Mathematics 1

Curriculum Guide 2016

Newfoundland Labrador

Education and Early Childhood Development

Table of Contents

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INTRODUCTION

Background

The curriculum guide communicates high expectations for students.

The Mathematics curriculum guides for Newfoundland and Labrador have been derived from *The Common Curriculum Framework for K-9 Mathematics: Western and Northern Canadian Protocol*, 2006. These guides incorporate the conceptual framework for Grades Kindergarten to Grade Nine Mathematics and the general outcomes, specific outcomes and achievement indicators established in the common curriculum framework. They also include suggestions for teaching and learning, suggested assessment strategies, and an identification of the associated resource match between the curriculum and authorized, as well as recommended, resource materials. This Mathematics 1 course was originally implemented in 2008.

Beliefs About Students and Mathematics Learning

Mathematical understanding is fostered when students build on their own experiences and prior knowledge.

Students are curious, active learners with individual interests, abilities and needs. They come to classrooms with varying knowledge, life experiences and backgrounds. A key component in developing mathematical literacy is making connections to these backgrounds and experiences.

Students learn by attaching meaning to what they do, and they need to construct their own meaning of mathematics. This meaning is best developed when learners encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract. Through the use of manipulatives and a variety of pedagogical approaches, teachers can address the diverse learning styles, cultural backgrounds and developmental stages of students, and enhance within them the formation of sound, transferable mathematical understandings. Students at all levels benefit from working with a variety of materials, tools and contexts when constructing meaning about new mathematical ideas. Meaningful student discussions provide essential links among concrete, pictorial and symbolic representations of mathematical concepts.

The learning environment should value and respect the diversity of students' experiences and ways of thinking, so that students feel comfortable taking intellectual risks, asking questions and posing conjectures. Students need to explore problem-solving situations in order to develop personal strategies and become mathematically literate. They must come to understand that it is acceptable to solve problems in a variety of ways and that a variety of solutions may be acceptable.

Program Design and Components

Affective Domain

To experience success, students must learn to set achievable goals and assess themselves as they work toward these goals.

A positive attitude is an important aspect of the affective domain and has a profound impact on learning. Environments that create a sense of belonging, encourage risk taking and provide opportunities for success help develop and maintain positive attitudes and self-confidence within students. Students with positive attitudes toward learning mathematics are likely to be motivated and prepared to learn, participate willingly in classroom activities, persist in challenging situations and engage in reflective practices.

Teachers, students and parents need to recognize the relationship between the affective and cognitive domains, and attempt to nurture those aspects of the affective domain that contribute to positive attitudes. To experience success, students must learn to set achievable goals and assess themselves as they work toward these goals.

Striving toward success and becoming autonomous and responsible learners are ongoing, reflective processes that involve revisiting, assessing and revising personal goals.

Goals For Students

Mathematics education must prepare students to use mathematics confidently to solve problems.

The main goals of mathematics education are to prepare students to:

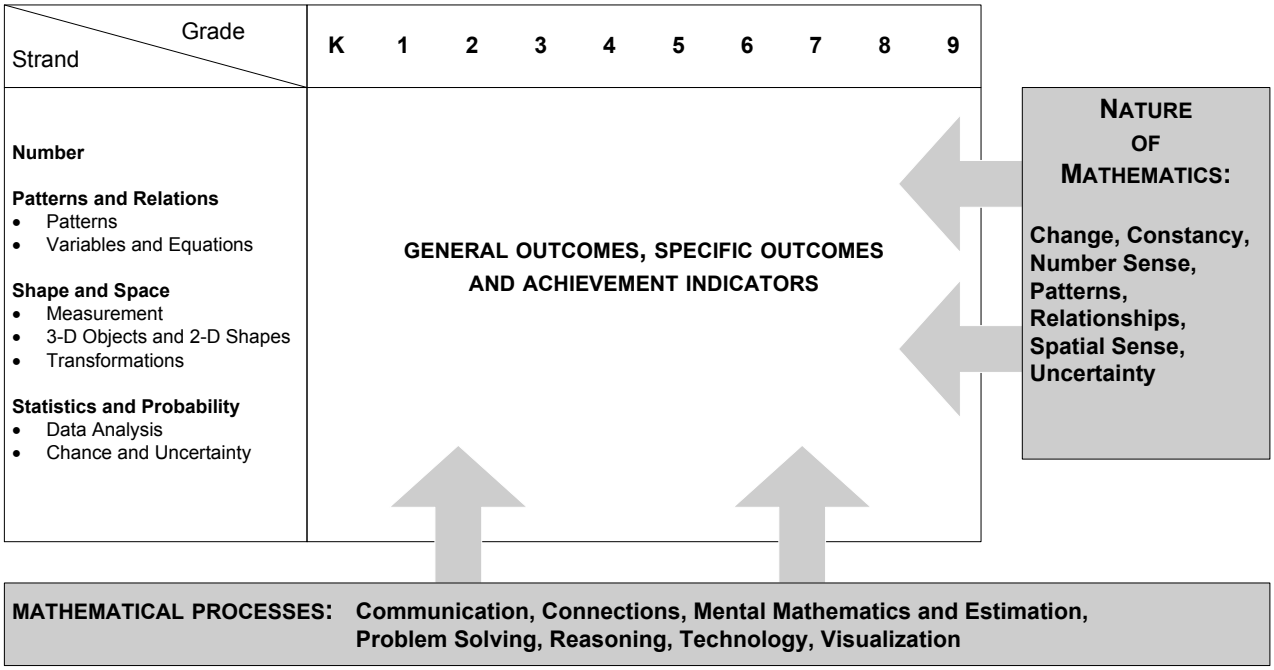
- use mathematics confidently to solve problems
- communicate and reason mathematically
- appreciate and value mathematics
- make connections between mathematics and its applications
- commit themselves to lifelong learning
- become mathematically literate adults, using mathematics to contribute to society.

Students who have met these goals will:

- gain understanding and appreciation of the contributions of mathematics as a science, philosophy and art
- exhibit a positive attitude toward mathematics
- engage and persevere in mathematical tasks and projects
- contribute to mathematical discussions
- take risks in performing mathematical tasks
- exhibit curiosity.

CONCEPTUAL FRAMEWORK FOR K - 9 MATHEMATICS

The chart below provides an overview of how mathematical processes and the nature of mathematics influence learning outcomes.



Mathematical Processes

- *Communication [C]*
- *Connections [CN]*
- *Mental Mathematics and Estimation [ME]*
- *Problem Solving [PS]*
- *Reasoning [R]*
- *Technology [T]*
- *Visualization [V]*

There are critical components that students must encounter in a mathematics program in order to achieve the goals of mathematics education and embrace lifelong learning in mathematics.
Students are expected to:

- communicate in order to learn and express their understanding
- connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other disciplines
- demonstrate fluency with mental mathematics and estimation
- develop and apply new mathematical knowledge through problem solving
- develop mathematical reasoning
- select and use technologies as tools for learning and for solving problems
- develop visualization skills to assist in processing information, making connections and solving problems.

This curriculum guide incorporates these seven interrelated mathematical processes that are intended to permeate teaching and learning.

Communication [C]

Students need opportunities to read about, represent, view, write about, listen to and discuss mathematical ideas. These opportunities allow students to create links between their own language and ideas, and the formal language and symbols of mathematics.

Students must be able to communicate mathematical ideas in a variety of ways and contexts.

Communication is important in clarifying, reinforcing and modifying ideas, attitudes and beliefs about mathematics. Students should be encouraged to use a variety of forms of communication while learning mathematics. Students also need to communicate their learning using mathematical terminology.

Communication helps students make connections among concrete, pictorial, symbolic, oral, written and mental representations of mathematical ideas.

Connections [CN]

Contextualization and making connections to the experiences of learners are powerful processes in developing mathematical understanding. When mathematical ideas are connected to each other or to real-world phenomena, students begin to view mathematics as useful, relevant and integrated.

Through connections, students begin to view mathematics as useful and relevant.

Learning mathematics within contexts and making connections relevant to learners can validate past experiences and increase student willingness to participate and be actively engaged.

The brain is constantly looking for and making connections. "Because the learner is constantly searching for connections on many levels, educators need to *orchestrate the experiences* from which learners extract understanding … Brain research establishes and confirms that multiple complex and concrete experiences are essential for meaningful learning and teaching" (Caine and Caine, 1991, p.5).

Mental Mathematics and Estimation [ME]

Mental mathematics and estimation are fundamental components of number sense.

Mental mathematics is a combination of cognitive strategies that enhance flexible thinking and number sense. It is calculating mentally without the use of external memory aids.

Mental mathematics enables students to determine answers without paper and pencil. It improves computational fluency by developing efficiency, accuracy and flexibility.

"Even more important than performing computational procedures or using calculators is the greater facility that students need—more than ever before—with estimation and mental math" (National Council of Teachers of Mathematics, May 2005).

Students proficient with mental mathematics "... become liberated from calculator dependence, build confidence in doing mathematics, become more flexible thinkers and are more able to use multiple approaches to problem solving" (Rubenstein, 2001, p. 442).

Mental mathematics "... provides the cornerstone for all estimation processes, offering a variety of alternative algorithms and nonstandard techniques for finding answers" (Hope, 1988, p. v).

Estimation is used for determining approximate values or quantities or for determining the reasonableness of calculated values. It often uses benchmarks or referents. Students need to know when to estimate, how to estimate and what strategy to use.

Estimation assists individuals in making mathematical judgements and in developing useful, efficient strategies for dealing with situations in daily life.

Problem Solving [PS]

Learning through problem solving should be the focus of mathematics at all grade levels.

Learning through problem solving should be the focus of mathematics at all grade levels. When students encounter new situations and respond to questions of the type, "How would you know?" or "How could you ...?", the problem-solving approach is being modelled. Students develop their own problem-solving strategies by listening to, discussing, and trying different strategies.

A problem-solving activity requires students to determine a way to get from what is known to what is unknown. If students have already been given steps to solve the problem, it is not a problem, but practice. A true problem requires students to use prior learning in new ways and contexts. Problem solving requires and builds depth of conceptual understanding and student engagement.

Problem solving is a powerful teaching tool that fosters multiple, creative, and innovative solutions. Creating an environment where students openly seek and engage in a variety of strategies for solving problems empowers students to explore alternatives and develops confident, cognitive, mathematical risk takers.

Reasoning [R]

Mathematical reasoning helps students think logically and make sense of mathematics.

Mathematical reasoning helps students think logically and make sense of mathematics. Students need to develop confidence in their abilities to reason and justify their mathematical thinking. High-order questions challenge students to think and develop a sense of wonder about mathematics.

Mathematical experiences in and out of the classroom provide opportunities for students to develop their ability to reason. Students can explore and record results, analyze observations, make and test generalizations from patterns, and reach new conclusions by building upon what is already known or assumed to be true.

Reasoning skills allow students to use a logical process to analyze a problem, reach a conclusion and justify or defend that conclusion.

Technology [T]

Technology contributes to the learning of a wide range of mathematical outcomes and enables students to explore and create patterns, examine relationships, test conjectures and solve problems.

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Technology can be used to:

- explore and demonstrate mathematical relationships and patterns
- organize and display data
- extrapolate and interpolate
- assist with calculation procedures as part of solving problems
- decrease the time spent on computations when other mathematical learning is the focus
- reinforce the learning of basic facts
- develop personal procedures for mathematical operations
- create geometric patterns
- simulate situations
- develop number sense.

Technology contributes to a learning environment in which the growing curiosity of students can lead to rich mathematical discoveries at all grade levels.

Visualization [V]

Visualization "involves thinking in pictures and images, and the ability to perceive, transform and recreate different aspects of the visual-spatial world" (Armstrong, 1993, p. 10). The use of visualization in the study of mathematics provides students with opportunities to understand mathematical concepts and make connections among them.

Visualization is fostered through the use of concrete materials, technology and a variety of visual representations.

Visual images and visual reasoning are important components of number, spatial and measurement sense. Number visualization occurs when students create mental representations of numbers.

Being able to create, interpret and describe a visual representation is part of spatial sense and spatial reasoning. Spatial visualization and reasoning enable students to describe the relationships among and between 3-D objects and 2-D shapes.

Measurement visualization goes beyond the acquisition of specific measurement skills. Measurement sense includes the ability to determine when to measure, when to estimate and which estimation strategies to use (Shaw and Cliatt, 1989).

Nature of Mathematics

- *Change*
- *Constancy*
- *Number Sense*
- *Relationships*
- *Patterns*
- *Spatial Sense*
- *Uncertainty*

Mathematics is one way of trying to understand, interpret and describe our world. There are a number of components that define the nature of mathematics and these are woven throughout this curriculum guide. The components are change, constancy, number sense, patterns, relationships, spatial sense and uncertainty.

Change

Change is an integral part of mathematics and the learning of mathematics.

It is important for students to understand that mathematics is dynamic and not static. As a result, recognizing change is a key component in understanding and developing mathematics.

Within mathematics, students encounter conditions of change and are required to search for explanations of that change. To make predictions, students need to describe and quantify their observations, look for patterns, and describe those quantities that remain fixed and those that change. For example, the sequence 4, 6, 8, 10, 12, … can be described as:

- the number of a specific colour of beads in each row of a beaded design
- skip counting by 2s, starting from 4
- an arithmetic sequence, with first term 4 and a common difference of 2
- a linear function with a discrete domain

(Steen, 1990, p. 184).

Constancy

Constancy is described by the terms stability, conservation, equilibrium, steady state and symmetry.

Different aspects of constancy are described by the terms stability, conservation, equilibrium, steady state and symmetry (AAAS-Benchmarks, 1993, p.270). Many important properties in mathematics and science relate to properties that do not change when outside conditions change. Examples of constancy include the following:

- The ratio of the circumference of a teepee to its diameter is the same regardless of the length of the teepee poles.
- The sum of the interior angles of any triangle is 180°.
- The theoretical probability of flipping a coin and getting heads is 0.5.

Some problems in mathematics require students to focus on properties that remain constant. The recognition of constancy enables students to solve problems involving constant rates of change, lines with constant slope, direct variation situations or the angle sums of polygons.

Number Sense

An intuition about number is the most important foundation of a numerate child.

Number sense, which can be thought of as intuition about numbers, is the most important foundation of numeracy (British Columbia Ministry of Education, 2000, p.146).

A true sense of number goes well beyond the skills of simply counting, memorizing facts and the situational rote use of algorithms. Mastery of number facts is expected to be attained by students as they develop their number sense. This mastery allows for facility with more complex computations but should not be attained at the expense of an understanding of number.

Number sense develops when students connect numbers to their own real-life experiences and when students use benchmarks and referents. This results in students who are computationally fluent and flexible with numbers and who have intuition about numbers. The evolving number sense typically comes as a by product of learning rather than through direct instruction. It can be developed by providing rich mathematical tasks that allow students to make connections to their own experiences and their previous learning.

Patterns

Mathematics is about recognizing, describing and working with numerical and non-numerical patterns.

Mathematics is about recognizing, describing and working with numerical and non-numerical patterns. Patterns exist in all strands of mathematics.

Working with patterns enables students to make connections within and beyond mathematics. These skills contribute to students' interaction with, and understanding of, their environment.

Patterns may be represented in concrete, visual or symbolic form. Students should develop fluency in moving from one representation to another.

Students must learn to recognize, extend, create and use mathematical patterns. Patterns allow students to make predictions and justify their reasoning when solving routine and non-routine problems.

Learning to work with patterns in the early grades helps students develop algebraic thinking, which is foundational for working with more abstract mathematics.

Relationships

Mathematics is used to describe and explain relationships.

Mathematics is one way to describe interconnectedness in a holistic world view. Mathematics is used to describe and explain relationships. As part of the study of mathematics, students look for relationships among numbers, sets, shapes, objects and concepts. The search for possible relationships involves collecting and analyzing data and describing relationships visually, symbolically, orally or in written form.

Spatial Sense

Spatial sense offers a way to interpret and reflect on the physical environment.

Spatial sense involves visualization, mental imagery and spatial reasoning. These skills are central to the understanding of mathematics.

Spatial sense is developed through a variety of experiences and interactions within the environment. The development of spatial sense enables students to solve problems involving 3-D objects and 2-D shapes and to interpret and reflect on the physical environment and its 3-D or 2-D representations.

Some problems involve attaching numerals and appropriate units (measurement) to dimensions of shapes and objects. Spatial sense allows students to make predictions about the results of changing these dimensions; e.g., doubling the length of the side of a square increases the area by a factor of four. Ultimately, spatial sense enables students to communicate about shapes and objects and to create their own representations.

Uncertainty

Uncertainty is an inherent part of making predictions.

In mathematics, interpretations of data and the predictions made from data may lack certainty.

Events and experiments generate statistical data that can be used to make predictions. It is important to recognize that these predictions (interpolations and extrapolations) are based upon patterns that have a degree of uncertainty.

The quality of the interpretation is directly related to the quality of the data. An awareness of uncertainty allows students to assess the reliability of data and data interpretation.

Chance addresses the predictability of the occurrence of an outcome. As students develop their understanding of probability, the language of mathematics becomes more specific and describes the degree of uncertainty more accurately.

Essential Graduation Learnings

Essential graduation learnings are statements describing the knowledge, skills and attitudes expected of all students who graduate from high school. Essential graduation learnings are cross-curricular in nature and comprise different areas of learning: *aesthetic expression, citizenship, communication, personal development, problem solving, technological competence* and *spiritual and moral development*.

Aesthetic Expression

Graduates will be able to respond with critical awareness to various forms of the arts and be able to express themselves through the arts.

Citizenship

Graduates will be able to assess social, cultural, economic and environmental interdependence in a local and global context.

Communication

Graduates will be able to use the listening, viewing, speaking, reading and writing modes of language(s) and mathematical and scientific concepts and symbols to think, learn and communicate effectively.

Personal Development

Graduates will be able to continue to learn and to pursue an active, healthy lifestyle.

Problem Solving

Graduates will be able to use the strategies and processes needed to solve a wide variety of problems, including those requiring language and mathematical and scientific concepts.

Technological Competence

Graduates will be able to use a variety of technologies, demonstrate an understanding of technological applications, and apply appropriate technologies for solving problems.

Spiritual and Moral Development

Graduates will be able to demonstrate an understanding and appreciation for the place of belief systems in shaping the development of moral values and ethical conduct.

See *Foundations for the Atlantic Canada Mathematics Curriculum*, pages 4-6.

The mathematics curriculum is designed to make a significant contribution towards students' meeting each of the essential graduation learnings (EGLs), with the communication, problem-solving and technological competence EGLs relating particularly well to the mathematical processes.

Program Organization

The learning outcomes in the mathematics program are organized into four strands across the grades K–9. Some strands are subdivided into substrands. There is one general outcome per substrand across the grades K–9.

The strands and substrands, including the general outcome for each, follow.

Number

Number

- Develop number sense.

Patterns and Relations

Patterns

- Use patterns to describe the world and to solve problems.

Variables and Equations

- Represent algebraic expressions in multiple ways.

Shape and Space

Measurement

- Use direct and indirect measurement to solve problems.

3-D Objects and 2-D Shapes

- Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Transformations

- Describe and analyze position and motion of objects and shapes.

Statistics and Probability

Data Analysis

- Collect, display and analyze data to solve problems.

Chance and Uncertainty

- Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

Outcomes and Achievement Indicators

The curriculum is stated in terms of general outcomes, specific outcomes and achievement indicators (pp. 19 - 146)

General Outcomes

General outcomes are overarching statements about what students are expected to learn in each course.

Specific Outcomes

Specific outcomes are statements that identify the specific skills, understanding and knowledge that students are required to attain by the end of a given grade.

In the specific outcomes, the word *including* indicates that any ensuing items must be addressed to fully meet the learning outcome. The phrase *such as* indicates that the ensuing items are provided for illustrative purposes or clarification, and are not requirements that must be addressed to fully meet the learning outcome.

Achievement Indicators

Achievement indicators are samples of how students may demonstrate their achievement of the goals of a specific outcome. The range of samples provided is meant to reflect the scope of the specific outcome.

The list of indicators contained in this section is not intended to be exhaustive but rather to provide teachers with examples of evidence of understanding that may be used to determine whether or not students have achieved a given specific outcome. Teachers may use any number of these indicators or choose to use other indicators as evidence that the desired learning has been achieved.

Summary

The conceptual framework for K - Grade 9 Mathematics (p. 3) describes the nature of mathematics, mathematical processes and the mathematical concepts to be addressed. The components are not meant to stand alone. Activities that take place in the mathematics classroom should result from a problem-solving approach, be based on mathematical processes and lead students to an understanding of the nature of mathematics through specific knowledge, skills and attitudes among and between topics.

ASSESSMENT AND EVALUATION

Purposes of Assessment

What learning is assessed and evaluated, how it is assessed and evaluated, and how results are communicated send clear messages to students and others about what is really valued.

Assessment techniques are used to gather information for evaluation. Information gathered through assessment helps teachers determine students' strengths and needs in their achievement of mathematics and guides future instructional approaches.

Teachers are encouraged to be flexible in assessing the learning success of all students and to seek diverse ways in which students might demonstrate what they know and are able to do.

Evaluation involves the weighing of the assessment information against a standard in order to make an evaluation or judgment about student achievement.

Assessment has three interrelated purposes:

- assessment *for* learning to guide and inform instruction;
- assessment *as* learning to involve students in self-assessment and setting goals for their own learning; and
- assessment *of* learning to make judgements about student performance in relation to curriculum outcomes.

Assessment *for* Learning

Assessment *for* learning involves frequent, interactive assessments designed to make student understanding visible. This enables teachers to identify learning needs and adjust teaching accordingly. It is an ongoing process of teaching and learning.

Assessment *for* learning:

- requires the collection of data from a range of assessments as investigative tools to find out as mush as possible about what students know
- provides descriptive, specific and instructive feedback to students and parents regarding the next stage of learning
- actively engages students in their own learning as they assess themselves and understand how to improve performance.

Assessment *as* Learning

Assessment *as* learning actively involves students' reflection on their learning and monitoring of their own progress. It focuses on the role of the student as the critical connector between assessment and learning, thereby developing and supporting metacognition in students.

Assessment *as* learning:

- supports students in critically analyzing their learning related to learning outcomes
- prompts students to consider how they can continue to improve their learning
- enables students to use information gathered to make adaptations to their learning processes and to develop new understandings.

Assessment *of* Learning

Assessment *of* learning involves strategies to confirm what students know, demonstrate whether or not they have met curriculum outcomes, or to certify proficiency and make decisions about students' future learning needs. Assessment *of* learning occurs at the end of a learning experience that contributes directly to reported results.

Traditionally, teachers relied on this type of assessment to make judgments about student performance by measuring learning after the fact and then reporting it to others. Used in conjunction with the other assessment processes previously outlined, however, assessment *of* learning is strengthened.

Assessment *of* learning:

- provides opportunities to report evidence to date of student achievement in relation to learning outcomes, to parents/guardians and other stakeholders
- confirms what students know and can do
- occurs at the end of a learning experience using a variety of tools.

Because the consequences of assessment *of* learning are often far-reaching, teachers have the responsibility of reporting student learning accurately and fairly, based on evidence obtained from a variety of contexts and applications.

Assessment Strategies

Assessment techniques should match the style of learning and instruction employed. Several options are suggested in this curriculum guide from which teachers may choose, depending on the curriculum outcomes, the class and school/district policies.

Observation (formal or informal)

This technique provides a way of gathering information fairly quickly while a lesson is in progress. When used formally, the student(s) would be aware of the observation and the criteria being assessed. Informally, it could be a frequent, but brief, check on a given criterion. Observation may offer information about the participation level of a student for a given task, use of a concrete model or application of a given process. The results may be recorded in the form of checklists, rating scales or brief written notes. It is important to plan in order that specific criteria are identified, suitable recording forms are ready, and all students are observed within a reasonable period of time.

Performance

This curriculum encourages learning through active participation. Many of the curriculum outcomes promote skills and their applications. In order for students to appreciate the importance of skill development, it is important that assessment provide feedback on the various skills. These may be the correct manner in which to use a manipulative, the ability to interpret and follow instructions, or to research, organize and present information. Assessing performance is most often achieved through observing the process.

Paper and Pencil

These techniques can be formative or summative. Whether as part of learning, or a final statement, students should know the expectations for the exercise and how it will be assessed. Written assignments and tests can be used to assess knowledge, understanding and application of concepts. They are less successful at assessing processes and attitudes. The purpose of the assessment should determine what form of paper and pencil exercise is used.

Journal

Journals provide an opportunity for students to express thoughts and ideas in a reflective way. By recording feelings, perceptions of success, and responses to new concepts, a student may be helped to identify his or her most effective learning style. Knowing how to learn in an effective way is powerful information. Journal entries also give indicators of developing attitudes to mathematical concepts, processes and skills, and how these may be applied in the context of society. Self-assessment, through a journal, permits a student to consider strengths and weaknesses, attitudes, interests and new ideas. Developing patterns may help in career decisions and choices of further study.

Interview

This curriculum promotes understanding and applying mathematics concepts. Interviewing a student allows the teacher to confirm that learning has taken place beyond simple factual recall. Discussion allows a student to display an ability to use information and clarify understanding. Interviews may be a brief discussion between teacher and student or they may be more extensive. Such conferences allow students to be proactive in displaying understanding. It is helpful for students to know which criteria will be used to assess formal interviews. This assessment technique provides an opportunity to students whose verbal presentation skills are stronger than their written skills.

Presentation

The curriculum includes outcomes that require students to analyze and interpret information, to be able to work in teams, and to communicate information. These activities are best displayed and assessed through presentations. These can be given orally, in written/pictorial form, by project summary, or by using electronic systems such as video or computer software. Whatever the level of complexity, or format used, it is important to consider the curriculum outcomes as a guide to assessing the presentation. The outcomes indicate the process, concepts and context for which a presentation is made.

Portfolio

Portfolios offer another option for assessing student progress in meeting curriculum outcomes over a more extended period of time. This form of assessment allows the student to be central to the process. There are decisions about the portfolio, and its contents, which can be made by the student. What is placed in the portfolio, the criteria for selection, how the portfolio is used, how and where it is stored, and how it is evaluated are some of the questions to consider when planning to collect and display student work in this way. The portfolio should provide a long-term record of growth in learning and skills. This record of growth is important for individual reflection and self-assessment, but it is also important to share with others. For all students, it is exciting to review a portfolio and see the record of development over time.

INSTRUCTIONAL FOCUS

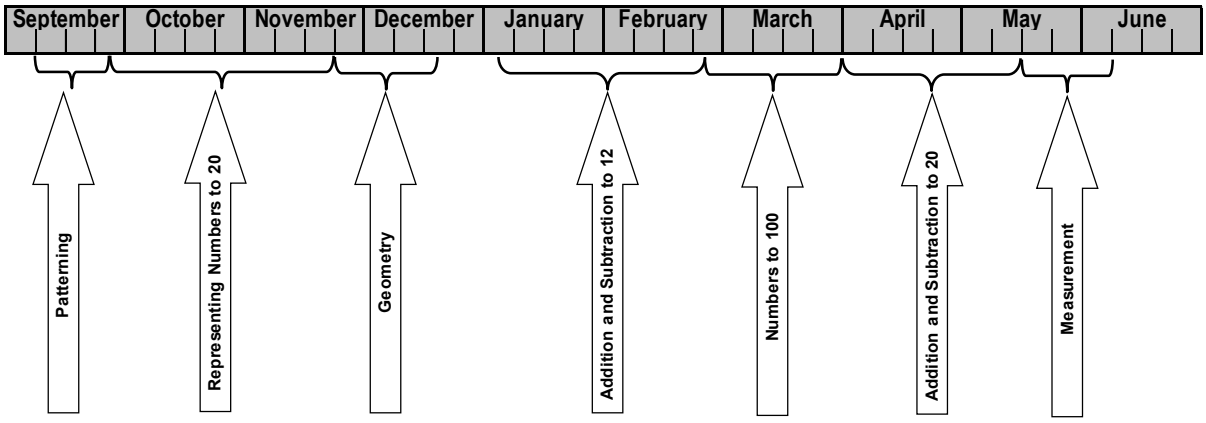
Planning for Instruction

Consider the following when planning for instruction:

- Integration of the mathematical processes within each strand is expected.
- By decreasing emphasis on rote calculation, drill and practice, and the size of numbers used in paper and pencil calculations, more time is available for concept development.
- Problem solving, reasoning and connections are vital to increasing mathematical fluency and must be integrated throughout the program.
- There is to be a balance among mental mathematics and estimation, paper and pencil exercises, and the use of technology, including calculators and computers. Concepts should be introduced using manipulatives and be developed concretely, pictorially and symbolically.
- Students bring a diversity of learning styles and cultural backgrounds to the classroom. They will be at varying developmental stages.

Teaching Sequence

The curriculum guide for Grade One is organized by units. A timeline has been provided to assist in planning. The use of this timeline is not mandatory; however, it is mandatory that all outcomes are taught during the school year so a long term plan is advised. There are a number of combinations of sequences that would be appropriate for teaching this course. The arrow showing 'estimated focus' does not mean the outcomes are never addressed again. The teaching of the outcomes is ongoing and may be revisited as necessary.



Instructional Time per Unit

The suggested number of weeks of instruction per unit is listed in the guide at the beginning of each unit. The number of suggested weeks includes time for completing assessment activities, reviewing and evaluating.

Resources

The authorized resource for Newfoundland and Labrador for students and teachers is *Math Makes Sense 1* (Pearson). Schools and teachers have this as their primary resource offered by the Department of Education. Column Four of the curriculum guide references *Math Makes Sense 1* for this reason.

Teachers may use any resource or combination of resources to meet the required specific outcomes listed in Column One of the curriculum guide.

General and Specific Outcomes

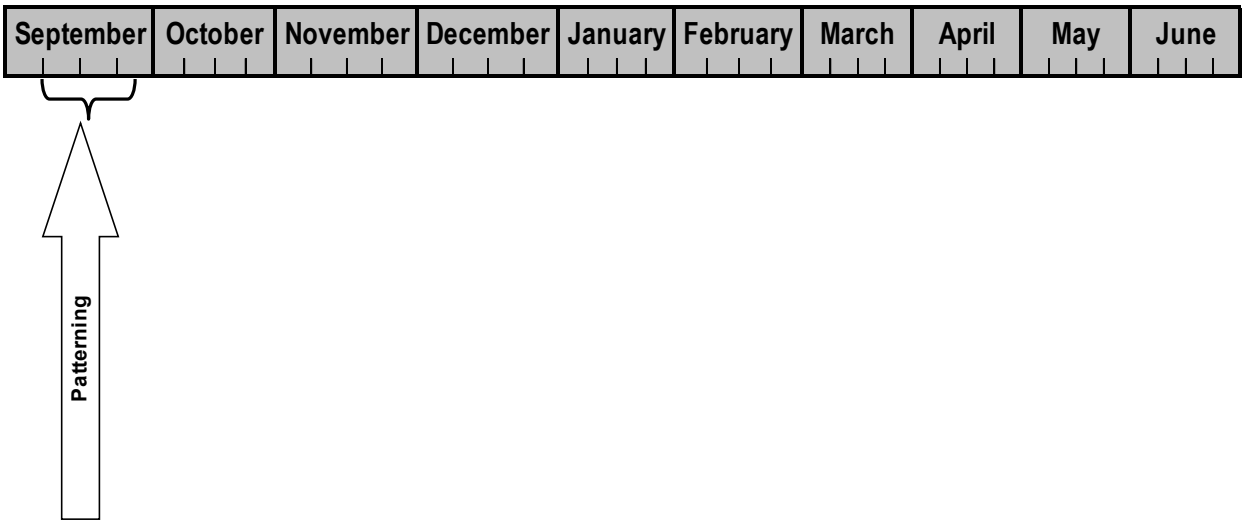
GENERAL AND SPECIFIC OUTCOMES WITH ACHIEVEMENT INDICATORS (pp. 19 - 146)

This section presents general and specific outcomes with corresponding achievement indicators and is organized by unit. The list of indicators contained in this section is not intended to be exhaustive but rather to provide teachers with examples of evidence of understanding to be used to determine whether or not students have achieved a given specific outcome. Teachers should use these indicators but other indicators may be added as evidence that the desired learning has been achieved. Achievement indicators should also help teachers form a clear picture of the intent and scope of each specific outcome.

Mathematics 1 is organized into seven units: *Patterning*, *Representing Numbers to 20*, *Geometry*, *Addition and Subtraction to 12*, *Numbers to 100*, *Addition and Subtraction to 20*, and *Measurement*.

Patterning

Suggested Time: 2½ Weeks

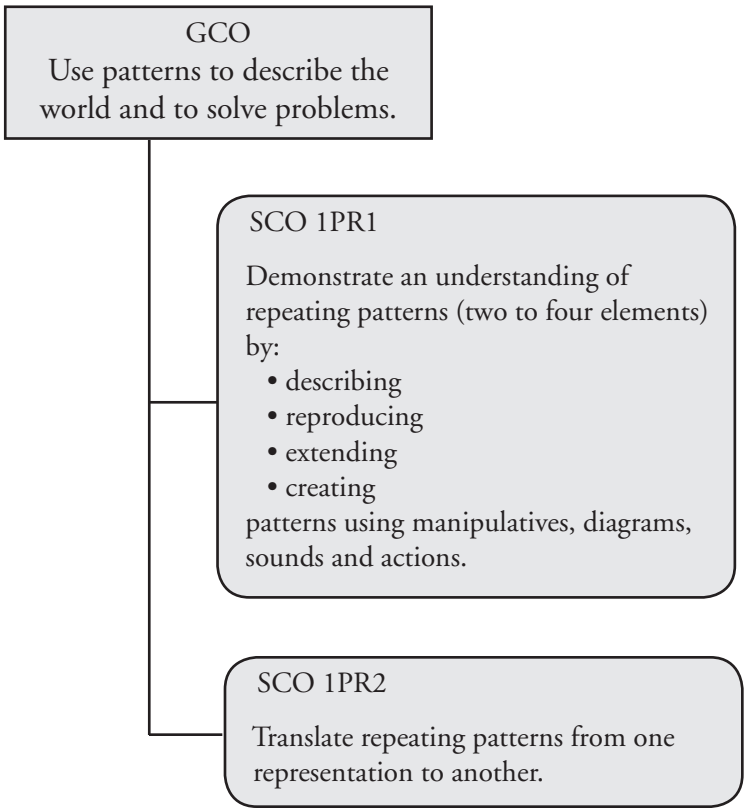


Unit Overview

Focus and Context

In Kindergarten, students were exposed to repeating patterns of two to three elements. This patterning concept is essential to help students understand repeating patterns as they continue to study patterning up to four elements in Grade One. They learn that repeating patterns can be represented in a variety of ways using a variety of materials, sounds, movements or visuals. Students verbalize and communicate rules to help them understand the predictability of a pattern. As students have more experiences with this, they will begin to understand that the patterns exist all around us and can be used to solve a variety of everyday problems. In Grade Two, students will continue working with repeating patterns, extending their knowledge to include five elements, and they will also explore increasing patterns.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Patterns and Relations (Patterns)		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
KPR1. Demonstrate an understanding of repeating patterns (two or three elements) by: • identifying • reproducing • extending • creating patterns using manipulatives, sounds and actions. [C, CN, PS, V]	1PR1. Demonstrate an understanding of repeating patterns (two to four elements) by: • describing • reproducing • extending • creating patterns using manipulatives, diagrams, sounds and actions. [C, PS, R, V] 1PR2. Translate repeating patterns from one representation to another. [C, CN, R, V]	2PR1. Demonstrate an understanding of repeating patterns (three to five elements) by: • describing • extending • comparing • creating patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V] 2PR2. Demonstrate an understanding of increasing patterns by: • describing • reproducing • extending • creating numerical (numbers to 100)and non-numerical patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Daily Routine Opportunity

This curriculum guide contains suggestions for daily routines. They will be indicated with the graphic seen here.

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

1PR1 Demonstrate an understanding of repeating patterns (two to four elements) by:
• describing
• reproducing
• extending
• creating
patterns using manipulatives, diagrams, sounds and actions.
[C, PS, R, V]

Achievement Indicators:

1PR1.1 Describe a given repeating pattern containing two to four elements in its core.

1PR1.2 Identify and describe errors in a given repeating pattern.

1PR1.3 Identify and describe the missing element(s) in a given repeating pattern.

1PR1.4 Reproduce and extend a given repeating pattern using manipulatives, diagrams, sounds and actions.

1PR1.5 Identify and describe, using every day language, a repeating pattern in the environment, e.g., in the classroom, outdoors.

1PR1.6 Identify repeating events; e.g., days of the week, birthdays, seasons.

Elaborations—Strategies for Learning and Teaching

Pattern experiences should be an ongoing part of Math throughout the year. In Kindergarten, students have had opportunities to work with patterns of two or three elements. In Grade One, students should begin the year interpreting patterns using a variety of manipulatives. Suggested manipulatives for creating patterns include:

- connecting cubes
- rubber stamps and adding machine paper rolls
- stickers
- colour tiles
- Link-Its™
- pattern blocks
- collections (each collection should consist of 60 – 100 small items of one kind, such as bread tags, buttons, shells, small plastic animals)
- two-colour counters
- bingo dabbers
- coloured pompoms

Students should have many opportunities to work with these materials before using other materials, such as attribute blocks, that have more than one visible attribute.

Young students first need to experience repeating patterns in a variety of different ways. They need both teacher-directed and independent activities. Teacher-directed activities should encourage students to analyze a variety of patterns. Independent activities provide students with the opportunity to explore, reproduce, extend, and create patterns appropriate to their level of understanding. Examples of patterns students should describe, reproduce, extend, and create include:

Rhythmic/Sound patterns

e.g., clap, snap, clap, snap, clap, snap, …

Action pattern

e.g., sit, sit, stand, sit, sit, stand, sit, sit, stand, …

Colour patterns

e.g. red, red, yellow, red, red, yellow, red, red, yellow, …

Shape patterns

e.g., circle, square, triangle, circle, square, triangle,…

Patterns of attributes

e.g., using buttons: four holes, two holes, four holes, two holes, …

Patterns of size

e.g., long, long, short, short, long, long, short, short, long, …

Number patterns

e.g., 1, 2, 3, 1, 2, 3, 1, 2, 3, …

General Outcome: Use patterns to describe the world and to solve problems

Suggested Assessment Strategies

Performance

- In circle time or when lining up, begin a repeating pattern using the students (e.g., sit, stand, sit, stand, …, boy, boy, girl, girl, boy, boy, girl, girl …,). Ask students to describe and extend the pattern. Have students take turns creating and extending other repeating patterns. (1PR1.1, 1PR1.7, 1PR1.4)

- Ask students to repeat a rhythmic pattern presented to them (e.g., clap, clap, stamp, clap, clap, stamp, clap, clap, stamp . . .). (1PR1.1)

- Have students look at a repeating visual pattern, or listen to a repeating sound pattern, that contains an error or omission. Ask students to correct the error or omission and explain how they know. (1PR1.2, 1PR1.3)

- Have students brainstorm events that occur during each school day (e.g., I eat breakfast. I go to school. I go home from school. I eat supper.) Ask students to describe any patterns they notice in their daily schedules. (1PR1.6)

- Take students on a nature walk, collect leaves and ask students to make a leaf pattern. (1PR1.5)

Interview

- Provide students with a pattern of linking cubes (e.g., red, green, green, red, green, green, red, green, green). This task involves describing a three element pattern using objects with one attribute (colour). Ask students to describe the pattern, using colour words. This task can be repeated with patterns with two to four elements in its core. (1PR1.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Launch
Teacher Resource (TR): p. 9
Student Book (SB): pp. 1 - 2

Lesson 1: Recognize and Copy a Pattern
TR: pp. 10 - 13
SB: pp. 3 - 4

Audio CD 1:
Selections 1, 2, 3 & 4

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/patterning.html
- pattern games
- matching patterns

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

1PR1 Continued

Achievement Indicators:

1PR1.1 (Continued) Describe a given repeating pattern containing two to four elements in its core.

1PR1.2 (Continued) Identify and describe errors in a given repeating pattern.

1PR1.3 (Continued) Identify and describe the missing element(s) in a given repeating pattern.

1PR1.4 (Continued) Reproduce and extend a given repeating pattern using manipulatives, diagrams, sounds and actions.

1PR1.5 (Continued) Identify and describe, using every day language, a repeating pattern in the environment, e.g., in the classroom, outdoors.

1PR1.6 (Continued) Identify repeating events; e.g., days of the week, birthdays, seasons.

Elaborations—Strategies for Learning and Teaching

Students should be given the opportunity to describe patterns orally, as it helps them interpret the patterns they experience visually and solidify their understanding of the concept. It also allows other students to learn from each other.

The core of a repeating pattern is the shortest string of elements that repeats. For example, the colour pattern, red, yellow, green, red, yellow, green, …, has a core of three different elements that repeat over and over. The pattern, red, red, yellow, yellow, red, red, yellow, yellow…, is also a four element pattern even though the elements are repeated. It is important to repeat the core of the pattern at least three times before expecting students to describe, reproduce, or extend a pattern.

When presenting a pattern for students to reproduce or extend, repeat the core three times (e.g., red, red, blue, red, red, blue, red, red, blue,...). As students become more efficient reproducing and extending patterns, repeat the core three times and begin the fourth repetition (e.g., red, red, blue, red, red, blue, red, red, blue, red, …). Observe whether the students continue the pattern from the last element given or repeat the entire core.

Patterning becomes more meaningful to students when it is evident in many areas of their daily life (e.g., clothing, signs, food packages). Students should have opportunities to look for and describe patterns in the classroom and/or outdoors. They should recognize that there are many patterns that occur in cycles such as the seasons, the days of the week, the months of the year, and some daily routines. The exploration of repeating events can be experienced during morning calendar routines ongoing throughout the school year.

Students should be provided with repeating patterns containing two to four elements in which there are errors or missing elements. They should be able to identify the errors or omissions in the repeating patterns.

General Outcome: Use patterns to describe the world and to solve problems

Suggested Assessment Strategies

Performance

- Patterning Ourselves – Choose one student to go to the far side of the room. Instruct the student to turn away from the group and cover his/her ears. Have the remainder of the group form a circle or a line. Begin a people pattern by directing the students to do a particular action. Point to each student in order, as you say:

  "hands up, hands up, hands down, hands down, hands up, hands up, hands down, hands down . . ."

  After the core has been repeated three times make an error in the pattern (e.g., hands up, hands up, hands up, hands down). Ask the student to return to the group and identify the error in the pattern and explain how he/she knows. Repeat this task, leaving a gap in the pattern, and ask the student to identify the missing element and explaining how he/she knows. (1PR1.2, 1PR1.3)

Presentation

- Say, "I made a pattern with red and green cubes and then it fell apart. This is what's left" (show a piece of a pattern). Ask students to use cubes to show what the pattern might have looked like. Working with a partner, have students create possible patterns which may contain a different number of elements in its core. Ask students to present their patterns to the class. (1PR1.1, 1PR1.4, 1PR1.7)

- Ask students to use ipads™ or a school camera to take pictures of patterns in and around the school (patterns on windows, clothing, art work, etc.). Use the images to make a collage of patterns on a Math bulletin board. (1PR1.5)

Interview

- Display a collection of objects from the environment, some with visible patterns and some without. Discuss each object by naming it and observing its features. Ask:
  - Did anyone see an object with a pattern? How did you know?
  - Did anyone see an object that did not have a pattern? How did you know? (1PR1.5)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 1 (Continued): Recognize and Copy a Pattern
TR: pp. 10 - 13
SB: pp. 3 - 4

Unit Centres: Paper Plate Garden
TR: p. 7

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

1PR1 Continued

Achievement Indicators:

1PR1.7 Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.

Elaborations—Strategies for Learning and Teaching

Students should be encouraged to create and describe patterns as soon as they have an understanding of what patterns are. By changing the number of elements presented in teacher-directed lessons and independent activities, students working at all levels can be supported and challenged.

A patterning learning centre will give students opportunities to make patterns on an informal and independent basis. The choice of manipulatives can affect the difficulty of the task. Connecting cubes, Link-Its™ and colour tiles are the easiest manipulatives from which students can make patterns, as they have only one visible attribute. More challenging manipulatives would include attribute blocks or other items with more than one attribute.

Many students at this stage are able to successfully create and extend patterns beyond four elements. It is common, however, for some students to have difficulties creating and extending patterns beyond the simple AB pattern. Providing many opportunities to explore patterns using manipulatives is critical.

General Outcome: Use patterns to describe the world and to solve problems

Suggested Assessment Strategies

Interview

- Use connecting cubes to create a colour pattern with one element missing (e.g., red, yellow, green, red, yellow, green, red yellow, green, red, ___, green). Ask :
  - Are there colours missing?
  - What colour is missing from the pattern? How do you know?

  Repeat using other patterns. Objects, such as attribute blocks, with more than one visible attribute may be used. (1PR1.3)

Performance

- Provide students with a variety of manipulatives and ask them to create and describe a repeating pattern. Ask another student to extend the pattern that has been created. (1PR1.4, 1PR1.7)

- Create a Border – Provide students with two to four rubber stamps or bingo dabbers and ask them to create a patterned border around the edge of a picture frame, place mat, or a piece of paper. Ask them to describe their patterns to the class. (1PR1.7)

- Make One Like Mine – Use pattern blocks to create a repeating pattern on the overhead projector. Ask students to reproduce and extend the pattern on their desks. (1PR1.4)

- Colour Towers – Use interlocking cubes to create a tower with a repeating pattern. Ask students to extend the pattern to determine the colour of the 11th cube. (1PR1.4)

- Ask students to use coloured bingo dabbers and paper strips to make patterns. Students should identify the pattern created using letters (e.g., AB, ABC, ABB). (1PR1.7)

- Give students Froot Loops™ to create patterns of their choice. They can glue the cereal to paper and label the patterns by colours and letters. (1PR1.4, 1PR1.7)

- Use small musical instruments (drums, triangles, maracas, etc.) to engage students in creating sound patterns. (1PR1.7)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 2: Make and Extend a Pattern
TR: pp. 20 - 21
SB: pp. 5 - 7

Unit Centres: Paper Plate Garden
TR: p. 7

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

1PR2 Translate repeating patterns from one representation to another.
[C, CN, R, V]

Achievement Indicators:

1PR2.1 Represent a given repeating pattern, using another mode; e.g., actions to sound, colour to shape, ABC ABC to moose, puffin, bear, moose, puffin, bear.

1PR2.2 Describe a given repeating pattern, using a letter code; e.g., ABC ABC,…

Elaborations—Strategies for Learning and Teaching

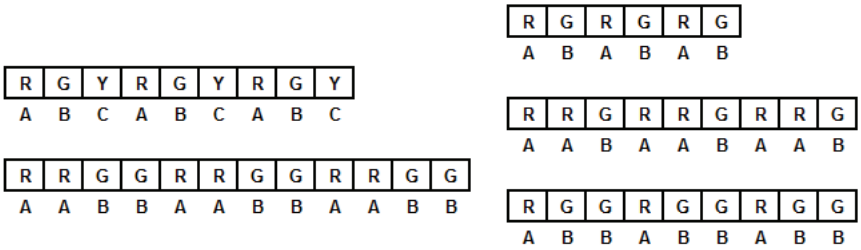
Students should recognize many different forms of the same pattern. They need to see that patterns constructed with different materials are the same pattern. Translating two or more alike patterns (e.g., snap, clap, snap, clap, snap, clap… and red, green, red, green red, green …) to a common format (e.g., ABABAB) helps students see beyond the materials making up the pattern. Using some form of symbolism (in this case the letter code, ABABAB) to represent the structure of a pattern is the beginning of algebraic reasoning.

When given a repeating pattern, students should represent that pattern using another form described in 1PR1 (i.e., rhythmic/sound patterns, action patterns, colour patterns, shape patterns, patterns of attributes, patterns of size, and number patterns). For example, if students are given the repeating rhythmic pattern - clap, clap, snap, clap, clap, snap . . . they may represent the pattern in other forms such as a colour pattern (e.g., red, red, yellow, red, red, yellow …) or a shape pattern (e.g., square, square, triangle, square, square, triangle…).

Repeating patterns are sometimes described using a letter code. Labeling patterns with ABC helps students name and compare patterns.

Using interlocking cubes is one way to represent a two-element repeating pattern. (e.g., red, yellow, red, yellow, red, yellow). With the students, describe the pattern using a letter code (e.g., ABABAB). Repeat using two different colours of interlocking cubes. Draw students' attention to the fact that although different colours have been used, the letter code has not changed. Extend these activities to include repeating patterns with a core of three and four different elements.

Students should be provided with many experiences describing repeating patterns using letters. It is important to use many forms of patterns containing two to four elements such as AB, AAB, ABB, ABC, AABB, and other combinations, so students realize they do not always have to make the same pattern, e.g.,



General Outcome: Use patterns to describe the world and to solve problems

Suggested Assessment Strategies

Performance

- During Circle Time, spread out the connecting cubes on the floor so that all students have access to them. Begin by acting out a rhythmic pattern and have students join in (e.g., clap, slap, slap, clap, slap, slap, clap, slap, slap…). Once they are able to copy the pattern, stop the actions and ask the students to use the connecting cubes to represent the same pattern. (1PR2.1)

- Provide a collection of manipulatives and task cards of pattern-train outlines. For example:

R	G	Y	R	G	Y	R	G	Y

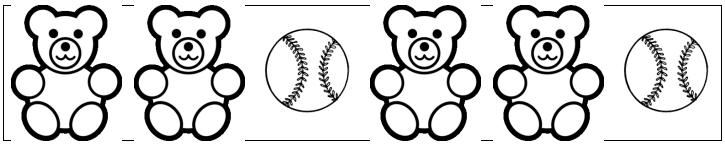
Ask the students to choose a card and use the manipulatives to reproduce and extend the pattern shown. Ask another student to represent the same pattern using different manipulatives. (1PR2.1)

- Sing the song "Old MacDonald had a Farm". Ask the students to make sound patterns (e.g., woof-woof-oink-woof-woof –oink). Record these patterns on a chart. Ask students to translate the pattern into a colour pattern using interlocking cubes. Ask, What colour cube would you like for the dog sound? How many cubes will we need each time we come to that sound? Choose one student to translate the pattern using a letter code (e.g., AABAAB). Have students look at their own patterns and see if there is another pattern on the chart similar to theirs. Students may sort the patterns based on their letter codes.

(1PR2.1, 1PR2.2)

- Begin a rhythmic pattern (e.g., clap, snap, clap, snap, clap, snap, …). Ask the students to extend the pattern and label it, while performing the actions, using a letter code. Repeat using other modes of patterns. (1PR2.2)

- Provide students with pattern cards, e.g.,



Ask them to use buttons or blocks to represent and extend the patterns. Students then label the patterns using a letter code.

(1PR2.1, 1PR2.2)

Resources/Notes

Authorized Resource

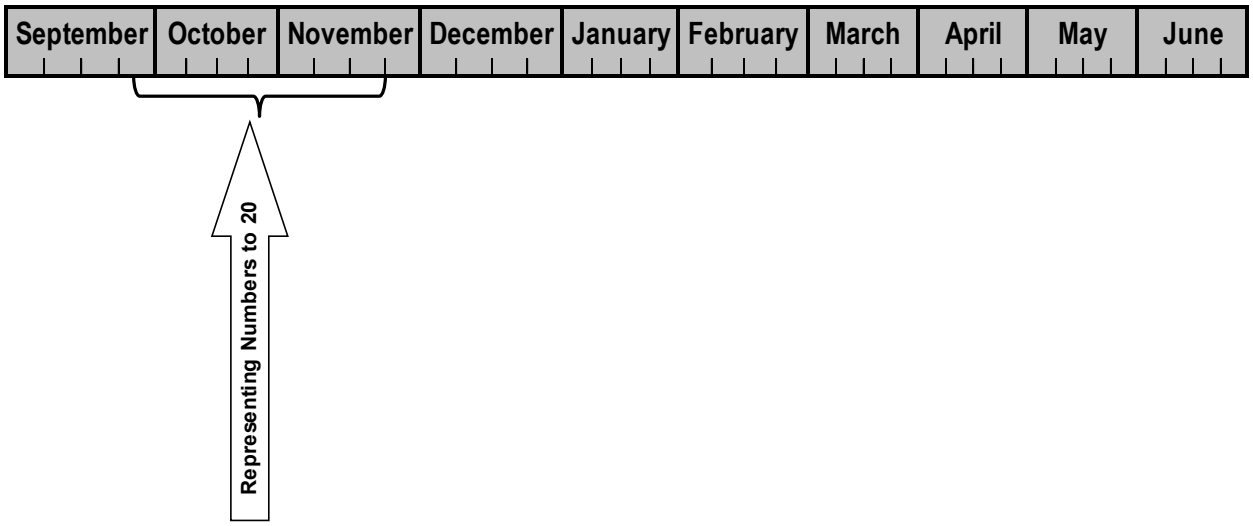
Math Makes Sense 1
Lesson 4: Translate a Pattern
TR: pp. 14 - 17
SB: p. 10

Unit Centres: Treasure Boxes; Stamp It
TR: p. 7

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/patterning.html
- describing patterns

Representing Numbers to 20

Suggested Time: 7½ Weeks

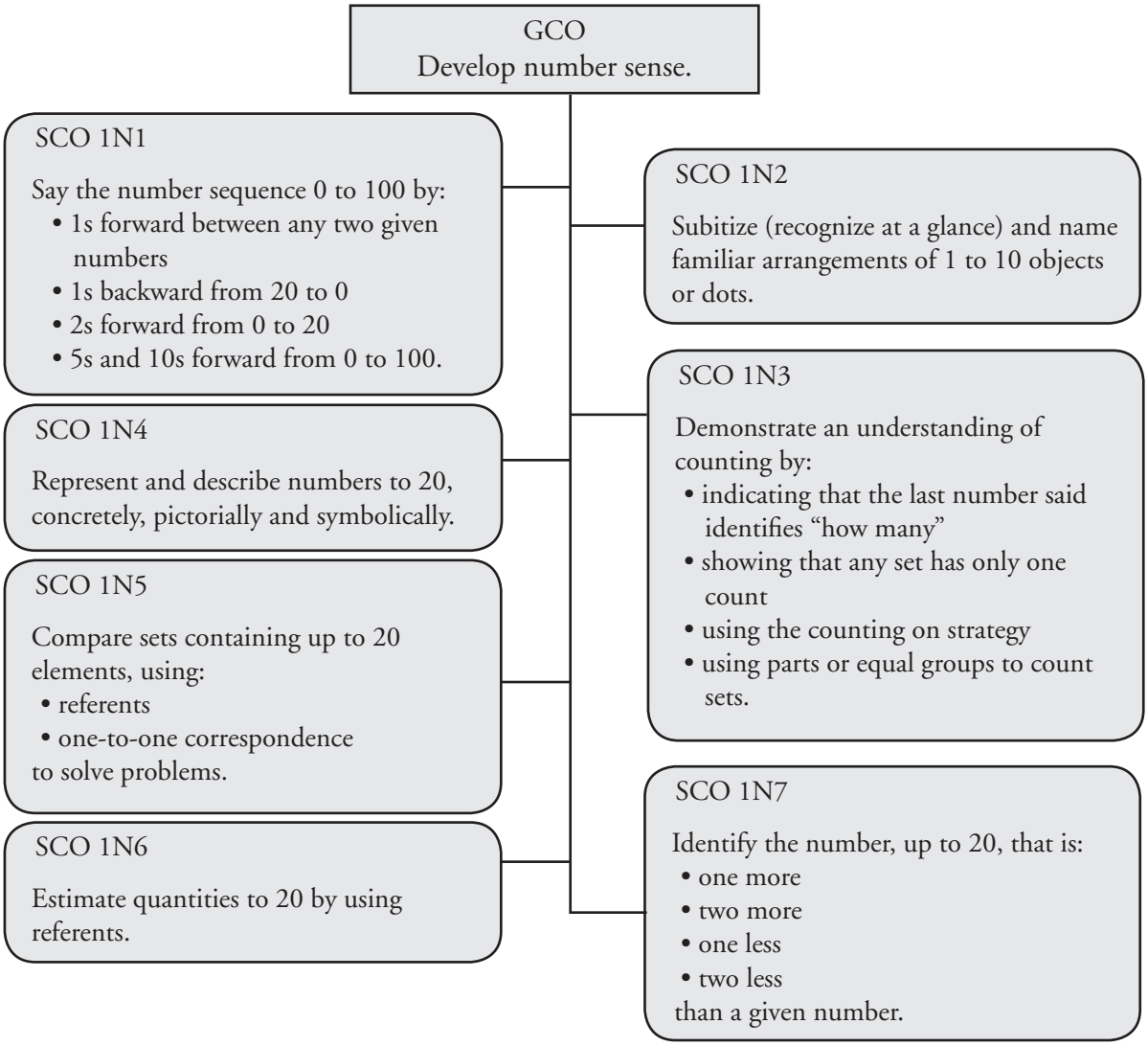


Unit Overview

Focus and Context

In Kindergarten, number concepts were explored while focusing on numbers one to ten. An understanding of the number combinations to ten is critical in building a strong mathematics foundation. If students are to develop strong number concepts and number sense, considerable instructional time must be devoted to number and numeration. In Grade One, students will be provided with meaningful experiences using numbers to 20 and later in the year they will be introduced to numbers to 100. In this unit, sufficient time must be given for students to deepen their understanding first of the numbers to ten and then to 20. Students will learn and practice skills for counting, estimating and grouping objects into sets. There will be a focus on developing the part-part-whole relationship of numbers to 20. It is important that students experience activities using a variety of manipulatives such as ten-frames, number lines, and snap cubes.

Outcomes Framework



GCO
Represent algebraic expressions in multiple ways.

SCO 1PR3
Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).

SCO 1PR4
Record equalities using the equal symbol (0 to 20).

SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
KN1. Say the number sequence by 1s: • starting anywhere from 1 to 10 and from 10 to 1 • forward from 1 to 30. [C, CN, V] KN2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects, dots or pictures. [C, CN, ME, V] KN3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V] KN4. Represent and describe numbers 2 to 10, in two parts, concretely and pictorially. [C, CN, ME, R, V] KN5. Compare quantities 1 to 10, • using one-to-one correspondence • by ordering numbers representing different quantities. [C, CN, V]	1N1. Say the number sequence 0 to 100 by: • 1s forward between any two given numbers • 1s backward from 20 to 0 • 2s forward from 0 to 20 • 5s and 10s forward from 0 to 100. [C, CN, ME, V] 1N2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects or dots. [C, CN, ME, V] 1N3. Demonstrate an understanding of counting by: • indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets. [C, CN, ME, R, V]	2N1. Say the number sequence 0 to 100 by: • 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively • 10s, using starting points from 1 to 9 • 2s, starting from 1. [C, CN, ME, R] 2N2. Demonstrate if a number (up to 100) is even or odd. [C, CN, PS, R] 2N3. Describe order or relative position, using ordinal numbers (up to tenth). [C, CN, R] 2N4. Represent and describe numbers to 100, concretely, pictorially and symbolically. [C, CN, V] 2N5. Compare and order numbers up to 100. [C, CN, ME, R, V]

SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	Specific Outcomes	Specific Outcomes
	1N4. Represent and describe numbers to 20, concretely, pictorially and symbolically. [C, CN, V] 1N5. Compare sets containing up to 20 elements, using: • referents • one-to-one correspondence to solve problems. [C, CN, ME, PS, R, V] 1N6. Estimate quantities to 20 by using referents. [C, CN, ME, PS, R, V] 1N7. Identify the number, up to 20, that is: • one more • two more • one less • two less than a given number. [C, CN, ME, R, V]	2N6. Estimate quantities to 100, using referents. [C, ME, PS, R] 2N7. Illustrate, concretely and pictorially, the meaning of place value for numerals to 100. [C, CN, R, V]

SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Patterns and Relations (Variables and Equations)		
Specific Outcomes	Specific Outcomes	Specific Outcomes
	1PR3. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). [C, CN, R, V] 1PR4. Record equalities using the equal symbol (0 to 20). [C, CN, PS, V]	2PR3. Demonstrate and explain the meaning of equality and inequality, concretely and pictorially (0 – 100). [C, CN, R, V] 2PR4. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number

Outcomes

Students will be expected to

1N1 Say the number sequence 0 to 100 by:

- **1s forward between any two given numbers**
- **1s backward from 20 to 0**
- 2s forward from 0 to 20
- 5s and 10s forward from 0 to 100.

[C, CN, ME, V]

Achievement Indicators:

1N1.1 Recite forward by 1s, the number sequence between two given numbers (0 to 100).

1N1.2 Recite backward by 1s, the number sequence between two given numbers (20 to 0).

Elaborations—Strategies for Learning and Teaching

In Kindergarten, students learned to count by 1s forward from one to thirty. They also learned to count backwards from ten to one. In this unit, the focus will be on counting forwards and backwards between zero and twenty by 1s. In the *Numbers to 100* unit, this will be extended to 100 and will also include counting by 2s, 5s, and 10s. Being able to "count on" and "count back" are also important skills for adding and subtracting.

This outcome is an important prerequisite for counting items in a set. "Before there can be any meaningful counting, students must be able to recite the sequence beginning 1, 2, 3, 4, 5, etc" (Small, 2008, p. 84). There is a difference between being able to recite the number words (1, 2, 3…) and understanding how counting is used to describe a set. The counting sequence itself is a rote procedure; however, "the meaning attached to counting is the key conceptual idea on which all other number concepts are developed" (Van de Walle, 2006, p. 39).

Students' early understandings of saying the number sequence and counting can be naturally nurtured through exposure to rich, quality literature. For example, use literature such as *The Wonderful Pigs Of Jillian Jiggs* by Phoebe Gilman or *Two Ways to Count to Ten* by Ruby Dee to show various ways of counting. Depending on the students' ability and experience, teachers may choose to introduce this lesson using numbers to ten and later work with numbers 11-20.

The calendar is an effective visual aid for counting. Daily calendar routines provide opportunities for students to hear and speak mathematical vocabulary in a natural setting. A calendar exposes students to counting to and from larger numbers each day as the month progresses. Good questioning techniques during calendar activities provide occasions for students to learn the number that comes 'before', the number that comes 'after', and the number (s) that comes 'in between'.

Through experience, students become more comfortable saying the number sequence forwards and backwards and should be provided with many opportunities to do so throughout the day. For example, as a way to get students' attention, call out a forwards or backwards number sequence starting at different numbers and have students join in (e.g., 10, 9, 8… or 17, 16, 15… and later in the year, 21, 22, 23...).

Playing games, in which students roll a number cube and say the numbers aloud as they count the number of spaces to move, is a valuable task to engage students in reciting a number sequence. As well, invite students to sing songs and recite poems which involve counting forwards and backwards, for example: "Ten In A Bed", "One, Two, Buckle My Shoe" and "This Old Man."

General Outcome: Develop number sense

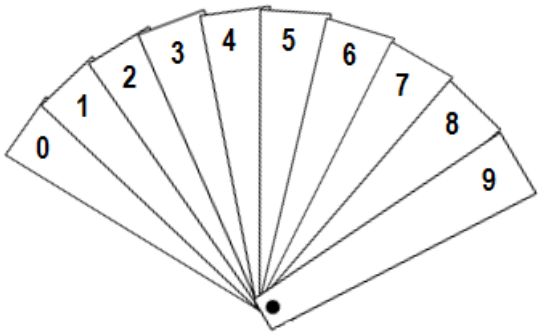
Suggested Assessment Strategies

Performance

- Pass the Counting - Begin by counting aloud, saying the first two or three numbers (1, 2, 3). Then, "pass" the counting on to a student by tapping him/her on the shoulder. The student continues the counting from where you left off, saying the next few numbers (4, 5, 6), until you tap another student. Continue to "pass" the counting from one student to another until the count reaches 20, and later in the year, 100. This activity can be modified for counting backwards from 20 to 0.

  (1N1.1, 1N1.2)

- Copy one set of numeral wands for each student on heavy paper. Each set should include an extra wand with "1" so students can make the teen numbers. Ask students to cut out their set of cards, punch holes in them and put each set onto a single paper fastener as shown below. Using the numeral wands, begin counting in sequence aloud two or three numbers (e.g., 9, 10, 11...). Ask students to hold up the wand(s) showing the number that comes next. This activity can be done for counting backwards as well. These wands can be used throughout the year to allow students to display answers to questions during morning routines and various other activities.



  (1N1.1, 1N1.2)

- Ask students to practice responsive counting from zero to 20 with the teacher or a classmate, beginning at different starting points. For example, begin by saying "10," then they say "11," you say "12," they say "13," and so on, as far as they can count. Repeat the same activity counting backward, beginning at 20.

  (1N1.1, 1N1.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Launch
Teacher Resource (TR): p. 17
Student Book (SB): pp. 13 - 15

Lesson 1: Counting to 20
TR: pp. 18 - 21
SB: pp. 16 - 17

Note:
Lesson 1 in the resource asks students to read number words eleven to twenty. This goes beyond the expectation for this grade level.

Audio CD 1
Selections: 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Unit Centres: Numbers Everywhere
TR: p. 15

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resources

- *The Wonderful Pigs of Jillian Jiggs* by Phoebe Gilman
- *Two Ways to Count to Ten* by Ruby Dee

Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/representing-numbers-to-20.html

- counting videos and songs
- virtual manipulatives

Strand: Number

Outcomes

Students will be expected to

1N1 Continued

Achievement Indicators:

1N1.1 (Continued) Recite forward by 1s, the number sequence between two given numbers (0 to 100).

1N1.2 (Continued) Recite backward by 1s, the number sequence between two given numbers (20 to 0).

1N1.3 Record a given numeral (0 to 100) symbolically when it is presented orally.

1N1.4 Read a given numeral (0 to 100) when it is presented symbolically.

Elaborations—Strategies for Learning and Teaching

Because it is important that students develop an efficient means of recording numerals, numeral writing should be taught. In Kindergarten, students learned to write the numerals from one to ten. The expectation now is that they learn to write the numerals to 20. By the end of Grade One, students should be able to write the numbers to 100.

Specific instruction and practice will be necessary. Allow students to experiment freely on lined and unlined paper, whiteboards, chart paper, and other mediums. Observe students as they write their numerals, both when copying from a model and when forming them from memory. Students should be encouraged to start at the top when printing numerals. At this stage of development it is common to see students reverse numbers. One suggestion for practice is to use their index fingers to form the numerals on their desks or in the air.

Numeral writing should not be taught in isolation but in relationship with the quantities they represent. Numeral symbols have meaning for students only when they are introduced as labels for quantities. Learning to write symbols is a separate task from learning to associate numerals with specific quantities. Therefore, when a student has learned to write the numerals, we must be very careful to not assume that he or she is learning anything about the quantities they represent.

As part of a morning routine, randomly cover numbers on a hundred chart and ask students to uncover and read the numbers that are hidden. In daily routines, use a hundred chart or a calendar, and ask students to read the numerals that are presented.

General Outcome: Develop number sense

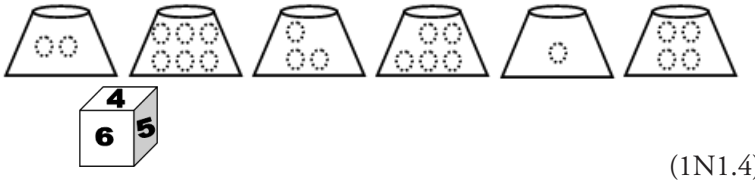
Suggested Assessment Strategies

Performance

- Hang Your Socks - Place a clothesline in your classroom to hang socks in order. As students enter the room, they pick a number sock and place it in order on the clothesline. Place benchmarks 0, 5, 10 and 20 on the line as a guide. (1N1.1, 1N1.2)

- Using a walk-on number line and bean bags, ask students to take turns tossing a bean bag on the number line and reading the number where the bean bag landed. They then walk to the number, counting as they go. (1N1.4)

- Find the Counters - Hide sets of counters under plastic containers to match the numerals on a number cube. Students roll the cube, and say the number rolled, to determine the number of counters that they are to look for. Students take turns lifting the tubs and counting to see who can find the number of counters matching the number rolled.



(1N1.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 1 (Continued): Counting to 20
TR: pp. 18 - 21
SB: pp. 16 - 17

Strand: Number

Outcomes

Students will be expected to

1N3 Demonstrate an understanding of counting by:

- **indicating that the last number said identifies "how many"**
- **showing that any set has only one count**
- using the counting on strategy
- **using parts or equal groups to count sets.**

[C, CN, ME, R, V]

Achievement Indicator:

1N3.1 Answer the question, "How many are in the set?", using the last number counted in a given set.

Elaborations—Strategies for Learning and Teaching

Counting is very significant for students as it enables them to decide how many are in a collection. Contrasted with rote counting, meaningful counting is the foundation on which all other number concepts are developed. For this reason, it is necessary to assess students individually in order to determine their understanding of number, not only in the oral expression of numbers, but also in counting abilities and sense of number.

Students should be encouraged to count items in natural situations that arise in the classroom. All other work with numbers, whether representing quantities or performing operations, is dependent on students learning to count. Students should also experience a wide variety of situations which require counting beyond ten. Students will be expected to work with only two-digit numbers at this grade level, and to begin, the focus should be on numbers to 20.

Counting tells how many things are in a set. When counting a set of objects, the last number in the counting sequence, names the quantity for that set. Provide a number of objects for students to count. Observe students to determine their understanding of each of the principles underlying meaningful counting.

- Do they touch each object as they count?
- Do they set items aside as they count them?
- Do they show confidence in their count or feel the need to check?
- Do they check their counting in the same order as the first count or a different order?

When students have an understanding of counting a set, they will display confidence in answering the question, "How many are in the set?" without having to recount. Provide a set of twelve objects and ask, "How many are here?" The student counts correctly and says, "Twelve." Ask, "Are there twelve?" Students who understand that the last number counted is the quantity of the set (cardinality) will not need to recount.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide students with a tub filled with different objects, such as buttons, blocks, cubes, and beans. Ask them take a handful (or a small scoop) of items from the collection. Students then sort the items, count, and record the numeral to match each set. The size of the items in the collection, and the readiness level of your students, will determine the appropriate number of items to use. (1N3.1)

- Make animals or shapes using interlocking cubes. Ask students to replicate, count, and record the number of cubes used to make the design. (1N3.1)

- Display a set of objects. Ask the student, "How many are in your set?" Observe whether the student:
  - says the numbers in the correct order
  - moves the objects to avoid confusion
  - realizes that the last number said is the number in the set.

  Repeat this activity varying the number of objects for students to count. (1N3.1)

- Walk around the room, stop and make a noise (e.g., ring a bell, clap hands). Students show the number of sounds using their 'Numeral Wand' (described on p. 37). (1N3.1)

- Hide various quantities of counters under plastic tubs. Lift the tubs one at a time and ask the students to count and record the number of counters that are hidden under each tub. (1N3.1)

- Provide students with a tub containing a variety of coloured linking cubes. Ask students to sort the cubes by colour and then count and record the number of each. (1N3.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 1 (Continued): Counting to 20
TR: pp. 18 - 21
SB: pp. 16 - 17

Strand: Number

Outcomes

Students will be expected to

1N3 Continued

1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.

[C, CN, V]

Achievement Indicator:

1N3.2 Show that the count of the number of objects in a given set does not change regardless of the order in which the objects are counted.

1N3.3 Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction.

1N4.1 Read given number words to 10.

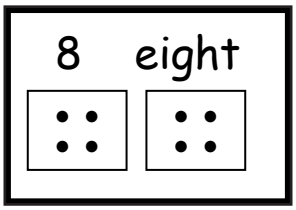
Elaborations—Strategies for Learning and Teaching

The ability to think about a number in terms of its parts is an important milestone in the development of number. It is important not to rush students to work with larger numbers until they are able to deal confidently with smaller numbers. In Kindergarten, students would have explored part-part-whole relationships of numbers to ten. Students need to be confident with number combinations to ten as this work is critical to building a strong mathematical foundation that will serve students in later grades.

To continue to build on the concept of counting, students must have an understanding that the number of objects does not change if they are counted in a different order. Conservation of number, or the understanding that the number of objects does not change when the objects are moved, rearranged, or hidden, is something that occurs with experience and maturity. As students mature cognitively, they begin to realize that the arrangement of items is irrelevant to the total number in the set. It is important to provide students with opportunities to count sets of objects where they realize that they get the same total regardless of the order in which the objects were counted.

Have students count out a number of counters and lay them in a row. Ask, "How many counters do you have?" Then, spread out the counters or change their formation as the students are watching. Ask, "How many are there now?" If students can tell you that there are the same number of counters without recounting, then they are demonstrating conservation of number. If they recount the counters, conservation of number is not evident.

Number words to twenty can be displayed in the classroom, with pictorial and symbolic representations. However, students are not expected to read number words eleven to twenty.



General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Put ten counters on the overhead projector or interactive whiteboard and count them in different orders (left to right, right to left, starting in the middle). Ask the students to predict what the count would be if they counted in a different order. Have them count. (1N3.2)

- Ask students to line up. A student will count how many students are in the line. Have the student count the line again starting at a different place. (1N3.2)

- Ask students to count out fourteen blocks/counters on the table. Rearrange them by moving them around and displaying them in two groups. For example, five in one group and nine in the other. Ask students to identify how many there are altogether. Repeat using different combinations and observe students' method of determining how many in all. Observe whether the students have to re-count the objects or do they recognize that the amount has not changed. (1N3.3)

- Using a mobile projector or interactive whiteboard, display 12 counters. Ask a student to count the number of counters out loud. Rearrange the counters and have the student predict and verify the count. (1N3.3)

- Shuffle a pile of number word cards from zero to ten. Ask students to remove one card from the pile and identify the number that is written on the card. (1N4.1)

- Provide students with counters. Show them a number word card from zero to ten and ask them to read the word on the card and make a corresponding set with their counters (1N4.1)

- Using number word cards (zero to ten) and numeral cards (0-10), have students play a game of memory matching the numeral to the word card. (1N4.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 1 (Continued): Counting to 20
TR: pp. 18 - 21
SB: pp. 16 - 17

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/representing-numbers-to-20.html
- matching numbers and words

Strand: Number

Outcomes

Students will be expected to

1N3 Continued

Achievement Indicators:

1N3.4 Record the number of objects in a given set (up to 100).

Elaborations—Strategies for Learning and Teaching

Numeral symbols have meaning for students only when they are introduced as labels for quantities. Students learn to write numbers as they gain a deeper understanding of number. Opportunities should begin at first by focusing on counting and recording numbers to ten. As students acquire a deeper understanding of number, they should be able to count and record numbers up to 100.

Students need various opportunities to explore the numbers between ten and twenty and to develop a deep understanding of these numbers. The uniqueness of the "teen" numbers must not be overlooked. When dealing with numbers such as 28 or 46, we "hear" the tens number first; that is, we say the "twenty" and the "forty" first. This is not the case with eleven, twelve, or the "teen" numbers. Students need opportunities to investigate these numbers with concrete materials before moving on to pictorial and symbolic representations.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Scavenger Hunt – Ask students to find a given number of items in the classroom. For example, for the number 12, students may find twelve erasers, chairs, blocks, pencils, etc. Ask students to present their findings to the class. (1N3.3)

Pencil and Paper

- Extend the counting activities by having students record the number. (1N3.4)
- Provide pairs of students with paper bags (labelled A, B, C, D) containing different numbers of cubes. Have the students count the objects in each bag and record the number.

Name	Number of Cubes
A	
B	
C	
D	

(1N3.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2: Number Search
TR: pp. 22 - 25
SB: pp. 18 - 19

Audio CD 1:
Selection: 21

Audio CD 2:
Selections: 1, 2, 3

Lesson 3: Number Arrangements
TR: pp. 26 - 29
SB: pp. 20 - 21

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/representing-numbers-to-20.html

- video of counting up to 100
- virtual manipulatives

Strand: Number

Outcomes

Students will be expected to

1N4 Continued

1N2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects, dots or pictures.

[C, CN, ME, V]

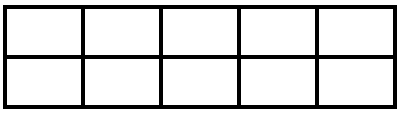
Achievement Indicators:

1N4.2 Represent a given number up to 20, using a variety of manipulatives, including ten-frames and base ten materials.

1N2.1 Identify the number represented by a given arrangement of dots on a ten-frame and describe the number's relationship to 5 and/or 10.

Elaborations—Strategies for Learning and Teaching

A ten-frame is a 2 x 5 array in which dots or counters are placed to illustrate numbers. How students use the ten-frame provides insight into their number concept development. Students would have already been introduced to a five-frame in kindergarten. The ten-frame is simply an extension of the five-frame. E.g.,



Ten-frames focus on the relationship to five and ten as anchors for numbers. Introduce the following rules for showing numbers on a ten-frame:

- only one counter, of the same colour, is permitted in each box of the ten-frame
- always fill the top row first starting from left to right (the same way you read or write)
- when the top row is filled, counters can be placed in the bottom row, also from left to right

Show the class a ten-frame with nine counters and ask how many counters there are. Some possible responses are:

- I saw nine. There are five on the top and four more on the bottom make nine.
- I know there are nine because there is one empty space and one less than ten is nine.
- If it was full, it would be ten. But, there is one empty space, so that makes nine.

Relating numbers to benchmark numbers, specifically five and ten, is a useful tool for thinking about various combinations of numbers. For example, six is the number that is one more than five, or nine is the number that is one less than ten.

- Note: There are different views on the placement of counters on the ten-frame. It is important to consider why ten-frames are used. The main purpose of a ten-frame is to visualize numbers in relation to five and ten, or relate numbers to five and ten as benchmarks. Hence, in Grade One, filling left to right with no empty spaces is strongly recommended so that students start to visualize that when you have three counters, you need two more to make five; it is two away from five; or three and two make five.

General Outcome: Develop number sense

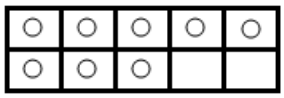
Suggested Assessment Strategies

Performance

- Ten-Frame Flash – Flash ten-frame cards to the class. Ask, "How many counters do you see on this ten-frame? How do you know? How many more will make ten?" Repeat using other numbers. Record the configurations that each student recognizes without counting and those that he/she must count to recognize. (1N2.1)

- Memory – Place matching sets of ten-frame cards face down in an array. Students take turns turning over any two cards to find matches. They identify the amount on each card and if they are the same, they take both cards. Play continues until all matches haven't been found. (1N2.1)

- Tell Me Fast – Provide students with a set of counters. Flash a ten-frame card for approximately three seconds. Have the students take the number of counters they think they would need to cover the dots displayed on the ten-frame. After students have made their sets, place the card in front of one student who should then place his or her counters on the dots, while the other students count and check. Ask the student to explain how they identified the number represented on the ten-frame.

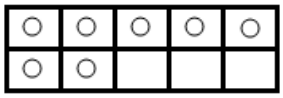


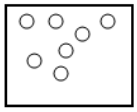
  For the above ten-frame, a student might respond, "I know there are eight because there are five on the top row and three more make eight". The student might also respond, "I know if the frame is full, there are ten but there are two missing so that makes eight". Repeat this activity using other ten-frame cards with different representations of numbers to ten. (1N2.1)

- Ten-Frame Match - using music. Half the students have prepared ten-frames, the other half have numeral cards. Play the music, and when the music stops, have students find their partner matching the ten-frame with the numeral card. (1N4.2)

Interview

- Ask students to explain why it might be easier to count the number of counters on the left than the number on the right.





(1N2.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 4: Terrific Ten
TR: pp. 30 - 33
SB: pp. 22 - 23

In this lesson, students will work with numbers 0 - 10. The focus on numbers 11 - 12 is in Lesson 9.

Audio CD 1:
Selections:17, 18

MMS Teacher Resource, Unit 2, pages 94 and 95, in which ten-frames are displayed showing counters in random places, should be disregarded.

Strand: Number

Outcomes

Students will be expected to

1N7 Identify the number, up to 20, that is one more, two more, one less and two less than a given number.

[C, CN, ME, R, V]

Achievement Indicators:

1N7.1 Name the number that is one more, two more, one less or two less than a given number, up to 20.

Elaborations—Strategies for Learning and Teaching

When simply counting, students do not necessarily reflect on the connection between two numbers. In order to relate numbers such as six and eight, students need to explore the "two more than" and "two less than" relationship and understand that the relationship between six and eight can be described as "six is two less than eight" and "eight is two more than six." Numbers with a difference of one should be similarly explored. Students' initial exploration of numbers that are one more than, one less than, two more than, and two less than should be done concretely using sets of objects.

Dot plates/cards, ten-frames and dominoes are worthwhile tools to use to facilitate development of the concepts of one more/less and two more/less.

Students could use counters to create a set equal in number to a given set. Ask them to change their set to equal a number that is one more/less or two more/less than their current set. For example, "Change your set of eight counters to show ten." Students should explain what they did to create the new set. Observe those who are aware that they have to add two more to make the set of ten and students who wipe away the initial set of eight counters and begin counting from one. To encourage counting on, rather than beginning the count again, ask students how many more counters need to be added to the set of eight to make the set of ten.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Ask students to count out a set of six counters by placing a counter above the numbers one to six on a number line. Ask, "What number would be two more than six?" Repeat using other numbers.

(1N7.1)

- In groups of two to four players, students play "More or Less Bingo."

2	4	••• •••	•• ••	7
•• •••	3	2	•	••• ••
7	5	FREE	• ••	6
•••	•• ••	8	••	•
6	••• •	5	••• •••	4

They take turns rolling a standard die and a spinner labeled with the words one more, one less, two more, and two less. The player covers the number on the game board to correspond with the number rolled and the direction on the spinner. The first player to get a straight line is the winner.

(1N7.1)

- Give each student a number between one and ten to make on their ten-frame. Students make up a riddle about their number using only the language "one more, one less, two more, two less". For example, "My number is two less than ten. What is my number?" This activity could also be done using the number wands (as described on p. 37).

(1N7.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 4 (Continued): Terrific Ten
TR: pp. 30 - 33
SB: pp. 22 - 23

Lesson 12: One and Two More, One and Two Less
TR: pp. 54 - 57
SB: pp. 36 - 37

Note:
This lesson provides extra practice and can be used now or later.

Strand: Number

Outcomes

Students will be expected to

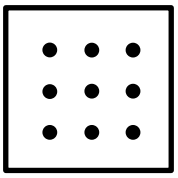
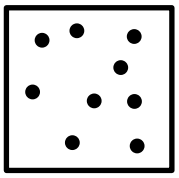
1N2 Continued

Achievement Indicator:

1N2.2 Look briefly at a given familiar arrangement of objects, dots or pictures and identify the number represented without counting.

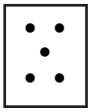
Elaborations—Strategies for Learning and Teaching

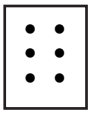
Subitizing is the ability to recognize, without counting, dot arrangements in different patterns. In Kindergarten, students learned to subitize dot arrangements for numbers from one to five. By the end of Grade One, students should be able to subitize dot arrangements up to ten. Students should recognize that there are many ways to arrange a set of objects and that some arrangements are easier to recognize more quickly than others. For example:

 versus 

Recognition of small arrangements of objects helps students understand the process of counting on, composing and decomposing numbers, and that a number can be represented in many ways. Subitizing also encourages reflective thinking while deepening number sense. It will be useful with respect to:

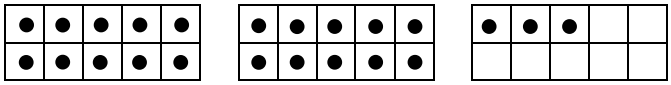
- addition

  5 = 4 + 1 (or 2 + 1 + 2) is apparent from: 

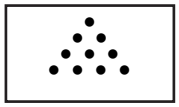
  6 = 3 + 3 (or 2 + 2 + 2) is apparent from: 

- place value

  groups of ten can be easily observed in:



Materials such as dot plates or cards, ten-frames, and number cubes are useful for the development of subitizing configurations of numbers from one to ten.

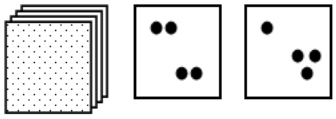
 

General Outcome: Develop number sense

Suggested Assessment Strategies

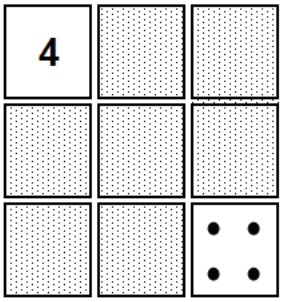
Performance

- Snap – Provide partners with two sets of dot cards in two different colours. Each student gets one set of cards. Play begins with each student flipping over their top card. If they are the same amount, they say "Snap." The student who says "Snap" first gets both cards. Play continues until all cards have been matched.



(1N2.2)

- Concentration - Begin by having students place a selection of dot cards and number cards face down on a table. Students take turns turning over cards to find matching sets. When they find a match, they remove the pair of cards from play.



(1N2.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5: Seeing Numbers
TR: pp. 34 - 35
SB: p. 24

Note:

This lesson should focus on subitizing.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/representing-numbers-to-20.html

- variety of counting activities

Strand: Number

Outcomes

Students will be expected to

1N2 Continued

Achievement Indicator:

1N2.2 (Continued) Look briefly at a given familiar arrangement of objects, dots or pictures and identify the number represented without counting.

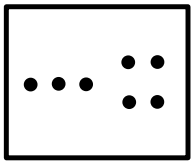
Elaborations—Strategies for Learning and Teaching

At first, students will count the dots or the objects. Eventually, students must be able to recognize the arrangements without counting. To avoid the misconception that an arrangement can only represent a specific quantity if it is arranged in a certain way, it is very important to vary the orientation of the objects, dots, or pictures. When asking students to identify the number of fingers, use different combinations of fingers so that students do not believe that there is only one way to represent the number. The number six can be represented with five fingers on one hand and one on the other, two fingers on one hand and four on the other, three fingers on each hand, etc.

Subitizing should initially focus on arrangements of numbers from one to five and gradually increase for numbers of items up to ten. For most numbers, there are several common arrangements. Configurations can also be made up of two or more easier arrangements of smaller numbers. For example:

This dot configuration shows seven as:

- a set of three and a set of four
- a set of three, a set of two, and a set of two



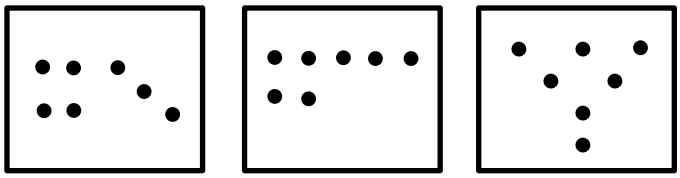
Prepare dot arrangements using stickers on recipe cards or on paper plates to create a variety of arrangements for numbers zero to ten. (For some dot arrangements, see Van de Walle, Teaching Student Centered Mathematics Grade K-3, p. 44.) The use of paper plates and cards provides numerous opportunities for students to "see" various configurations as the plates and cards are rotated. Game materials, such as number cubes and dominoes, could be used for subitizing activities.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide opportunities for students to discover which configurations are easier to recognize. For example, ask students to show seven in several ways, and then decide which configuration(s) is (are) easiest to identify. E.g.,



(1N2.2)

- Attach a string to a wall in the classroom. Provide each student with a numeral card and a random dot card. Ask students to match their cards by pinning them together with a clothespin. Then students should sequence the cards by attaching them to the string.

(1N2.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5 (Continued): Seeing Numbers
TR: pp. 34 - 35
SB: p. 24

Unit Centre: What's My Number?
TR: p. 15

Strand: Number

Outcomes

Students will be expected to

1N3 Demonstrate an understanding of counting by:

- indicating that the last number said identifies "how many"
- showing that any set has only one count
- **using the counting on strategy**
- using parts or equal groups to count sets.

[C, CN, ME, R, V]

Achievement Indicator:

1N3.5 Determine the total number of objects in a given set, starting from a known quantity and counting on.

Elaborations—Strategies for Learning and Teaching

In Kindergarten, students learned how to count on from a given number to a stated number, forwards and backwards, from one to ten. The focus of this outcome in this unit will include all the numbers to twenty.

When counting on, students should say aloud the number they are counting on from while pointing to that group, and then count on from there, pointing to each item as they continue the counting sequence. To use the counting on strategy efficiently, students should be encouraged to begin with the higher number. To count on to find the total of a dot plate of three and a dot plate of two, for example, students point to the plate showing three and say "three." They count on by pointing to each dot on the other plate and saying, "four, five." Students who are not yet counting on will recognize there are three dots on the first dot plate; but will recount those dots (e.g., 1, 2, 3) and then count the other dots (4, 5).

Similarly, ask students to place eight blocks in a straight line across the top of their desk and cover five with one hand. Ask them to count the total number of blocks, beginning with the number hidden and counting on to include the others that are in view. Observe whether students point to the hidden blocks saying, "five" and then point to each block in view and count on, "six, seven, eight." Repeat using different numbers.

Counting on and counting back are fundamental prerequisites for addition and subtraction and the importance of these strategies should not be underestimated.

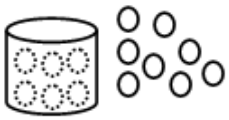
General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- This game is played in pairs and requires a spinner, cup, counters, and recording sheet. The first player spins and places the indicated number of counters in the cup. The second student spins and places that number of counters next to the cup. Together, they decide how many counters in all and record the numerals on the recording sheet.

In	Outside	In all
6	8	14

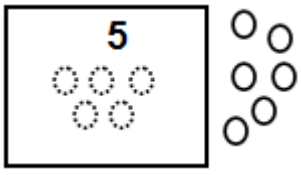


(1N3.5)

- Roll two number cubes (one standard die and one labeled with numerals 10 - 14). Students find the total by starting their count with the numeral on one cube and counting on to determine the total of both cubes. For example, to 'count on' to find the sum of a roll of the numeral 14 on one cube and the dot configuration of three on the other cube, students can say, "14," while pointing to the die showing 14, and then say "15, 16, 17," as they point to each dot on the other cube.

(1N3.5)

- Make two groups of objects. Hide one group under a sheet of paper and write the numeral on the paper for the student to see. Leave the other group exposed. Ask: "How many counters are there altogether?" Because the student cannot see the hidden counters, he/she is forced to count on from the number they see written on the paper covering the hidden counters. For example:



Students may respond to this task by pointing to the paper, saying "5," and then counting on, "6, 7, 8, 9, 10, 11" (1N3.5)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 6: Representing Numbers 10 to 20
TR: pp. 36 - 39
SB: pp. 25 - 27

Strand: Number

Outcomes

Students will be expected to

1N4 Continued

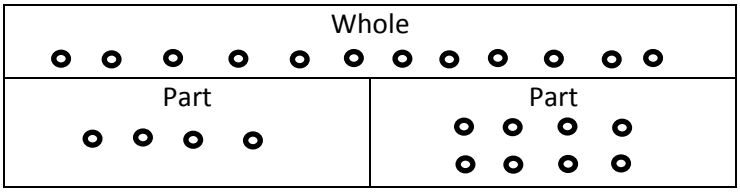
Achievement Indicator:

1N4.3 Partition any given quantity up to 20 into 2 parts, and identify the number of objects in each part.

Elaborations—Strategies for Learning and Teaching

Students' understanding of number combinations to ten should now be extended to numbers to 20. They need many opportunities to explore part-part-whole relationships of numbers to 20.

To assess students' understanding of number combinations, it is important to use hands-on activities whereby they manipulate the materials to break a number into two different parts. For example, provide students with counters and a part-part-whole mat and ask them to show the number 12 broken into two separate parts. One possible combination would be:



Then, ask them to find other ways to partition the number into two parts. Repeat using other numbers up to 20.

Playing "Snap It" also reinforces this concept. This activity can be used as part of your daily routine. To play the game, students sit in a circle with the same number of Unifix™ cubes. Count, "one, two, three," and everyone says, "Snap It!" Students break off some of the Unifix™ cubes and hide them behind their backs. Taking turns, each student shows how many cubes are left in their hand while the other students figure out how many are hidden. For example, if each student has 12 cubes, they may snap it into two parts hiding five behind their back and seven in view. Students then show how they snapped their cubes and verbalize the part-part-whole combination. For example, "I've got seven in my hand, and five hiding behind my back. Now I've got 12."

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide each student with a number of two-sided counters. Ask students to shake the counters in a cup and spill them onto a plate. Have students say the number combinations that make up the whole. E.g.

Students may verbalize "I have three red counters and seven white counters. Three and seven more make ten."

Students may shake and spill the same number of counters again and verbalize the resulting number combinations.

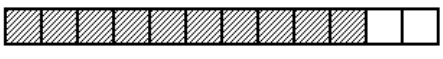
(1N4.3)

- Students should use a part-part-whole mat and counters to represent the following scenarios:
  (i) There are 16 monkeys at the zoo. In their cage, there are two trees. When it rains, the monkeys like to climb up the trees. One day when I visited the zoo, all the monkeys were in the trees. How many monkeys could be in each tree? Are there other answers?
  (ii) In my bowl, I have apples and bananas. There are 14 pieces of fruit altogether. How many apples and bananas do I have? Are there any other answers? (1N4.3)

- What's My Hidden Number? – Provide counters, numeral cards from 0 to 20, and a small container. In pairs, one student selects a numeral card and counts the number of counters to represent the number selected. The other student hides some of the counters under the small container and then asks, "How many do you think are hidden? How do you know?" The partner guesses the number hidden and explains his/her answer. The number hidden is revealed to check the answer. Model this activity with the whole group prior to having students work in small groups.

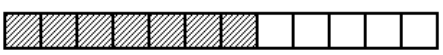
(1N4.3)

- Ask students to use two different colours of snap cubes to build three different cube trains to represent a number up to 20. For example, to represent the number 12, students may build the following trains:



"Ten and two more make twelve."

"Six and six more make twelve"



"Seven and five make twelve`

(1N4.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 6 (Continued): Representing Numbers 10 to 20
TR: pp. 36 - 39
SB: pp. 25 - 27

Lesson 8: Grouping Numbers to 20
TR: pp. 42 - 43
SB: p. 30

Unit Centre: Grouping Madness
TR: p. 15

Strand: Number

Outcomes

Students will be expected to

1N4 Continued

Achievement Indicator:

1N4.2 (Continued) Represent a given number up to 20, using a variety of manipulatives, including ten-frames and base ten materials.

1N4.4 Model a given number, using two different objects; e.g., 10 desks represents the same number as 10 pencils.

Elaborations—Strategies for Learning and Teaching

Physical models, provided through the use of ten-frames, Unifix™ cubes, and later, base ten materials, play a key role in helping students develop the idea of "a ten" as both a single entity and as a set of ten units. Models should be proportional, that is, a ten model should be ten times larger than a model for a one. Students should group materials themselves, as would be the case with popsicle sticks, straws, ten-frames, and Unifix™ cubes. Pre-grouped models, like base-ten blocks, should be used later only when students realize the value of the model. It is not appropriate to discuss place-value concepts at this time (e.g., expecting the students to tell what the "1" in "16" represents). However, making the group of ten is explored when developing number meanings for 11 – 19. For example, using ten as the benchmark, students will see 13 as ten and three more; however, they do not need to understand that the "1" in 13 represents the tens place.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

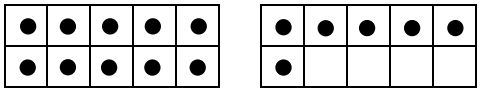
- Number Trains – Provide students with a spinner with numbers 11 to 20, and Unifix™ cubes. Students spin the spinner and count that number of cubes. They link the cubes together to form a train of ten and leave the remaining cubes separate. Observe whether they describe this appropriately (e.g., "ten and three more are thirteen"). (1N4.2)

- Spill It Out! – Provide students with bags of objects, such as lima beans, buttons, or counters, to represent numbers from 11 to 20. Ask students to choose a bag and spill the objects onto their desks. They place one object in each block of their ten-frame and count how many altogether. Observe if they count on from ten or begin counting at one. Have students record the total number. Repeat using other bags of objects with various quantities. (1N3.4, 1N4.2)

- Ten-Frame Counting - Provide each student with a different number (0-20). On a blank ten-frame students will represent their number using a bingo dabber. As a class, place the ten-frames in order from 0-20 and display in the class for future use. (1N4.2)

Observation

- Provide two ten-frames and counters for each student. Ask students to model a number between 11 and 19 with the counters. For example, ask students to model the number 16.



Observe:

(i) Do they make the ten first?

(ii) Are they able to verbalize appropriately saying, "Ten and six are sixteen"?

Next ask them to show 13 on their ten-frame.

Observe:

(i) Do they remove all the counters?

(ii) Do they add to/remove counters on the bottom frame?

(1N4.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 9: Numbers to 20
TR: pp. 44 - 45
SB: p. 31

Strand: Number

Outcomes

Students will be expected to

1N4 Continued

Achievement Indicator:

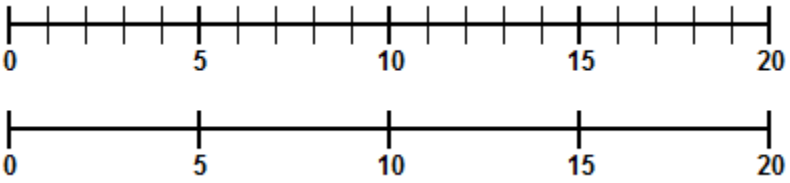
1N4.5 Place given numerals on a number line with benchmarks 0, 5, 10 and 20.

Elaborations—Strategies for Learning and Teaching

It is essential for students to have a strong number sense to prepare them for other outcomes where the relationships of one more than, two more than, one less than, and two less than are explored. Making connections to benchmarks of five and ten (and their multiples) are critical. For example, students need to understand that eleven is ten and one more, 12 is ten and two more, and 16 is ten and six more. A number line is a valuable tool to encourage reference to benchmarks. Using a number line throughout the year helps students develop a stronger understanding of number. At first, start a number line from only zero to five and ask students to place one, two, three, and four on it and explain why they placed the number where they placed it. (e.g., "I placed one there because it is closer to zero than to five"). As students become more confident, increase the numbers on the number line.

Provide students with long strips of paper and different number cards from 1 to 20. Have students work with a partner and place the numbers on the number line. Number lines can range from 0 - 5, 0 - 10, 0 - 20 or even 10 - 20 depending on the students.

Create a walk-on number line with benchmarks 5, 10, 15 and 20. Distribute different numbers to students and ask them to either stand on the number line in place or place the number where it should go. At first, each number should be marked. Then, after students develop confidence placing numbers on the line, it should just have the benchmarks.



1N7 Continued

Achievement Indicator:

1N7.2 Represent a number on a ten-frame that is one more, two more, one less or two less than a given number.

Ask students to show a number between one and ten on their ten-frames. Ask them to add/remove counters to make the number that is one more/less, two more/less. Students must change their ten-frame to show the new number. Use a double ten-frame to explore the numbers from one to twenty.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Use beads in two different colours to create number lines on strings. Alternate colours every five beads. Label the beads at the benchmarks 5, 10, 15, and 20. Call out a number between zero and twenty. Ask students to find the bead corresponding to the number and identify its place in relation to the benchmark number. For example, eight can be seen as three more than five or two less than ten. (1N4.5)

- Number Ladders – The benchmark numbers 5, 10, 15, and 20 are placed across the table, with spaces between each number. In small groups, students take turns selecting a numeral card and placing it on the number ladder, explaining their placement. For example, if a student selects the number 12, he or she might place the card a little above 10 and say, "It goes here because it is two more than ten." Play continues until the ladder is completed will all numbers from zero to twenty placed in correct order on the ladder. (Model this activity with the whole group prior to having students work in small groups). (1N4.5)

- Give each student a number card (the card may have the number word, the numeral, and/or a dot configuration). Ask students with the numbers 5, 10, 15 and 20 to line up in order, spacing themselves out. Have the remaining students place themselves in order according to their number. (1N4.5)

- Clear the Deck – Provide students with a double ten-frame and ask them to use counters to fill their ten-frames to show 20 (some students may need to fill one ten-frame to show 10). Students take turns spinning a spinner with the words one more, two more, one less, and two less, to see whether to add or remove counters. If the player spins a direction that cannot be followed, the player loses a turn. Therefore, to begin the game, students must spin one less or two less as they cannot add one more or two more to their ten-frames. The first player to clear their double ten-frame is the winner. (1N7.2)

Interview

- Record, tape, or pin the benchmark numbers on a section of adding machine tape, sentence strip paper, or a skipping rope. Ask students to place numbers between zero and twenty in the appropriate places on the number line. Ask students to identify where they placed their number and why. For example, "I placed the number twelve three spaces past the number nine because twelve is three more than nine." (1N4.5)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 9 (Continued): Numbers to 20
TR: pp. 44 - 45
SB: p. 31

Strand: Number

Outcomes

Students will be expected to

1N6. Estimate quantities to 20 by using referents.

[C, CN, ME, PS, R, V]

Achievement Indicators:

1N6.1 Estimate a given quantity by comparing it to a given referent (known quantity).

1N6.2 Select an estimate for a given quantity from at least two possible options, and explain the choice.

Elaborations—Strategies for Learning and Teaching

Estimation helps to develop useful benchmarks for thinking about numbers. To develop estimation skills, students should be provided with collections of objects and asked to estimate the size of the group. Referents such as 5, 10, 15, and 20 are useful benchmarks to facilitate the development of estimation skills. For smaller collections, one might be asking whether it is closer to five or ten. For larger collections, one might be asking whether the group is closer to ten or 20. Include situations in which sets have the same number of items but differ in the amount of physical space they cover. The ability to estimate, a key reasoning skill in mathematics, should develop with regular practice over the course of the year, with larger collections being examined later in the year.

Randomly scatter six or eight objects on an overhead projector or interactive whiteboard. Display the objects long enough for students to see the objects but not to count them. Ask:

- Do you think there were more or fewer than ten?
- About how many objects did you see?

Record students' estimates on chart paper. Begin to count the objects together. After counting three or four of the counters, pause counting, and ask if any students would like to revise their estimates and then continue counting. Record the actual number counted. Compare the actual number to the estimates given. Determine which estimates were the most reasonable. Ask students whose estimates were closest to the actual count to share how they arrived at their estimates.

Repeat the overhead activity several times throughout the year using a variety of objects representing quantities up to 20. As well, place the objects in regular and irregular patterns. For example, place seven objects as they would appear on a ten-frame or scattered randomly on the overhead projector/interactive whiteboard screen.

It is important for students to understand what makes a good estimate. All counting activities can be modified to include estimation. Students may estimate how many are in a set prior to finding the actual count. Prepare daily estimation tasks by placing several objects in a jar and having students record their names and estimates. Sometime throughout the day, empty the jar, count the objects, and compare the estimates to the actual number. Be sure to have students share how they arrived at their estimates.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Prepare plastic baggies with varying quantities of objects from one to 20. Show students the collections, one at a time, and ask them to estimate the quantity by relating it to the benchmark of 5, 10, 15, or 20. Count the objects to determine the reasonableness of their estimates. (1N6.1)
- Show students a group of 12 buttons. Ask: "Do you think there are about ten or 20 buttons in the group? Explain your choice." Repeat using different objects and quantities. (1N6.1, 1N6.2)
- Prepare three transparent containers, one with three objects, one with 11 objects and one with 18 objects. The objects and containers must be the same. Provide students with three numeral cards with the numbers 1, 9, and 20. Ask them to match the container with the numeral card that shows the most reasonable estimate and explain their choice. (1N6.2)

Interview

- Provide four or more sets of objects such as a set of interlocking cubes, a set of pompoms, or a set of blocks. Ask students to look at each set separately and ask, "How many interlocking cubes do you think will fit in your hand? Would the number be closer to 5, 10, 15, or 20?" After students have made their estimates, they take a handful of objects from the set and count them. When students have counted, ask: "Did you make a good estimate? Why or why not?" Repeat using other sets of objects. (1N6.1, 1N6.2)
- Place 18 cubes in a container. Show it to students and ask:
  (i) How many cubes do you think are in the container?
  (ii) Do you think there are more than 20 or fewer than 20 cubes?
  Why or why not? A lot more/fewer or just a few more/fewer?
  Have the students count the cubes and then ask, "Are there more cubes or fewer cubes than you predicted?" Repeat using a variety of objects and quantities. (1N6.1, 1N6.2)
- Ask students:
  - If I showed you a set of seven objects, would one be a good estimate? What about 15? Why or why not?
  - If I showed you a set of 18 objects, would 100 be a good estimate? What about 20? Why or why not? (1N6.1, 1N6.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 10: Estimating Quantities
TR: pp. 46 - 49
SB: pp. 32 - 33

Strand: Number

Outcomes

Students will be expected to

1N5 Compare sets containing up to 20 elements, using:

- **referents**
- **one-to-one correspondence**

to solve problems.

[C, CN, ME, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Students should compare the size of sets in many different contexts. Include situations in which:

- the size of the sets are the same
- the size of the sets differ

This will lead to exploring number relationships such as "one more than," "one less than," "two more than," etc. Students should first compare sets that are lined up side by side. They will pair the items. They should also compare sets that are grouped in clusters. They will move the items to match them one-to-one and compare the size of the sets.

It is desirable, at times, that the items in the sets go together naturally (e.g., left glove/right glove), and that at other times the items are unrelated (e.g., desks and pencils). Concrete objects should be used when exploring one-to-one correspondence.

Achievement Indicators:

1N5.1 Build a set equal to a given set that contains up to 20 elements.

1N5.2 Build a set that has more elements than, fewer elements than or as many elements as a given set.

Students should be encouraged to continue to compare amounts to benchmarks such as 5, 10, 15 or 20, so as to get a feel for the relative size of quantities. For example, for smaller collections, is it closer to five or ten? For larger collections, is it closer to ten or 20?

The term "fewer than" is used when describing sets of objects. Later, when numbers are compared, the term "less than" is more appropriate. When talking about sets that have the same number of objects, use the terms "the same number" and "as many as".

The concept of fewer (or less) is often more difficult for students because thinking about what is not there is harder than thinking about what is there. It is easier for students to see the relationships between quantities, and tell how many more or how many fewer, when the difference between the quantities is small.

Provide students with a set of objects and ask them to build a set that has more, a set that has less, and a set that is has the same number as the given set.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide pairs of students with a strip of six to eight mixed-up numbers ranging from zero to 20 (consider beginning with numbers zero to ten if needed). E.g.

6
9
12
14
8
5

Beginning at the top of the strip, one student reads a number and the other student builds it with counters. As each number is read, the builder must change the quantity of objects to reflect the number being read. Both students must identify how many objects need to be added or removed in order to move from one number to the next.

(1N5.1, 1N5.2)

Interview

- Give students a set of interlocking cubes and ask them to build towers using more than, fewer than, or the same as in the directions. For example,
  - Build a tower that is one more than 11.
  - Build a tower that is two fewer than 18.
  - Build a tower that is the same as mine. (1N5.1, 1N5.2)

- Give each student two ten-frames and 20 counters. Have all students show you the number fourteen on the ten-frames, filling from left to right. Ask students what they will do to display the number twelve. Ask: "Will you add or remove counters to the ten-frames?" "Is twelve more or less than fourteen? How do you know?" (1N5.2)

- Show the student a set of objects representing a number between one and 20. Ask the student to build a set that is the same as the given set. Observe if the student uses one-to-one correspondence to build the set. Then, ask him/her to build a set that has more and a set that has fewer. Observe whether the student can manipulate his or her set to demonstrate these concepts. (1N5.1, 1N5.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 11: More, Fewer or the Same?
TR: pp. 50 - 53
SB: pp. 34 - 35

Strand: Number

Outcomes

Students will be expected to

1N5 Continued

Achievement Indicators:

1N5.3 Compare two given sets, using one-to-one correspondence, and describe them, using comparative words such as more, fewer or as many.

1N5.4 Solve a given story problem (pictures and words) that involves the comparison of two quantities.

Elaborations—Strategies for Learning and Teaching

One-to-one correspondence is a very important concept to understand in relationships among numbers, in problem solving, and later in constructing and analyzing graphs. Most students use one-to-one correspondence when comparing sets of concrete objects. Students should be able to create and compare sets, using comparative words, by matching one-to-one.

Label two paper bags, one with "Yes" and one with "No." Ask students a yes or no question such as "Do you like strawberries?" To answer the question, students place a cube in either the "Yes" or the "No" bag. The cubes are then counted and the numbers are compared using the comparative language more, fewer, and as many as. Consider including students from other classes for this activity to compare larger numbers.

Problem solving enables students to make sense of mathematical concepts. Problems should be relevant and there should be multiple paths to arrive at a solution. Students need many opportunities to model and solve a variety of problems involving the comparison of two quantities. Examples of problems include:

- There are 15 students in our class. Nine are girls and six are boys. How many more girls are there than boys? (Students may physically arrange themselves into two groups and then solve the problem).
- Mark blew up ten balloons. Four were red and six were green. How many more balloons does Mark have to blow up to have the same number of red and green balloons? (Students may draw a picture to solve this problem).

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- In pairs, give each student 20 interlocking cubes. They snap their cubes together to form a tower and compare their towers to show that they are the same. Students put their towers behind their back and simultaneously break off part of their tower and place one of the pieces in view. One player spins a spinner, with the words more and fewer. If the spinner lands on more, the student with more cubes in view takes both stacks. If the spinner lands on fewer, the student with fewer cubes in view takes both stacks. Play continues until one player runs out of cubes. (1N5.2, 1N5.3)

- Ask students to record their first and last names and compare the number of letters in his/her first name to the number in his/her last name to see which name has more. (1N5.3)

- Line up seven boys and three girls. Ask: What must be changed to make the number of girls equal to the number of boys? (1N5.3)

- Prepare a set of 30 cards displaying objects up to 20. Shuffle the cards and deal ten to each player. Each player places their cards face down on the table. Players take turns flipping cards from their respective piles. Students compare sets to determine who has the set with fewer. That student earns a counter. Play continues until all cards have been played. The student with the most counters is the winner. (1N5.3)

- In pairs, students take turns spinning a spinner with any combination of numbers to 20. Using interlocking cubes, they build a set that is the same as the number on the spinner. They compare their sets to determine who has more/fewer/same. The student who has more/fewer/same (depending on the rule), earns a counter. The first student to earn ten counters is the winner. (1N5.3)

- Ask students to solve the following problems using pictures, numbers, and words and present their work to the class
  (i) I have 12 stickers in my collection. My friend says she has fewer. How many stickers might my friend have in her collection?
  (ii) There are 15 flowers in the green pot and 18 flowers in the blue pot. Which pot has more (or fewer) flowers? How do you know?
  (iii) Molly has seven toy cars. Jack has five cars. How many more cars does Molly have? (1N5.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 11 (Continued): More, Fewer or the Same?
TR: pp. 50 - 53
SB: pp. 34 - 35

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).

[C, CN, R, V]

Achievement Indicator:

1PR3.1 Construct two equal sets, using the same objects (same shape and mass), and demonstrate their equality of number, using a balance scale.

1PR3.2 Construct two unequal sets, using the same objects (same shape and mass), and demonstrate their inequality of number, using a balance scale.

1PR3.3 Determine if two given concrete sets are equal or unequal, and explain the process used.

Elaborations—Strategies for Learning and Teaching

In everyday life, we sort things by comparison relationships. For example, we may observe that Ron is taller than Mary or that Monica takes more time than Valerie to complete her homework. Relationships also apply to number. We may observe that five is two less than seven or twelve is three more than nine. Many opportunities should be provided to allow students to learn the relationships between numbers to ten and then to twenty.

It is important for students to focus on comparing numbers and learning the language used to describe these relationships. Students should use the vocabulary: more/greater, fewer/less, same as, and equal, and as well as talk about the strategies they use to compare groups.

Balance activities form a basis for understanding equality. Working with balance scale problems, students build the foundation for further study in the area of algebra and solving equations.

Using concrete materials, students can examine how a balance operates like the seesaw in the playground. Place an equal sign between the two arms of the scale. This will help students begin to make the connection between the relationship of the quantities on each side of the scale and the equal sign.

Place six red cubes on one side of a balance scale and four yellow cubes on the other. Ask students to predict how many more cubes they would need to make the scale balance. Students should place blue cubes, one at a time, onto the scale until it balances. They then count the number of cubes on each side, reinforcing the idea that both sides have the same number of cubes by saying, "Both sides are equal." Draw attention to the fact that one side of the balance scale is represented by six red cubes. The other side of the balance scale is represented by four yellow and two blue cubes.

The interpretation of simple bar graphs is another way in which students may demonstrate an understanding of the concepts of equality and inequality. For example, students could indicate the way they come to school by placing a cube on the tower that represents their means of getting to school. By observing the towers, students should determine if the sets are equal or unequal.

When comparing numbers, many students may recognize that five is greater than four, but not automatically realize, that four is less than five. Both sides of the relationship need to be considered when completing the tasks.

Whenever possible, use mathematical language (e.g., "Five is greater than four" and "three is less than five"). Although students will eventually use the greater-than symbol and less-than symbol (e.g., $5 > 4$ or $3 < 5$), it is not required at this grade level.

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

Performance:

- Working in partners, one student puts cubes in a paper bag and places the bag on a balance scale. The partner predicts the number of cubes in the bag. (He/she may change their prediction as the scale begins to balance). The partner then begins to add cubes to the other side of the balance to verify his/her prediction. Once the scale is balanced, ask: How many cubes do you think are in the bag? How do you know? The partners count and compare the number of cubes on both sides.

  (1PR3.1)

- Provide a balance scale and two colours of interlocking cubes separated into two paper bags. Have a student take a handful of cubes from one bag and count and then take another handful of cubes from the second bag and count. The student puts each set on opposite sides of the balance scale. He/she compares the sets and states which one has more cubes and which has fewer cubes (e.g., three is less than six or six is greater than three).

  (1PR3.1, 1PR3.2)

- Provide two colours of Unifix™ cubes in two paper bags, a balance scale, and a spinner labeled more/less. Working in partners, one student takes a handful of cubes from one bag and counts. The other student spins the spinner. If the spinner lands on greater, he/she must make a set greater than their partner. If the spinner lands on less, he/she must make a set that is less than their partner. The sets are placed on the balance scale to confirm the inequality of the two sets.

  (1PR3.1, 1PR3.2)

- Line up students in two unequal groups. The groups could represent the number of boys and the number of girls in the class or the groups could represent two teams. Students from each group line up across from each other, showing one to one correspondence. The group that has students left over is the larger group and the number representing it is the greater number. Give examples where both groups are equal as well. Repeat with different groupings of students.

  (1PR3.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 11 (Continued): More, Fewer or the Same
TR: pp. 50 - 53
SB: pp. 34 - 35

Note:
Indicators 1PR3.1 and 1PR3.2 are not covered by the text.

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Record equalities using the equal symbol (0 to 20).

[C, CN, PS, V]

Achievement Indicator:

1PR4.1 Represent a given equality, using manipulatives or pictures.

Elaborations—Strategies for Learning and Teaching

When students begin the study of equality, it is important for them to see that the equal sign represents a relation, not an operation. It tells us that the quantity on the left is the same as the quantity on the right. Students should see the symbol as a way of communicating what they know about the relationship. Using the words "is the same as" for the equal sign will help them further understand this relation.

Students should be provided with task cards showing pictures of given equalities using the equal sign. They should use a variety of manipulatives to represent equalities by making sets.

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

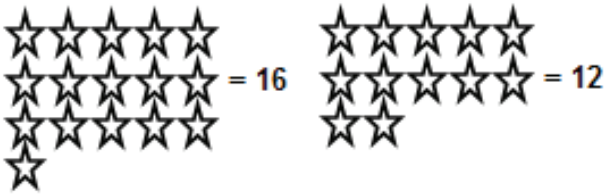
Paper and Pencil

- Students write the letters of their name, one letter in a square on a grid. Students compare the number of letters in their names to determine which has more or less. Ask:
  (i) Who in your group has the greater/most number of letters in their name?
  (ii) Does anyone in your group have the same/equal number of letters in their name(s) as in your name? How do you know?
  (iii) Who in your group has the least/fewest number of letters in their name? How do you know? (1PR3.3)

Performance

- Provide students with two bags of counters and ask them to determine if the sets are equal or unequal and to explain how they know.
  (1PR3.3)

- Prepare two sets of cards, one set containing numerals 11-20, the other set displaying pictures of 11-20 objects. Students are given a numeral or picture card and are asked to find a partner with the corresponding card. In their math journals, students will record the equalities using the equal sign.



(1PR4.1)

Resources/Notes

Authorized Resource

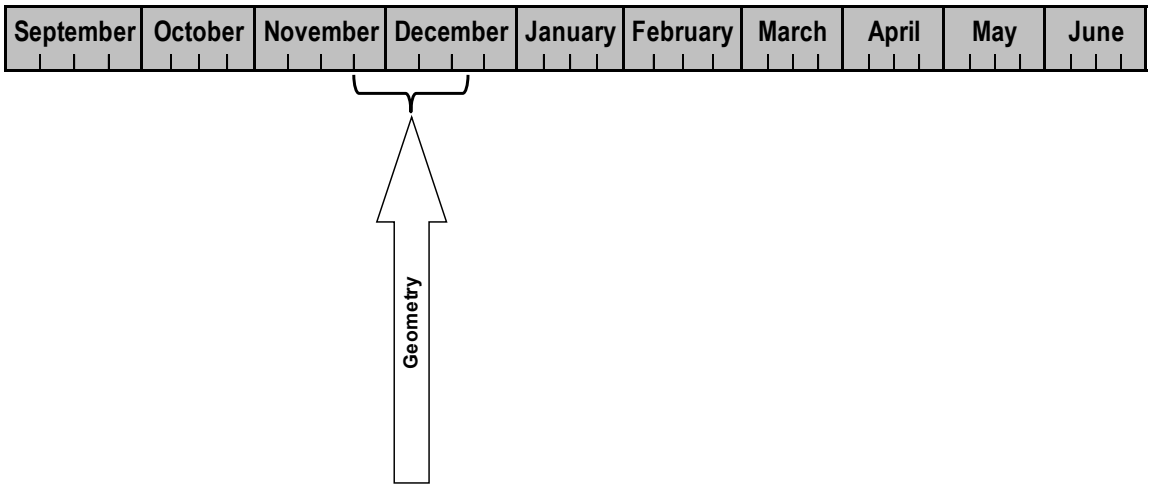
Math Makes Sense 1

Lesson 11 (Continued): More, Fewer or the Same
TR: pp. 50 - 53
SB: pp. 34 - 35

Unit Centre: Dare to Compare
TR: p. 15

Geometry

Suggested Time: 3½ Weeks

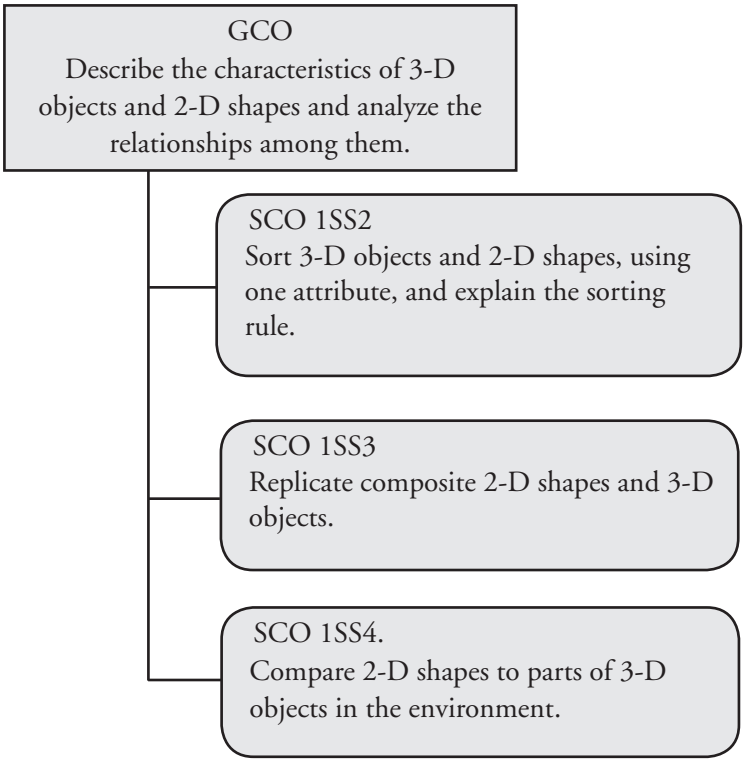


Unit Overview

Focus and Context

This unit provides students with experiences sorting, comparing, describing, constructing and representing 2-D shapes and 3-D objects. In Kindergarten, students sorted, built and described 3-D objects. In Grade One, students will continue working with 3-D objects and will be formally introduced to 2-D shapes. The focus is on sorting and comparing 2-D shapes and 3-D objects using one attribute, rather than on naming the shapes and objects.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Shape and Space (3-D Objects and 2-D Shapes)		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
KSS2. Sort 3-D objects, using a single attribute and explain the sorting rule. [C, CN, PS, R, V] KSS3. Build and describe 3-D objects. [CN, PS, V]	1SS2. Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule. [C, CN, R, V] 1SS3. Replicate composite 2-D shapes and 3-D objects. [CN, PS, V] 1SS4. Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]	2SS6. Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule. [C, CN, R, V] 2SS7. Describe, compare and construct 3-D objects, including: • cubes • spheres • cones • cylinders • pyramids. [C, CN, R, V] 2SS8. Describe, compare and construct 2-D shapes, including: • triangles • squares • rectangles • circles. [C, CN, R, V] 2SS9. Identify 2-D shapes as parts of 3-D objects in the environment. [C, CN, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

1SS2 Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule.
[C, CN, R, V]

Elaborations—Strategies for Learning and Teaching

In Kindergarten, the focus of teaching and learning was on sorting and comparing 3-D objects using one attribute (i.e., can all roll, can all slide, all look like a box) rather than on naming shapes and objects. Students may have been informally exposed to terms such as circle, square, triangle, rectangle, cube, cylinder, cone and sphere. In Grade One, students will be expected to sort objects and shapes by comparing the numbers of edges, faces, and vertices.

Activities selected in geometry should provide students with the opportunity to explore. They need to see and feel, to build and take apart, to sort and identify their rule(s), and to share their observations with their classmates. It is through such activities that students will become familiar with the names of 2-D shapes and 3-D objects, and begin to recognize their attributes. It is very important to encourage students to use accurate language when describing shapes.

Achievement Indicators:

1SS2.1 Sort a set of familiar 3-D objects or 2-D shapes, using a given sorting rule.

1SS2.2 Sort a set of familiar 3-D objects using a single attribute, determined by the student, and explain the sorting rule.

1SS2.3 Sort a set of 2-D shapes using a single attribute, determined by the student, and explain the sorting rule.

Students should explore the following attributes of 2-D shapes:

- the number of sides (edges)
- the number of corners (vertices)

For 3-D objects they should explore:

- the number of edges
- the number of vertices
- the number of faces
- Will it roll? Stack? Slide?

With this knowledge, students should sort a set of objects or shapes using a given sorting rule.

Before expecting students to generate their own sorting rule(s), it is important to guide explorations about sets of 3-D objects and 2-D shapes by asking questions such as:

- How are these objects/shapes alike?
- How are these objects/shapes different?
- How many faces/vertices/edges does this object have?
- What would happen if I tried to stack this object on top of another object just like it?
- Can you find another example of this type of geometric solid/shape in our classroom?

When objects have been explored, ask: "How can we sort these objects?" It is important to allow students to use their own ideas and understanding of 3-D objects and 2-D shapes to generate their own sorting rules.

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes and analyze the relationships among them

Suggested Assessment Strategies

Performance

- Seat students in a circle and distribute familiar 3-D objects such as a water bottle, soup can, small box, tennis ball, etc. Using two hula hoops, placed side by side, ask students to sort their objects based on a given rule. Students take turns placing their 3-D object in the hula hoop that matches its sorting rule. Possible sorting rules include:
  - Stack or does not stack?
  - Roll or does not roll?
  - Slide or does not slide?
  - Edges or no edges?
  - Square faces or no square faces? (1SS2.1)

- Provide students with a set of familiar 3-D objects to sort based on a single attribute. Ask the students to explain their sorting rule to the class. (1SS2.2)

- Seat students in a circle and distribute familiar 2-D shapes. Using two hula hoops, placed side by side, ask students to sort their objects based on a given rule. Students take turns placing their 2-D shape in the hula hoop that matches its sorting rule. Possible sorting rules include:
  - number of sides
  - number of corners
  - curved lines / straight lines
  - colour
  - size

  Ask them to explain the sorting rule.

  (1SS2.1, 1SS2.3)

- Invite students to build 2-D shapes and 3-D objects using pretzel sticks (sides) and mini marshmallows (vertices). Sort the shapes and objects made and discuss the sorting rules used.

  (1SS2.2, 1SS2.3)

- Have students play "What's My Shape?" or "Which Solid Am I?" Make headbands from strips of construction paper and attach a picture of a shape/solid without the student knowing which picture it is. The students must ask yes/no questions to determine which shape is on their headband.

  (1SS2.1, 1SS2.2, 1SS2.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Launch
Teacher Resource (TR): p. 13
Student Book (SB): pp. 139 - 141

Lesson 1: Sorting 3-D Objects
TR: pp. 14 - 15
SB: pp. 142 - 143

Lesson 3: Sorting 2-D Shapes
TR: pp. 20 - 23
SB: pp. 146 - 148

Unit Centres: Sort and Match
TR: p. 11

Note:
Indicator 1SS2.1 is not directly covered in resource. You may wish to add tasks from other resources.

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/geometry.html
- variety of geometry activities

Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

1SS2 Continued
1SS3 Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V]

Elaborations—Strategies for Learning and Teaching

Students need ample opportunity to recognize and discuss the sorting rule for two pre-sorted sets of familiar 2-D shapes. During circle time or whole group activities, sort 2-D shapes while students observe. Have them predict where each object would be placed, explaining the possible sorting rules used. Free play, with 2-D shapes and 3-D objects, provides students with opportunities to explore the attributes of shapes, and how they can be used make other shapes. Pattern blocks, attribute blocks, geometric solids and tangram pieces are useful tools with which students can explore these relationships.

Achievement Indicators:

1SS2.4 Determine the difference between two pre-sorted sets of familiar 3-D objects or 2-D shapes, and explain a possible sorting rule used to sort them.

1SS3.1 Select 2-D shapes from a set to reproduce a composite 2-D shape.

1SS3.2 Select 3-D objects from a set to reproduce a composite 3-D object.

1SS3.3 Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.

1SS3.4 Predict and select the 3-D objects used to produce a composite 3-D object, and verify by deconstructing the composite object.

Students should develop the ability to replicate composite 2-D shapes and 3-D objects. It is through such replication that students become familiar with the attributes of various 2-D shapes and 3-D objects.

Students will use their knowledge of the properties of 2-D shapes and 3-D objects to predict and select which shapes are necessary to produce a composite shape/object. To verify their predictions and selections, they will then deconstruct the original composite shape/object and compare that set of pieces to the set they predicted they would need. Students need to be aware that sometimes a shape or object can be constructed in more than one way (e.g., using a single square or using two right triangles to form a square). Therefore, depending on the composite task presented, there may be more than one way to predict and select shapes and objects to use in its construction.

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes and analyze the relationships among them

Suggested Assessment Strategies

Performance

- Set up a barrier for pairs of students. One student will use geometric solids to create a composite 3-D object. When completed, remove the barrier, and ask the partner to replicate the object.

  (1SS3.2, 1SS3.4)

- Provide sets of shapes that have been sorted into two groups. Ask students to explain the sorting rule used.

  (1SS2.4)

- Use pattern blocks, pieces of construction paper or felt to make an animal, such as a cat. Show this design to the students and ask them to use a set of the same material to replicate the design.

  (1SS3.1, 1SS3.2)

- Provide students with a tangram puzzle (with only an outside outline) and ask them to predict and select the tangram pieces required to replicate the shape. Students may then replicate the shape to verify their predictions. Pattern blocks may also be used for this activity.

  (1SS3.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2: Replicating Composite Objects
TR: pp. 16 - 19
SB: pp. 144 - 145

Unit Centres: Build This!
TR: p. 11

Lesson 5: Replicating Composite Shapes
TR: pp. 26 - 30
SB: pp. 151 - 152

Unit Centres: Shape Patterns and Pictures
TR: p. 11

Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

1SS4 Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V]

Achievement Indicators:

1SS4.1 Identify 3-D objects (cylinder, cone, cube, sphere) in the environment that have parts similar to a 2-D shape (circle, triangle, square, rectangle).

Elaborations—Strategies for Learning and Teaching

Students should recognize 2-D shapes and 3-D objects in their environment. These real-world associations are most important in the development of geometric concepts. Students should become familiar with the 2-D shapes that are the faces of 3-D objects. They should learn to describe 3-D objects in relation to the shape of its faces.

Prior to identifying 3-D objects in the environment, students need many opportunities to explore the properties of 3-D objects. Explorations may include tracing the faces of the solids, or pressing the faces in plasticine to identify the 2-D shapes.

Take students for a "Shape Hunt" around the school or the playground looking for 2-D shapes in 3-D objects. For example, the door to the classroom has a rectangular shape, the trash can has a circular face, etc. Some students may need to move or touch the objects to determine the 2-D shapes. As students become more familiar with finding 2-D shapes in 3-D objects, they may use magazines, flyers, or catalogues to identify 3-D objects that have parts similar to a 2-D shape.

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes and analyze the relationships among them

Suggested Assessment Strategies

Performance

- Give students a target shape and have them find others in the environment that are alike in some way. Discuss strategies that could be used to help solve this problem.

(1SS4.1)

- Provide students with a set of paper 2-D shapes and have them circulate in the classroom, or another environment, to find parts of 3-D objects. Students may record their findings in their Math journal. E.g.,

Shape I Looked For	Things I Found
○	
△	
□	

(1SS4.1)

- Before going to lunch, ask students to look at their recess snack or in their lunch boxes to find 2-D shapes in 3-D objects. For example, a sandwich container has a square face, a yogurt container has a circular face, and a juice box has a rectangular face. Ask students to choose one object and name the 2-D shape(s).

(1SS4.1)

- Ask students to use as many 2-D shapes as they can to create a seasonal piece of art, e.g., a Christmas tree with decorations, a winter or spring scene, etc.

(1SS4.1)

Resources/Notes

Authorized Resource

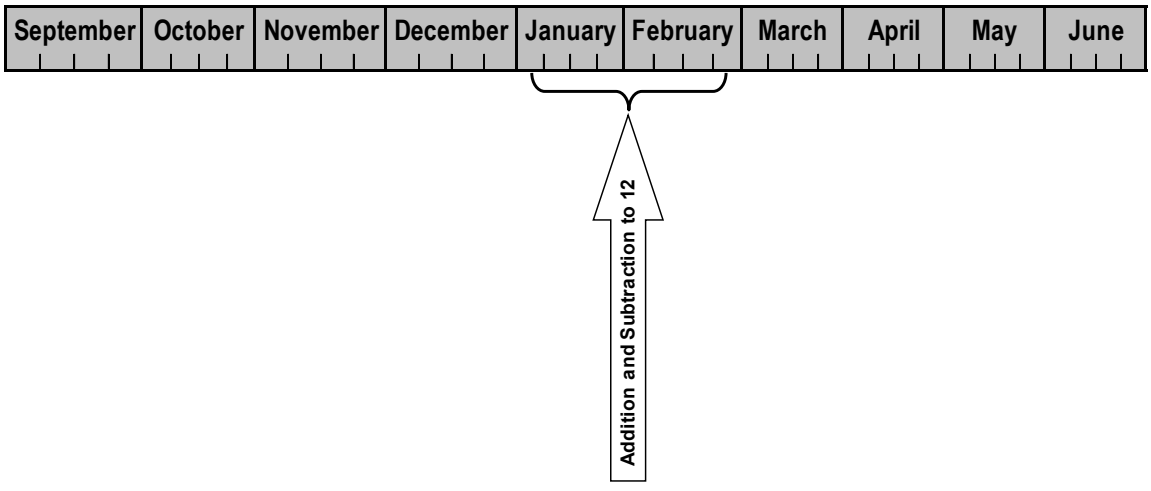
Math Makes Sense 1

Lesson 6: Comparing 3-D Objects and 2-D Shapes
TR: pp. 31 - 34
SB: pp. 153 - 154

Unit Centres: Sand Prints
TR: p. 11

Addition and Subtraction to 12

Suggested Time: 6 Weeks

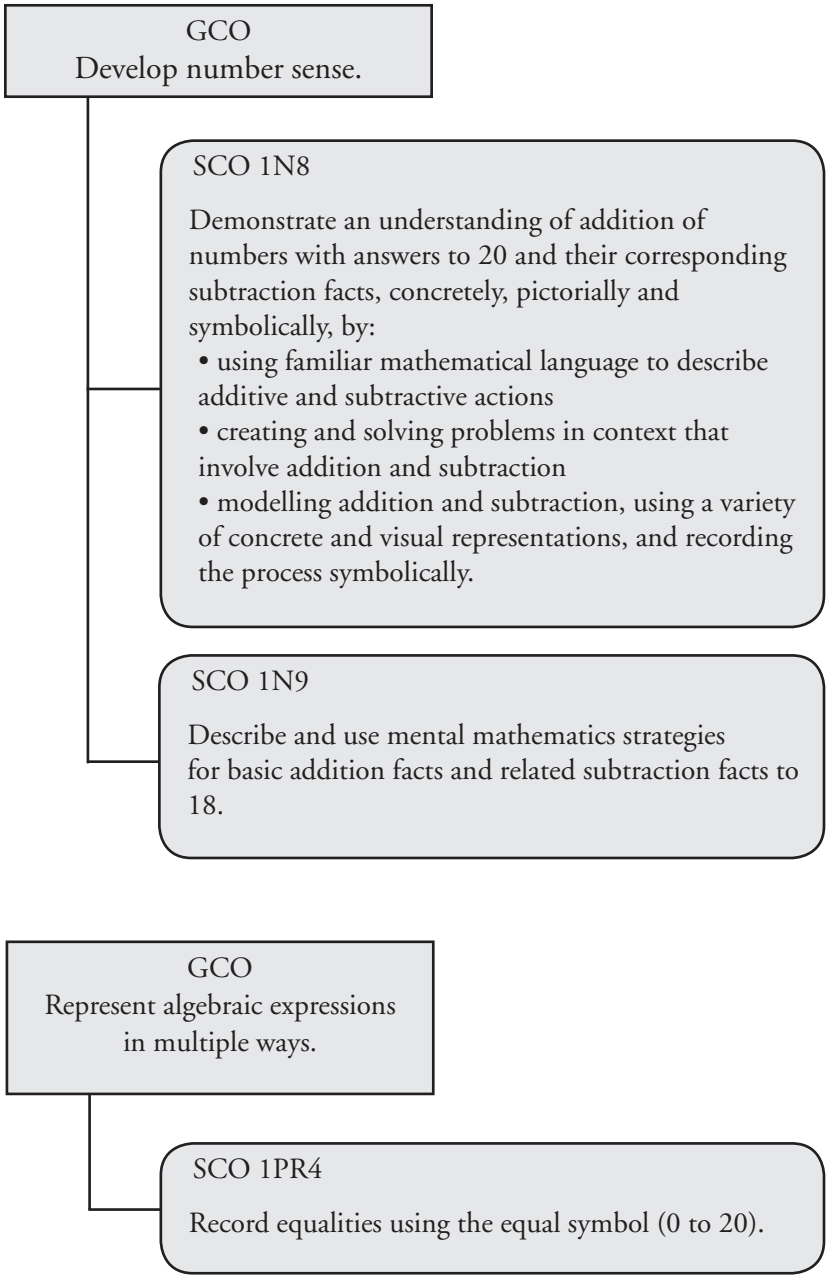


Unit Overview

Focus and Context

In Grade One, students will have many opportunities to develop a strong sense of numbers to 20. As they develop number sense, students simultaneously build their understanding of the operations for addition and subtraction. This occurs naturally as students count and compare numbers in everyday situations. The focus of this unit is to provide meaningful learning so students will be able to see the connection between the process of addition and subtraction and the world they live in. They will have opportunities to act out problems and use a variety of manipulatives to develop an understanding of these processes of addition and subtraction. Both mathematical language and everyday language should be used when presenting problems to students. As they think about number problems involving addition and subtraction, students devise personal strategies to compute. Through activities, discussion, and explanation, students will refine their strategies for addition and subtraction and deepen their understanding of number operations. It is with this understanding that students are then introduced to the symbols used to represent the processes. Symbolic tasks should not be presented in isolation, nor should they be emphasized until after the addition and subtraction processes have been modeled using real life problem solving. Students must be given sufficient time and opportunity to internalize the concepts. The equal sign will be introduced using a balance scale and the symbol must be thought of as a relationship, not an operation. In this unit, students will work with numbers to 12, laying the foundation for future work in the unit Addition and Subtraction to 20.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	Specific Outcomes	Specific Outcomes
	1N8. Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by: • using familiar mathematical language to describe additive and subtractive actions • creating and solving problems in context that involve addition and subtraction • modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically. [C, CN, ME, PS, R, V]	2N8. Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number. [C, R] 2N9. Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by: • using personal strategies for adding and subtracting with and without the support of manipulatives • creating and solving problems that involve addition and subtraction • using the commutative property of addition (the order in which numbers are added does not affect the sum) • using the associative property of addition (grouping a set of numbers in different ways does not affect the sum) • explaining that the order in which numbers are subtracted may affect the difference. [C, CN, ME, PS, R, V]

SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
	1N9. Describe and use mental mathematics strategies for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]	2N10. Apply mental mathematics strategies for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]

Kindergarten	Grade 1	Grade 2
Strand: Patterns and Relations (Variables and Equations)		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
	1PR4. Record equalities using the equal symbol (0 to 20). [C, CN, PS, V]	2PR4. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number

Outcomes

Students will be expected to

1N8 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:

- **using familiar mathematical language to describe additive and subtractive actions**
- **creating and solving problems in context that involve addition and subtraction**
- **modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.**

[C, CN, ME, PS, R, V]

Achievement Indicators:

1N8.1 Act out a given problem presented orally or through shared reading.

1N8.2 Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.

Elaborations—Strategies for Learning and Teaching

Students should have a good understanding of number (1N3, 1N4) before beginning Addition and Subtraction to 12.

As with many early concepts, the development of the meaning of addition cannot be rushed. It is desirable to explore adding situations in meaningful contexts. Experiences should be provided in which students use a variety of concrete materials to model addition situations prior to recording the process symbolically.

Students require experience interpreting how addition situations are portrayed in print. Include examples of:

- Active situations which involve the physical joining of sets.

E.g., I had four pencils and my teacher gave me three more. How many do I have now?

- Static situations which involve the implied joining of sets that are not physically joined to form a whole.

E.g., There are four cars parked on one side of the road and three cars parked on the other side of the road. Altogether, how many cars are parked on the road?

Working with number combinations to ten is critical for students in building a strong foundation for working with larger numbers. Begin working with number combinations to six. Teachers should not move on to numbers from seven to ten until students have a strong understanding of numbers to six. A good indicator that a student is ready to work with larger numbers, is when he or she can confidently break up a number to ten and put the parts together again,

Remember that memorizing basic math facts is very different from internalizing number combinations. The important achievement of this stage is for students to understand the concept of combination.

In joining problems there are three quantities involved: an initial amount, a change amount (the part being added or joined), and the resulting amount (the amount after the action is over). This generates three types of joining problems where either the result, change or initial is unknown. It is important to give equal opportunities for students to explore all three types of joining problems.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Present addition stories. Ask students to act out the story, representing it concretely, pictorially and/or symbolically. The following examples may be used:

  Joining Problems

  (i) Result Unknown - Sarah placed four pencils on the table. Stephen placed three more pencils on the table. How many pencils are on the table altogether?

  (ii) Change Unknown – Sarah placed four pencils on the table. Stephen placed some pencils on the table. There are seven pencils altogether. How many pencils did Stephen place on the table?

  (iii) Initial Unknown - Sarah placed some pencils on the table and Stephen placed three more. There are seven pencils altogether. How many pencils did Sarah place on the table? (1N8.1, 1N8.2, 1N8.6)

- Use a floor size ten-frame to reinforce addition and subtraction stories. Use blocks, markers, or students in the frame.

  (1N8.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Launch
Teacher Resource (TR): p. 15
Student Book (SB): pp. 59 - 61
Consider reviewing Representing Numbers to 20 (Lesson 6) TR pp. 36 - 39

Lesson 1: Different Combinations of a Number
TR: pp. 16 - 20
SB: pp. 62 - 63

Lesson 2: Addition Stories
TR: pp. 21 - 25
SB: pp. 64 - 67

Unit Centres: Shake the Counters
TR: p. 13

Audio CD 2:
Selections: 6, 8, 9

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/addition-and-subtraction-to-12.html
- variety of addition and subtraction activities

Strand: Number

Outcomes

Students will be expected to

1N8 Continued

Achievement Indicators:

1N8.2 (Continued) Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.

1N8.3 Create an addition problem based on personal experiences, and simulate the action with counters.

1N8.4 Create a word problem for a given addition or subtraction number sentence (equation).

Elaborations—Strategies for Learning and Teaching

Students need experiences where they model number stories. They can take a number addition fact (3 + 7) and be asked to "develop the script" and then act out the story. At this time, students are not required to use words to record the story.

By applying their own experiences to the numbers, they will create many different scripts. Students tend to create word problems where the result or the difference is unknown. Encourage the creation of joining and separating problems with the result, change or initial unknown, and compare problems with the difference, larger or smaller number unknown.

Students need many opportunities to make connections between personal experiences and the symbols they represent. The class attendance can be used to reinforce addition and subtraction. Also, morning routines and discussing the temperature can add to the daily incorporation of addition and later subtraction based in real-life contexts.

When recording addition number sentences, the use of both horizontal and vertical representations should be encouraged to familiarize students with both methods. Models should continue to be used as long as students find them helpful. When students are ready to use addition symbols, they can be introduced in the context of solving story problems. When students become comfortable recording addition sentences, it is important that they make connections between the equations and the stories they represent. At this stage, students not only model and symbolize word problems but should have practice providing a number story when a model and/or the equations are provided.

When explaining the symbols for addition, it is important that the addition sign be referred to more as "and" rather than "plus". This is to emphasize a combining of, or joining of, quantities using a word with which they are already familiar. The equality sign should be referred to as "equals" or "is the same as". Students need to realize that the equal sign represents a balance between both sides of the equation.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Ask students to create their own story problems for addition and demonstrate the additive action with counters. Incorporate the use of manipulatives, such as dominoes and dice, to generate numbers for story problems. (1N8.3, 1N8.4)

- Bean Bag Addition - Draw a line down the center of a plastic sandwich bag. Provide students with number cards for numerals 2 to 12, 12 beans (or another manipulative) and blank pieces of paper. A student chooses a number card and places that number of beans into the bag and then seals the bag. The student moves the beans to either side of the line to create a number combination, and records that number sentence on the paper. The student continues to manipulate the beans until he/she generates as many number sentences as they can. (1N8.2)

- Double Dice - Ask students to roll two dice and create a word problem to match the two numbers shown. They can develop a subtraction or addition problem. (Dominoes can be used instead of dice.) (1N8.4)

- Ask students to use the interactive whiteboard, mobile projector, whiteboard, Ipad™, felt board, document camera, counters, etc., to create story problems for a variety of addition and subtraction number sentences. (1N8.4)

- Place a variety of number sentences in a bag and invite a student to choose one. He/she must tell a story (word problem) for that number sentence. (1N8.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2 (Continued): Addition Stories
TR: pp. 21 - 25
SB: pp. 64 - 67

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Record equalities using the equal symbol (0 to 20).

[C, CN, PS, V]

Achievement Indicators:

1PR4.1 Represent a given equality, using manipulatives or pictures.

1PR4.2 Represent a given pictorial or concrete equality in symbolic form.

Elaborations—Strategies for Learning and Teaching

When students begin the study of equality, it is important for them to see that the equal sign represents a relation, not an operation. It tells us that the quantity on the left is the same as the quantity on the right. Students should see the symbol as a way of communicating what they know about the relationship. Using the words "is the same as" for the equal sign will help them further understand this relation.

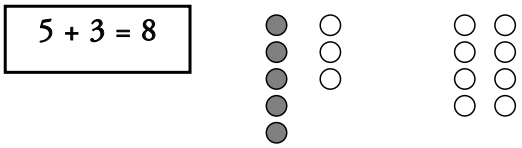
Provide students with task cards showing given equalities using the equal sign. Examples of task cards at various levels of complexity include:

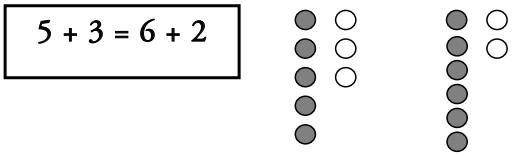
8 = 8

5 + 3 = 8

5 + 3 = 6 + 2

Students should use a variety of manipulatives to represent the equality by making sets to show each side of the equal symbol. For example:





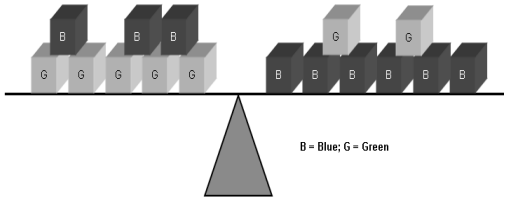
As students develop confidence with this concept, they may move on to represent the equalities using pictures of familiar objects or shapes.

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

Performance

- Show students a balance scale with an equal number of snap cubes on each side. The snap cubes may be of two colours to represent parts of a number on either side of the balance.



Students should represent the following equations using two colours of snap cubes:

- 8 = 8
- 8 = 5 + 3
- 5 + 3 = 8
- 5 + 3 = 2 + 6 (1PR4.2)

- Show the students two number trains: one train with six red and one green and the other with four red and three green.

Students should represent the trains in symbolic form: e.g.,

R	R	R	R	R	R	G

R	R	R	R	G	G	G

or 6 + 1 = 4 + 3

or 6 + 1 = 7

or 7 = 4 + 3 (1PR4.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2 (Continued): Addition Stories
TR: pp. 21 - 25
SB: pp. 64 - 67

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Continued

Achievement Indicators:

1PR4.3 Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).

1PR4.4 Record different representations of the same quantity (0 to 20) as equalities.

Elaborations—Strategies for Learning and Teaching

Introducing the recording of number combinations should be done in three stages. In the first stage, teachers should model the recording of the number combinations where the sum is on either the left or right side of the equal sign. In the second stage, students should record the number combinations by copying what the teacher has written. In the final stage, students record the number combinations independently. Students should be encouraged to read number sentences from left to right.

Students should be exposed to various ways of writing addition, and later subtraction, sentences. Both "towers" and "trains" should be used.

- Towers:

$$\begin{array}{r} 2 \\ +\,3 \\ \hline 5 \end{array} \qquad \begin{array}{r} 6 \\ -\,4 \\ \hline 2 \end{array}$$

- Trains:

$$2 + 3 = 5$$
$$6 = 4 + 2$$
$$8 - 1 = 7$$
$$1 = 4 - 3$$

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

Performance

- Students sit in a circle. Each student is given a train of the specified number (e.g., six) of cubes of one colour. On the signal, "break it", students will break their train into two parts and hold one part in each hand behind their back. Students may choose not to break their train apart and keep the train in one hand to represent the combination using zero. Going around the circle, each student takes a turn showing first what is in one hand and then what is in the other. The other students say the number combination shown. (e.g., four and two, five and one …) When everyone has had a turn, repeat the activity several times modeling the recording of the equation. (1PR4.4)

Paper and Pencil

- Provide students with snap cubes and number-train outlines for a specified number. Students snap together as many different combinations of cubes of two colours for the specified number. They record their work by colouring the individual outlines cut from the sheet to match the number- trains they have created. The outlines are stapled together as a book and students write an equation for each combination. (1PR4.4)

- Provide students with a number train that represents seven. The number train could be three red cubes and four blue cubes. Ask students to represent the number train using numbers and addition. Sample answers may look like this:

  $4 + 3 = 7$ or $7 = 4 + 3$

  Ensure that students learn to read number sentences from left to right. (1PR4.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2 (Continued): Addition Stories
TR: pp. 21 - 25
SB: pp. 64 - 67

Note:
1PR4.3 is not covered in *Math Makes Sense 1*.

Unit Centres: Addition Stories
TR: p. 13

Strand: Number

Outcomes

Students will be expected to

1N9 Describe and use mental mathematics strategies for basic addition facts and related subtraction facts to 18.

[C, CN, ME, PS, R, V]

Achievement Indicators:

1N9.1 Use and describe a mental mathematics strategy for determining a given sum.

1N9.2 Use and describe a mental mathematics strategy for determining a given difference.

1N9.3 Use and describe mental mathematics strategies, such as:

- *counting on and counting back*
- *making 10*
- *using doubles*
- *thinking addition for subtraction.*

1N9.4 Refine mental mathematics strategies to increase their efficiency.

Elaborations—Strategies for Learning and Teaching

By the end of Grade One, students should:

- ***understand and apply strategies for addition facts up to and including 9 + 9 and related subtraction facts***
- ***recall addition facts to a sum of 5 and related subtraction facts.***

Students are expected to master their number facts. Mastery occurs when they both understand and recall number facts. Recall of number facts is when students commit them to memory and retrieve them when needed. Students who simply recall facts without understanding have not achieved mastery. Similarly, students who understand the facts but are unable to recall them have not achieved mastery.

Students should be encouraged to use the relationships between facts to learn new facts, rather than counting to compute sums or differences. For example, if students want to add 4 + 3 and know that 3 + 3 = 6, they might think that 4 + 3 is one more than 3 + 3, so it must be 7.

Students will construct number relationships by making connections with prior knowledge. These relationships will lead to the development of patterns that students will be able to access to recall number facts. If the focus is on rote practicing without ensuring that students understand the process, they often forget or incorrectly remember computational methods.

Addition Strategy	Explanation and Example
Counting on	This strategy is used for adding one or two to a given number. 7 + 2 = __ think 7... 8, 9.
Making ten	When presented with a more difficult equation, 8 + 4 = __ , think 8 + 2 is 10 and 2 more is 12.
Using doubles	Add two of the same number together 5 + 5 = 10.

Subtraction Strategy	Explanation and Example
Counting on	Start with the number you are subtracting and count on to the other number: 11 - 8 __ think 8... 9, 10, 11. The answer would be 3 because we counted 3 numbers.
Counting back	Start with the minuend (larger number) and count back: 8 - 2 think 8... 7, 6. The answer is 6.
Using doubles	We have 12 - 6 = __ . Think 6 + 6.
Thinking addition to subtract	We see 7 - 5 = __ . Think of the related addition fact 5 + 2 = 7 so 7 - 5 = 2.

General Outcome: Develop number sense

Suggested Assessment Strategies

Interview

- Provide students with addition sentences and ask them to explain the strategy they used to find the given sum.

  Observe whether the student:
  - begins counting at one
  - counts on from the larger or smaller number
  - can communicate the strategy used
  - can solve any of the problems without needing to figure them out (e.g., using doubles, one more, sum to 5)
  - is confident in his/her answer (1N9.1, 1N9.2)

Performance

- Simon Says – Play the game Simon Says, giving directions that involve using strategies to solve a mathematical equation. Examples include: Simon says:
  - o Do seven and four jumping jacks
  - o Do seven and two and one bunny hops
  - o Do five and three toe touches

  Students solve the additive action mentally, explain the strategy they used, and complete the action. (1N9.1, 1N9.2, 1N9.3)

- Give students a bag with eight counters and have them remove some of the counters. Ask: "How many are still in the bag? How do you know?" Repeat using other numbers. (1N9.1, 1N9.2, 1N9.3)

- Think About It! – Provide students with a number of scenarios in which they visualize the action that is taking place and mentally solve each problem. For example: If I put five counters in the bag and then add three more, how many counters would be in the bag? How do you know? (1N9.1, 1N9.2, 1N9.3)

- Ask students to make a "Doubles Poster" featuring facts as 1+1, 2+2, 3+3, etc. These posters can be shared with the class and displayed. (1N9.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 3: Using Doubles to Add
TR: pp. 26 - 29
SB: pp. 68 - 70

Note:
Math Makes Sense 1 focuses on the strategy of using doubles. Attention needs to be given to all the strategies.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/addition-and-subtraction-to-12.html
- songs about addition and subtraction

Strand: Number

Outcomes

Students will be expected to

1N9 Continued

Achievement Indicator:

1N9.1 (Continued) Use and describe a mental mathematics strategy for determining a given sum.

Elaborations—Strategies for Learning and Teaching

The use of strategies provides a foundation for mental mathematics. Solving problems mentally provides opportunities for students to focus on the relationships between numbers and operations. Students need many rich experiences to explore strategies concretely and pictorially as this will lead to an understanding that all of the facts are conceptually related. As students develop and share strategies for addition and subtraction, they become more comfortable with numbers, develop flexibility when thinking about numbers, and become more fluent in computing.

Some students will be able to respond instantly when an addition or subtraction fact is presented. Others will need an extra few seconds in order to use a strategy to find the answer. **By the end of Grade One, it is expected that students should be able to recall the addition facts to a sum of five, and the related subtraction facts.** By using facts frequently in games and problems, most students will commit them to memory.

Students should be provided with situations where they have opportunities for solving problems in different ways. This will help them recognize the value of various strategies for themselves and use the strategies that are most meaningful to them. Students may not use all strategies and only employ a strategy once it makes sense to them.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Cover Up – Prepare a variety of 3 X 3 cards with the numbers zero to 12. Call out addition and subtraction facts where students use their mental strategies to solve. For example,
  - 3 and 3
  - 7 and 2 and 1 more
  - 6 and 5 more

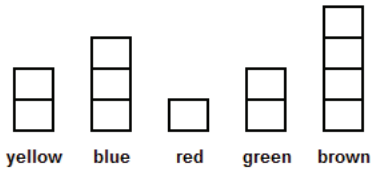
3	11	8
4	10	7
9	5	1

  Students cover the sum with a counter. The first player to cover all of the numbers on their card is the winner. (1N9.1, 1N9.2, 1N9.3)

- Pose a task such as the following to the class: "If you did not know the answer to 4 + 6, what are some really good strategies you can use to get the answer?" Encourage students to come up with more than one strategy to solve the equation. Students discuss their ideas with a partner and then present their ideas to the class. (1N9.1, 1N9.3)

Interview

- Pick up Stacks - Show the student five stacks of snap cubes of different colour and amounts.



  Ask: Can you pick up four (or five or six)?

  The student may pick up more than one stack at a time to represent the number. Ask the student to explain the strategy he/she used.

  As an extension of this activity, you could ask the student to make another combination of the same number using the remaining stacks or the original configuration of stacks. (1N9.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 3 (Continued): Using Doubles to Add
TR: pp. 26 - 29
SB: pp. 68 - 70

Strand: Number

Outcomes

Students will be expected to

1N8 Continued

Elaborations—Strategies for Learning and Teaching

With addition skills being developed or having been established, the focus should now include subtraction. As with addition, the development of the meaning of subtraction usually takes time and cannot be rushed. Students should be provided ample opportunity to use concrete materials to model subtraction prior to recording it symbolically.

Students require experience interpreting how subtraction situations are portrayed in print. Include examples of:

- Active situations involve the physical separating of sets.

  I had eight pencils. I gave four of them to my friend. How many do I have left?

- Static situations involve the implied separating of sets that are not physically joined to form a whole.

  There are seven cars parked on the road. Four of them are red. The rest are green. How many cars are green? (In this situation, the group or the whole remains the same, nothing is added or taken away, we are looking to find the two parts that make up the whole.)

Achievement Indicators:

1N8.1 (Continued) Act out a given problem presented orally or through shared reading.

1N8.2 (Continued) Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.

As with joining problems, separating problems have three quantities: initial, change, and result amounts. In separating problems, the initial amount is the largest amount. Addition and subtraction cannot be simply defined as "put together" and "take away". Students need opportunities to be exposed to all structures of problems: result unknown, change unknown, and initial unknown.

In each of the structures, keep in mind that there may be several interpretations to a situation. For example: There are nine students. Three are boys. How many are girls? Some students see this as an addition. (Three "and" how many more make nine?). Others see it as a subtraction. (There are nine in all. Remove the three boys. How many girls would be left?) Some students might think of a subtraction sentence (9 - 3 = 6), whereas others might think of an addition sentence (6 + 3 = 9). Students should be aware that every time they encounter either an addition or a subtraction situation, the inverse operation is implicit.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Present various types of subtraction stories. Students act out the problem and represent the problem concretely, pictorially and/or symbolically. While students should work with all kinds of subtraction situations, they are not expected to identify the various types.

  Separate Problems

  (i) Result Unknown – Five students are sitting on the story mat. Two students left the circle to go back to their seats. How many students stayed on the mat?

  (ii) Change Unknown – Five students are sitting on the story mat. Some of the students left the circle to go back to their seats. There are three students left sitting on the mat. How many students went back to their seats?

  (iii) Initial Unknown - Some students are sitting on the story mat. Two students left the circle to go back to their seats and there are 3 students left sitting on the mat. How many students were on the mat in the beginning?

  Compare Problems

  (i) Difference Unknown - Mark has 12 stickers. Julia has eight stickers. How many more stickers does Mark have than Julia?

  (ii) Comparing Quantity Unknown - Mark has four more stickers than Julia. Mark has 12 stickers. How many stickers does Julia have?

  (iii) Referent Quantity Unknown - Mark has four more stickers than Julia. Julia has eight stickers. How many stickers does Mark have?

  (1N8.1, 1N8.2)

- Students could use a floor size number line to act out subtraction or addition stories. (1N8.1)
- Pretend that students are sitting on a bus by lining up a number of chairs side by side. Ask students to create and act out story problems related to a trip on the bus. E.g., There were eight students on the bus and three got off at the first stop. How many were left?

  (1N8.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5: Subtraction Stories
TR: pp. 32 - 36
SB: pp. 73 - 75

Strand: Number

Outcomes

Students will be expected to

1N8 Continued

Achievement Indicators:

1N8.4 (Continued) Create a word problem for a given addition or subtraction number sentence (equation).

1N8.5 Create a subtraction problem based on personal experiences, and simulate the action with counters.

1N8.6 Write the related subtraction fact for a given addition fact.

1N8.7 Write the related addition fact for a given subtraction fact.

Elaborations—Strategies for Learning and Teaching

While addition always relates to the combining of things, subtraction is much more complex and is not simply the opposite of addition. In its simplest form subtraction is the taking away or separating of objects. In its more complex forms, subtraction is what allows us to compare two quantities or to find a missing addend. Consider the question, for example, "Elias has 11 cars and Evan has 7. How many more cars does Elias have than Evan?". It is important that students realize the connections between subtraction as taking away, subtraction as comparing, and subtraction as missing addend.

Some students have difficulty with subtraction stories involving the words, "in the beginning". For example, students are shown a picture with five birds - two in a tree, and three flying away. Some students think, say, or write 2 – 3. Teachers are cautioned to be clear in stating and modelling "in the beginning", in this case, before the birds flew away.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Using dominoes or dice to generate numbers, ask students to create story problems for subtraction. They should then demonstrate the subtractive action with counters. (1N8.3, 1N8.5)

- Students could share their own real life subtraction stories. For example: *I had six shirts and two did not fit me any more so mom gave them away.* The class can determine how many shirts remain. (1N8.1)

- Ask students to use the mobile overhead, interactive whiteboard, whiteboard, felt board, counters, ipad™, etc., to create word problems for a variety of subtraction number sentences. Other students in the class should solve the problems. Students should write a related number fact for each problem. (1N8.4, 1N8.7)

- Ask students to represent the number ten using counters on a part-part whole mat. Students then create an addition story and a subtraction story based on their representation in their math journal. (1N8.5, 1N8.6, 1N8.7)

- Ask students to create and solve a problem for 11 – 4 using one of the following strategies:

  (i) number line

  (ii) manipulatives

  (1N8.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5 (Continued): Subtraction Stories
TR: pp. 32 - 36
SB: pp. 73 - 75

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Continued

Achievement Indicators:

1PR4.1 (Continued) Represent a given equality, using manipulatives or pictures.

1PR4.2 (Continued) Represent a given pictorial or concrete equality in symbolic form.

1PR4.3 (Continued) Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).

Elaborations—Strategies for Learning and Teaching

As with addition number sentences, when recording subtraction number sentences the use of both horizontal and vertical representations should be encouraged to familiarize students with both methods. Models should continue to be used as long as students find them helpful. When students are ready to use subtraction symbols, they can be introduced in the context of solving story problems. When students become comfortable recording subtraction sentences, it is important that they make connections between the equations and the stories they represent. At this stage, students not only model and symbolize word problems but should have practice providing a number story when a model and/or the equations are provided.

When explaining the symbols for subtraction, it is important that the minus sign be referred to as "minus" or "subtract" rather than just "take away". As with addition, students need to realize that the equal sign represents a balance between both sides of the equation.

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

Paper and Pencil

- Provide students with a number train that represents nine. The number train could be five red cubes and four blue cubes.

  Ask students to represent this situation using numbers and subtraction. Sample answers may look like this:

  9 – 4 = 5 or 4 = 9 – 5

  Ensure that students learn to read number sentences from left to right. (1PR4.2, 1PR4.3)

Performance

- Use a ten-frame card showing a certain number. Ask students to tell a subtraction story using ten as their reference (i.e., all number sentences start with ten such as 10 – 1 = 9, or 10 is the minuend such as 1 = 10 – 9). (1PR4.1, 1N8.2)

- Provide story boards for students to use with manipulatives to create, model, and solve story problems. Story boards can be created by drawing a simple scene, such as a fence, an ocean, or a tree, on a half-sheet of 8½ X 11 paper. As well, a piece of black construction paper can be used to represent outer space or night time, sandpaper for a beach, and blue paper for the sky. Many different problems can be created using the same story boards. Students should share their story problems with others and record the corresponding number sentence for each of their problems. (1N8.3, 1N8.5, 1N8.9, 1PR4.1, 1PR4.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5 (Continued): Subtraction Stories
TR: pp. 32 - 36
SB: pp. 73 - 75

Unit Centres: Make a Number Fact
TR: p. 13

Note:
1PR4.3 is not covered in *Math Makes Sense 1.*

Strand: Number

Outcomes

Students will be expected to

1N9 Continued

Achievement Indicators:

1N9.1 (Continued) Use and describe a mental mathematics strategy for determining a given sum.

1N9.2 (Continued) Use and describe a mental mathematics strategy for determining a given difference.

1N9.4 (Continued) Refine mental mathematics strategies to increase their efficiency.

Elaborations—Strategies for Learning and Teaching

Mental mathematics strategies allow students to make sense of algorithms. They need to become flexible in working with numbers and operations. Before memorizing facts, students must have many opportunities to use concrete materials and mental math strategies to see number relations.

When engaging in mental math activities, students should be given opportunities to:

- Develop their own strategies for determining a given sum or difference
- Discover strategies for solving problems that include making doubles, making 10, using compensation (using addition to solve subtraction problems) and using known facts.
- Employ as many representations as possible for determining sums and differences, including physically acting out.

General Outcome: Develop number sense

Suggested Assessment Strategies

Interview

- Provide students with subtraction sentences and ask them to explain the strategy they used to find the given difference.

  Observe whether the student:

  - counts on from the smaller number
  - counts back from the larger number
  - can communicate the strategy used
  - can solve any of the problems without needing to figure them out (e.g., differences less than five, one-less)
  - is confident in his/her answer (1N9.1, 1N9.2)

- Think About It! – Provide students with a number of scenarios in which they visualize the action that is taking place and mentally solve each problem. For example: I have twelve counters in a bag and I remove four. How many counters remain in the bag?

  (1N9.2)

Performance

- Cover Up – Prepare a variety of 3 X 3 cards with the numbers zero to 12. Call out subtraction facts where students use their mental strategies to solve. E.g.

  - 10 less 4
  - 6 and 6 and then minus 2
  - 2 less than 9

2	0	7
5	9	12
4	6	10

  Students cover difference with a counter. The first player to cover all of the numbers on their card is the winner. Have students use concrete materials to verify their answer.

  (1N9.1, 1N9.2, 1N9.4)

- Pose a question such as the following to the class: If you did not know the answer to 10 - 6, what are some really good strategies you can use to get the answer? Encourage students to come up with more than one strategy to solve the equation. Students discuss their ideas with a partner and then present their ideas to the class.

  (1N9.1, 1N9.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 6: Another Way to Use Subtraction
TR: pp. 37 - 40
SB: pp. 76 - 77

Lesson 7: Mental Math
TR: pp. 41 - 45
SB: pp. 78 - 79

Strand: Number

Outcomes

Students will be expected to

1N8 Continued

Achievement Indicators:

1N8.2 (Continued) Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.

1N8.8 Indicate if the scenario in a given story problem represents additive or subtractive action.

1N8.9 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.

Elaborations—Strategies for Learning and Teaching

When interpreting number stories, students need to make sense of the story and not just listen for key words. Present a variety of addition and subtraction problems, alternating mathematical terms and everyday language. The use of everyday language helps students make connections between the real world and the mathematical concepts they are learning. For example:

- Mathematical Language: Mary stacked 13 books on the table. She added four more books to the stack. How many books are in the stack altogether?
- Everyday Language: Mary stacked 13 books on the table. She piled four more books on the stack. How many books are in the stack now?

Using everyday experiences and the names of your students will make math meaningful.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Students will represent and solve problems pictorially and symbolically. Ask students to represent and solve:

  Jimmy has 12 marbles. Amy takes seven. How many marbles does Jimmy have left?

  (1N8.2, 1N8.6, 1N8.8, 1N8.9)

- Display two ten-frames and tell a story. Ask students to represent the story with counters on the ten-frames. For example: seven cars were in the parking lot. Five more cars drove in. How many cars are in the parking lot now?

  (1N8.2, 1N8.8, 1N8.9)

Paper and Pencil

- Provide students with a paper copy of a story board. Ask them to draw/glue objects to represent an addition or subtraction story. For example: After reading the story *Snowmen at Night* by Carolyn Buehner, give students a copy of an empty park and have them draw snowmen to represent an addition or subtraction story.

  (1N8.9)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 8: Combining and Separating Stories
TR: pp. 46 - 50
SB: pp. 80 - 81

Audio CD 2:
Selection: 17

Unit Centres: Toy Store
TR: p. 13

Suggested Resources

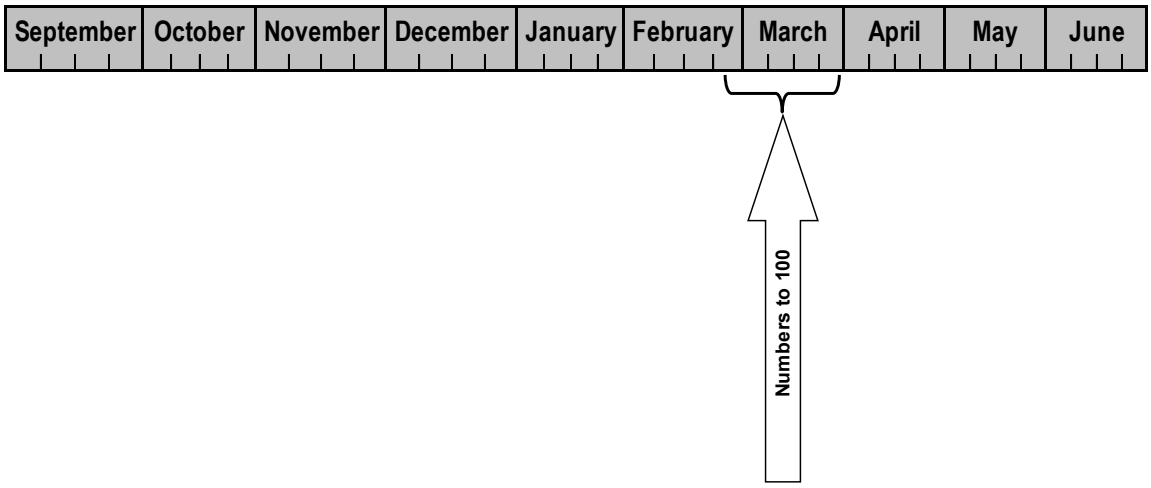
- *Snowmen at Night* by Carolyn Buehner

Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/addition-and-subtraction-to-12.html

- addition and subtraction games

Numbers to 100

Suggested Time: 4½ Weeks

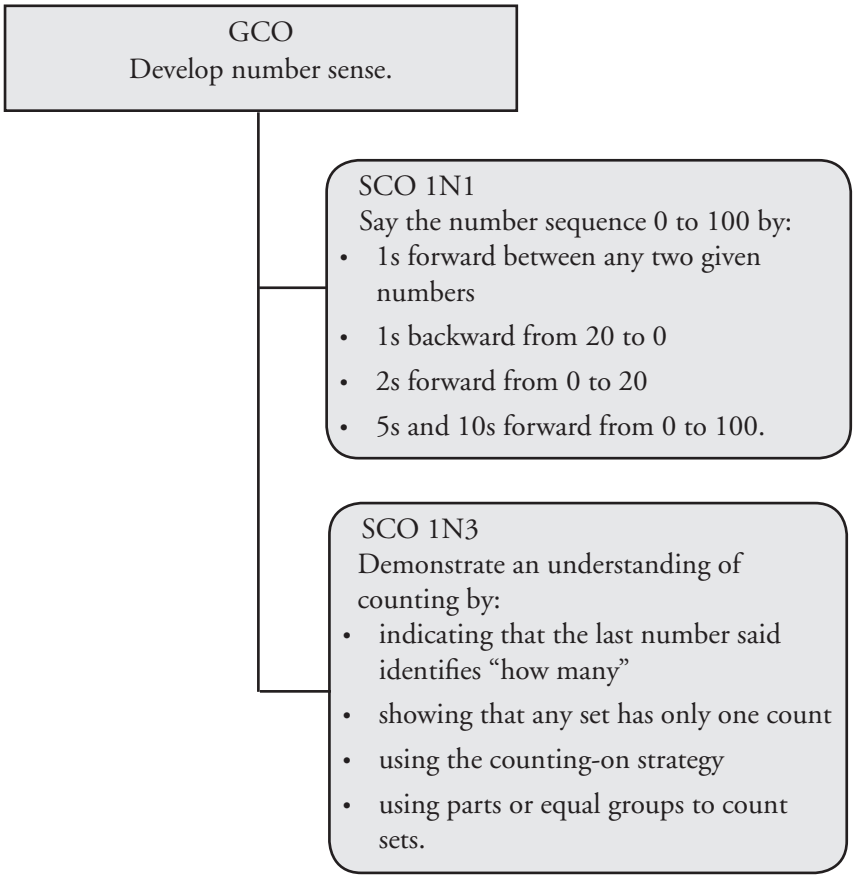


Unit Overview

Focus and Context

Earlier work in Grade One explored the number concepts for numbers to 20. Students will build new understanding of the numbers to 100 on the foundation of their prior knowledge of numbers to 20. They will learn and practise approaches for counting, estimating and grouping objects into sets for numbers to 100. It is important that students experience activities using a variety of manipulatives, such as ten-frames, number lines, and snap cubes. This unit is an introduction to numbers to 100, which will be further explored and developed in Grade Two.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
KN1. Say the number sequence by 1s: • starting anywhere from 1 to 10 and from 10 to 1 • forward from 1 to 30. [C, CN, V] KN3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V]	1N1. Say the number sequence 0 to 100 by: • 1s forward between any two given numbers • 1s backward from 20 to 0 • 2s forward from 0 to 20 • 5s and 10s forward from 0 to 100. [C, CN, ME, V] 1N3. Demonstrate an understanding of counting by: • indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets. [C, CN, ME, R, V]	2N1. Say the number sequence 0 to 100 by: • 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively • 10s, using starting points from 1 to 9 • 2s, starting from 1. [C, CN, ME, R] 2N2. Demonstrate if a number (up to 100) is even or odd. [C, CN, PS, R] 2N3. Describe order or relative position, using ordinal numbers (up to tenth). [C, CN, R] 2N4. Represent and describe numbers to 100, concretely, pictorially and symbolically. [C, CN, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number

Outcomes

Students will be expected to

1N1. Say the number sequence 0 to 100 by:

- **1s forward between any two given numbers**
- 1s backward from 20 to 0
- **2s forward from 0 to 20**
- **5s and 10s forward from 0 to 100.**

[C, CN, ME, V]

Achievement Indicators:

1N1.1 Recite forward by 1s the number sequence between two given numbers (0 - 100).

1N3 Demonstrate an understanding of counting by:

- **indicating that the last number said identifies "how many"**
- **showing that any set has only one count**
- **using the counting on strategy**
- **using parts or equal groups to count sets.**

[C, CN, ME, R, V]

Achievement Indicator:

1N3.6 Identify and correct errors in a given counting sequence.

Elaborations—Strategies for Learning and Teaching

The work students have done with numbers to 20 will now be extended to include numbers to 100. Focus should initially be on numbers to 50. As students become more comfortable working with numbers to 50, they should begin to apply the same strategies to numbers to 100.

Students have worked on counting forwards and backwards to 20 in a previous unit. Activate this prior knowledge and then extend the numbers to 100. As students begin to recite the numbers to 100 by 1s, they should realize that this is time consuming and move to skip counting.

Throughout daily counting activities, where objects are counted meaningfully, make errors in counting sequences for students to identify and correct. Students will gain increased confidence in their counting abilities as many opportunities are provided for meaningful counting.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide each student with a number card from any range of numbers - 12 to 25, 7 to 19, 34 to 44 for example. Ask students to line up in order. Have students count the number sequence (lowest to highest or highest to lowest if the numbers are between zero and 20). This activity can be modified counting forward with larger numbers.

  (1N1.1, 1N1.2)

- Provide a set of objects for students to count. After students have counted, count the set making an error in the counting sequence. Have students identify and correct the error.

  (1N3.6)

- Play the game *Oink!* To start this game, the teacher will give the class a counting pattern and goal: *Today we will begin counting by fives from ten to 85.* The students stand behind their chairs and the counting begins as the teacher taps each student on the shoulder. When a number ending with a zero is reached, the student must say "*Oink!*". If a student makes an error he or she must sit until the game starts again, or the teacher taps them on the shoulder. Counting continues until the goal is reached.

  (1N1.1, 1N1.2)

- Place the numbers from 20 to 100 in a bag and, as part of the morning routine, invite a student to choose the "Number of the Day". He/she will put the number up on the board and will write the numbers that come before and after the "Number of the Day".

  (1N1.1)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Launch
Teacher Resource (TR): p. 15
Student Book (SB): pp. 119 - 120

Lesson 1: Counting to 50
TR: pp. 16 - 17
SB: p. 121

Audio CD 3:
Selection: 3

Lesson 2: Counting Sets to 50
TR: pp. 18 - 21
SB: pp. 122 - 124

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/numbers-to-100.html

- build a number chart
- number games and videos

Strand: Number

Outcomes

Students will be expected to

1N1 Continued
1N3 Continued
Achievement Indicators:

1N1.5 Skip count by 2s to 20, starting at 0.

1N1.6 Skip count by 5s to 100, starting at 0.

1N1.7 Skip count by 10s to 100, starting at 0.

1N3.7 Count quantity, using groups of 2, 5 or 10 and counting on.

1N3.4 Record the number of objects in a given set (up to 100).

1N1.3 Record a given numeral (0 to 100) symbolically when it is presented orally.

1N1.4 Read a given numeral (0 to 100) when it is presented symbolically.

Elaborations—Strategies for Learning and Teaching

Counting larger collections is more efficient using skip counting as a strategy. With frequent opportunities to count collections, students will be able to count larger quantities more efficiently using groups of two, five, or ten. Provide students with a collection of objects such as counters, snap cubes, or beads. Have them count the objects by 2s, using their fingers to touch and move the objects as they count (e.g., 2, 4, 6, 8). To count by 5s and 10s, ask students to sort the collection into groups of five or ten, and then count the collection by touching the groups (e.g., 5, 10, 15, 20 or 10, 20, 30, 40). Students should start by skip counting to 20 and then to 50. Later, provide opportunities to skip count to 100.

The hundred chart is a valuable tool to provide practice saying the number sequence from zero to 100, as well as skip counting by 2s, 5s, and 10s. For example, when skip counting by 5s, the student may place a counter on every fifth number, reading the number as the counter is placed on the numeral.

For collections that cannot be sorted evenly into groups of five or ten, students should be able to sort the items into groups of five, or ten and then count on to find the total. For example, if provided with a set of 34 counters, students should make three groups of ten and one group of four, and count, "10, 20, 30, 31, 32, 33, 34."

Numeral symbols have meaning for students only when they are introduced as labels for quantities. Students learn to write numbers as they gain a deeper understanding of number. Students have already focused on counting, reading and recording numbers to 20. Start with students recording numerals to 50. As students acquire a deeper understanding of number, students should count, read and record numbers up to 100.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Provide students with a bag of counters. Tell them they must find out how many there are in total without counting by ones. Ask students to illustrate or demonstrate to the class how they counted and decide which way of counting was the most efficient. (1N3.7, 1N1.5, 1N1.6, 1N1.7)
- Provide students with a hundred chart. Ask them to colour the numbers they land on when they count by 5s and 10s. (A number strip from zero to 20 can be used when counting by 2s). (1N1.6, 1N1.7)
- Use buttons or counters to have students practice counting by 1s and 2s to 20. Ask students to drop the items into a transparent piggy bank or container as they count. For example, when counting by 2s, students can count on every second item dropped into the bank. Using a transparent bank provides a visual and auditory means for students as they count. (1N1.5)
- Ask students to count the number of eyes at their table by 2s and the number of fingers by 5s and the number of toes by 10s. (1N1.5, 1N1.6)

Interview

- Ask students how many ways they can count to 20 and record their findings.
- Ask: If you count by 2s, starting at zero, will you say the number 7? Why or why not? (1N1.5, 1N1.6, 1N1.7)

Pencil and Paper

- Many counting activities can be extended to meet this indicator by having students record their answers. (1N3.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2 (Continued): Counting Sets to 50
TR: pp. 18 - 21
SB: pp. 122 - 124

Unit Centres: Picture Perfect
TR: p. 13

Lesson 3: Skip Counting
TR: pp. 22 - 25
SB: p. 125

Audio CD 3:
Selections: 4, 5, 6, 7, 8, 9, 10

Lesson 4: The 100 - Chart
TR: pp. 26 - 27
SB: p. 126

Unit Centres: 100 Chart Puzzle
TR: p. 13

Strand: Number

Outcomes

Students will be expected to

1N1 Continued

Achievement Indicator:

1N1.8 Identify and correct errors/ omissions in a given number sequence and explain.

Elaborations—Strategies for Learning and Teaching

Provide a number sequence, visually and/or orally, with one number missing or one number that does not belong. Ask students to listen for, identify, and/or record the missing or incorrect number and explain their answer. When presented with the number sequence 22, 23, 25, 26, 27 for example, students should be able to identify that 24 is missing. Possible explanations could include:

- *24 comes between 23 and 25.*
- *24 comes after 23.*
- *If I count by 2s, the pattern is 22, 23, 26.*
- *I checked the hundred chart.*
- *I looked at a number line.*
- *I looked on the calendar.*

General Outcome: Develop number sense

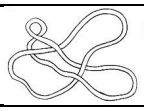
Suggested Assessment Strategies

Performance

- Ask students to work with a partner to create a number sequence with a missing number. Exchange sequence with another pair and identify the missing number. (1N1.8)

- Find My Mistake - Say any number sequence (0-100) incorrectly. Ask the students to identify the error, correct it, and explain their answer. (1N1.8)

- Grab a Handful - Provide students with a variety of objects in paper bags (e.g., buttons, macaroni, paper clips, elastic bands). Students grab a handful of objects from one bag and sort into groups of two. Ask students to record how many groups of two, how many are left over, and how many in all. This activity can be repeated with students sorting into groups of five or ten.

	How many groups of 2?	How many left over?	How many in all?
			
			
			
			

(1N3.7)

- Put a hundred chart on the board with a number of omissions. Hide the missing numbers around the room. Invite students to go on a treasure hunt in the classroom to find the missing numbers and then have the students place the numbers in the correct places using tape, sticky tack or magnets.

(1N1.8)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5: Grouping Sets
TR: pp. 28 - 31
SB: pp. 127 - 129

Unit Centres: Number Mix-Up
TR: p. 13

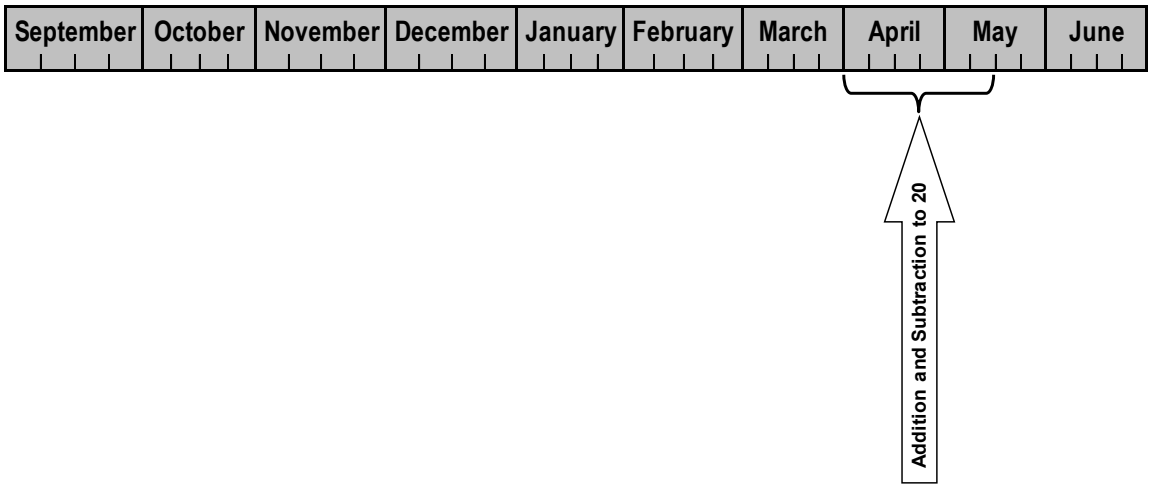
Lesson 6: Groups of 10
TR: pp. 32 - 35
SB: pp. 130 - 133

Audio CD 1:
Selection: 17

Unit Centres: Roll it and Build it
TR: p. 13

Addition and Subtraction to 20

Suggested Time: 6 Weeks



Unit Overview

Focus and Context

Earlier work in Grade One provided students with many opportunities to develop personal strategies for solving addition and subtraction problems to 12. In this unit, students will use their previous experiences to refine their strategies, as well as develop new strategies for adding and subtracting numbers to 20. The emphasis will continue to be a problem solving approach using manipulatives, such as number lines, ten-frames and snap cubes. Students will be engaged in activities to develop the relationship between addition and subtraction. As they develop the understanding that addition and subtraction have an inverse relationship, they will become more flexible in using strategies to solve problems.

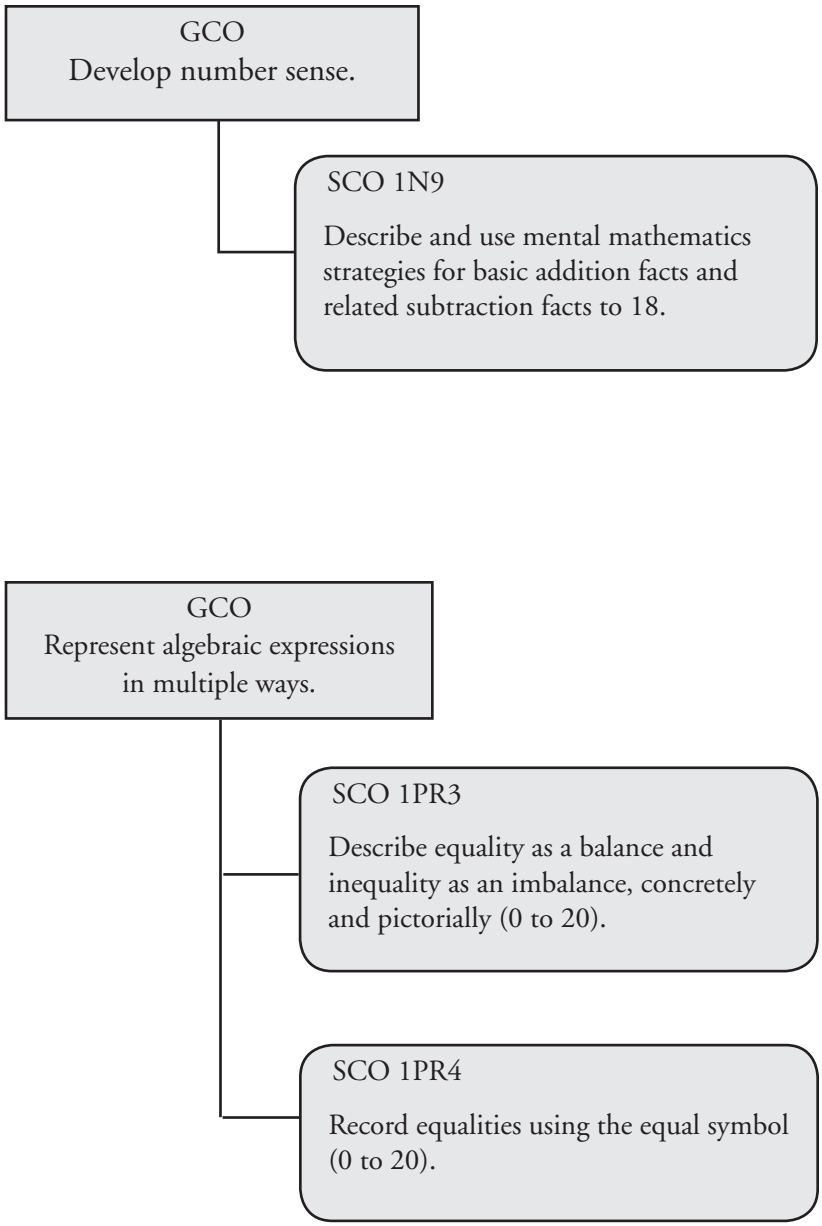
Outcomes Framework

GCO
Develop number sense.

SCO 1N8

Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:
- using familiar mathematical language to describe additive and subtractive actions
- creating and solving problems in context that involve addition and subtraction
- modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	Specific Outcomes	Specific Outcomes
	1N8. Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by: • using familiar mathematical language to describe additive and subtractive actions • creating and solving problems in context that involve addition and subtraction • modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically. [C, CN, ME, PS, R, V]	2N8. Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number. [C, R] 2N9. Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by: • using personal strategies for adding and subtracting with and without the support of manipulatives • creating and solving problems that involve addition and subtraction • using the commutative property of addition (the order in which numbers are added does not affect the sum) • using the associative property of addition (grouping a set of numbers in different ways does not affect the sum) • explaining that the order in which numbers are subtracted may affect the difference. [C, CN, ME, PS, R, V]

SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Number		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
	1N9. Describe and use mental mathematics strategies for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]	2N10. Apply mental mathematics strategies for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]

Kindergarten	Grade 1	Grade 2
Strand: Patterns and Relations (Variables and Equations)		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
	1PR4. Record equalities using the equal symbol (0 to 20). [C, CN, PS, V]	2PR4. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number

Outcomes

Students will be expected to

1N9 Describe and use mental mathematics strategies for basic addition facts and related subtraction facts to 18.

[C, CN, ME, PS, R, V]

Achievement Indicators:

1N9.1 Use and describe a mental mathematics strategy for determining a given sum.

1N9.2 Use and describe a mental mathematics strategy for determining a given difference.

1N9.3 Use and describe mental mathematics strategies, such as:

- *counting on and counting back*
- *making 10*
- *using doubles*
- *thinking addition for subtraction.*

Elaborations—Strategies for Learning and Teaching

By the end of Grade One, students should:

- ***understand and apply strategies for addition facts up to and including 9 + 9 and related subtraction facts***
- ***recall addition facts to a sum of five and related subtraction facts***

Students have worked with addition and subtraction to 12. They will now build on their prior knowledge and strategies to work with addition and subtraction to 20. Students need to be proficient with sums and differences to 12 before we can expect them to see relationships with larger numbers. When they begin adding and subtracting to 20 many students will solve problems by counting. The focus in this unit is for students to see that the relationships between numbers, and the strategies they developed when working with smaller numbers, can be applied when working with larger numbers.

The strategies for mentally determining sums and differences which were introduced in a previous unit are presented again below.

Addition Strategy	Explanation and Example
Counting on	This strategy is used for adding one or two to a given number. 11 + 3 = __ think 11... 12, 13, 14.
Making ten	When presented with a more difficult equation, 9 + 4 = __ , think 9 + 1 is 10 and 3 more is 13.
Using doubles	Add two of the same number together 6 + 6 = 12

Subtraction Strategy	Explanation and Example
Counting on	Start with the number you are subtracting and count on to the other number: 15 - 9 = __ think 9... 10, 11, 12, 13, 14, 15. The answer would be 6 because we counted 6 numbers
Counting back	Start with the minuend (larger number) and count back: 13 - 2 = __ think 13... 12, 11. The answer is 11.
Using doubles	We have 12 - 6 = __ , think 6 + 6.
Thinking addition for subtraction	We see 14 - 5= __, we think of the related addition fact 9 + 5 = 14 so 14 - 5 = 9.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Double your Die - Using a four to nine number cube (or spinner), students roll the die and double the number shown on the die. Students record the number sentence. (1N9.1)

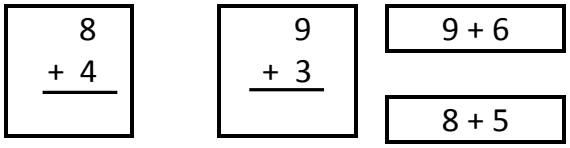
- Double your Die plus one / less one - This is an extension of Double your Die for students who are ready. Students roll and think "double plus one". They record the resulting equation. As an extension, students can also do "Double less One".

(1N9.1, 1N9.2)

Interview

- Provide students with addition and subtraction sentences and ask them to explain the strategy they used to find the given sum or difference. Observe whether the student:
  - (i) can solve problems involving numbers to ten in a different way than numbers to 20.
  - (ii) can explain the strategy used.
  - (iii) is confident in their answer. (1N9.1, 1N9.2)

- Show students flash cards with the addition facts where at least one addend is eight or nine. Students choose a card and build on the eight or nine to think "ten and so many more". Ask students to "think out loud" as they are finding each sum.



(1N9.1, 1N9.2)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Launch

Teacher Resource (TR): p. 15
Student Book (SB): pp. 157 - 158

Lesson 1: Addition and Subtraction Facts to 18
TR: pp. 16 - 17
SB: p. 159

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/addition-and-subtraction-to-20.html

- songs, games, and activities

Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Record equalities using the equal symbol (0 to 20).

[C, CN, PS, V]

1N9 Continued

Achievement Indicators:

1PR4.1 Represent a given equality, using manipulatives or pictures.

1PR4.2 Represent a given pictorial or concrete equality in symbolic form.

1PR4.3 Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).

1PR4.4 Record different representations of the same quantity (0 to 20) as equalities.

1N9.4 Refine mental mathematics strategies to increase their efficiency.

Elaborations—Strategies for Learning and Teaching

Students will have worked with recording equalities using the equal symbol for numbers up to 12. Using the words "the same as" for the equal sign will help them to further understand this relation.

Previously in this course, students have worked through addition and subtraction sentences and problems. At this point, they may be already starting to refine their strategies. As they begin to take more risks with different strategies, encourage them to compare their known strategies with new ones, asking which they think is better and why. It may be necessary to have a discussion about using strategies that help students find the sums and differences quickly. Provide plenty of opportunities for students to share their thinking and their strategies with their classmates.

Once students have a good understanding of what a strategy is and how to use it, the strategies listed in this outcome can be addressed individually. They can be combined to expand students' existing repertoire of strategies. This will increase their efficiency with number computation. It is important to remember that students' computation abilities will vary according to the strategies that work best for them.

General Outcome: Represent algebraic expressions in multiple ways

Suggested Assessment Strategies

Performance

- Ask students to sit in a circle. Each student is given a chain of the specified number (e.g., 17) of links of one colour. On the signal, "break it", students will break their chain into two parts. Record it as an equality. Repeat until students discover as many representations for the same number (17) as they can find. (1PR4.1, 1PR4.2, 1PR4.4)

- Play "What's in the bag?". Students work in pairs using a balance scale and counters. Partner A puts 15 counters on one side of the scale and on the other side, a brown paper bag with nine counters inside. Partner B must add counters to the side of the scale holding the bag (not in the bag) until both sides are balanced. Partner B then figures out how many counters were in the bag and explains his/her strategy. Both partners record the equality. Partners then switch roles, change the number of counters in the bag, and record a different equality for the same number (15). (1PR4.4)

- Tell me how - Ask students the following question, "If you did not know the answer to 8 + 7, what are some really good ways to find the answer? Tell me how you found the answer." This activity can be done as a whole class activity or using a think-pair-share approach. (1N9.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 2: Addition to 20
TR: pp. 18 - 19
SB: pp. 160 - 161

Unit Centres: Same Number, Different Ways
TR: p. 13

Unit Centres: Domino-me!
TR: p. 13

Lesson 3: Subtraction to 20
TR: pp. 20 - 23
SB: pp. 162 - 163

Audio CD 3:
Selections: 13, 14

Strand: Number

Outcomes

Students will be expected to

1N8 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:

- **using familiar mathematical language to describe additive and subtractive actions**
- **creating and solving problems in context that involve addition and subtraction**
- **modeling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.**

[C, CN, ME, PS, R, V]

Achievement Indicators:

1N8.3 Create an addition problem based on personal experiences, and simulate the action with counters.

1N8.4 Create a word problem for a given addition or subtraction number sentence (equation).

1N8.5 Create a subtraction problem based on personal experiences, and simulate the action with counters.

1N8.8 Indicate if the scenario in a given story problem represents additive or subtractive action.

1N8.9 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.

Elaborations—Strategies for Learning and Teaching

In demonstrating understanding of addition and subtraction, students need to be able to explain how they got their answers. By observing students at work, we can assess their understanding of how they solve addition and subtraction problems.

Addition and subtraction problems can be categorized based on the kinds of relationships they represent. It is important that all of the following categories of problems be presented and that these are derived from students' experiences.

These categories include:

- Join Problems: result unknown, change unknown, initial unknown
- Separate Problems: result unknown, change unknown, initial unknown
- Compare Problems: difference unknown, larger unknown, smaller unknown

(Van de Walle and Lovin, 2006, pp. 67- 69).

These categories were developed in an earlier unit. Students are not required to identify the categories.

It is important that they observe problems being created so they can model the language and the process. Word problems created by students are more meaningful to them and reflect their experiences and interests. Ask students, for example, to take cards with addition or subtraction number sentences from a container. Developing multiple stories for each card connects their personal experiences to the mathematics they are learning.

9 + 5	11 – 3

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Ask students the following:

  Joining Problems

  (i) Result Unknown - There are seven students in line at the water fountain. Six more join the line. How many students are in the line now?

  (ii) Change Unknown - There are seven students lined up at the water fountain. More students join the line. There are now 13 students in the line. How many students joined the line?

  (iii) Initial Unknown - There are some students lined up at the water fountain. Six students join the line. There are now 13 students in the line. How many students were there first?

  Separating Problems

  (i) Result Unknown - There are 14 candles on Julie's birthday cake. Chris blows five of the candles out. How many candles are still burning?

  (ii) Change Unknown - There are 14 candles on Julie's birthday cake. Chris blows some of the candles out. There are eight candles still burning. How many candles did Chris blow out?

  (iii) Initial Unknown - There are candles on Julie's birthday cake. Chris blows five of the candles out. Now there are eight candles still burning. How many candles were first burning on the cake?

  Comparing Problems

  (i) Difference Unknown - Bob has 18 stickers. Julie has nine stickers. How many more stickers does Bob have?

  (ii) Larger Unknown - Bob has eight more stickers than Julie. Julie has nine stickers. How many stickers does Bob have?

  (iii) Smaller Unknown - Julie has ten fewer stickers than Bob. Bob has 15 stickers. How many stickers does Julie have?

  (1N8.9)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 6: Creating and Solving Story Problems
TR: pp. 31 - 32
SB: pp. 167 - 168

Lesson 7: Further Strategies for Solving Story Problems
TR: pp. 33 - 36
SB: p. 169

Unit Centres: Word Problems
TR: p. 13

Investigation 3: Classroom Plants
TR: pp. 41 - 45

Strand: Number

Outcomes

Students will be expected to

1N8 Continued

Achievement Indicators:

1N8.6 Write the related subtraction fact for a given addition fact.

1N8.7 Write the related addition fact for a given subtraction fact.

Elaborations—Strategies for Learning and Teaching

It is important that students recognize that every addition problem can also be viewed as a subtraction problem and vice versa. Fact families, for example, demonstrate that four number sentences, two addition sentences and two subtraction sentences, are all related to the same situation or problem.

- Put 18 two sided counters in a cup. Spill them on the table. Separate the red and yellow counters. Write a subtraction sentence to represent the counters shown. For example, if there were 12 red counters and six yellow counters, write 18 – 6 = 12. Ask students to join the groups of counters together and write the related addition sentences.
- Create two Link-Its™ chains, one with 13 red links and one with four blue links. Have students join the two together and give them the addition sentence: 13 + 4 = 17. Ask students to separate the two colours and write the related subtraction sentences.

General Outcome: Develop number sense

Suggested Assessment Strategies

Performance

- Ask students to write a related addition/subtraction fact for the following facts:

  (i) 12 + 6 = 18

  (ii) 14 + 3 = 17

  (iii) 16 - 9 = 7

  (iv) 12 – 8 = 4

  (1N8.6, 1N8.7)

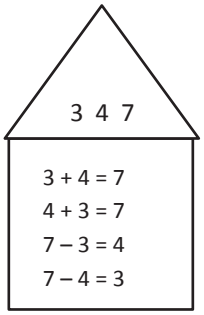
- When using story boards to create problems for addition and subtraction, ask students to record the related addition/subtraction fact for each problem they create.

  (1N8.6, 1N8.7)

- What's Hiding? - Working in pairs, students use a two part mat (or part-part-whole mat), counters and number cards 8 to 20. Students choose a number card and count out that many counters. Partner A covers their eyes while partner B splits the counters into two parts, placing them on the two part mat. Partner B covers one side of the mat with a piece of paper. Partner A then has to find the hidden number and record it as either an addition or subtraction sentence depending on the strategy he/she used.

  (1N8.6, 1N8.7)

- Ask students to create houses for some of the fact families:



(1N8.6, 1N8.7)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 4: Strategies for Addition and Subtraction
TR: pp. 24 - 27
SB: pp. 164 - 165

Audio CD 2:
Selections: 6, 7, 15, 16

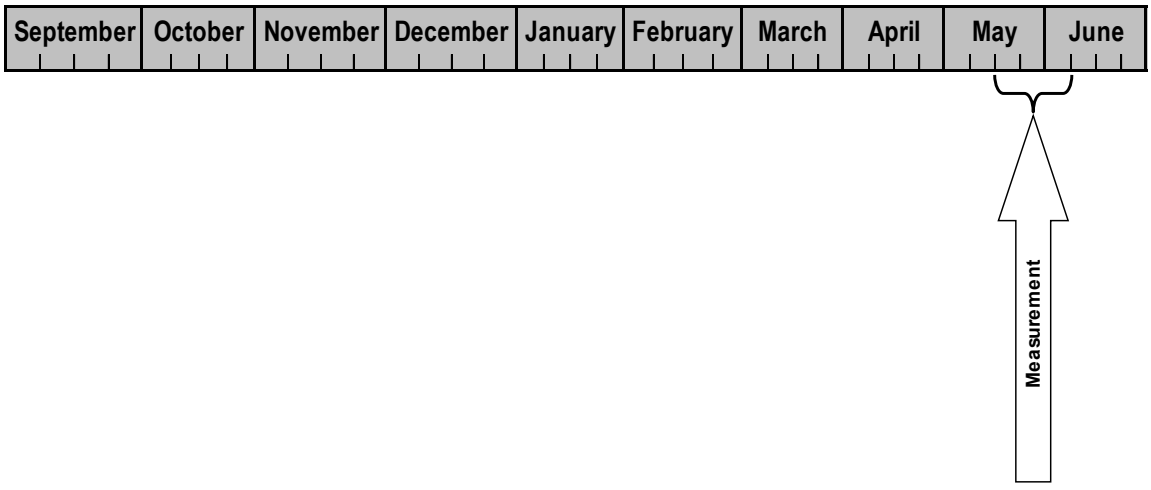
Audio CD 3:
Selections: 6, 7, 8, 9, 13, 14

Lesson 5: Relating Addition and Subtraction Facts
TR: pp. 28 - 30
SB: p. 166

Unit Centres: Connect It!
TR: p. 13

Measurement

Suggested Time: 3 Weeks

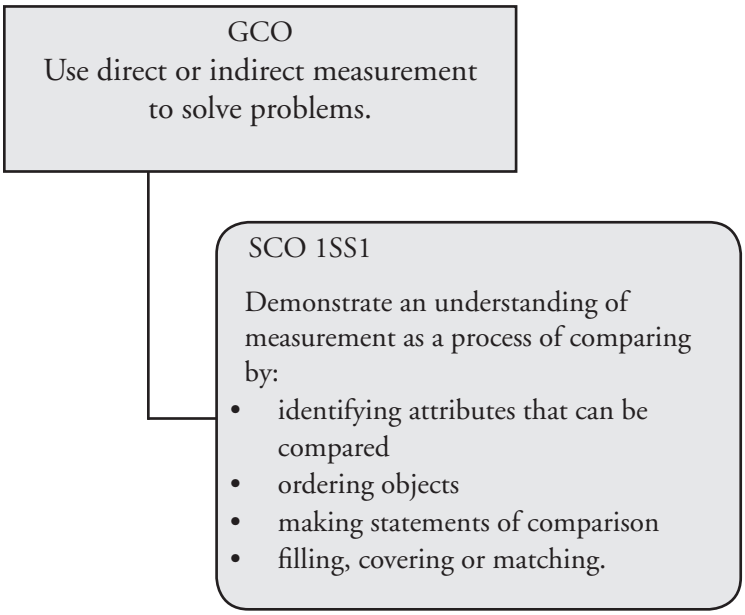


Unit Overview

Focus and Context

In this unit, students compare two or more objects using a single attribute. In Kindergarten, students used direct comparison to compare two objects based on a single attribute of length, height, mass and capacity. In Grade One, students will compare two or more objects using a single attribute and will expand their experiences to include area. Students will also make statements of comparison in communicating their understanding of measurement.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1	Grade 2
Strand: Shape and Space (Measurement)		
Specific Outcomes	**Specific Outcomes**	**Specific Outcomes**
KSS1. Use direct comparison to compare two objects based on a single attribute, such as: • length including height • mass • capacity. [C, CN, PS, R, V]	1SS1. Demonstrate an understanding of measurement as a process of comparing by: • identifying attributes that can be compared • ordering objects • making statements of comparison • filling, covering or matching. [C, CN, PS, R, V]	2SS1. Relate the number of days to a week and the number of months to a year in a problem-solving context. [C, CN, PS, R] 2SS2. Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass. [C, CN, ME, R, V] 2SS3. Compare and order objects by length, height, distance around and mass, using nonstandard units, and make statements of comparison. [C, CN, ME, R, V] 2SS4. Measure length to the nearest nonstandard unit by: • using multiple copies of a unit • using a single copy of a unit (iteration process). [C, ME, R, V] 2SS5. Demonstrate that changing the orientation of an object does not alter the measurements of its attributes. [C, R, V]

Mathematical Processes

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

1SS1 Demonstrate an understanding of measurement as a process of comparing by:

- **identifying attributes that can be compared**
- **ordering objects**
- **making statements of comparison**
- **filling, covering or matching.**

[C, CN, PS, R, V]

Achievement Indicators:

1SS1.1 Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.

1SS1.2 Order a set of objects by length, height, mass, capacity or area, and explain their ordering.

1SS1.3 Compare two given objects, and identify the attributes used to compare.

1SS1.4 Determine which of two or more objects is longest or shortest by matching, and explain the reasoning.

Elaborations—Strategies for Learning and Teaching

Measurement involves identifying and comparing similar attributes. In Kindergarten, students used direct comparison to compare objects based on a single attribute, such as length, height, mass and capacity. Through measurement activities in Grade One, students should realize that the same object can have many measurable attributes. Students should use terminology involving measurement including: longest, shortest, heaviest, lightest, most, least, etc. It is important that students explore measurement in context throughout each day using direct comparison. This involves students lining up items side by side to compare. In the development of measurement skills, students must engage in a wide variety of activities that promote measurement experiences. Students must have first hand practices to gain true understanding of this skill. Activities involving measurement will enable students to better incorporate computational skills and to make connections between basic geometric concepts and number concepts.

Using two objects of different lengths, ask students how they would compare the objects. Working with a variety of objects will allow many opportunities for students to compare lengths. Provide two books, for example, and ask them to compare the books by length. Students should recognize that length tells about the extent of an object along one dimension. When describing measurement in one dimension, we use the term length, or linear measure. This includes measurements of height, width, length, depth, and distance. Direct measurement consists of comparing lengths by lining up items side by side beginning at a common base. Students should understand why a common starting point is important. Although length is usually the first attribute students learn to measure, it is not immediately understood by young students.

Students should recognize that there are certain sized objects that are best suited for measuring certain things. It would not be efficient, for example, to use a quarter to measure the length of a classroom.

Students should order objects from shortest to longest and shortest to tallest. Include situations in which students are dealing with an extraneous variable, such as objects which are not straight and objects which are also wide or thick.

General Outcome: Use direct or indirect measurement to solve problems

Suggested Assessment Strategies

Interview

- Ask students to make two snakes using plasticine. Ask: "Which snake is longest? How do you know?" (1SS1.4)

- Provide students with two objects such as an eraser and a book. Ask: Can you tell which of these two objects is longer? How do you know? (1SS1.1)

Performance

- Provide students with hands-on activities to order length and height. They should explain their reasoning. The following tasks may be used:
  - (i) Provide students with "trains" of various lengths made from interlocking cubes. Ask students to order the trains from shortest to longest.
  - (ii) Ask five or more students to line-up at the front of the room. Ask them to order themselves from tallest to shortest or shortest to tallest. Repeat this activity using different students.
  - (iii) Ask students to work with a partner to trace and cut out their shoe print. Ask students to compare their shoe prints using lengths. Repeat this activity using other objects to compare.
  - (iv) Ask students to prepare a set of ribbons for first, second, and third places in a race, so that the first place runner gets the longest ribbon and the third place runner gets the shortest ribbon. (1SS1.2, 1SS1.3)

- Take students outside to observe and compare the heights and/or lengths of anything growing. Encourage them to make statements like: "The tree is taller than the flower." or " The grass is shorter than the flowers." (1SS1.3, 1SS1.4, 1SS1.2)

- Ask students to stand at a starting line and jump forward as far as they can. Mark the spot on the ground with tape or chalk. Using a cut out image of a frog, have students measure and compare how far they jumped. (1SS1.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Launch
Teacher Resource (TR): p. 11
Student Book (SB): 85 - 87

Lesson 1: Comparing Lengths
TR: pp. 12 - 15
SB: pp. 88 - 89

Unit Centre: Comparing Lengths
TR: p. 9

Lesson 2: Ordering Lengths
TR: pp. 16 - 19
SB: p. 90

Unit Centre: Comparing Lengths
TR: p. 9

Refer to Appendix B (pp. 155-159) for problem solving strategies and ideas.

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/grade-1/resource-links/measurement.html
- measurement games and activities

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

1SS1 Continued

Achievement Indicators:

1SS1.1 (Continued) Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.

1SS1.2 (Continued) Order a set of objects by length, height, mass, capacity or area, and explain their ordering.

1SS1.3 (Continued) Compare two given objects, and identify the attributes used to compare.

1SS1.5 Determine which of two or more objects has the greatest or least area by covering, and explain the reasoning.

Elaborations—Strategies for Learning and Teaching

Students need to be introduced to area. Area tells about the amount of space which an object covers. You may wish to use tangrams, pentominoes or pattern blocks to cover the area of given objects. Students should order objects that cover the least amount of space to the greatest amount of space, or vice versa.

Provide two objects and ask students to compare their areas. Direct measurement involves placing one surface on top of another similar surface to see which "sticks out". For example, one book might cover more of a desk than a smaller book covers. While developing measurement skills for area, students should use terms such as greatest/most area and least/smallest area.

General Outcome: Use direct or indirect measurement to solve problems

Suggested Assessment Strategies

Performance

- Provide students with three books. Ask them to order the books from the greatest area to the least area or vice versa. Repeat using different objects. (Objects that are used should be similar in shape). (1SS1.2)

- Give students a trapezoid, or other shape. Ask them to draw another shape with a larger area. Ask them to explain their thinking. (1SS1.5)

- Provide students with a set of tangrams and ask them to compare the areas of the triangles in the set. Ask students to order the triangles from the greatest area to the least area. (1SS1.2, 1SS1.3)

- Provide students with two objects. Ask: Can you tell which of these two objects takes up the most space? (1SS1.2, 1SS1.3)

- Ask students to work in pairs to trace and cut out their shoe prints. Using coloured tiles the students will cover their shoe prints and count the number of tiles used in order to compare the area of both prints. (1SS1.1, 1SS1.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1
Lesson 4: Comparing by Covering
TR: pp. 22 - 23
SB: pp. 93 - 94

Unit Centre: Exploring Area with Pattern Blocks
TR: p. 9

Audio CD 2:
Selection: 18

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

1SS1 Continued

Achievement Indicators:

1SS1.1 (Continued) Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.

1SS1.2 (Continued) Order a set of objects by length, height, mass, capacity or area, and explain their ordering.

1SS1.3 (Continued) Compare two given objects, and identify the attributes used to compare.

1SS1.6 Determine which of two or more objects holds the most or least by filling, and explain the reasoning.

Elaborations—Strategies for Learning and Teaching

Students should recognize that capacity tells how much something will hold. In Kindergarten, students compared the capacities of two different objects. In Grade One, they should investigate strategies to directly compare the capacities of two or more containers. Direct measurement involves filling one container and then pouring the contents into another to find out which holds more. Students should order objects from those that hold the least to those that hold the most, or vice versa. Include containers that have the same height but different capacities. While developing measurement skills for capacity, students should use terms such as holds more, holds less, holds the same, full and empty.

Using two objects of different sizes, ask students how they could compare the objects. Two glasses, for example, could be compared by height as well as capacity. Likewise, two bowls could be compared by their masses, their heights and their capacities. Working with a variety of objects will allow many opportunities for students to make comparisons relating to measurement, using many attributes.

General Outcome: Use direct or indirect measurement to solve problems

Suggested Assessment Strategies

Performance

- Provide students with two objects such as a pencil and an eraser. Ask: How can we compare these objects using measurement words? Students should recognize that while they can compare the lengths, heights, masses and areas of the objects, capacity is an attribute that can not be used to measure these objects. Repeat the activity with other sets containing two objects.

  (1SS1.3)

- Provide students with three (or more) containers of various sizes. Using rice or macaroni, ask students to order the containers from *holds more* to *holds less*. Repeat using different containers.

  (1SS1.2)

- Provide students with rice or macaroni and two containers of different sizes, such as a coffee mug and a drinking glass. Ask: "Which container holds more rice? How do you know?" Repeat using different containers and materials with which to measure.

  (1SS1.6)

- Give pairs of students two objects such as two little cars. Ask them to discuss common attributes about the cars (length, mass, height, etc.). Invite them to roll the cars down the hallway or across the classroom and to generate ideas to measure how far the cars went.

  (1SS1.2, 1SS1.3)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 5: Comparing by Filling
TR: pp. 24 - 27
SB: pp. 96 - 97

Unit Centre: At the Water Table
TR: p. 9

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

1SS1 Continued

Achievement Indicators:

1SS1.1 (Continued) Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.

1SS1.2 (Continued) Order a set of objects by length, height, mass, capacity or area, and explain their ordering.

1SS1.3 (Continued) Compare two given objects, and identify the attributes used to compare.

1SS1.7 Determine which of two or more objects is heaviest or lightest by comparing, and explain the reasoning.

Elaborations—Strategies for Learning and Teaching

Students should recognize that mass tells about the "heaviness" of an object. It is important to work with a variety of different objects to compare and explore mass. Students should order objects from lightest to heaviest or vice versa. When comparing the mass of two objects, it is important that they have experiences with objects that are smaller but have a greater mass. The most conceptual way for students to compare the mass of objects is to hold the objects in their hands and compare. Students could collect items from around the classroom to compare masses. Students take turns predicting and then lifting an item in each hand to feel which is heavier and which is lighter. More than one student should do the same comparison. Observe if there is agreement. Students may then use a direct method to confirm their predictions. Direct measurement involves placing two objects on a balance simultaneously and comparing the mass of one with that of the other. While developing measurement skills for mass, students should use terms such as heavier and lighter.

General Outcome: Use direct or indirect measurement to solve problems

Suggested Assessment Strategies

Performance

- Provide students with two objects such as an eraser and a book. Ask: Can you tell which of these two objects is heavier? (1SS1.1)

- Provide students with a set of three objects. Using a pan balance to measure, ask them to order the objects from heaviest to lightest or lightest to heaviest. Repeat using different objects. (The number of objects used may vary depending on the students understanding of mass). (1SS1.2)

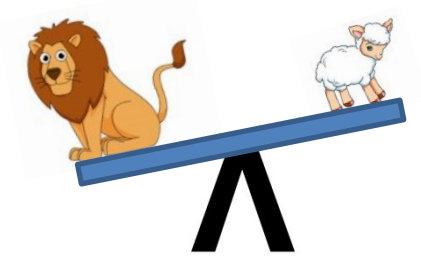
- Provide students with two objects, such as two pieces of fruit, and a two-pan balance. Ask: "Which piece of fruit is the heaviest? How do you know?" Repeat using other objects. (1SS1.7)

- Ask students to make two balls out of play dough, predict which ball is the heavier by placing one in each hand, and confirm their predictions using a pan balance. (1SS1.7)

- Ask students to predict which is heavier - a large bag of cotton balls or a small glue stick. (1SS1.3, 1SS1.7)

- Show the students three balls of similar size but different mass, including an inflated balloon. Ask them to predict which ball has the greatest mass. Verify the predictions using a pan balance. (1SS1.2, 1SS1.7)

- Ask students to create their own balance scale from a one inch strip of construction paper and a die-cut "V". Have them search through grocery flyers or magazines for pictures to glue on the scale to show which object was heavier and which was lighter. Students can present their finished product to the class and explain how they knew which was heavier and which was lighter.



(1SS1.7)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Lesson 6: Comparing Mass
TR: pp. 28 - 31
SB: pp. 98 - 100

Investigation 2: At the Fire Hall
TR: pp. 34 - 37

Audio CD 3:
Selections: 1, 2

Appendix A
Outcomes by Strand
(with page references)

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number	**General Outcome:** Develop number sense.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1N1 Say the number sequence 0 to 100 by: • 1s forward between any two given numbers • 1s backward from 20 to 0 • 2s forward from 0 to 20 • 5s and 10s forward from 0 to 100. [C, CN, ME, V]	1N1.1 Recite forward by 1s the number sequence between two given numbers (0 to 100).	pp. 36-38, 114
	1N1.2 Recite backward by 1s the number sequence between two given numbers (20 to 0).	pp. 36-38
	1N1.3 Record a given numeral (0 to 100) symbolically when it is presented orally.	pp. 38, 116
	1N1.4 Read a given numeral (0 to 100) when it is presented symbolically.	pp. 38, 116
	1N1.5 Skip count by 2s to 20, starting at 0.	p. 116
	1N1.6 Skip count by 5s to 100, starting at 0.	p. 116
	1N1.7 Skip count by 10s to 100, starting at 0.	p. 116
	1N1.8 Identify and correct errors/omissions in a given number sequence and explain.	p. 118
1N2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects, dots or pictures. [C, CN, ME, V]	1N2.1 Identify the number represented by a given arrangement of dots on a ten frame and describe the number's relationship to 5 and/or 10.	p. 46
	1N2.2 Look briefly at a given familiar arrangement of objects, dots or pictures and identify the number represented without counting.	pp. 50-52
1N3 Demonstrate an understanding of counting by: • indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets. [C, CN, ME, R, V]	1N3.1 Answer the question, "How many are in the set?", using the last number counted in a given set.	p. 40
	1N3.2 Show that the count of the number of objects in a given set does not change regardless of the order in which the objects are counted.	p. 44
	1N3.3 Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction.	p. 44
	1N3.4 Record the number of objects in a given set (up to 100).	pp. 44, 116
	1N3.5 Determine the total number of objects in a given set, starting from a known quantity and counting on.	p. 54
	1N3.6 Identify and correct counting errors in a given counting sequence.	p. 114
	1N3.7 Count quantity, using groups of 2, 5 or 10 and counting on.	p. 116
1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically. [C, CN, V]	1N4.1 Read given number words to 10.	p. 42
	1N4.2 Represent a given number up to 20, using a variety of manipulatives, including ten-frames and base ten materials.	pp. 46, 58
	1N4.3 Partition any given quantity up to 20 into 2 parts, and identify the number of objects in each part.	p. 56
	1N4.4 Model a given number, using two different objects; e.g., 10 desks represents the same number as 10 pencils.	p. 58
	1N4.5 Place given numerals on a number line with benchmarks 0, 5, 10 and 20.	p. 60

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number (Continued)	**General Outcome:** Develop number sense.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1N5 Compare sets containing up to 20 elements, using: • referents • one-to-one correspondence to solve problems. [C, CN, ME, PS, R, V]	1N5.1 Build a set equal to a given set that contains up to 20 elements.	p. 64
	1N5.2 Build a set that has more elements than, fewer elements than or as many elements as a given set.	p. 64
	1N5.3 Compare two given sets, using one-to-one correspondence, and describe them, using comparative words such as more, fewer or as many.	p. 66
	1N5.4 Solve a given story problem (pictures and words) that involves the comparison of two quantities.	p. 66
1N6 Estimate quantities to 20 by using referents. [C, CN, ME, PS, R, V]	1N6.1 Estimate a given quantity by comparing it to a given referent (known quantity).	p. 62
	1N6.2 Select an estimate for a given quantity from at least two possible options, and explain the choice.	p. 62
1N7 Identify the number, up to 20, that is one more, two more, one less and two less than a given number. [C, CN, ME, R, V]	1N7.1 Name the number that is one more, two more, one less or two less than a given number, up to 20.	p. 48
	1N7.2 Represent a number on a ten-frame that is one more, two more, one less or two less than a given number.	p. 60
1N8 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by: • using familiar and mathematical language to describe additive and subtractive actions from their personal experience • creating and solving problems in context that involve addition and subtraction • modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically. [C, CN, ME, PS, R, V]	1N8.1 Act out a given problem presented orally or through shared reading.	pp. 88, 100
	1N8.2 Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.	pp. 88-90, 100, 108
	1N8.3 Create an addition problem based on personal experiences, and simulate the action with counters.	pp. 90, 130
	1N8.4 Create a word problem for a given addition or subtraction number sentence (equation).	pp. 90, 102, 130
	1N8.5 Create a subtraction problem based on personal experiences, and simulate the action with counters.	pp. 102, 130
	1N8.6 Write the related subtraction fact for a given addition fact.	pp. 102, 132
	1N8.7 Write the related addition fact for a given subtraction fact.	pp. 102, 132
	1N8.8 Indicate if the scenario in a given story problem represents additive or subtractive action.	pp. 108, 130
	1N8.9 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.	pp. 108, 130

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Number (Continued)	**General Outcome:** Develop number sense.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1N9 Describe and use mental mathematics strategies for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]	1N9.1 Use and describe a mental mathematics strategy for determining a given sum.	pp. 96-98, 106, 126
	1N9.2 Use and describe a mental mathematics strategy for determining a given difference.	pp. 96, 106, 126
	1N9.3 Use and describe mental mathematics strategies, such as: • counting on and counting back • making 10 • using doubles • thinking addition for subtraction.	pp. 96, 126
	1N9.4 Refine mental mathematics strategies to increase their efficiency.	pp. 96, 106, 128

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Patterns and Relations (Patterns)	**General Outcome:** Use patterns to describe the world and to solve problems.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1PR1 Demonstrate an understanding of repeating patterns (two to four elements) by: • describing • reproducing • extending • creating patterns using manipulatives, diagrams, sounds and actions. [C, PS, R, V]	1PR1.1 Describe a given repeating pattern containing two to four elements in its core.	pp. 22-24
	1PR1.2 Identify and describe errors in a given repeating pattern.	pp. 22-24
	1PR1.3 Identify and describe the missing element(s) in a given repeating pattern.	pp. 22-24
	1PR1.4 Reproduce and extend a given repeating pattern using manipulatives, diagrams, sounds and actions.	pp. 22-24
	1PR1.5 Identify and describe, using every day language, a repeating pattern in the environment, e.g., in the classroom, outdoors.	pp. 22-24
	1PR1.6 Identify repeating events; e.g., days of the week, birthdays, seasons	p. 22
	1PR1.7 Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.	p. 26
1PR2 Translate repeating patterns from one representation to another. [C, CN, R, V]	1PR2.1 Represent a given repeating pattern, using another mode; e.g., actions to sound, colour to shape, ABC ABC to moose, puffin, bear, moose, puffin, bear.	p. 28
	1PR2.2 Describe a given repeating pattern, using a letter code; e.g., ABC ABC,…	p. 28

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Patterns and Relations (Variables and Equations)	**General Outcome:** Represent algebraic expressions in multiple ways.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). [C, CN, R, V]	1PR3.1 Construct two equal sets, using the same objects (same shape and mass), and demonstrate their equality of number, using a balance scale.	p. 68
	1PR3.2 Construct two unequal sets, using the same objects (same shape and mass), and demonstrate their inequality of number, using a balance scale.	p. 68
	1PR3.3 Determine if two given concrete sets are equal or unequal, and explain the process used.	p. 68
1PR4 Record equalities using the equal symbol (0 to 20). [C, CN, PS, V]	1PR4.1 Represent a given equality, using manipulatives or pictures.	pp. 70, 92, 104, 128
	1PR4.2 Represent a given pictorial or concrete equality in symbolic form.	pp. 92, 104, 128
	1PR4.3 Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).	pp. 94, 104, 128
	1PR4.4 Record different representations of the same quantity (0 to 20) as equalities.	pp. 94, 128

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Shape and Space (Measurement)	**General Outcome:** Use direct or indirect measurement to solve problems.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1SS1 Demonstrate an understanding of measurement as a process of comparing by: • identifying attributes that can be compared • ordering objects • making statements of comparison • filling, covering or matching. [C, CN, PS, R, V]	1SS1.1 Identify common attributes, such as length, height, mass, capacity and area, that could be used to compare two given objects.	pp. 138-144
	1SS1.2 Order a set of objects by length, height, mass, capacity or area, and explain their ordering.	pp. 138-144
	1SS1.3 Compare two given objects, and identify the attributes used to compare.	pp. 138-144
	1SS1.4 Determine which of two or more objects is longest or shortest by matching, and explain the reasoning.	p. 138
	1SS1.5 Determine which of two or more objects has the greatest or least area by covering, and explain the reasoning.	p. 140
	1SS1.6 Determine which of two or more objects holds the most or least by filling, and explain the reasoning.	p. 142
	1SS1.7 Determine which of two or more objects is heaviest or lightest by comparing, and explain the reasoning.	p. 144

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Strand: Shape and Space (3-D Objects and 2-D Shapes)	**General Outcome:** Use direct or indirect measurement to solve problems.	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
1SS2 Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule. [C, CN, R, V]	1SS2.1 Sort a set of familiar 3-D objects or 2-D shapes, using a given sorting rule.	p. 76
	1SS2.2 Sort a set of familiar 3-D objects using a single attribute, determined by the student, and explain the sorting rule.	p. 76
	1SS2.3 Sort a set of 2-D shapes using a single attribute, determined by the student, and explain the sorting rule.	p. 76
	1SS2.4 Determine the difference between two pre-sorted sets of familiar 3-D objects or 2-D shapes, and explain a possible sorting rule used to sort them.	p. 78
1SS3 Replicate composite 2-D shapes and 3-D objects. [CN, PS, V]	1SS3.1 Select 2-D shapes from a set to reproduce a composite 2-D shape.	p. 78
	1SS3.2 Select 3-D objects from a set to reproduce a composite 3-D object.	p. 78
	1SS3.3 Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.	p. 78
	1SS3.4 Predict and select the 3-D objects used to produce a composite 3-D object, and verify by deconstructing the composite object.	p. 78
1SS4 Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]	SS4.1 Identify 3-D objects (cylinder, cone, cube, sphere) in the environment that have parts similar to a 2-D shape (circle, triangle, square, rectangle).	p. 80

Appendix B
Problem Solving Strategies and Ideas

Outcomes

Students will be expected to

Problem Solving

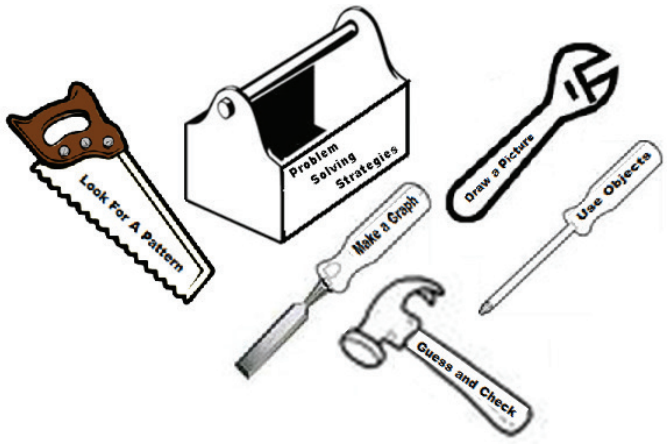
Elaborations—Strategies for Learning and Teaching

A student's earliest experience with mathematics is through solving problems. NCTM (2000) states that "problem solving means engaging in a task for which the solution method is not known in advance" (p.52). Solving problems is naturally embedded within the curriculum. To find solutions, students must draw on knowledge, and through this process they will often develop new mathematical understanding. By engaging in problem solving tasks, students will develop new ways of thinking, perseverance, curiosity and confidence with unfamiliar situations. Good problem solvers are able to tackle everyday situations effectively.

Good mathematical problems should arise from daily routine, as well as non-routine, tasks. Engaging students in rich problem solving tasks gives them the opportunity to solidify and extend upon what they already know, thus stimulating their mathematical learning. Problems can be presented orally, visually or whereby a problem is written and read aloud for the students to solve. Your role is to choose worthwhile problems that are meaningful to the student, and to provide an environment that encourages risk-taking and persistence.

It is important to explicitly discuss problem solving strategies with students, preferably as they come up naturally in classroom activities and discussions. There is value in naming the strategies so that students can discuss and recall them readily. You may consider posting the strategies in your classroom where they are taught.

Although certain strategies are more applicable to specific topics, students are essentially 'filling their toolboxes' with problem solving tools that can be used at any time. It is important to be cognizant of your language and not refer to a problem solving strategy as incorrect or correct. It is important that they learn to be risk takers and try different strategies in different situations. With enough experience, they will learn to choose the most efficient strategy for their individual learning styles.



Suggested Assessment Strategies

Performance

- Show students a snap cube train with a simple AB colour pattern. Patterns must have three core repeats. Ask students to identify and extend the pattern. This can be modified to include more complex patterns to meet the students' instructional needs. (1PR1.5)

- Ask students to solve this problem using available concrete materials:
  (i) 12 crayons fell on the floor. Some were red and some were blue. How many are red? How many are blue? (If necessary, adjust the colours in the problem to match the crayons you have available.)
  (ii) Use red and blue snap cubes to represent the red and blue crayons. Count the red cubes to determine the number of red crayons, count the blue cubes to determine the number of blue crayons.

  Some discussion questions while solving this problem could be:

  Do you think there will be only one answer?

  What do we already know?

  What are we looking for?

  How can we show our work?

  This may be a good place to introduce T-charts. Their charts could then be placed in their portfolios. (1N4.3)

- Ask the student to solve this problem by physically acting it out: 15 (use the number of students in your class) students are in the classroom, some are sitting and some are standing. How many are sitting? How many are standing? Ask certain groups to stand up while others remain seated. Have students count the number of students sitting and the number of students standing. (1N4.3)

- Provide students with a variety of 3-D solids. Show a composite 3-D object, such as a tower, and ask students to predict and select which solids they need to replicate the object. Students build the object using the solids they selected. They may then decompose the given object to verify their predictions. (1SS3.2, 1SS3.4)

Resources/Notes

Authorized Resource

Math Makes Sense 1

Patterning
Lesson 3: Strategies Toolkit
TR: pp. 18 - 19
SB: pp. 8 - 9

Representing Numbers to 20
Lesson 7: Strategies Toolkit
TR: pp. 40 - 41
SB: pp. 28 - 29

Geometry
Lesson 4: Strategies Toolkit
TR: pp. 24 - 25
SB: pp. 149 - 150

Outcomes

Students will be expected to

Problem Solving (Continued)

Elaborations—Strategies for Learning and Teaching

These are the problem solving strategies presented this year. It is not intended that these strategies be taught in a block of time, but rather explored throughout the year.

Strategy	Description
Act it Out	Students physically act out the problem to find the solution.
Make a Model	Students use a variety of materials or manipulatives to represent the elements in the problem.
Look for a Pattern	Students' surroundings contain many patterns such as in their clothing, in structures and buildings, and in the classroom. Students can look for patterns to help them solve problems.
Draw a Picture	Students draw a picture of the problem before attempting to solve it. This can be beneficial to visual learners. Although students may think that drawing a picture to solve a problem is easy, the thought that goes into creating the picture is important to the success of the investigation and is helpful in presenting the solution.
Guess and Check	Students make a guess and then check to see if they are correct. If their guess does not work they revise their initial guess based on what was tried and learned. This continues until the correct answer is found.
Use an Object	Students use simple objects such as string, paper clips, snap cubes or any non-standard measuring tool to solve the problem.
Choose a Strategy	The strategy students choose may be determined by their style of learning or their developmental phase. Encourage them to use the strategy that they are most confident using.

Suggested Assessment Strategies	Resources/Notes
Performance	**Authorized Resource**
• Place 12 snap cubes of the same colour in a paper bag. Reach in and remove 5 cubes. Ask students: *If I had 12 cubes in the bag and I took out 5, how many are left in the bag?* Students guess 6. On a chart or white board write 5 + 6 = 11. *That is a great guess but was there more or less than 11 in the bag? Let's try again.* Students guess 7. Write 5 + 7 = 12. *That is the number we were looking for. So there are 7 cubes still in the bag.* Count the remaining cubes in the bag to confirm the guess. (1N9.1)	*Math Makes Sense 1* **Addition and Subtraction to 12** **Lesson 4: Strategies Toolkit** TR: pp. 30 - 31 SB: pp. 71 - 72
• Model this problem for the students: There are 5 birds in my neighbour's back garden. When I look over the fence how many bird legs do I see? Discuss how many legs are on one bird and then draw the five birds. Count the number of legs by ones and twos. (1N1.5)	**Numbers to 100** **Lesson 7: Strategies Toolkit** TR: pp. 36 - 37 SB: pp. 134 - 135
• Present the problem: Bobby and Luke own 18 toy cars. When they were cleaning up their room they could only find 9. How many cars are missing? Ask students to choose a strategy to solve the problem. (1N8.4, 1N8.5, 1N8.7)	**Addition and Subtraction to 20** **Lesson 8: Strategies Toolkit** TR: pp. 37 - 38 SB: p. 170
• Working in pairs, direct students to compare the length of their forearms from the wrist to the elbow. Give students paper clips or Link-Its™ to measure the length of their forearms and compare the object(s) used to see who has the longest arm and who has the shortest arm. (1SS1.1, 1SS1.2, 1SS1.3)	**Measurement** **Lesson 3: Strategies Toolkit** TR: pp. 20 - 21 SB: pp. 91 - 92

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