - suggest ways of comparing objects at home*
 - who has the widest gate?*
 - measure with string and bring the string to school for comparison and discussion.*

- solve and complete practical tasks and problems involving length
 - find the height of each child in a group*
 - who is the shortest/tallest?*
 - graph results.*

Linkage

Data: Representing and interpreting data

Strand unit

Area

The child should be enabled to

- estimate and measure area using non-standard units
 - how many playing-cards, postcards or workbooks cover the table?*
 - which shape is the most suitable?*
 - measure the area of the same surface several times with different units*
 - which surface has more wood, the table-top or the window-sill?*
 - children suggest ways of finding out*
 - estimate, discuss, measure and record.*

Linkage

Shape and space: 2-D shapes

The treatment of content as suggested in the exemplars is common to both classes.

Content for first class

Content for second class

Strand unit

Weight

The child should be enabled to

- estimate, compare, measure and record weight using non-standard units
 - heavy, heavier, heaviest; light, lighter, lightest; balance**
 - sort objects into heavy or light by hand*
 - find objects that are lighter or heavier than given object*
 - estimate comparative weight of two objects by sight*
 - compare weights by hand weighing*
 - check using balance*
- select and use appropriate non-standard measuring units and instruments
 - choose a measuring unit from a selection available in the classroom, e.g. selecting either stones, cubes or beads to weigh school bag*
 - discuss which units are best for weighing various objects*
- estimate, measure and record weight using standard unit (the kilogram) and solve simple problems
 - discuss the need for standard units*
 - collect sets of objects lighter than, heavier than or the same weight as a kilogram*
 - find the largest packet and the smallest packet that weighs a kilogram*
 - make two objects (two balls of Plasticine) weigh the same.*

The child should be enabled to

- estimate, compare, measure and record weight using non-standard units
- select and use appropriate non-standard measuring units and instruments
- estimate, measure and record weight using kilogram, half kilogram and quarter kilogram and solve simple problems
 - measuring with pan balance, kitchen scales, bathroom scales*
 - how many kilograms do you weigh?*
 - graph the weights of a group of children*
- explore and discuss instances when objects or substances that weigh 1 kg vary greatly in size
 - fill bags or containers with 1 kg of sand, flour, polystyrene strips, beads.*

The child should be enabled to

- estimate, compare, measure and record capacity using non-standard units
 - pour, fill, full, empty, holds more, less or the same amount as**
 - find the capacity of a larger container by using teaspoons, egg-cups, cups*
 - find containers that hold more or less than a given container; estimate, and check by measuring*
- select and use appropriate non-standard measuring units and instruments
 - choose a measuring unit from a selection*
 - which container is best for filling the bucket? why?*
- estimate, measure and record capacity using standard unit (the litre) and solve simple problems
 - discuss the need for standard units*
 - collect sets of containers that hold more than, less than or about the same as a litre*
 - collect litre containers of different shapes and sizes; label; check capacity by pouring from one to the other*
 - how many children could have a full cup of water from a litre bottle?*

The child should be enabled to

- estimate, compare, measure and record the capacity of a wide variety of containers using non-standard units
 - estimate comparative capacity of two containers by sight; check by measuring and discuss results*
 - fill several containers using the same unit and arrange in order of capacity; discuss*
 - make a collection of different-shaped containers that hold the same amount*
- select and use appropriate non-standard measuring units and instruments
- estimate, measure and record capacity using litre, half-litre and quarter-litre bottles and solve simple problems
 - make collections of bottles of differing shapes but similar capacity*
 - compare capacity of litre, $\frac{1}{2}$ litre and $\frac{1}{4}$ litre containers*
 - ask the children to suggest reasons why some liquids are sold in a variety of different-sized or different-shaped cartons.*

The treatment of content as suggested in the exemplars is common to both classes.

Content for first class

Content for second class

Strand unit

Time

The child should be enabled to

- use the vocabulary of time to sequence events
sequence events associated with different times of the day, days of the week, months of the year
discuss characteristics of seasons, of months of the year, day before, day after
- read and record time using simple devices
find how many times sand will pass through an egg-timer while a story is read
use candle clock or water clock to measure amount of time that passes by the end of a class activity, by roll call, by break time, by home time
- read time in hours and half-hours on 12-hour analogue clock
become familiar with clock face, movement of hands
record positions at hours and half-hours
record activities at these times
examine television schedules to find programmes that begin on hour and half-hour
state what time it will be one hour later, half an hour later
- read day, date and month using calendar
read today's day, date and month
discuss birthdays and other significant dates
identify from the calendar the day of the week on which a given date occurs.

The child should be enabled to

- use the vocabulary of time to sequence events
- read and record time using simple devices
- read time in hours, half-hours and quarter-hours on 12-hour analogue clock
- read time in hours and half-hours on digital clock
- read day, date and month using calendar and identify the season
discuss the passing of time: 24 hours in a day, 7 days in a week, numbers of days in the month.

Strand unit Money (use up to introduction of the euro)

The child should be enabled to

- recognise, exchange and use coins up to the value of 50p
 - practise tendering and receiving amounts of money*
 - calculate and give change*
 - exchange a coin or coins for others of equal value*
- calculate how many items may be bought with a given sum.

The child should be enabled to

- recognise, exchange and use coins up to the value of £2
- write the value of a group of coins; record money amounts as pence and later as pounds
 - 135p may be written as £1.35.*

Strand unit Money—euro

The child should be enabled to

- recognise, exchange and use coins up to the value of 50 cents
 - practise tendering and receiving amounts of money*
 - calculate and give change*
 - exchange a coin or coins for others of equal value*
- calculate how many items may be bought with a given sum.

The child should be enabled to

- recognise, exchange and use coins up to the value of €2
- write the value of a group of coins; record money amounts as cents and later as euro
 - 135 cents may be written as €1.35.*

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Data

Content for first class

Content for second class

Strand unit

Representing and interpreting data

The child should be enabled to

- sort and classify objects by two and three criteria
 - sort blocks according to colour, shape, size and thickness*
 - identify a block in the collection from a description of its attributes*
- represent and interpret data in two, three or four rows or columns using real objects, models and pictures
 - represent concretely and pictorially the sets of children who had an apple, an orange or a banana for lunch*
 - identify the correspondence between the number of symbols (fruit pictures) and the people in the set*
 - progress to representing data using more abstract 3-D forms, e.g. coloured blocks to represent people*
 - construct simple pictograms.*

Integration

Geography: Natural environments

The child should be enabled to

- sort and classify objects by two and three criteria
- represent, read and interpret simple tables and charts (pictograms)
 - chart of cars passing school during a particular time*
 - weather chart records*
- represent, read and interpret simple block graphs
 - construct by fixing coloured squares to large sheet of paper*
 - progress to drawing on squared paper.*

Integration

Geography: Natural environments

The treatment of content as suggested in the exemplars is common to both classes.

Third
and fourth
classes

Overview

third and fourth classes

Skills development

Skills

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

Strands

Strand units

Number

- Place value
 - Operations
 - Addition and subtraction*
 - Multiplication*
 - Division*
 - Fractions
 - Decimals
-

Algebra

- Number patterns and sequences
 - Number sentences
-

Shape and space

- 2-D shapes
 - 3-D shapes
 - Symmetry
 - Lines and angles
-

Measures

- Length
 - Area
 - Weight
 - Capacity
 - Time
 - Money
-

Data

- Representing and interpreting data
- Chance

Skills development for third and fourth classes

Through completing the strand units of the mathematics curriculum the child should be enabled to

Applying and problem-solving

- select appropriate materials, concepts and processes for mathematical tasks and applications
- apply concepts and processes in a variety of contexts
- analyse problems and plan an approach to solving them
- select and apply a variety of strategies to complete tasks and projects or to solve problems
- evaluate solutions to problems

Communicating and expressing

- discuss and explain the processes used and the results of mathematical activities, problems, and projects
- listen to and discuss other children's mathematical descriptions and explanations
- discuss and record the processes and results of work using a variety of methods
- discuss problems presented verbally or diagrammatically and carry out analyses

Integrating and connecting

- connect informally acquired mathematical ideas and processes with formal mathematical ideas and processes
- understand the connections between mathematical procedures and the concepts he/she uses
- recognise mathematics in the environment
- represent mathematical ideas and processes in different modes: verbal, pictorial, diagrammatic, and symbolic
- recognise and apply mathematical ideas and processes in other areas of the curriculum

Reasoning

- make hypotheses and carry out experiments to test them
- make informal deductions involving a small number of steps
- explore and investigate mathematical patterns and relationships
- reason systematically in a mathematical context
- justify processes and results of mathematical activities, problems and projects

Implementing

- devise and use mental strategies and procedures for carrying out mathematical tasks
- use appropriate manipulatives to carry out mathematical procedures
- execute standard procedures efficiently with a variety of tools

Understanding and recalling

- understand and recall terminology, facts and definitions.

Strand: Number

Content for third class

Content for fourth class

Strand unit

Place value

The child should be enabled to

- explore and identify place value in whole numbers, 0–999
 - grouping and swapping activities involving units, tens, hundreds using concrete materials, e.g. lollipop sticks, abacus, notation boards, base ten materials, money*
 - significance of zero: 208, 420*
- read, write and order three-digit numbers
 - identify and record numbers represented by money and abacus*
 - identify and express numbers in expanded form*
 $246 = 2 \text{ hundreds} + 4 \text{ tens} + 6 \text{ units}$
 - order numbers on the number line or hundred square*
247: what is the value of 4 in this number?
which digit has the greatest value?
what is the next number after 499?
- round whole numbers to the nearest ten or hundred
 - which number is nearer to 40: 29 or 79?*
 - which number is nearer to 500: 432 or 567?*
- explore and identify place value in decimal numbers to one place of decimals.

The child should be enabled to

- explore and identify place value in whole numbers, 0–9999
 - grouping and swapping activities involving units, tens, hundreds and thousands using concrete materials and notation boards*
 - significance of zero: 1078, 2005, 3620*
- read, write and order four-digit numbers and solve simple problems
 - write 5683 in expanded form*
 $5000 + 600 + 80 + 3$
 - what is the value of the underlined 7 in 7777?*
 - make as many numbers as you can from 3, 7, 0, 6 place in order, starting with the largest*
- round whole numbers to the nearest thousand
 - which number is nearer to 5000: 4328 or 5675?*
- explore and identify place value in decimal numbers to two places of decimals.

Content for third class

The child should be enabled to

- explore, understand and apply the zero, commutative and distributive properties of multiplication

use concrete materials, charts and illustrations to establish and record:

zero property, e.g. $5 \times 0 = 0$ and $0 \times 7 = 0$

commutative property, e.g. $3 \times 4 = 4 \times 3$

distributive property, e.g. $5 \times 4 = (3 \times 4) + (2 \times 4)$

- develop and/or recall multiplication facts within 100

counting in 2, 3, 5 and 10

doubles, trebles

$2 \times 9 = 18$, $4 \times 9 = 36$, $8 \times 9 = 72$

$3 \times 4 = 12$, $9 \times 4 = 36$

- multiply a one-digit or two-digit number by 0–10

use rounding to estimate products

rounding up/down, e.g. 6×28 is near to 6×30

represent in horizontal and vertical form

23×7 and 23

$\times 7$

establish effect of multiplication by 1 and by 10

$1 \times 17 = 17$, $10 \times 53 = 530$

- solve and complete practical tasks and problems involving multiplication of whole numbers

how many days in 9 full weeks?

Content for fourth class

The child should be enabled to

- explore, understand and apply the zero, commutative, distributive and associative properties of multiplication

use concrete materials and charts to establish associative property,

e.g. $(3 \times 4) \times 5 = 3 \times (4 \times 5)$

- develop and recall multiplication facts within 100

- multiply a two-digit or three-digit number by a one or two-digit number

estimate products

represent multiplication in expanded form

$26 \times 37 = (20 \times 37) + (6 \times 37)$

record and calculate using long multiplication algorithm

37

$\underline{26} \times$

222 (37×6)

$\underline{740}$ (37×20)

962

- use a calculator to check estimates
- solve and complete practical tasks and problems involving multiplication of whole numbers

*34 children buy one packet of sweets per child each day
how many packets altogether do they buy in a month?*

Division

- develop an understanding of division as sharing and as repeated subtraction, without and with remainders

share a quantity in equal groups of 2, 3 ...

record using number sentences or vertically

$$20 - 4 - 4 - 4 - 4 - 4 = 0$$

- develop and/or recall division facts within 100

use inverse of multiplication facts

use halves

9 is half of 18 ($2 \times 9 = 18$)

- divide a one-digit or two-digit number by a one-digit number without and with remainders

represent division as repeated subtraction

represent division as number sentences

$$20 \div 4 = 5$$

record using the division algorithm

$$\begin{array}{r} 5 \\ 4 \overline{)20} \end{array} \quad \begin{array}{r} 7 \text{ r } 2 \\ 5 \overline{)37} \end{array} \quad \text{or} \quad \begin{array}{r} 4 \overline{)20} \\ 5 \end{array} \quad \begin{array}{r} 5 \overline{)37} \\ 7 \text{ r } 2 \end{array}$$

use different strategies to estimate quotients and check answers

rounding up or down, e.g. $44 \div 12$ is about $40 \div 10$

Division

- develop an understanding of division as sharing and as repeated subtraction, without and with remainders

- develop and/or recall division facts within 100

- divide a three-digit number by a one-digit number without and with remainders

using regrouping

$372 \div 6$ may be seen as 37 tens + 2 units $\div 6$

(37 tens $\div 6$) and (2 units $\div 6$)

6 tens and $(12 \div 6) = 62$

using algorithm

$$\begin{array}{r} 62 \\ 6 \overline{)372} \end{array} \quad \begin{array}{r} 34 \text{ r } 2 \\ 6 \overline{)206} \end{array}$$

explore, understand and apply the distributive property of division

$$84 \div 7 = (70 \div 7) + (14 \div 7)$$

- use calculator to check estimates

using compatible numbers (i.e. numbers easily worked with an extension of basic facts)

$338 \div 7$ is compatible with $350 \div 7$

The treatment of content as suggested in the exemplars is common to both classes.

Content for third class

- solve and complete practical tasks and problems involving division of whole numbers
problems based on the environment
how many cars are needed to take 27 children to a game if only 4 children are allowed in each car?
estimate, discuss and record.

Content for fourth class

- solve and complete practical tasks and problems involving division of whole numbers
how many small boxes of eggs (6 per box) can be filled from a crate containing 350 eggs?
estimate, discuss and record.

Strand unit

Fractions

The child should be enabled to

- identify fractions and equivalent forms of fractions with denominators 2, 4, 8 and 10
construct and cut out simple fractions of regular shapes
record using diagrams or fraction charts
- compare and order fractions with appropriate denominators and position on the number line
- calculate a fraction of a set using concrete materials
- develop an understanding of the relationship between fractions and division
 $\frac{1}{4}$ of 32 = 8, $\frac{32}{4} = 8$
- calculate a unit fraction of a number and calculate a number, given a unit fraction of the number
what is $\frac{1}{4}$ of 12?
 $\frac{1}{8}$ of a number = 6, *find the number*

The child should be enabled to

- identify fractions and equivalent forms of fractions with denominators 2, 3, 4, 5, 6, 8, 9, 10 and 12
construct and cut out simple fractions of regular shapes
record using diagrams or fraction charts
- compare and order fractions with appropriate denominators and position on the number line
- calculate a fraction of a set using concrete materials
- calculate a number, given a multiple fraction of the number
 $\frac{3}{10}$ of a number = 45, *find the number*
- express one number as a fraction of another number
 $3 = \frac{1}{2}$ of 6

- solve and complete practical tasks and problems involving fractions
what fraction of a chart is coloured yellow/is not green?

- solve and complete practical tasks and problems involving fractions
find $\frac{3}{4}$ of a 1 metre piece of string
find $\frac{1}{5}$ of 2500 metres.

Strand unit

Decimals

The child should be enabled to

- identify tenths and express in decimal form
express $\frac{1}{10}$ as 0.1
cut out tenths and/or 0.1 of regular shapes
record using diagrams or charts

Linkage

Fractions

- order decimals on the number line
draw a circle around the number with the greatest value: 0.5, 0.1, 0.7, 0.2
- solve problems involving decimals.

The child should be enabled to

- express tenths and hundredths as fractions and decimals
- identify place value of whole numbers and decimals to two places and write in expanded form
 $3.45 = 3 + 0.4 + 0.05$
- order decimals on the number line
identify the number with the greatest value: 0.57, 0.01, 0.72, 0.25
what is the value of the 6 in the following?
 $4.\underline{6}5$, $2.7\underline{6}$, $\underline{6}.05$
- add and subtract whole numbers and decimals up to two places
- multiply and divide a decimal number up to two places by a single-digit whole number
- solve problems involving decimals.

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Algebra

Content for third class

Content for fourth class

Strand unit

Number patterns and sequences

The child should be enabled to

- explore, recognise and record patterns in number, 0–999

group and count in twos, threes, fours ... tens on number line and hundred square

recognise number bonds through grouping

17 + 3, 27 + 3, 37 + 3

recognise links within and between multiplication tables (e.g. links between 4 and 8 times tables)

patterns of odd and even numbers

- explore, extend and describe (explain rule for) sequences

patterns or sequences of objects or shapes

whole-number sequences

(e.g. 54, 44, 34, or 1, 3, 9, 27)

- use patterns as an aid in the memorisation of number facts

make patterns on the hundred square.

The child should be enabled to

- explore, recognise and record patterns in number, 0–9999

- explore, extend and describe sequences

- use patterns as an aid in the memorisation of number facts

make patterns on the hundred square.

The child should be enabled to

- translate an addition or subtraction number sentence with a frame into a word problem (frame not in initial position)

$$3 + 7 = \square$$

Mary has three sweets, she gets seven more, how many has she now?

- solve one-step number sentences

$$400 - \square = 350$$

$$810 + 23 = \square .$$

The child should be enabled to

- translate an addition, subtraction, multiplication or division number sentence with a frame into a word problem (frame not in initial position)

Rita has 18 toy cars

She wants to arrange them in 3 rows

$$18 = 3 \times \square$$

- solve one-step number sentences

discuss and record solutions for open number sentences

$$3 + \square < 7 \quad \text{or} \quad 5 + \square > 8.$$

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Shape and space

Content for third class

Content for fourth class

Strand unit

2-D shapes

The child should be enabled to

- identify, describe and classify 2-D shapes: square, rectangle, triangle, hexagon, circle, semicircle, oval and irregular shapes
- explore, describe and compare the properties (sides, angles, parallel and non-parallel lines) of 2-D shapes
- construct and draw 2-D shapes
use templates, stencils, geostrips, geoboards
- combine, tessellate and make patterns with 2-D shapes
cover surfaces with 2-D shapes that tessellate or do not tessellate
identify properties that facilitate or hinder tessellation
combine shapes to make patterns
- identify the use of 2-D shapes in the environment
buildings, road signs, printing, household objects
- solve and complete practical tasks and problems involving 2-D shapes.

Linkage

Area

Integration

Visual arts:Drawing—An awareness of line, shape

The child should be enabled to

- identify, describe and classify 2-D shapes: equilateral, isosceles and scalene triangle, parallelogram, rhombus, pentagon, octagon
- explore, describe and compare the properties (sides, angles, parallel and non-parallel lines) of 2-D shapes
- construct and draw 2-D shapes
use ruler and set square
- combine, tessellate and make patterns with 2-D shapes
combine shapes to make patterns and to make other shapes
create a tessellating pattern on squared paper
- identify the use of 2-D shapes in the environment
hoardings, shop fronts, paving-stones
- solve and complete practical tasks and problems involving 2-D shapes.

Linkage

Area

Integration

Visual arts:Drawing—An awareness of line, shape

The child should be enabled to

- identify, describe and classify 3-D shapes, including cube, cuboid, cylinder, cone, sphere, triangular prism, pyramid
- explore, describe and compare the properties of 3-D shapes

number and shape of faces, number of edges and corners, ability to roll, slide or stack

- explore and describe the relationship of 3-D shapes with constituent 2-D shapes

identify constituent 2-D shapes by observation and deconstruction and compile a table of results

- construct 3-D shapes

trace around nets and cut out; use straws or pipe cleaners

- solve and complete practical tasks and problems involving 2-D and 3-D shapes.

Integration

Visual arts: Construction; Paint and colour

Geography: Human environments

The child should be enabled to

- identify, describe and classify 3-D shapes, including cube, cuboid, cylinder, cone, sphere, triangular prism, pyramid
- establish and appreciate that when prisms are sliced through (in the same direction) each face is equal in shape and size

keep work exploratory and simple

e.g. use Plasticine, triangular prisms or suitable foods

- explore and describe the relationship of 3-D shapes with constituent 2-D shapes

- construct 3-D shapes

construct from 2-D shapes

- solve and complete practical tasks and problems involving 2-D and 3-D shapes

identify the use of 3-D shapes in the environment.

Integration

Visual arts: Construction; Paint and colour

Geography: Human environments

The treatment of content as suggested in the exemplars is common to both classes.

Content for third class

Content for fourth class

Strand unit

Symmetry

The child should be enabled to

- identify line symmetry in the environment
- identify and draw lines of symmetry in two-dimensional shapes

fold paper shapes or use a mirror to identify lines of symmetry

use fold lines to draw and record lines of symmetry

classify 2-D shapes according to their number of lines of symmetry.

Linkage

Fractions

The child should be enabled to

- identify line symmetry in the environment
- identify lines of symmetry as horizontal, vertical or diagonal

using examples from the environment, e.g. an open book, windows, gates

- use understanding of line symmetry to complete missing half of a shape, picture or pattern

in drawings, on geoboard or pegboard where the fold is vertical, horizontal or diagonal.

Linkage

Fractions

The child should be enabled to

- identify, describe and classify vertical, horizontal and parallel lines

discuss and describe lines in the environment

draw and label lines

use geostrips to construct vertical and horizontal lines

- recognise an angle in terms of a rotation

form angles by opening books and doors, by rotating clock hands and geostrip arms, by physically turning (clockwise/anti-clockwise), or on computer

- classify angles as greater than, less than or equal to a right angle

construct and use a right-angle measure to identify right angles in the environment and in

2-D and 3-D shapes

classify and record angles as $>$, $<$ or $=$ to a right angle

- solve problems involving lines and angles.

Integration

Physical education: Dance; Gymnastics

Visual arts: Drawing; Construction

The child should be enabled to

- identify, describe and classify oblique and perpendicular lines

use straws to construct oblique and perpendicular lines and diagonals in a square

- draw, discuss and describe intersecting lines and their angles

perpendicular and oblique lines

acute, obtuse and right angles

- classify angles as greater than, less than or equal to a right angle

- solve problems involving lines and angles.

Integration

Physical education: Dance; Gymnastics

Visual arts: Drawing; Construction

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Measures

Content for third class

Content for fourth class

Strand unit

Length

The child should be enabled to

- estimate, compare, measure and record lengths of a wide variety of objects using appropriate metric units (m, cm)

*everyday objects, furniture, heights of children
estimate length and height without and with unit of
measurement present measure to check estimates*

- rename units of length in m and cm

$$125 \text{ cm} = 1 \text{ m } 25 \text{ cm}$$

- solve and complete practical tasks and problems involving the addition and subtraction of units of length (m, cm)

*confine to totals that can be readily checked
by measuring.*

Integration

Physical education: Athletics

The child should be enabled to

- estimate, compare, measure and record lengths of a wide variety of objects, using appropriate metric units, and selecting suitable instruments of measurement

*lengths and heights of doors, corridors, school yard,
paths, drives, playing-fields
instruments: rulers, tape measures, trundle wheel*

- rename units of length using decimal or fraction form

$$25 \text{ cm} = 0.25 \text{ m} = \frac{1}{4} \text{ m}$$
$$2 \text{ km } 150 \text{ m} = 2150 \text{ m} = 2.15 \text{ km}$$

- understand, estimate and measure the perimeter of regular 2-D shapes
- solve and complete practical tasks and problems involving the addition, subtraction, multiplication and simple division of units of length (m, cm, km).

Integration

Physical education: Athletics

Strand unit

Area

The child should be enabled to

- estimate, compare and measure the area of regular and irregular shapes

counting non-standard square units.

Linkage

Shape and space: 2-D shapes

The child should be enabled to

- estimate, compare and measure the area of regular and irregular shapes

use standard square units: sq. cm, sq. m (cm^2 , m^2).

Linkage

Shape and space: 2-D shapes

Strand unit

Weight

The child should be enabled to

- estimate, compare, measure and record the weight of a wide variety of objects using appropriate metric units (kg, g)

everyday objects, books, piles of copybooks lighter and heavier than 1 kg

objects showing that there is no constant relationship between weight and size

handle and compare objects as an aid to estimation

- solve and complete practical tasks and problems involving the addition and subtraction of units of weight (kg and g)

confine to totals which can be readily checked by weighing.

The child be enabled to

- estimate, compare, measure and record the weight of a wide variety of objects using appropriate metric units (kg, g) and selecting suitable instruments of measurement

use and select from bathroom scales, kitchen scales, spring balance

become familiar with major and minor markings on scales

(e.g. 100 g markings, $\frac{1}{2}$ kg, $\frac{1}{4}$ kg)

- rename units of weight in kg and g

2 kg 250 g = 2250 g

- rename units of weight using decimal or fraction form

250 g = 0.25 kg = $\frac{1}{4}$ kg

confine to examples requiring only two places of decimals

- solve and complete practical tasks and problems involving the addition, subtraction, multiplication and simple division of units of weight (kg and g).

The treatment of content as suggested in the exemplars is common to both classes.

Content for third class

Content for fourth class

Strand unit

Capacity

The child should be enabled to

- estimate, compare, measure and record the capacity of a wide variety of objects using appropriate metric units (*l*, ml)

use cartons, spoons, cups, jugs, plastic bottles and other common containers

use litre, 250 ml and 500 ml measuring containers

use tall, low, wide and narrow containers

- solve and complete practical tasks and problems involving the addition and subtraction of units of capacity (*l*, ml)

confine to totals that can be readily checked by measuring.

The child should be enabled to

- estimate, compare, measure and record capacity using appropriate metric units (*l*, ml) and selecting suitable instruments of measurement

become familiar with major and minor markings on measuring containers

(e.g. 100 ml markings, $\frac{1}{2}$ l, $\frac{1}{4}$ l)

- rename units of capacity in *l* and ml

1500 ml = 1 l 500 ml

- rename units of capacity using decimal and fraction form

250 ml = 0.25 l = $\frac{1}{4}$ l

2 l 150 ml = 2.150 ml = 2.15 l

confine to examples requiring only two places of decimals

- solve and complete practical tasks and problems involving the addition, subtraction, multiplication and simple division of units of capacity (*l*, ml).

The child should be enabled to

- consolidate and develop further a sense of time passing

place daily, weekly, monthly and annual events in sequence

discuss movement of hands of clock or sand in hour-glass as indicating passing of time

refine and develop vocabulary of time

before/after, a long time ago, last year, last month, yesterday, immediately, soon, tomorrow, in a week's time, for a short/long time

Integration

Geography: The physical world

- read time in five-minute intervals on analogue and digital clock (12-hour)

count in fives up and down number line, hundred square and clock face

construct simple clock face and relate intervals

$$\frac{1}{4} \text{ hour} = 15 \text{ min} = 3 \times 5 \text{ min}$$

discuss and record times of a variety of common events, school and home activities, television programmes

- record time in analogue and digital forms
- read and interpret simple timetables

school, bus, train, television schedules.

The child should be enabled to

- consolidate and develop further a sense of time passing

Integration

Geography: The physical world

- read time in one-minute intervals on analogue and digital clock (12-hour)

- express digital time as analogue time and vice versa
- read and interpret simple timetables.

The treatment of content as suggested in the exemplars is common to both classes.

Content for third class

- rename minutes as hours and hours as minutes
confine work to five-minute intervals
 $70 \text{ min} = 1 \text{ hour } 10 \text{ min}$
 $1\frac{1}{2} \text{ hour} = 1 \text{ hour } 30 \text{ min} = 90 \text{ min}$
- read dates from calendars and express weeks as days and vice versa
collect and record significant personal dates and dates in life of school and family
- solve and complete practical tasks and problems involving times and dates
practical problems that can be readily checked by measurement.

Content for fourth class

- rename minutes as hours and hours as minutes
- read dates from calendars and express weeks as days and vice versa
- solve and complete practical tasks and problems involving times and dates and the addition and subtraction of hours and minutes
practical problems that can be readily checked by measurement

add hours and minutes separately

$$\begin{array}{r} 4 \text{ hours} \quad 45 \text{ minutes} \\ + 3 \text{ hours} \quad 25 \text{ minutes} \\ \hline \end{array}$$

$$= 7 \text{ hours } 70 \text{ min}$$

$$8 \text{ hours} \quad 10 \text{ minutes}$$

rename minutes before subtraction

$$\begin{array}{r} 3 \text{ hours} \quad 30 \text{ minutes} \\ - 1 \text{ hour} \quad 40 \text{ minutes} \\ \hline \end{array} = 2 \text{ hours } 90 \text{ min}$$

$$1 \text{ hour} \quad 50 \text{ minutes.}$$

Integration

Physical education: Athletics

Strand unit Money (use up to introduction of the euro)

The child should be enabled to

- rename amounts of money as pounds or pence and record using p or £ symbol and decimal point
- solve and complete one-step problems and tasks involving the addition and subtraction of money.

The child should be enabled to

- rename amounts of money as pounds or pence and record using p or £ symbol and decimal point
 $125\text{p} = \text{£}1.25$ $\text{£}3.56 = 356\text{p}$
- solve and complete practical one-step and two-step problems and tasks involving the addition, subtraction, multiplication and simple division of money.

Strand unit Money—euro

The child should be enabled to

- rename amounts of euro or cents and record using symbols and decimal point
- solve and complete one-step problems and tasks involving the addition and subtraction of money.

The child should be enabled to

- rename amounts of money as euro or cents and record using € symbol and decimal point
 $125 \text{ cents} = \text{€}1.25$ $\text{€}3.56 = 356 \text{ cents}$
- solve and complete practical one-step and two-step problems and tasks involving the addition, subtraction, multiplication and simple division of money.

Integration

History: Early peoples and ancient societies

Integration

History: Early peoples and ancient societies

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Data

Content for third class

Content for fourth class

Strand unit

Representing and interpreting data

The child should be enabled to

- collect, organise and represent data using pictograms, block graphs and bar charts
 - collect data from the environment and record in tabular form*
 - represent data in appropriate format*
 - discuss strengths and limitations of the format used*
 - use simple scale in block graphs and bar charts*
 - use computer applications if available to organise and represent data*
- read and interpret tables, pictograms, block graphs and bar charts
- use data sets to solve and complete practical tasks and problems
 - solve simple problems using data collected from own environment.*

Linkage

Shape and space: Lines and angles

Integration

Geography: Natural environments

Science: Energy and forces

The child should be enabled to

- collect, organise and represent data using pictograms, block graphs, bar charts and bar-line graphs incorporating the scales 1:2, 1:5, 1:10, and 1:100
 - use scales appropriate to the range of numbers for this level*
- read and interpret bar-line graphs and simple pie charts
 - involving use of $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$*
- use data sets to solve and complete practical tasks and problems.

Linkage

Shape and space: Lines and angles

Integration

Geography: Natural environments

Science: Energy and forces

The child should be enabled to

- use vocabulary of uncertainty and chance: **possible, impossible, might, certain, not sure**
- order events in terms of likelihood of occurrence

examine and discuss the likelihood of occurrence of simple events and order from least likely to most likely

Our school will be closed next Monday

The sun will shine for two hours tomorrow

The teacher will fall asleep at 11 o'clock today

- identify and record outcomes of simple random processes

toss a coin ten or twenty times and record results

draw a cube from a bag containing, for example, 4 blue cubes and 8 red cubes a number of times, replacing the drawn cube each time; discuss results.

Integration

Music:Composing—Improvising and creating

The child should be enabled to

- use vocabulary of uncertainty and chance: **chance, likely, unlikely, never, definitely**
- order events in terms of likelihood of occurrence

- identify and record outcomes of simple random processes

toss a coin, roll a die ten or twenty times and record results

draw a cube from a bag of two red, one blue and one yellow cube a number of times, replacing drawn cube each time; discuss results and record outcomes.

Integration

Music:Composing—Improvising and creating

The treatment of content as suggested in the exemplars is common to both classes.

Fifth
and sixth
classes

Overview

fifth and sixth classes

Skills development

Skills

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

Strands

Strand units

Number

- Place value
 - Operations
 - Fractions
 - Decimals and percentages
 - Number theory
-

Algebra

- Directed numbers
 - Rules and properties
 - Variables
 - Equations
-

Shape and space

- 2-D shapes
 - 3-D shapes
 - Lines and angles
-

Measures

- Length
 - Area
 - Weight
 - Capacity
 - Time
 - Money
-

Data

- Representing and interpreting data
- Chance

Skills development for fifth and sixth classes

Through completing the strand units of the mathematics curriculum the child should be enabled to

Applying and problem-solving

- select appropriate materials, concepts and processes for particular tasks and applications
- apply concepts and processes in a variety of contexts
- analyse problems and plan an approach to solving them
- select and apply a variety of strategies to complete tasks and projects or solve problems
- reflect upon and evaluate solutions to problems

Communicating and expressing

- discuss and explain the processes used and the results of mathematical activities, problems and projects in an organised way
- listen to and discuss other children's mathematical descriptions and explanations
- discuss and record the processes and results of work using a variety of methods
- discuss problems and carry out analyses

Integrating and connecting

- connect informally acquired mathematical ideas and processes with formal mathematical ideas and processes
- recognise mathematics in the environment
- represent mathematical ideas and processes in different modes: verbal, pictorial, diagrammatic and symbolic
- understand the connections between mathematical procedures and the concepts he/she uses
- recognise and apply mathematical ideas and processes in other areas of the curriculum

Reasoning

- make hypotheses and carry out experiments to test them
- make informal deductions
- search for and investigate mathematical patterns and relationships
- reason systematically in a mathematical context
- justify processes and results of mathematical activities, problems and projects

Implementing

- devise and use mental strategies and procedures for carrying out mathematical tasks
- use appropriate manipulatives to carry out mathematical procedures
- execute standard procedures efficiently with a variety of tools

Understanding and recalling

- understand and recall facts, definitions and formulae.

Strand: Number

Content for fifth class

Content for sixth class

Strand unit

Place value

The child should be enabled to

- read, write and order whole numbers and decimals
extend previous conceptual and practical work to include larger numbers and decimals
- identify place value in whole numbers and decimals
extend previous conceptual and practical work to include larger numbers and decimals
- round whole numbers and round decimals
*round whole numbers to nearest ten, hundred, thousand
round decimals to nearest whole number.*

The child should be enabled to

- read, write and order whole numbers and decimals
- identify place value in whole numbers and decimals
- round decimals
round decimals to one, two or three decimal places.

Strand unit

Operations

The child should be enabled to

- estimate sums, differences, products and quotients of whole numbers
*use strategies for estimation, e.g. front-end estimation, rounding, clustering, special numbers
estimate calculations and compute answers with a calculator
e.g. $450 \times 9 = 4500$ (estimation based on 450×10)
estimate first, then use calculator to get actual result*
- add and subtract whole numbers and decimals (to three decimal places) without and with a calculator
develop and extend the use of existing algorithms

The child should be enabled to

- estimate sums, differences, products and quotients of decimals
*use strategies for estimation
estimate calculations and compute answers with a calculator*
- add and subtract whole numbers and decimals (to three decimal places) without and with a calculator

- multiply a decimal (up to three places) by a whole number, without and with a calculator

develop and extend the use of existing algorithms
 8.125×9

- divide a three-digit number by a two-digit number, without and with a calculator

explore the concept of division with concrete materials
develop the long division algorithm from repeated subtraction and multiples of repeated subtraction

- divide a decimal number by a whole number, without and with a calculator

explore the concept of division of decimals with concrete materials, money and measurement
extend the algorithm in conjunction with place value
 $75.6 \div 4.$

- multiply a decimal by a decimal, without and with a calculator

develop and extend the use of existing algorithms
 7.25×1.5 ; 13.2×0.75

understand that multiplication does not always make larger

- divide a four-digit number by a two-digit number, without and with a calculator

develop and extend the use of existing algorithms
 $7852 \div 26$

- divide a decimal number by a decimal, without and with a calculator

explore the concept of division by decimals with concrete materials, money and measurement
 $36.92 \div 2.6$; $27.6 \div 0.2$
understand that division does not always make smaller.

Strand unit

Fractions

The child should be enabled to

- compare and order fractions and identify equivalent forms of fractions with denominators 2–12

explore, compare and record simple equivalence using concrete materials, paper folding, and fraction charts

- express improper fractions as mixed numbers and vice versa and position them on the number line

establish equivalence by using concrete materials
explore, compare and record simple improper fractions and mixed numbers diagrammatically, numerically and on the number line

- add and subtract simple fractions and simple mixed numbers

use equivalent fractions to simplify calculations

The child should be enabled to

- compare and order fractions and identify equivalent forms of fractions

order equivalent fractions on the number line and on fraction charts

- express improper fractions as mixed numbers and vice versa and position them on the number line

- add and subtract simple fractions and simple mixed numbers

common denominator should be found by listing multiples

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

- multiply a fraction by a whole number
develop concepts with concrete materials, paper folding and fraction charts
four $\frac{3}{4}$ of a pizza is how many pizzas?
- express tenths, hundredths and thousandths in both fractional and decimal form
explore and compare using concrete materials
express as fractions and as decimals.

Content for sixth class

- multiply a fraction by a fraction
explore and develop concept by using concrete materials and the number line and by drawing diagrams to illustrate examples, leading to the development of an algorithm
- express tenths, hundredths and thousandths in both fractional and decimal form
- divide a whole number by a unit fraction
how many quarters in 2?
 $2 \div \frac{1}{4}; 15 \div \frac{1}{5}$
- understand and use simple ratios
explore and record the relationship between the natural numbers and their multiples.

The child should be enabled to

- develop an understanding of simple percentages and relate them to fractions and decimals

express percentages as fractions and as decimals, and vice versa

calculate simple percentages, e.g. 50%, 25% 10%

- compare and order fractions and decimals

explore, compare and record using concrete materials and money

order diagrammatically or on the number line

- solve problems involving operations with whole numbers, fractions, decimals and simple percentages

use diagrams; estimate and compute answers with a calculator

include simple discount and increase examples

10% off all jeans, 20% extra free.

Linkage

Measures: Money

Integration

Geography: Human environments

The child should be enabled to

- use percentages and relate them to fractions and decimals

express quantities as percentages

- compare and order percentages of numbers

- solve problems relating to profit and loss, discount, VAT, interest, increases, decreases.

Linkage

Measures: Money

Integration

Geography: Human environments

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

Content for sixth class

Strand unit

Number theory

The child should be enabled to

- identify simple prime and composite numbers
 - define a prime number, i.e. a number greater than 1 with exactly two divisors, itself and 1*
 - identify simple prime numbers by trial and error, e.g. 2, 5, 7, 11*
 - identify and record primes with Sieve of Eratosthenes*
 - define a composite number, i.e. a number that has more than two divisors, e.g. 4, 6, 9*
 - identify and record composite numbers using number facts and/or a calculator*
 - investigate relationship with odd and even numbers*
- identify square and rectangular numbers
 - construct diagrams on geoboards, pegboards and squared paper to illustrate simple square and rectangular numbers*
 - explore, compare and record these numbers*
- identify factors and multiples
 - identify factors and multiples from basic multiplication facts.*

The child should be enabled to

- identify simple prime and composite numbers
- identify and explore square numbers
 - $16 = 4 \times 4 = 4^2$
- explore and identify simple square roots
 - construct diagrams*
 - record and relate to square numbers*
- identify common factors and multiples
 - explore and record factors and multiples to identify common factors and multiples*
- write whole numbers in exponential form
 - $1000 = 10 \times 10 \times 10 = 10^3$
 - $8 = 2 \times 2 \times 2 = 2^3 .$

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Algebra

Content for fifth class

Content for sixth class

Strand unit

Directed numbers

The child should be enabled to

- identify positive and negative numbers in context
examine and discuss money affairs, video counters and calculator displays, sports reports, golf scores, temperature, sea level and lifts, leading to the need to distinguish between amounts above and below zero
refer to positive and negative numbers as 'positive seven' and 'negative three'
record positive and negative numbers with + or - signs raised e.g.
 $+7$ -3
rewind a video tape
pupils draw and label a thermometer, mark in temperatures, consult weather forecasts in newspapers.

Integration

Geography: Natural environments: weather, climate and atmosphere

The child should be enabled to

- identify positive and negative numbers on the number line
walk the number line to experience positive and negative numbers that arise in discussion and/or in context
identify and mark positive and negative numbers on personal and class number lines
- add simple positive and negative numbers on the number line
add simple positive and negative numbers by walking the number line and by counting on the class and personal number line
 $+5 + -7 = \square$ $-9 + -3 = \square$
 $-8 + +2 = \square$
add positive and negative numbers that arise contextually, e.g. a golfer's score over four rounds was 6 under par, 2 over par, 3 under par, and 1 under par; what was her final score relative to par?

Integration

Geography: Natural environments: weather, climate and atmosphere

The child should be enabled to

- explore and discuss simple properties and rules about brackets and priority of operation

identify, discuss and compute expressions with brackets in a variety of positions

$$10 + (4 + 7) = \square \quad (10 + 4) + 7 = \square$$

$$(8 - 1) + 4 = \square \quad 8 - (1 + 4) = \square$$

$$(3 \times 4) + 5 = \square \quad 3 \times (4 + 5) = \square$$

$$8 \div (2 + 2) = \square \quad (8 \div 2) + 2 = \square$$

what is the significance of the positions of the brackets?

identify, discuss and compute expressions with brackets excluded

$$4 + 3 \times 5 = \square \quad 12 \times 6 + 3 = \square$$

$$2.45 \div 5 - 0.75 = \square \quad 96 \div 8 - 12 = \square$$

what is the significance of starting operations at different points?

e.g. 4 + 3 before 3 × 5 or vice versa in 4 + 3 × 5

establish the value of brackets, leading to the priority of multiplication and division over addition and subtraction

explore these properties and rules without and with a calculator

- identify relationships and record verbal and simple symbolic rules for number patterns

identify and discuss rules for simple number sequences

2.0, 3.5, 5.0, 6.5 ... i.e. sequence increases by adding 1.5

81, 27, 9 ... decreases by dividing by 3

1, 4, 9, 16, 25, 36 ...

The child should be enabled to

- know simple properties and rules about brackets and priority of operation

use the calculator in exercises to find missing numerals and missing operator

$$\text{e.g. } 37 \quad ? \quad 21 \quad ? \quad 23 = 800$$

$$27 \quad ? \quad (36 \quad ? \quad 11) = 675$$

- identify relationships and record symbolic rules for number patterns

deduce and record rules for given number patterns

2, 6, 12, 20, 30 ...

4:1, 8:2, 16:4 ...

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

Content for sixth class

Strand unit

Variables

The child should be enabled to

- explore the concept of a variable in the context of simple patterns, tables and simple formulae and substitute values for variables

identify and discuss simple formulae from other strands

e.g. $d = 2 \times r$; $a = l \times w$

substitute values into formulae and into symbolic rules developed from number patterns.

The child should be enabled to

- translate number sentences with a frame into word problems and vice versa

create number stories to describe a given number sentence

how many teams of four can the teacher make for relays from a class of twenty-eight children?

$$28 \div 4 = \square$$

a man has twenty-eight windows to clean; it takes him an hour to clean four; how long will it take him altogether?

construct number sentences to describe mathematically a given word problem

- solve one-step number sentences and equations

$$75 - 43 = \square \quad 3.5 \times \square = 14$$

$$25\% \text{ of } \square = 15.$$

The child should be enabled to

- translate word problems with a variable into number sentences

Peter cut a length of ribbon into five equal parts; each part was 30 cm long. How long was the ribbon before it was cut?

$$x \div 5 = 30$$

- solve one-step number sentences and equations

$$-3 + +6 = \square \quad -4 + \square = +1$$

$$10 \times \square = 8 \times 5.$$

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Shape and space

Content for fifth class

Content for sixth class

Strand unit

2-D shapes

The child should be enabled to

- make informal deductions about 2-D shapes and their properties
- use angle and line properties to classify and describe triangles and quadrilaterals

name, explore and compare a wide variety of three and four-sided figures in terms of size and number of angles, type and number of sides e.g. trapezium, scalene triangle, regular hexagon

- identify the properties of the circle
 - explore and compare circles of various unit diameters*
 - measure and identify the relationship of diameter to radius*
 - examine area by counting square units*
- construct a circle of given radius or diameter
 - draw using a compass*
- tessellate combinations of 2-D shapes

The child should be enabled to

- make informal deductions about 2-D shapes and their properties
- use angle and line properties to classify and describe triangles and quadrilaterals

- construct triangles from given sides or angles
 - complete the construction of triangles, given two sides and the angle between them or given two angles and the line between them*
- identify the properties of the circle
 - relate the diameter of a circle to its circumference by measurement*
 - measure the circumference of a circle or object such as a rolling-pin or wheel e.g. use a piece of string*

- construct a circle of given radius or diameter
- tessellate combinations of 2-D shapes

- classify 2-D shapes according to their lines of symmetry
explore, compare and record lines of symmetry in 2-D shapes
- use 2-D shapes and properties to solve problems
make a specified shape with Tangram shapes.

- classify 2-D shapes according to their lines of symmetry
- plot simple co-ordinates and apply where appropriate
use geoboards and squared paper
- use 2-D shapes and properties to solve problems.

Strand unit

3-D shapes

The child should be enabled to

- identify and examine 3-D shapes and explore relationships, including tetrahedron (faces, edges and vertices)
explore, compare and record the number of faces of 3-D shapes
identify number of edges and vertices of 3-D shapes
name the shape of the faces
deconstruct 3-D shapes into nets; examine and discuss
- draw the nets of simple 3-D shapes and construct the shapes
discuss and draw simple net including flaps where necessary
construct 3-D shapes from nets.

Integration

Visual arts: Construction

The child should be enabled to

- identify and examine 3-D shapes and explore relationships, including octahedron (faces, edges and vertices)
- draw the nets of simple 3-D shapes and construct the shapes.

Integration

Visual arts: Construction

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

Content for sixth class

Strand unit

Lines and angles

The child should be enabled to

- recognise, classify and describe angles and relate angles to shape and the environment
*explore and compare a wide variety of angles and shapes
measure and record angles as acute, obtuse, reflex or right angles, and determine the number of such angles in relation to common regular shapes*
- recognise angles in terms of a rotation
*examine, measure and record the angles (including the reflex angle) formed by the hands of a clock at a variety of different times
extend by using manipulatives, e.g. straws, lollipop sticks, Meccano, string, 360° protractor, LOGO computer language if available*
- estimate, measure and construct angles in degrees
*measure and record a wide variety of angles using a protractor
construct angles of various sizes using a protractor
estimate angle sizes and check by measuring with a protractor*

The child should be enabled to

- recognise, classify and describe angles and relate angles to shape
identify types of angles in the environment
- recognise angles in terms of a rotation
- estimate, measure and construct angles in degrees

- explore the sum of the angles in a triangle

cut off the three corners of a paper triangle and put them together to make 180°

measure the angles in a variety of triangles using a protractor

calculate and record their sum

examine and discuss results.

- explore the sum of the angles in a quadrilateral

cut off the four corners of a paper quadrilateral and put them together to make 360°

measure the angles in a variety of quadrilaterals and calculate their sums.

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Measures

Content for fifth class

Content for sixth class

Strand unit

Length

The child should be enabled to

- select and use appropriate instruments of measurement
 - ruler for shorter objects*
 - metre stick for longer objects or distances*
 - trundle wheel for distances*
- estimate and measure length using appropriate metric units
 - estimate and measure a large variety of objects and places, both outdoors and indoors: books, desks, corridors, driveways, playing-pitch sidelines*
 - how far can you throw a ball? jump?*
 - run in 20 seconds?*
 - use appropriate measuring units*
 - mm (shorter objects) cm (longer objects)*
 - m (short distances) km (long distances)*
- estimate and measure the perimeter of regular and irregular shapes.

Integration

Physical education: Athletics; Outdoor and adventure activities

The child should be enabled to

- select and use appropriate instruments of measurement
- rename measures of length
 - rename measurements of appropriate metric units; express results as fractions and decimal fractions of appropriate metric units*
 - $233 \text{ m} = \frac{233}{1000} \text{ km} = 0.233 \text{ km}$
 - $1 \text{ m } 11 \text{ cm} = 1 \frac{11}{100} \text{ m} = 1.11 \text{ m}$
- estimate and measure the perimeter of regular and irregular shapes
- use and interpret scales on maps and plans
 - identify given scale on a map or plan and draw items to a larger or smaller scale.*

Integration

Geography: Natural environments

Physical education: Athletics; Outdoor and adventure activities

The child should be enabled to

- discover that the area of a rectangle is length by breadth
determine by repeated experiments using rectangles with sides measured in whole centimetres and square units of one square centimetre
- estimate and measure the area of regular and irregular 2-D shapes
measure a wide variety of regular and irregular shapes using square units of one square centimetre and one square metre
- calculate area using square centimetres and square metres
*choose appropriate measuring units:
square centimetres (smaller objects)
square metres (large objects or rooms)*
- compare visually square metres and square centimetres.

The child should be enabled to

- recognise that the length of the perimeter of a rectangular shape does not determine the area of the shape
construct rectangles of constant perimeter with varying areas
- calculate the area of regular and irregular 2-D shapes
*estimate and calculate area of shapes, and check by measuring with square centimetre units
circles: calculate by counting squares only*
- measure the surface area of specified 3-D shapes
measure 3-D surfaces by measuring individual 2-D faces or by extending into nets
- calculate area using acres and hectares
fields, large playgrounds, car parks
- identify the relationship between square metres and square centimetres
explore and compare areas of one, four, twenty-five and one hundred square centimetres to establish relationships
- find the area of a room from a scale plan
*measure and calculate area of rectangular shapes by partitioning into rectangles and combining individual areas
extend to finding area of room plans (rectangular)
extend to using scale to find area of rooms from plans.*

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

Content for sixth class

Strand unit

Weight

The child should be enabled to

- select and use appropriate instruments of measurement
choose measurement instruments appropriate to given tasks, e.g. balance, kitchen scales, bathroom scales and spring balance
- estimate and measure weight using appropriate metric units
*estimate and measure a large variety of objects use appropriate measuring units
grams (pencils and copybooks)
kilograms (school bags and people).*

The child should be enabled to

- select and use appropriate instruments of measurement
- rename measures of weight
*rename measurements of appropriate metric units
express results as fractions or decimals of appropriate metric units
 $750 \text{ g} = \frac{3}{4} \text{ kg} = 0.75 \text{ kg}$
 $4 \text{ kg } 45 \text{ g} = 4\frac{45}{1000} \text{ kg} = 4.045 \text{ kg}.$*

Strand unit

Capacity

The child should be enabled to

- select and use appropriate instruments of measurement
choose measurement instruments appropriate to given tasks graduated jugs, litre containers or fractional litre containers

The child should be enabled to

- select and use appropriate instruments of measurement

- estimate and measure capacity using appropriate metric units

*estimate and measure a large variety of objects use appropriate measuring units
millilitres (cups), litres (watering-can).*

- rename measures of capacity

*rename measurements of appropriate metric units
express results as fractions or decimals of appropriate metric unit*

$$625 \text{ ml} = \frac{5}{8} \text{ l} = 0.625 \text{ l}$$

$$8 \text{ l } 253 \text{ ml} = 8 \frac{253}{1000} \text{ l} = 8.253 \text{ l}$$

- find the volume of a cuboid experimentally

fill a cuboid container with water and measure capacity in litres

fill a cuboid container with unit cubes and count.

Strand unit

Time

The child should be enabled to

- read and interpret timetables and the 24-hour clock (digital and analogue)

bus, train, air, ship, films, theatre, school, class

- interpret and convert between times in 12-hour and 24-hour format

$$10:30 \text{ p.m.} = 22:30 \text{ hours}$$

$$07:50 \text{ hours} = 7:50 \text{ a.m.}$$

The child should be enabled to

- explore international time zones

identify and discuss the need for time zones

calculate time differences between Ireland and other countries

- explore the relationship between time, distance and average speed

measure, using a stop-watch, the time taken for short journeys to be completed or short distances to be covered and compile database to examine averages.

Linkage

Data: Representing and interpreting

Integration

Physical education: Athletics

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

Content for sixth class

Strand unit Money (use up to introduction of the euro)

The child should be enabled to

- compare 'value for money' using unitary method
 - compare the cost of 6 apples costing 75p and 4 apples costing 50p*
 - calculate pay, based on hourly or daily rate*
 - calculate totals of shop bills.*

The child should be enabled to

- explore value for money
 - calculate sale prices, e.g. 10% discount, 20% VAT added*
- convert foreign currencies to Irish pounds and vice versa
 - identify and discuss exchange rates from newspaper*
 - calculate major currency equivalents for basic sums of Irish money*
 - convert sums of foreign money to Irish equivalents.*

The child should be enabled to

- compare 'value for money' using unitary method
 - compare the cost of 6 apples costing 75 cents and 4 apples costing 50 cents*
 - calculate pay, based on hourly or daily rate*
 - calculate totals of shop bills.*

The child should be enabled to

- explore value for money
 - calculate sale prices, e.g. 10% discount, 20% VAT added*
- convert other currencies to euro and vice versa
 - identify and discuss exchange rates from newspaper*
 - calculate major currency equivalents for basic sums of euro*
 - convert sums of money in other currencies to euro equivalents.*

Linkage

Number: Operations, Decimals and percentages

The treatment of content as suggested in the exemplars is common to both classes.

Strand: Data

Content for fifth class

Content for sixth class

Strand unit

Representing and interpreting data

The child should be enabled to

- collect, organise and represent data using pictograms, single and multiple bar charts and simple pie charts

collect data from the environment in tabular form and represent in appropriate format

discuss and explore modes of representation

- read and interpret pictograms, single and multiple bar charts, and pie charts

examine and discuss class-based examples and interpret charts from newspapers, magazines and computer-generated charts

Linkage

Number: Fractions

Shape and space: Angles

Integration

Geography: Human environments

- compile and use simple data sets

compile lists of statistics from children's experiences

e.g. personal data (height, age, hair colour) sports results (wins, losses, scores)

use data as source for representation, interpretation and setting problems

The child should be enabled to

- collect, organise and represent data using pie charts and trend graphs

sales or rainfall per month

- read and interpret trend graphs and pie charts

e.g. height or weight in relation to age

Linkage

Number: Fractions

Shape and space: Angles

Integration

Geography: Human environments

- compile and use simple data sets

compile lists of statistics from children's experiences

e.g. personal data (height, age, hair colour) sports results (wins, losses, scores)

use data as source for representation, interpretation and setting problems

- explore and calculate averages of simple data sets
identify the most frequently occurring item in a data set
calculate average by adding all the values and dividing by the number of items (use a calculator)
- use data sets to solve problems
solve problems based on data sets and representations used in class
what were the most popular buns at a cake sale?

- explore and calculate averages of simple data sets
identify the most frequently occurring item in a data set
compare calculated averages with the most frequently occurring items
- use data sets to solve problems.

Strand unit

Chance

The child should be enabled to

- identify and list all possible outcomes of simple random processes
discuss and list all possible outcomes of:
rolling a die (1, 2, 3, 4, 5, 6)
tossing two coins (2 heads, 2 tails, head and tail)
drawing a cube from a bag containing blue, red and green cubes (blue cube, red cube, green cube)

The child should be enabled to

- identify and list all possible outcomes of simple random processes
discuss and list all possible outcomes of:
rolling two dice and calculating the total (2, 3, 4 ... 12)
selecting two numbers at random from the numbers 1, 2, 3, 4, 5 (ten possibilities)

The treatment of content as suggested in the exemplars is common to both classes.

Content for fifth class

The child should be enabled to

- estimate the likelihood of occurrence of events
if we toss a coin, say, 100 times, how many heads would we expect to get? a head has 50 chances in 100, or 1 chance in 2, of appearing; heads and tails are equally likely to occur if we roll a die: how often would we expect to get a 2? (1 chance in 6); each of the 6 outcomes is equally likely; this activity can be done in groups with each child or group throwing the die (or coin) 20 times and pooling the results; discuss the fairness of board games
- construct and use frequency charts and tables
*perform the experiment (toss a coin, roll a die, draw a cube from a bag containing 3 blue and 6 green cubes ...) a large number of times (50–100 times)
this activity can be done in groups with each child or group throwing the die (or coin) 20 times and pooling the results
record the outcomes and use to construct a frequency table; for example, if drawing a cube from a bag as above, the table might be as follows:*

colour	number of times drawn
blue	36
green	64

Content for sixth class

The child should be enabled to

- estimate the likelihood of occurrence of events; order on a scale from 0 to 100%, 0 to 1
*when tossing a coin, a head has 1 chance in 2 of occurring; thus the likelihood of a head is 1 in 2, or $\frac{1}{2}$ or 50%, similarly for a tail
when rolling a die, each outcome has a 1 in 6 chance of occurring—therefore the likelihood is $\frac{1}{6}$
when drawing a cube from a bag containing 3 red and 6 blue cubes, a blue cube has 6 chances in 9 of occurring and thus has a probability of $\frac{6}{9}$ or $\frac{2}{3}$; the probability of drawing a red cube is $\frac{3}{9}$ or $\frac{1}{3}$
what if the bag contains 5 red, 5 blue and 5 green cubes? or 3 red, 6 blue and 6 green?*
- construct and use frequency charts and tables
*perform the experiment (toss two coins, draw a cube from a bag containing a number of different-coloured cubes) a large number of times; larger numbers of throws can be achieved by using group work
record the outcomes and use to construct a frequency table; for example, when tossing two coins, the table might look as follows:*

outcome	frequency
2 heads	20
2 tails	28
1 head, 1 tail	52

we estimate the likelihood of a blue cube to be 36 in 100 and that of a green cube to be 64 in 100

discuss: is that what we expected?

data sets compiled from children's experiences (personal data, weather, sports) might be used; for example, a survey of favourite cereals might have produced the following table:

cereal	number of pupils who prefer it
corn flakes	19
porridge	4
crispies	9
muesli	3

the likelihood that a pupil picked at random prefers corn flakes is estimated to be 19 in 35.

Integration

Music: Improvising and creating

we estimate the chance of 2 heads to be 20/100, that of 2 tails to be 28/100, that of one head and one tail to be 52/100:

discuss, is this what we expected?

using two coins of different colours may help examine a table of school attendance for the class what is the chance of full attendance on any one day?

what is the chance of more than 20% of the class being absent on any one day?

pupils are given a bag and told it contains 10 cubes in 3 different colours; by drawing a cube repeatedly, say 50 times, and constructing a frequency table, they must estimate how many cubes of each colour there are in the bag.

Integration

Music: Improvising and creating

The treatment of content as suggested in the exemplars is common to both classes.

Assessment

Assessment

Assessment: an integral part of teaching and learning

Assessment is a continuous, dynamic and often informal process. It is a continuum, ranging from classroom observation to standardised tests. Equally important are questioning and dialogue, homework, and structured tests developed by teachers. Assessment provides information that can be used in decision-making about how the teacher can realistically answer the needs of the child. It must be an integral part of the educational process and should not become an end in itself. A balance must be struck between time spent on assessment and the time spent on teaching and learning.

The constructivist approach to mathematics encourages the use of guided-discovery learning and dialogue. Teaching and the gathering and analysis of assessment information should run concurrently, with the results of assessment feeding back into the teaching and learning process. Assessment should be a positive experience for the child, as this makes his/her learning more effective. Teacher-designed tasks and tests that are linked to the actual teaching provide a wealth of information. The role of the teacher is paramount in helping the child to develop his/her own learning.

Roles of assessment: why assess?

Assessment is particularly helpful in mathematics because of the highly structured nature of the subject. It is also important in the identification of the kinds of difficulty experienced by children in developing mathematical concepts and skills.

Assessment has a *formative* role. It enhances the child's learning by providing accurate feedback for both the child and the teacher. It informs the teacher of the child's strengths and weaknesses and indicates the child's readiness to proceed to a new topic. Assessment assists the teacher in his/her planning and in the pacing of mathematics lessons and activities. Learning a new concept in mathematics is dependent on the child having a firm grasp of all aspects of previous concepts: for example, it is impossible for the child to progress in the area of decimals if he/she has an incomplete concept of place value. Assessment also has an *evaluative* role in planning. The results of assessment encourage the teacher to examine the suitability of the curriculum content for his/her particular class or group and also the methodologies and approaches being used.

Diagnostic assessment helps the teacher to identify children who may have difficulties in specific areas of mathematics. It helps the teacher to identify children with special needs, for example the mathematically more able child or the child with learning difficulties in mathematics, so that that child's needs may be more closely met.

Summative assessment is the recording of a child's mathematical development in a systematic way at the end of a specified time, for example a week, a term, or a year. This information is essential when reporting to parents and providing information for other teachers.

Assessment in the mathematics curriculum: what should be assessed?

The emphasis in assessment should be on finding out what pupils know, what they can do, and how they do it, rather than focusing on what they cannot do. Assessment should look at the whole child and consider both the processes of the child's learning and the products of that learning. The cognitive and affective areas that should be assessed to provide this information include the following:

- *conceptual knowledge and understanding* is assessed in the application of mathematical concepts, for example the conservation of length. This must be done in a variety of contexts, including observation of the child performing a task or noting the child's application of a concept in a real-life situation.
- *problem-solving ability* is assessed by evaluating the approaches, strategies and processes the child uses in dealing with mathematical tasks and the connections he/she makes within mathematics itself and within other subjects
- *computational proficiency* includes assessing the use of number, the appropriate application of the four number operations, and the ability to compute numbers efficiently, both mentally and in written situations
- *recall skills* are assessed in the recall of number facts, terminology, definitions and formulae and in their efficient use within a given situation. This is a particularly important skill in the area of estimation

- mastery of *specific content areas* (for example number, algebra, measures, shape and space, data) is assessed through the application of these areas in practical, everyday contexts.
- *the ability to communicate and express mathematical ideas and processes* and the correct use of mathematical language in oral and written form can be assessed by observation while the children are engaged in a mathematical task. Discussion of their own work can reveal gaps in their knowledge and skills. Incomplete understanding of mathematical terminology or processes can also be identified. When recording, children can communicate pictorially, orally or in written form using words and/or symbols.
- *attitudes* towards mathematics, including confidence, interest, willingness to take risks, and perception of the usefulness of mathematics, are assessed by observing the enthusiasm with which the child approaches a task. Attitudes also encompass the interest the child shows in completing tasks and in using mathematics confidently in other curricular areas and in real-life situations. Teachers' observations of such attitudes contribute to an overall picture of the child's mathematical development and are continuing and informal.

Assessment tools: how to assess

Although proficiency in computation is essential, assessment should encompass examination of the child's understanding of mathematical concepts and skills and his/her ability to verbalise that understanding. Assessment tools must also consider the child's use of mathematical language and symbols.

A broad range of assessment tools is available in mathematics. It is suggested that teachers use a variety of tools in assessing mathematics, for example a portfolio that includes samples of a child's work, observation records, mastery check-list results, and the results of both teacher-designed tests and standardised tests.

Teacher observation

Teachers assess children every day as they observe them at work, correct homework or class work, and engage them in discussion. Many of these observations are done informally but indicate to the teacher how the child is responding to a particular topic as it is being taught.

This type of continuing assessment includes observation of the child's activity, written work, discussion and questioning during class or group work. It is useful to have a notebook to hand in which to note the strengths or difficulties a particular child may have during an activity, for example a child who frequently chooses an inappropriate measuring tool or a child who constantly approaches addition tasks by adding the tens first. These short observations help teachers in planning the next step of a lesson or in assessing the child's readiness for a new topic and in the building up of a pupil profile.

Discussing a child's work with him/her can be very revealing, particularly when he/she is asked to explain how an assignment was completed, either individually or in groups. The responses will often indicate gaps in knowledge and skills, and appropriate action can then be taken.

This type of observational assessment also includes analysis of the child's written work to identify types and patterns of error and is a useful way of establishing how he/she is performing in relation to his/her peers.

Teacher-designed tasks and tests

Teacher-designed tasks and tests, used regularly, provide information useful in planning for children of differing ability and in matching the programme and methodology to the needs of those children. They also enable teachers to determine the level of progress of each child and provide information for reappraisal and modification of the mathematics programme. They are directly linked to the instructional objectives of a particular class and can be used to provide formative, diagnostic and summative data on children's progress. By providing a variety of formats in the presentation of teacher-designed tasks and tests the teacher can help the child become comfortable with assessment. A broad range of presentations helps children who have different learning styles.

Some examples of such presentations would be:

- oral tests of recall skills (tables, continuation of number patterns)
- written tests of numerical competence
- problem-solving exercises that use a variety of mathematical skills
- projects that require compilation of data, construction of a model or drawing a diagram.

In examining and recording the results of these tests and tasks the teacher can also note the processes used by the child in performing the task, for example using a separate sheet for rough estimates or choosing the correct tool for the task (long ruler, protractor, number line).

Work samples, portfolios and projects

These are systematic collections of children's work kept in a folder or file, and they provide a tangible record of development over a term or a year. They provide a basis for discussion with both the child and the parent and can be passed on to the next teacher. Models of portfolio assessment include representative sampling of progress through written work or subject-based portfolios that contain all work done in that area. Manageability is an issue in the compilation of a portfolio, and consideration must be given to the quantity and value of the work that is kept. The child can take an active part in the compilation of his/her own portfolio by sometimes choosing a piece of work for inclusion.

Curriculum profiles

Curriculum profiles allow the teacher to make an overall judgement about the achievement of an individual child. They allow for the interpretation of a wide span of learning outcomes. This requires the teacher to look at the child's ability to select materials and processes for particular mathematical tasks, to select and use appropriate strategies for completing a task, or to identify the solution to a simple problem. The teacher then decides whether the child in question has developed these skills or whether they are still in the developmental stage.

Diagnostic testing

Diagnostic tests identify learning difficulties in particular areas of mathematics, and the results can then be used in the remediation of a problem. Commercial diagnostic testing kits often provide schemes of work that are specifically aimed at the skill or skills that the child needs to improve. This type of assessment is often undertaken by a remedial teacher. However, analysis of a child's work can also fulfil a diagnostic function, and tests can

be designed by the teacher. Persistent errors in a child's work can be analysed to identify areas of difficulty. The use of early screening tests at infant level means that children who are experiencing problems in mathematics can be identified at an early stage and appropriate remediation provided at this point. This type of analysis also indicates the child's strengths, and the results can be used by the teacher in providing extension work.

Standardised testing

Standardised tests comprise norm-referenced tests and criterion-referenced tests. *Norm-referenced tests* compare pupils with other pupils or with national standards. They consist of highly structured tasks that have associated with them a set of scoring rules. Standardisation refers to the uniformity of procedures in administering a test. All children take the same test under the same time limits and instructions. These rules must be adhered to rigidly in order to produce a standard score and maintain the validity of the test. Administering the same test to all children under the same conditions means that achievement can be judged independently of external factors.

Criterion-referenced tests provide information on the child's functional performance level, but, unlike norm-referenced tests, this is not made in relation to the performance of others. They allow a teacher to estimate the amount of specified content an individual pupil has learned and are based on sets of instructional objectives or on course content.

Mastery records and check-lists are one type of criterion-referenced test and are used to keep track of mastery in certain elements of the curriculum in a structured manner. This form of assessment can be based on teacher-made tests or may be part of a mathematics textbook or scheme. Unlike more formal tests, these are not administered in a strictly standardised manner, and the child's scores cannot be interpreted with reference to class or age-level norms. They are, however, extremely useful in providing diagnostic information on a pupil's achievement.

Standardised tests should be used judiciously. They can be diagnostic if errors are analysed and are used as a means of identifying children's strengths and their readiness for further learning.

A balanced approach to assessment

Evaluating tests

Tests must be evaluated with regard to their aims and suitability for the children for whom they are intended. Teacher-made tests, purchased tests and check-ups in textbooks all have different purposes and applications. It is important to consider variety in the types of test given to children, for example a dictated test that requires short written answers, tests where the child has to show how they worked out the answer, and multiple-choice tests. The language used in a test must also be considered, as it can militate against the performance of a child with a reading difficulty.

Manageability of tests

The manageability of tests is an important issue. Tests that can be administered to a whole class are useful for screening but are not usually diagnostic. Where an area of weakness has been identified, a more detailed test will need to be given to a smaller group or an individual child. Tests must be easy to administer, as many teachers operate in a shared or multi-class situation.

Recording and communicating

Reporting the results of assessment

The results of assessment must be meaningful. At school level it can be decided to have a common format for reporting to ensure that accurate information is carried from class to class. Assessment results for parents should also cover more than just numerical proficiency. The use of a portfolio-type system that includes areas such as perseverance, presentation of work and ability to work in a group gives an informative and rounded view of the child's mathematical ability. This provides an opportunity for parental feedback. The analysis of results on a school or class level can show areas of weakness or strength, which can then be developed.

Pupil profile cards

Pupil profile cards allow the teacher to systematically record the progress of the children and include some examples of observations that the teacher has noted throughout the year. These profiles provide an overall description of the child's progress in mathematics and are completed over the course of the school year. They contain information derived from various forms of assessment, for example standardised tests, teacher-designed tests and tasks, and teacher observation. They are then used to provide accurate information for parents and other relevant parties. The recording system should complement sound instructional practice and reflect the breadth of learning outcomes implicit in the curriculum. Each school should develop a co-ordinated policy on record-keeping, which sets out the types of information to be gathered, the frequency of the data-gathering, and the uses to which it will be put.

Appendix

Glossary

These descriptions are intended to be a help to primary teachers and are not necessarily the full mathematical definition of the term.

algorithm	a logical, arithmetical or computational procedure that, if correctly applied, ensures the solution of a problem
analogue clock	a clock on which hours, minutes and sometimes seconds are indicated by hands on a dial
are	a unit of area equal to 100 square metres
associative	an operation such as multiplication or addition is associative if the same answer is produced regardless of the order in which the elements are grouped, e.g. $(2 + 3) + 5 = 10$, $2 + (3 + 5) = 10$
cardinal number	a number denoting quantity but not order in a set
commutative	giving the same result irrespective of the order of the elements in addition and multiplication $6 + 2 = 8$, $2 + 6 = 8$; $5 \times 7 = 35$, $7 \times 5 = 35$
composite number	a number with more than two factors that is not a prime number, e.g. 6, 10
denominator	the divisor in a fraction
diameter	a straight line connecting the centre of a circle with two points on the perimeter
distributive	the same result is produced when multiplication is performed on a set of numbers as when performed on the members of the set individually, e.g. $5 \times 4 = (3 + 2) \times 4 = (3 \times 4) + (2 \times 4)$
dividend	a number or quantity to be divided <i>by</i> another number or quantity
divisor	a number or quantity to be divided <i>into</i> another number or quantity
equation	a mathematical sentence with an equals sign
hectare	a unit of area equal to 100 ares
line symmetry	a shape has line symmetry if one half of the shape can be folded exactly onto the other half

number sentence	an equation or statement of inequality e.g. $4 + x = 11$, $4 \times 2 < 12$ or $2 + 5 = 7$
numerator	the number above the line in a fraction
ordinal number	a number denoting relative position in a sequence, e.g. first, second, third
perimeter	the sum of the length of the sides of a figure or shape
prime factor	a factor that is a prime number
prime number	a whole number that has only two factors, itself and 1, e.g. 2, 3, 7
product	the result of multiplying two numbers
quotient	the result of dividing one number by another number
radius	a straight line from the centre of a circle to a point on the circumference; a radius is half the diameter
ratio	the relationship between two numbers of the same kind; e.g. the ratio of 2 kg to 6 kg is 2:6
subitise	tell at a glance, without counting, the number of items in a set
subtrahend	the number to be subtracted from another number, e.g. $10 - 4$ (4 is the subtrahend)
tessellation	shapes tessellate if they fit together exactly, form a repeating pattern, and make an angle of 360° at the points of contact
variable	a letter or symbol that stands for a number, e.g. $y + 7 = 12$

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