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## References
Acknowledgements

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- **Ruth Power-Blackmore**, Teacher – Larkhall Academy, St. John’s

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Foreword

The Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics released in 2006 by the National Council of Teachers in Mathematics (NCTM) and the WNCP Common Curriculum Frameworks for Mathematics K – 9 (WNCP, 2006), assists many provinces in developing a mathematics curriculum framework. Newfoundland and Labrador has used this curriculum framework to direct the development of this curriculum guide.

This curriculum guide is intended to provide teachers with the overview of the outcomes framework for mathematics education. It also includes suggestions to assist teachers in designing learning experiences and assessment tasks.
BACKGROUND

The province of Newfoundland and Labrador commissioned an independent review of mathematics curriculum in the summer of 2007. This review resulted in a number of significant recommendations. In March of 2008, it was announced that this province accepted all recommendations. The first and perhaps most significant of the recommendations were as follows:

• That the WNCP Common Curriculum Frameworks for Mathematics K – 9 and Mathematics 10 – 12 (WNCP, 2006 and 2008) be adopted as the basis for the K – 12 mathematics curriculum in this province.

• That implementation commence with Grades K, 1, 4, 7 in September 2008, followed by in Grades 2, 5, 8 in 2009 and Grades 3, 6, 9 in 2010.

• That textbooks and other resources specifically designed to match the WNCP frameworks be adopted as an integral part of the proposed program change.

• That implementation be accompanied by an introductory professional development program designed to introduce the curriculum to all mathematics teachers at the appropriate grade levels prior to the first year of implementation.

As recommended, the implementation schedule for K-6 mathematics is as follows:

<table>
<thead>
<tr>
<th>Implementation Year</th>
<th>Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>K, 1 and 4</td>
</tr>
<tr>
<td>2009</td>
<td>2, 5</td>
</tr>
<tr>
<td>2010</td>
<td>3, 6</td>
</tr>
</tbody>
</table>

All teachers assigned to these grades will receive professional development opportunities related to the new curriculum and resources.
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, May 2006* (the Common Curriculum Framework). These guides incorporate the conceptual framework for Kindergarten to Grade 9 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.

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 successfully developing numeracy 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. At all levels, students 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 are 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 realize that it is acceptable to solve problems in a variety of ways and that a variety of solutions may be acceptable.
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 be taught 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 the setting and assessing of personal goals.

**Affective Domain**

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

**Early Childhood**

Young children are naturally curious and develop a variety of mathematical ideas before they enter Kindergarten. Children make sense of their environment through observations and interactions at home, in daycares, in preschools and in the community. Mathematics learning is embedded in everyday activities, such as playing, reading, beading, baking, storytelling and helping around the home.

Activities can contribute to the development of number and spatial sense in children. Curiosity about mathematics is fostered when children are engaged in, and talking about, such activities as comparing quantities, searching for patterns, sorting objects, ordering objects, creating designs and building with blocks.

Positive early experiences in mathematics are as critical to child development as are early literacy experiences.
Goals For Students

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.

The program of studies 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.

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. This can be particularly true for First Nations, Métis and Inuit learners. When mathematical ideas are connected to each other or to real-world phenomena, students begin to view mathematics as useful, relevant and integrated.

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 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.
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? 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 must ask students to determine a way to get from what is known to what is sought. If students have already been given ways to solve the problem, it is not a problem, but practice. A true problem requires students to use prior learnings 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 look for, and engage in, finding a variety of strategies for solving problems empowers students to explore alternatives and develops confident, cognitive mathematical risk takers.

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.

Calculators and computers 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.

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).
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 program of studies. The components are change, constancy, number sense, patterns, relationships, spatial sense and uncertainty.

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).

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 byproduct of learning rather than through direct instruction. However, number sense 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. Patterns exist in all strands of this program of studies.

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 nonroutine problems.

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

### Relationships

Mathematics is one way to describe interconnectedness in a holistic worldview. 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 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

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.
The learning outcomes in the program of studies 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.

**STRANDS**

- **Number**
- **Patterns and Relations**
- **Shape and Space**
- **Statistics and Probability**

**Number**

- Develop number sense.

**Patterns and Relations**

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

**Variables and Equations**

- Represent algebraic expressions in multiple ways.

**Shape and Space**

- Use direct and indirect measurement to solve problems.

**Measurement**

- 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**

- Collect, display and analyze data to solve problems.

**Data Analysis**

- Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.
OUTCOMES AND ACHIEVEMENT INDICATORS

The program of studies is stated in terms of general outcomes, specific outcomes and achievement indicators.

<table>
<thead>
<tr>
<th>General Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General outcomes</strong> are overarching statements about what students are expected to learn in each strand/substrand. The general outcome for each strand/substrand is the same throughout the grades.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific outcomes</strong> are statements that identify the specific skills, understanding and knowledge that students are required to attain by the end of a given grade.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Achievement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Achievement indicators</strong> 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. Achievement indicators are context-free.</td>
</tr>
</tbody>
</table>

SUMMARY

The conceptual framework for K–9 mathematics describes the nature of mathematics, mathematical processes and the mathematical concepts to be addressed in Kindergarten to Grade 9 mathematics. The components are not meant to stand alone. Activities that take place in the mathematics classroom should stem 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 strands.
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.

Resources  The resource selected by 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.
**Teaching Sequence**

The curriculum guide for Grade 1 is organized by units from Unit 1 to Unit 7. The purpose of this timeline is 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.

**Instruction 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.
GENERAL AND SPECIFIC OUTCOMES

GENERAL AND SPECIFIC OUTCOMES BY STRAND
(pages 17–28)
This section presents the general and specific outcomes for each strand, for Kindergarten, Grade 1 and 2.
Refer to Appendix A for the general and specific outcomes with corresponding achievement indicators organized by strand for Grade 1.

GENERAL AND SPECIFIC OUTCOMES WITH ACHIEVEMENT INDICATORS (beginning at page 29)
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.
GENERAL AND SPECIFIC OUTCOMES BY STRAND

(Kindergarten, Grades 1 and 2)
## Number

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>1. Say the number sequence by 1s:</td>
<td>1. Say the number sequence 0 to 100 by:</td>
<td>1. Say the number sequence 0 to 100 by:</td>
</tr>
<tr>
<td>- starting anywhere from 1 to 10</td>
<td>- 1s forward between any two</td>
<td>- 2s, 5s and 10s, forward and</td>
</tr>
<tr>
<td>and from 10 to 1.</td>
<td>given numbers</td>
<td>backward, using starting points</td>
</tr>
<tr>
<td>- forward from 1 to 30</td>
<td>- 1s backward from 20 to 0</td>
<td>that are multiples of 2, 5 and 10</td>
</tr>
<tr>
<td>[C, CN, V]</td>
<td>- 2s forward from 0 to 20</td>
<td>respectively</td>
</tr>
<tr>
<td>2. Subitize (recognize at a glance)</td>
<td>- 5s and 10s forward from 0 to</td>
<td>- 10s, using starting points from</td>
</tr>
<tr>
<td>and name familiar arrangements</td>
<td>100.</td>
<td>1 to 9</td>
</tr>
<tr>
<td>of 1 to 6 objects, dots or pictures.</td>
<td>[C, CN, ME, V]</td>
<td>- 2s, starting from 1.</td>
</tr>
<tr>
<td>[C, CN, ME, V]</td>
<td>2. Subitize (recognize at a glance)</td>
<td>[C, CN, ME, R]</td>
</tr>
<tr>
<td>and name familiar arrangements</td>
<td>and name familiar arrangements</td>
<td>2. Demonstrate if a number (up to</td>
</tr>
<tr>
<td>of 1 to 10 objects or dots.</td>
<td>of 1 to 10 objects or dots.</td>
<td>100) is even or odd.</td>
</tr>
<tr>
<td>[C, CN, ME, V]</td>
<td>[C, CN, ME, V]</td>
<td>[C, CN, PS, R]</td>
</tr>
<tr>
<td>3. Relate a numeral, 1 to 10, to its</td>
<td>3. Demonstrate an understanding</td>
<td>3. Describe order or relative</td>
</tr>
<tr>
<td>respective quantity.</td>
<td>of counting by:</td>
<td>position, using ordinal numbers</td>
</tr>
<tr>
<td>[CN, R, V]</td>
<td>• indicating that the last number</td>
<td>(up to tenth).</td>
</tr>
<tr>
<td>4. Represent and describe</td>
<td>• said identifies “how many”</td>
<td>[C, CN, R]</td>
</tr>
<tr>
<td>numbers 2 to 10, in two parts,</td>
<td>• showing that any set has only</td>
<td>4. Represent and describe</td>
</tr>
<tr>
<td>concretely and pictorially.</td>
<td>one count</td>
<td>numbers to 100, concretely,</td>
</tr>
<tr>
<td>[C, CN, ME, R, V]</td>
<td>• using the counting-on strategy</td>
<td>pictorially and symbolically.</td>
</tr>
<tr>
<td>5. Compare quantities 1 to 10,</td>
<td>• using parts or equal groups to</td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td>- using one-to-one</td>
<td>count sets.</td>
<td></td>
</tr>
</tbody>
</table>
Number

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>4. Represent and describe numbers to 20, concretely, pictorially and symbolically. [C, CN, V]</td>
<td>5. Compare sets containing up to 20 elements, using: • referents • one-to-one correspondence to solve problems. [C, CN, ME, PS, R, V]</td>
<td>5. Compare and order numbers up to 100. [C, CN, ME, R, V]</td>
</tr>
<tr>
<td>6. Estimate quantities to 20 by using referents. [C, CN, ME, PS, R, V]</td>
<td>7. Illustrate, concretely and pictorially, the meaning of place value for numerals to 100. [C, CN, R, V]</td>
<td>7. Illustrate, concretely and pictorially, the meaning of place value for numerals to 100. [C, CN, R, V]</td>
</tr>
<tr>
<td>7. (No Outcome)</td>
<td>8. Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number. [C, R]</td>
<td>8. Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number. [C, R]</td>
</tr>
<tr>
<td>8. 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]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Number

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome</td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td>Specific Outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. 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.</td>
<td>9. 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.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
</tbody>
</table>
## Number

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome</td>
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<td>Develop number sense.</td>
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</tr>
<tr>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
</tr>
<tr>
<td>10. Describe and use mental mathematics strategies (memorization not intended), such as:</td>
<td>10. Apply mental mathematics strategies, such as:</td>
<td></td>
</tr>
<tr>
<td>- counting on and counting back</td>
<td>• counting on and counting back</td>
<td></td>
</tr>
<tr>
<td>- making 10</td>
<td>• making 10</td>
<td></td>
</tr>
<tr>
<td>- using doubles</td>
<td>• using doubles</td>
<td></td>
</tr>
<tr>
<td>- thinking addition for subtraction for basic addition facts and related subtraction facts to 18.</td>
<td>• using addition to subtract for basic addition facts and related subtraction facts to 18.</td>
<td></td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V]</td>
<td>[C, CN, ME, PS, R, V]</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
</tbody>
</table>
Patterns and Relations  
(Patterns)

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
</tbody>
</table>
| Use patterns to describe the world and to solve problems. | 1. 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] | 1. Demonstrate an understanding of repeating patterns (two to four elements) by:  
  - describing  
  - reproducing  
  - extending  
  - creating  
  patterns using manipulatives, diagrams, sounds and actions.  
  [C, CN, PS, R, V] |
| 2. Translate repeating patterns from one representation to another.  
  [C, CN, R, V] | | 2. Demonstrate an understanding of increasing patterns by:  
  - describing  
  - reproducing  
  - extending  
  - creating  
  patterns using manipulatives, diagrams, sounds and actions (numbers to 100).  
  [C, CN, PS, R, V] |
| 3. Sort objects, using one attribute, and explain the sorting rule.  
  [C, CN, R, V] | | |
| **Specific Outcomes** | **Specific Outcomes** | **Specific Outcomes** |
| 1. 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] | 2. Demonstrate an understanding of increasing patterns by:  
  - describing  
  - reproducing  
  - extending  
  - creating  
  patterns using manipulatives, diagrams, sounds and actions (numbers to 100).  
  [C, CN, PS, R, V] | |

[C] Communication  
[CN] Connections  
[ME] Mental Mathematics  
and Estimation  
[PS] Problem Solving  
[R] Reasoning  
[T] Technology  
[V] Visualization
**Patterns and Relations**  
**(Variables and Equations)**

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Use patterns to describe the world and to solve problems.</td>
<td>Use patterns to describe the world and to solve problems.</td>
<td>Use patterns to describe the world and to solve problems.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
</tbody>
</table>
| 4. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).  
[C, CN, R, V] | 3. Demonstrate and explain the meaning of equality by using manipulatives and diagrams (0 – 100)  
[C, CN, R, V] | 4. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.  
[C, CN, R, V] |
| 5. Record equalities, using the equal symbol.  
[C, CN, PS, V] | | |
**Shape and Space**  
*(Measurement)*

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Use direct or indirect measurement to solve problems.</td>
<td>Use direct or indirect measurement to solve problems.</td>
<td>Use direct or indirect measurement to solve problems.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>1. Use direct comparison to compare two objects based on a single attribute, such as - length including height - mass - capacity</td>
<td>1. 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.</td>
<td>1. Relate the number of days to a week and the number of months to a year in a problem-solving context.</td>
</tr>
<tr>
<td>[C, CN, PS, R, V]</td>
<td>[C, CN, PS, R, V]</td>
<td>[C, CN, PS, R]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Compare and order objects by length, height, distance around and mass, using nonstandard units, and make statements of comparison.</td>
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<tr>
<td></td>
<td></td>
<td>[C, CN, ME, R, V]</td>
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<tr>
<td></td>
<td></td>
<td>4. Measure length to the nearest nonstandard unit by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- using multiple copies of a unit - using a single copy of a unit (iteration process).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[C, ME, R, V]</td>
</tr>
</tbody>
</table>
# General and Specific Outcomes by Strand

<table>
<thead>
<tr>
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</tbody>
</table>

## Shape and Space (Measurement)

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome</td>
<td>Use direct or indirect measurement to solve problems.</td>
<td>Use direct or indirect measurement to solve problems.</td>
</tr>
<tr>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
</tr>
<tr>
<td>5. Demonstrate that changing the orientation of an object does not alter the measurements of its attributes. [C, R, V]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Shape and Space
(3-D Objects and 2-D Shapes)

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
</table>
| **General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them. | **General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them. | **General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them. |
| **Specific Outcomes**
2. Sort objects, including 3-D objects, using a single attribute and explain the sorting rule.
[C, CN, PS, R, V] | 2. Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule.
[C, CN, R, V] | 6. Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.
[C, CN, R, V] |
| 3. Build and describe 3-D objects.
[CN, PS, V] | 3. Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V] | 7. Describe, compare and construct 3-D objects, including:
- cubes
- spheres
- cones
- cylinders
- pyramids.
[C, CN, R, V] |
| 4. Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V] | | 8. Describe, compare and construct 2-D shapes, including:
- triangles
- squares
- rectangles
- circles.
[C, CN, R, V] |
| 9. Identify 2-D shapes as parts of 3-D objects in the environment.
[C, CN, R, V] |
Statistics and Probability
(Data Analysis)

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome</td>
<td>Collect, display and analyze data to solve problems.</td>
<td>Collect, display and analyze data to solve problems.</td>
</tr>
<tr>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
</tr>
<tr>
<td>1. Gather and record data about self and others to answer questions.</td>
<td>[C, CN, PS, V]</td>
<td>1. Gather and record data about self and others to answer questions.</td>
</tr>
<tr>
<td>2. Construct and interpret concrete graphs and pictographs to solve problems.</td>
<td>[C, CN, PS, R, V]</td>
<td>2. Construct and interpret concrete graphs and pictographs to solve problems.</td>
</tr>
</tbody>
</table>
Representing Numbers to 20

Suggested Time: 7 Weeks

This is the first explicit focus on numbers to 20, but as with other outcomes, it is ongoing throughout the year.
Unit Overview

Focus and Context
In Kindergarten, number concepts were explored while focusing numbers 1 to 10. An understanding of the number combinations to 10 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 10 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 manipulative such as ten frames, number lines, and snap cubes.

Math Connects
Number concepts are an important link to the world around us. Applying number relationships to the real world marks the beginning of making sense of the world in a mathematical manner. Number sense develops naturally when students connect numbers to their own life experiences, and begin to use numbers as benchmarks and referents. Students will develop multiple ways of thinking about and representing numbers. Opportunities to explain their thinking and reasoning through questions and discussion will strengthen their connections and deepen their sense of number concepts.
# Process Standards

**Key**

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

## Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>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.</td>
<td>[C, CN, ME, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects, dots or pictures.</td>
<td>[C, CN, ME, V]</td>
</tr>
<tr>
<td>Number</td>
<td>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.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.</td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N5 Compare and order sets containing up to 20 elements to solve problems, using: • referents (known quantities) • one-to-one correspondence to solve problems.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N6 Estimate quantities to 20 by using referents.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N8 Identify the number, up to 20, that is one more, two more, one less and two less than a given number.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Variables and Equations)</td>
<td>1PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Variables and Equations)</td>
<td>1PR4 Record equalities, using the equal symbol (0 to 20)</td>
<td>[C, CN, PS, V]</td>
</tr>
</tbody>
</table>
## 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]

### Elaborations—Strategies for Learning and Teaching

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).

As students learn the number sequences, practice should be provided through learning activities integrated throughout the number strand. Many suggestions for teaching and learning in outcome N3 on pages 36 - 41 will provide opportunities to learn number sequences.

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 Dee to show various ways of counting.

### 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).

Daily Routines - 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 comfortable with 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… or 21, 22, 23).

*Continued*
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 100. This activity can be modified for counting backwards from 20 to 0, as well as skip counting.

- Copy one set of numeral wands for each student on heavy paper. Have students 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 2 or 3 numbers (9, 10, 11). Have students hold up the card that comes next. This activity can be done for counting backwards as well. These can be used throughout the year to allow students to display answers to questions during morning routine and various other activities.

Resources/Notes

Math Makes Sense 1
Launch
Teacher Guide (TG) p. 17
Lesson 1: Counting to 20
1N1, 1N3, 1N4
TG pp. 18 - 21
Audio CD 1
Selections: 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
Depending on your class, you may choose to introduce this lesson using numbers to 10 and later work with numbers 11-20.

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

Unit Centres:
TG p. 15
Numbers Everywhere
Strand: Number

Outcomes

Students will be expected to

1N1 Continued

Achievement Indicators:

1N1.1 Continued

1N1.2 Continued

Elaborations—Strategies for Learning and Teaching

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, and skip counting. For example: “Ten In A Bed”, “One, Two, Buckle My Shoe” and “This Old Man.”

Have students practice responsive counting from 0 to 100 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.

Because it is important that students develop an efficient means of recording numerals, numeral writing should be taught. As students are ready to record information by recording the appropriate numeral(s), specific instruction and practice will be necessary. Allow the 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. 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 children 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, because a student has learned to write the numerals we must be very careful not to assume that students are 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 (a chart showing the numbers from 1 to 100 in lines of 10) or calendar, and ask students to read the numerals that are presented. The hundred chart is also a valuable tool to provide practice saying the number sequence from 0 to 100, as well as skip counting by 2’s, 5’s, and 10’s. 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.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Hide various quantities of counters under plastic tubs. Lift the tubs one at a time and have the students count and record the number of counters that are hidden under each tub. (1N1.3)

- Provide students with a tub containing a variety of colored linking cubes. Ask students to sort the cubes by color and then count and record the number of each. (1N1.3)

- Grab Bag Counting – Provide students with a paper bag containing 10 linking cubes. Students take turns grabbing handfuls of cubes from the grab bag. They count and record the number of cubes in their hand on a recording sheet. As an extension to this activity, use smaller counters to work with quantities 11 to 20. (1N1.3)

- Attach a string or a clothesline to a wall in the classroom with number cards displaying any number sequence from 0 to 20. Have students take turns choosing a number card on the string and reading their numbers aloud. (The number cards can be turned around so that students are unable to see the number until it is selected). (1N1.4)

- Using a walk-on number line and bean bags, have students 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

Math Makes Sense 1
Lesson 1 (Continued): Counting to 20
1N1, 1N3, 1N4
TG pp. 18 - 21

Name:
Red 6
Yellow 2
Green 0
Blue 3
Black

Math Makes Sense 1
Lesson 1 (Continued): Counting to 20
1N1, 1N3, 1N4
TG pp. 18 - 21
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]

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 involves an understanding that:

- one number is said for each item in the group and is counted only once (one-to-one correspondence).
- counting begins at the number 1 and there is a set number sequence (stable order).
- the starting point and order of counting the objects does not affect the quantity (conservation).
- the arrangement or types of objects does not affect the count (conservation).
- the number in the set is the last number said (cardinality).

The meaning attached to counting is the foundation on which all other number concepts are developed. For this reason, it is necessary to assess each student 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 10. Students will be expected to work with only 2-digit numbers at this grade level.

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?

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Provide students with a tub filled with different objects, such as buttons, blocks, and beans. Have students 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 Unifix 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 page 33).  

  \[(1N3.1)\]

**Resources/Notes**

*Math Makes Sense 1*

Lesson 1 (Continued): Counting to 20

1N1, 1N3, 1N4

TG pp. 18 - 21
Strand: Number

Outcomes

Students will be expected to
1N3 Continued

Achievement Indicator:

1N3.1 Continued

Elaborations—Strategies for Learning and Teaching

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 nine objects and ask, “How many are here?” The student counts correctly and says, “Nine.” Ask, “Are there nine?” Students who understand that the last number counted is the quantity of the set (cardinality) will not need to recount.

1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.
[C, CN, V]

Achievement Indicator:

1N4.2 Read given number words to 10.

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.

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**

- Shuffle a pile of number word cards from zero to ten. Have students remove one card from the pile and identify the number that is written on the card. (1N4.2)

- 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 (1N4.2)

- 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. (1N4.2)

**Resources/Notes**

*Math Makes Sense 1*
Lesson 1 (Continued): Counting to 20
1N1, 1N3, 1N4
TG pp. 18 - 21
**Strand: Number**

### Outcomes

*Students will be expected to*

1N3 Continued

**Achievement Indicators:**

1N3.3 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

1N3.4 Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction

1N3.7 Record the number of objects in a given set (up to 100).

1N4 Continued

**Achievement Indicator:**

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

1N3.3 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.

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. Therefore, 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 the student can tell you that there are 8 counters without recounting, then they are demonstrating conservation of number. If they recount the counters, conservation of number is not evident.

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 10. As students acquire a deeper understanding of number, students should count and record numbers up to 100.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Put 10 counters on the overhead projector 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. (1N3.3)

- Have students 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. (1N3.3)

- 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, 5 in one group and 9 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. (1N3.4)

- Using the overhead projector, display 12 counters, have a student count the number of counters out loud. Rearrange the counters and have the student predict and verify the count. (1N3.4)

- 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. Have students present their findings to the class. (1N4.4)

Pencil and Paper

- Extend the counting activities by having students record the number. (1N3.7)

- Provide each pair 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. (1N3.7)

Resources/Notes

Math Makes Sense 1
Lesson 2: Number Search
1N1, 1N3, 1N4
TG pp. 22 - 25

Audio CD 1:
Selection 21

Audio CD 2:
Selections 1, 2 & 3

Lesson 3: Number Arrangements
1N3, 1N4, 1N5
TG pp. 26 - 29
Outcomes

Students will be expected to

1N4 Continued

Achievement Indicators:

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

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 students’ 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 color, 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 9 counters and ask how many counters there are. Some possible responses are:

- I saw 9. There are 5 on the top and 4 more on the bottom make 9
- I know there are 9 because there is one empty space and one less than 10 is 9.
- If it was full, it would be 10. But, there is one empty space, so that makes 9.

Relating numbers to benchmark numbers, specifically 5 and 10, is a useful tool for thinking about various combinations of numbers. For example, 6 is the number that is 1 more than 5, or 9 is the number that is 1 less than 10.

- Note: There are different views on the placement of counters on the ten-frame. However, it is important to consider why ten-frames are used. The main purpose of a ten-frame is to visualize numbers in relation to 5 and 10, or relate numbers to 5 and 10 as benchmarks. Hence, in Grade 1, filling left to right with no empty spaces is strongly recommended so that children internally 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.

1N2.2 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.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

(1N2.2) 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. (1N2.2)

- 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. (1N2.2)

- 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 8 because there are 5 on the top row and 3 more make 8”. The student might also respond, “I know if the frame is full, there are 10 but there are 2 missing so that makes 8”. Repeat this activity using other ten frame cards with different representations of numbers to 10.

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

Student-Teacher Dialogue

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

Resources/Notes

Math Makes Sense 1
Lesson 4: Terrific Ten
1N2, 1N3, 1N4, 1N8
TG pp. 30 - 33

Audio CD 1:
Selections 17 & 18

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

Disregard MMS Teacher Guide, Unit 2, pages 94 & 95, in which ten-frames are displayed showing counters placed in a random order.
Strand: Number

Outcomes

_Students will be expected to_

1N8 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]

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 6 and 8, students need to explore the “two more than” and “two less than” relationship and understand that the relationship between 6 and 8 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. Student’s 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.

Have students 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 8 counters to show 10.” Have students explain what they did to create the new set. Observe those who are aware that they have to add 2 more to make the set of 10 and students who wipe away the initial set of 8 counters and begin counting from 1. To encourage counting on rather than beginning the count again, ask students how many more counters need to be added to the set of 8 to make the set of 10.

Achievement Indicators:

1N8.1 Name the number that is one more, two more, one less or two less than a given number, up to 20.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Show students a set of objects and count the objects to find the total. Say, “I am adding one more to the set. How many objects are there now?” Observe whether students can name the number without having to recount. Repeat using other quantities and assess if students can identify one more, one less, two more, and two less. (1N8.1)

- Have students count out a set of 6 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. (1N8.1)

- In groups of 2 to 4 players, have the students play “More or Less Bingo.”

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<tr>
<th>2</th>
<th>4</th>
<th>6</th>
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<tbody>
<tr>
<td>3</td>
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<tr>
<td>7</td>
<td>5</td>
<td>FREE</td>
<td>6</td>
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</tbody>
</table>

Take turns rolling a standard number cube and a spinner labeled with the words one more, one less, two more, and two less.

- Cover 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. (1N8.1)

- Give each student a number between one and ten to make on their ten-frame, or between one and twenty to make on their double 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 more than 10. What is my number?” This activity could also be done using the number wands. (1N8.2)

Resources/Notes

Math Makes Sense 1
Lesson 4 (Continued): Terrific Ten
1N2, 1N3, 1N4, 1N8
TG pp. 30 - 33

Lesson 12: One and Two More, One and Two Less
1N3, 1N8
TG pp. 54 - 57

This lesson provides extra practice and can be used now or later as follow up.
Strand: Number

Outcomes

Students will be expected to

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

[C, CN, ME, V]

Achievement Indicator:

1N2.1 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 dot arrangements in different patterns. 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.

E.g.

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; for example, \(5 = 4 + 1\) (or \(2 + 1 + 2\)) is apparent from:

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

• place value; for example, groups of 10 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 1 to 10.
**General Outcome: Develop Number Sense**

### Suggested Assessment Strategies

**Performance**

- **Dot Plate Flash** - Use prepared dot arrangements for numbers 0 to 10. Hold up a dot plate for one to three seconds. Say, “How many? How did you see it?” Students might say, “I saw 6. I saw 3 on one side and 3 on the other.” Observe how quickly students can recognize the number of dots without counting. *(1N2.1)*

- **Snap** – Provide partners with two sets of dot cards in two different colors. 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. *(1N2.1)*

- **Place one to ten counters on an overhead projector and cover them. Have students look at the screen and uncover the counters for a few seconds only. Ask students to tell you how many counters they saw and to explain their answer. Ask, “How did you know there are 5?” The student might respond, “There are 5 because I saw two on one side and three on the other.” Repeat with different numbers and different arrangements for each number.** *(1N2.1)*

- **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. *(1N2.1)*

### Resources/Notes

**Math Makes Sense 1**

**Lesson 5: Seeing Numbers**

1N2, 1N4

TG pp. 34 - 35

*This lesson should focus on subitizing.*

**MMS Teacher Guide, 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
1N2 Continued

Achievement Indicator:

1N2.1 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. For example, 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 1 to 5 and gradually increase for numbers of items up to 10. 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 7 as:
- a set of 3 and a set of 4
- a set of 2, a set of 3, and a set of 2

Dot Plates - Prepare dot arrangements using stickers on recipe cards or on paper plates to create a variety of arrangements for numbers 0 to 10. (For some dot arrangements, see Van de Walle, Teaching Student Centered Mathematics Grade K-3, p. 44). The use of paper plates as opposed to cards provides numerous opportunities for students to “see” various configurations as the plates are rotated.

Number Cubes – Game materials such as number cubes and dominoes are useful for recognizing familiar configurations (subitizing).
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 7 in several ways, and then decide which configuration(s) is (are) easiest to identify. E.g.,

\[ \begin{array}{c}
\begin{array}{c}
\bullet \bullet \bullet \bullet \\
\end{array} \\
\end{array} \]

(1N2.1)

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

(1N2.1)

**Resources/Notes**

*Math Makes Sense 1*
Lesson 5 (Continued): Seeing Numbers
1N2, 1N4
TG pp. 34 - 35

Unit Centre:
TG p. 15

What's My Number?
Strand: Number

Outcomes

Students will be expected to
1N3 Continued

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

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. For example, to count on to find the total of a dot plate of three and a dot plate of two, 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; however will recount the dots on the plate (e.g., 1, 2, 3) and then count the other dots (e.g., 4, 5).

Counting on and counting back are fundamental prerequisites for addition and subtraction and their importance should not be underestimated.

Have students place 8 blocks in a straight line across the top of their desk and cover 3 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 counters saying, “three” and then point to each counter in view and count on, “four, five, six, seven, eight.” Repeat using different numbers.
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.

<table>
<thead>
<tr>
<th>In</th>
<th>Outside</th>
<th>In all</th>
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<tbody>
<tr>
<td>6</td>
<td>8</td>
<td>14</td>
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</table>

(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 3 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

Math Makes Sense 1
Lesson 6: Representing Numbers
10 to 20
1N3, 1N4
TG pp. 36 - 39
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

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 10. 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. In Grade One, students need to be provided with many opportunities to explore part-part-whole relationships of numbers to 20.

To assess student’s understanding of number combinations, it is important to use hands-on activities whereby students 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 the students to find other ways to partition the number into two parts. Repeat using other numbers up to 20.

Snap It – 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 back. Taking turns, each student shows how many cubes are left in their hand while the other students guess 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.” This activity can be used as part of your daily routine.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Provide each student with a number of two-sided counters. Have students 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 10.”

  Students may shake and spill the same number of counters again and verbalize the resulting number combinations. (1N4.3)

- Tell stories such as:

  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?

  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?

  Have students use a part-part-whole mat and counters to represent the story. (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 colors 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:

  - [Diagram of snap cubes]
  "Ten and two more make twelve.”

  - [Diagram of snap cubes]
  "Six and six more make twelve”

  - [Diagram of snap cubes]
  "Seven and five make twelve”

  (1N4.3)

**Resources/Notes**

*Math Makes Sense 1*

Lesson 6 (Continued): Representing Numbers 10 to 20

1N3, 1N4

TG pp. 36 - 39

Unit Centre:

TG p. 15

Grouping Madness
### Strand: Number

#### Outcomes

March 8, 2001

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<tr>
<th>Students will be expected to</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Solving</strong></td>
<td>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.</td>
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<td>A true problem requires students to use prior learning in new ways and contexts. If students have already been given ways to solve the problem, it is not a problem, but practice. They should be comprised of problems arising from daily routines as well as non-routine tasks. Problem solving requires student engagement and builds depth of conceptual understanding. 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. Setting up an environment that encourages risk taking persistence in order for students to solve worthwhile problems that are meaningful, is important. Problems can be presented orally, visually or by written-and-oral approach. Your role is to choose worthwhile problems that are meaningful to the student, and to provide an environment that encourages risk taking and persistence.</td>
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<td>It is important to explicitly discuss problem solving strategies with students, preferably as they come up naturally in the 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).</td>
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</table>
General Outcome: Develop Number Sense

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Strand: Number

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<thead>
<tr>
<th>Outcomes</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
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<tbody>
<tr>
<td>Students will be expected to</td>
<td>Each unit will focus on one specific problem solving strategy with suggested ideas to practice. Although certain strategies are highlighted within specific units, students are essentially ‘filling their toolboxes’ with problem solving tools that can be used at any time. Here is a list of the strategies covered and their corresponding unit of focus:</td>
</tr>
<tr>
<td>Problem Solving (Continued)</td>
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<tr>
<td>Make a Model</td>
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<th>Strategy</th>
<th>Unit of Focus</th>
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<td>Act it Out</td>
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<tr>
<td>Make a Model</td>
<td>Numbers to 20</td>
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<tr>
<td>Look for a Pattern</td>
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<td>Draw a Picture</td>
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<tr>
<td>Guess and Check</td>
<td>Addition and Subtraction to 12</td>
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<tr>
<td>Use an Object</td>
<td>Measurement</td>
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<tr>
<td>Choose a Strategy</td>
<td>Addition and Subtraction to 20</td>
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<td>Geometry</td>
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</table>

- Act it Out

In ‘Act it Out’ students physically act out the problem to find the solution.

- Make a Model

‘Make a Model’ is very similar to ‘Act it Out’, but students use a variety of materials or manipulatives available in the classroom to represent the elements in the problem.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

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.

Have students solve this problem using concrete materials available:

• 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 colors in the problem to match the cubes you have available.)

• 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.

Resources/Notes

Math Makes Sense 1
Lesson 7 (Continued): Strategies Toolkit
TG pp. 40 - 41

Lesson 8:
Omitted
Strand: Number

Outcomes

Students will be expected to
1N4 Continued

Achievement Indicator:

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

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 10 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 10 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.

Provide 2 ten-frames and counters for each student. Ask the students to model a number between 11 and 19 with the counters. For example, ask students to model the number sixteen. Next ask them to show thirteen on their ten frame,

![Ten-frame](image)

Observe:
- Do they make the ten first?
- Do they remove all the counters?
- Do they add to/remove counters on the bottom frame?
- Are they able to verbalize appropriately saying, “Ten and six are sixteen”?
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Number Trains – Provide students with a spinner with numbers 11 to 20, and Unifix cubes (or interlocking base-ten units). Students spin the spinner and count that number of cubes. They link the cubes together to form a train of 10 and leave the remaining cubes separate. Observe whether they use appropriate verbalization to tell how many (e.g., “ten and three more are thirteen”). (1N4.1)

- Spill It Out! – Provide students with bags of objects, such as lima beans, buttons, or counters, to represent numbers from 11 to 20. Have students 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 (N3.7). Repeat using other bags of objects with various quantities. (1N3.7, 4.1)

- 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. (1N4.1)

Resources/Notes

Math Makes Sense 1
Lesson 9: Numbers to 20
1N1, 1N4, 1N8
TG pp. 44 - 45
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 5 and 10 (and their multiples) are critical. For example, students need to understand that eleven is 10 and 1 more, twelve is 10 and 2 more, and 16 is 10 and 6 more. A number line is a valuable tool to encourage reference to benchmarks.

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

1N8 Continued

**Achievement Indicator:**

1N8.2 Represent a number on a ten frame that is one more, two more, one less or two less than a given number.

Have students 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.

Using a number line throughout the year helps students develop a stronger understanding of number. At first, you may start a number line from only 0 to 5 and have students place 1, 2, 3, and 4 one it and explain why they placed the number where they placed it. (e.g., I placed 1 there because it is closer to 0 than to 5). As students become more confident, increase the numbers on the number line.

Provide students with strips of adding 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 your students.
**General Outcome: Develop Number Sense**

**Suggested Assessment Strategies**

**Performance**

- Use beads in two different colors to create number lines on strings. Alternate colors every 5 beads. Label the beads at the benchmarks 5, 10, 15, and 20. Call out a number between zero and twenty. Have students find the bead corresponding to the number and identify its place in relation to the benchmark number. For example, 8 can be seen as 3 more than 5 or 2 less than 10.  

  \[1N4.5\]

- 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 with 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) Have students with the numbers 5, 10, 15 and 20 line up in order, spacing themselves out. Have the remaining students place themselves in order according to their number.

  \[1N8.2\]

- 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.

  \[1N8.2\]

**Student-Teacher Dialogue**

- Record, tape, or pin the benchmark numbers on a section of adding machine tape, sentence strip paper, or a skipping rope. Have students 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 3 spaces past the number nine because 12 is 3 more than 9.”  

  \[1N4.5\]
Strand: Number

Outcomes

Students will be expected to

1N6. Estimate quantities to 20 by using referents.

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

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 5 or 10. For larger collections, one might be asking whether the group is closer to 10 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 6 or 8 objects on an overhead projector. Turn on the projector long enough for students to see the objects but not to count them. Turn off the projector and ask:

• Do you think there were more or fewer than 10?
• About how many objects did you see?

Record students' estimates on chart paper. Turn on the projector and 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. Have students, whose estimates were closest to the actual count, share how they arrived at their estimates.

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.

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 1 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 10 or 20 buttons in the group? Explain your choice.” Repeat using different objects and quantities. (1N6.1, 6.2)

- Prepare three transparent containers, one with 3 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)

Student-Teacher Dialogue

- Provide four or more sets of objects such as a set of interlocking cubes, a set of marbles, a set of clothespins, or a set of blocks. Have students 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, 6.2)

- Place 18 cubes in a container. Show it to the students and ask:
  - How many cubes do you think are in the container?
  - 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, 6.2)

- If I showed you a set of 7 objects, would 1 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?
- What do you think makes a good estimate? (1N6.1, 6.2)

Resources/Notes

Math Makes Sense 1
Lesson 10: Estimating Quantities
1N4, 1N6
TG pp. 46 - 49
Strand: Number

Outcomes

Students will be expected to

1N5 Compare and order sets containing up to 20 elements to solve problems, using:
- referents (known quantities)
- one-to-one correspondence

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. When students compare sets, ensure that the two sets are:
- lined up side by side and the students pair the items; or
- grouped in clusters and the students need to 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 might be encouraged 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 5 or 10? For larger collections, is it closer to 10 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 the same 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 0 to 20 (consider beginning with numbers 0 to 10 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, 5.2)

*Student-Teacher Dialogue*
- 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, 5.2)

- 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 1 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, 5.2)

**Resources/Notes**

*Math Makes Sense 1*
Lesson 11: More, Fewer or the Same?
1N5, 1PR3, 1PR4
TG pp. 50 - 53
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. Graphing is not specifically identified as an outcome for Grade One; however, it can be used as a strategy for comparing sets.

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. (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 10 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, 5.3)

- 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 7 boys and 3 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)

- Present problems such as the following:
  - I have 12 stickers in my collection. My friend says she has fewer. How many stickers might my friend have in her collection? (Any number less than twelve is acceptable for this problem).
  - 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?
  - Molly has 2 more toy cars that Jack. Jack has 5 cars. How many more cars does Molly have?
  Ask students to solve the problems using pictures, numbers, and words and present their work to the class. (1N5.4)

Resources/Notes

Math Makes Sense 1
Lesson 11 (Continued): More, Fewer or the Same?
1N5, 1PR3, 1PR4
TG pp. 50 - 53
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]

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. Have students place blue cubes, one at a time, onto the scale until it balances. Students 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 6 red cubes. The other side of the balance scale is represented by 4 yellow and 2 blue cubes.

When comparing numbers, many students may recognize that 5 is greater than 4, but not automatically realize, that 4 is less than 5. Both sides of the relationship need to be considered when completing the tasks.

Whenever possible, use mathematical language (e.g., “5 is greater than 4” and “3 is less than 5”). Eventually students will use the greater-than symbol and less-than symbol (e.g., $5 > 4$ or $3 < 5$), but is not required at this grade level.

Achievement Indicator:

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

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

- Provide a balance scale and two colors of Unifix 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., 3 is less than 6 or 6 is greater than 3).

- Provide two colors 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.

**Pencil and Paper**

- 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:
  - Who in your group has the greater/most number of letters in their name?
  - Does anyone in your group have the same/equal number of letters in their name(s) as in your name? How do you know?
  - Who in your group has the least/fewest number of letters in their name? How do you know? (1PR3.3)

**Resources/Notes**

- *Math Makes Sense 1*
  - Lesson 11 (Continued): More, Fewer or the Same
  - 1N5, 1PR3, 1PR4
  - TG pp. 50 - 53

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*

1PR3 Continued

**Achievement Indicator:**

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

#### Elaborations—Strategies for Learning and Teaching

- Line up students in two unequal groups. The groups could represent the number of boys and 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.

- 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 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 the same as for the equal sign will help them further understand this relation.

- Provide students with task cards showing pictures of given equalities using the equal sign. Students should use a variety of manipulatives to represent equalities by making sets.
## General Outcome: Represent Algebraic Expressions in Multiple Ways

### Suggested Assessment Strategies

**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.

  \[ \text{\textbf{(1PR3.3)}} \]

- 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 to find a partner with the corresponding card. In their math journals, students will record the equalities using the equal sign.

  \[ \text{\textbf{(1PR4.1)}} \]

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Patterning

Suggested Time: 2 Weeks

*This is the first explicit focus on patterning, but as with other outcomes, it is ongoing throughout the year.*
Unit Overview

Focus and Context
In Grade One, students are formally introduced to repeating patterns of two to four elements. 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 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. Students will continue working with repeating patterns, extending their knowledge to include five elements and will explore increasing patterns in Grade Two.

Math Connects
Through working with patterns, students learn to see relationships and make connections, generalizations, and predictions about the world around them. These experiences are important in all aspects of mathematics at this age. Looking for patterns is natural for young children. Even before Kindergarten, students develop concepts related to patterns, functions and algebra. They learn predictable poems, repetitive songs, and rhythmic chants that are based on repeating patterns. Patterns can be extended and described with both words and symbols. The same pattern can be found in many different forms. Patterns are found in physical and geometric situations, as well as in numbers. Pattern experiences at this grade level will give students the opportunity to explore repeating patterns. It is these experiences that are the foundation of the development of algebraic thinking that will be built upon during the year.
### Process Standards Key

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### Curriculum Outcomes

#### Patterns and Relations (Patterns)

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<td></td>
<td>• reproducing</td>
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<td>• extending</td>
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<td></td>
<td>• creating patterns using manipulatives, pictures, sounds and actions.</td>
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<td></td>
<td>1PR2 Translate repeating patterns from one representation to another.</td>
<td>[C, CN, R, V]</td>
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</tbody>
</table>
### 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, pictures, sounds and actions. [C, PS, R, V]

#### Elaborations—Strategies for Learning and Teaching

Pattern experiences should be an ongoing part of Math throughout the year. 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
- color 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, etc.)
- two-color counters

Students should have many opportunities to work with these materials before using 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 young 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, stand, sit, sit, stand, …
- **Color 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 children (e.g., sit, stand, sit, stand, …, boy, boy, girl, girl, boy, boy, girl, girl …, etc). Ask students to describe and extend the pattern. Have students take turns creating and extending other repeating patterns. (1PR1.1, 1.4, 1.5)

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

- Create a Border – Provide students with 2 to 4 rubber stamps and ask them to create a patterned border around the edge of a picture frame, place mat, or a piece of paper. Have them describe their patterns to the class. (1PR1.4)

- 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 illustrate each of the events in the order they occur. (1PR1.7)

- Use connecting cubes to create a color pattern with one element missing (e.g., red, yellow, green, red, yellow, green, red yellow, green, red, ___, green). Ask:
  - Are there colors missing?
  - What color 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)

- 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. (1PR1.3, 1.3)

Resources/Notes

* Math Makes Sense 1
  * Launch
    * Teacher Guide (TG) p. 9
  * Lesson 1: Recognize and Copy a Pattern
    * 1PR1
      * TG pp. 10 - 13
  * Audio CD 1:
    * Selections 1, 2, 3 & 4
### Strand: Patterns and Relations (Patterns)

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<th>Outcomes</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
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<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>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.</strong></td>
</tr>
<tr>
<td><strong>1PR1 Continued</strong></td>
<td><strong>The core of a repeating pattern is the shortest string of elements that repeats. For example, the color 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.</strong></td>
</tr>
<tr>
<td><strong>Achievement Indicators:</strong></td>
<td><strong>When presenting a pattern for students to reproduce or extend, repeat the core three times (e.g., red, red, blue, red, red, blue, 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 student is able to continue the pattern from the last element given or repeats the entire core.</strong></td>
</tr>
<tr>
<td>PR1.1 Describe a given repeating pattern containing two to four elements in its core.</td>
<td><strong>Patterning becomes more meaningful to students when it is evident in many areas of their daily life (e.g., clothing, signs, food packages, etc). Ask students to look for and describe patterns in the classroom and/or outdoors.</strong></td>
</tr>
<tr>
<td>PR1.5 Reproduce and extend a given repeating pattern using manipulatives, diagrams, sounds and actions.</td>
<td><strong>Students 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.</strong></td>
</tr>
<tr>
<td>1PR1.6 Describe, using everyday language, a repeating pattern in the environment, e.g., in the classroom, outdoors.</td>
<td><strong>Provide students with repeating patterns containing two to four elements in which there are errors or missing elements. Ask students to identify the errors or omissions in the repeating patterns.</strong></td>
</tr>
<tr>
<td>1PR1.7 Identify repeating events; e.g., days of the week, birthdays, seasons.</td>
<td></td>
</tr>
</tbody>
</table>
## 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 students to return to the group and identify the error in the pattern and explain how they know. Repeat this task leaving a gap in the pattern and asking the student to identify the missing element and explaining how they know. (1PR1.2, 1.3)

#### 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. (1PR 1.1, 1.4, 1.5)

- Take students on a walk around the inside and outside of the school looking for patterns. Students can draw a pattern they found and describe the pattern to a classmate. (1PR1.6)

### Student-Teacher Dialogue

- 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 (color). Ask students to describe the pattern, using color words. This task can be repeated with patterns with two to four elements in its core. (1PR 1.1)

- 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 do you know?
  - Did anyone see an object that did not have a pattern? How do you know? (1PR1.6)

### Resources/Notes

- **Math Makes Sense 1**
  - Lesson 1 (Continued): Recognize and Copy a Pattern
  - 1PR1
  - TG pp. 10 - 13

- **Unit Centres**
  - TG p. 7
  - Paper Plate Garden
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

1PR1 Continued

Achievement Indicators:

1PR1.4 Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.

1PR1.5 Reproduce and extend a given repeating pattern using 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 Center will give children opportunities to make patterns on an informal and independent basis. The choice of manipulatives can affect the difficulty of the task. Connecting cubes and color tiles are the easiest manipulatives from which children can make patterns, as they have only one visible attribute.

Problem Solving

Student’s surroundings contain many patterns such as their clothing, in structures and buildings, and the classroom. Mathematics is full of patterns. Students can look for patterns to help them solve problems.
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

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, 1.5)

• Make One Like Mine – Use pattern blocks to create a repeating pattern on the overhead projector. Ask the students to reproduce and extend the pattern on their desks. (1PR1.5)

• Color Towers – Use interlocking cubes to create a tower with a repeating pattern. Ask students to extend the pattern to determine the color of the 11th cube. (1PR1.5)

• Show students a snap cube train with a simple AB colour pattern. Patterns must have three repeats. Have them find (E.g., red, blue, red, blue) and extend the pattern. What colour comes next? This can be modified to include more complex patterns to meet the students’ instructional needs. (KPR1.5)

Resources/Notes

Math Makes Sense 1
Lesson 2: Make and Extend a Pattern
1PR1
TG pp. 14 - 17

Unit Centres:
TG p. 7
Pattern Cards

Lesson 3: Strategies Toolkit
TG pp. 18 - 19
Strand: Patterns and Relations (Patterns)

**Outcomes**

*Students will be expected to*

1PR2 Translate repeating patterns from one representation to another.

[C, CN, R, V]

**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 children 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 of pattern described in PR1.1 (i.e. rhythmic/sound patterns, action patterns, color 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 color pattern (e.g., red, red, yellow, 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.

Use interlocking cubes 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 colors of interlocking cubes. Draw student's attention to the fact that although different colors 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.,

\[
\begin{array}{cccc}
R & G & R & G \\
A & B & A & B
\end{array}
\]

\[
\begin{array}{cccc}
R & G & Y & R & G & Y \\
A & B & C & A & B & C
\end{array}
\]

\[
\begin{array}{cccc}
R & R & G & R & G & R & G \\
\end{array}
\]

\[
\begin{array}{cccc}
R & G & R & G & R & G & R & G \\
A & B & B & A & A & B & B & A
\end{array}
\]

\[
\begin{array}{cccc}
R & R & G & R & G & R & G \\
\end{array}
\]

\[
\begin{array}{cccc}
R & G & R & G & R & G \\
A & B & B & A & A & B
\end{array}
\]
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 |

  Have the students 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)

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

  ![Pattern Cards]
  
  Ask children to use buttons or blocks to represent and extend the patterns. Students then label the patterns using a letter code. (1PR2.1, 2.2)

- Sing the song “Old MacDonald had a Farm”. Have the students 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, 2.2)

- 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)

**Resources/Notes**

*Math Makes Sense 1*
Lesson 4: Translate a Pattern
1PR1, 1PR2
TG: pp. 14 - 17

Unit Centres
TG: p. 7
  - Treasure Boxes
  - Stamp It
Addition and Subtraction to 12

Suggested Time: 5 Weeks

This is the first explicit focus on addition and subtraction, but as with other outcomes, it is ongoing throughout the year.
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, young students devise personal strategies to compute. Through 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.

Math Connects

Work on number and computation should occur throughout the year and not in isolated parts. Students need experiences where they see how number and computation can be used on a daily basis in different forms. This can be done through cross-curricular activities, as a part of a morning routine or through informal lessons. Doing this, will provide students with different opportunities throughout the entire year to develop this essential understanding; it gives everyone a chance to learn. It is essential to give students meaningful contexts to learn, showing them real-life situations where computational skills are needed to solve a problem.

Process Standards Key

<table>
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<th>Communication</th>
<th>[PS]</th>
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<td>Connections</td>
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<td>and Estimation</td>
<td>[V]</td>
<td>Visualization</td>
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## Grade 1 Mathematics Curriculum Guide - Interim

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<td>Number</td>
<td>1N3 Demonstrate an understanding of counting by:</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td></td>
<td>• indicating that the last number said identifies “how many”</td>
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<td>• showing that any set has only one count</td>
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<td></td>
<td>• using the counting-on strategy</td>
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<td></td>
<td>• using parts or equal groups to count sets.</td>
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<tr>
<td>Number</td>
<td>1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.</td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N8 Identify the number, up to 20, that is one more, two more, one less and two less than a given number.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N9 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:</td>
<td>[C, CN, ME, PS, R, V]</td>
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<td></td>
<td>• using familiar and mathematical language to describe additive and subtractive actions from their personal experience</td>
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<td></td>
<td>• creating and solving problems in context that involve addition and subtraction</td>
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<td></td>
<td>• modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.</td>
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<tr>
<td>Number</td>
<td>1N10 Describe and use mental mathematics strategies (memorization not intended), such as:</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>• counting on and counting back</td>
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<td></td>
<td>• making 10</td>
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<td></td>
<td>• using doubles</td>
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<td></td>
<td>• using addition to subtract to determine the basic addition facts to 18 and related subtraction facts.</td>
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</tr>
<tr>
<td>Patterns and Relations (Variables and Equations)</td>
<td>1PR4 Record equalities, using the equal symbol (0 to 20)</td>
<td>[C, CN, PS, V]</td>
</tr>
</tbody>
</table>
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]

1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.
[C, CN, V]

Elaborations—Strategies for Learning and Teaching

Students should have a good understanding of number (N3, N4) before beginning Addition and Subtraction to 12.
General Outcome: Develop Number Sense

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<td>Consider reviewing Representing Numbers to 20 (Lesson 6) TG pp. 36-39</td>
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<td>Audio CD 2:</td>
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</tbody>
</table>
Strand: Number

Outcomes

Students will be expected to

1N9 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
- 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:

1N9.1 Act out a given problem presented orally or through shared reading.

1N9.3 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

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 4 pencils and my teacher gave me 3 more. How many do I have now?

- Static situations involve the implied joining of sets that are not physically joined to form a whole.
  E.g., There are 4 cars parked on one side of the road and 3 cars parked on the other side of the road. Altogether, how many cars are parked on the road?

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 3 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. Have students act out the story, represent concretely, pictorially and/or symbolically. The following examples may be used:

  **Joining Problems**
  - Result Unknown - Sarah placed 4 pencils on the table. Stephen placed 3 more pencils on the table. How many pencils are on the table altogether?
  - Change Unknown – Sarah placed 4 pencils on the table. Stephen placed some pencils on the table. There are 7 pencils altogether. How many pencils did Stephen place on the table?
  - Initial Unknown - Sarah placed some pencils on the table and Stephen placed 3 more. There are 7 pencils altogether. How many pencils did Sarah place on the table? [1N9.1, 9.2, 9.3]

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**Resources/Notes**

- *Math Makes Sense 1*
  - Lesson 2: Addition Stories
  - 1N9, PR4
  - TG pp. 21 - 25

- Audio CD 2:
  - Selections 8 & 9
### Strand: Number

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<tr>
<th>Outcomes</th>
<th>Elaborations — Strategies for Learning and Teaching</th>
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<tbody>
<tr>
<td>Students will be expected to</td>
<td>Students need experiences where they model number stories. They can take a number sentence (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.</td>
</tr>
<tr>
<td><strong>1N9 Continued</strong></td>
<td>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 join and separate problems with the result, change or initial unknown, and compare problems with the difference, larger or smaller number unknown.</td>
</tr>
<tr>
<td><strong>Achievement Indicators:</strong></td>
<td>Students need many opportunities to make connections between personal experiences and the symbols they represent. 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.</td>
</tr>
<tr>
<td>N.3 Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.</td>
<td>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.</td>
</tr>
<tr>
<td>N.4 Create a story problem for addition that connects to personal experience, and simulate the action with counters.</td>
<td>When explaining the symbols for addition, it is important that the addition sign be referred to as “and” rather than “plus”. 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.</td>
</tr>
<tr>
<td>N.6 Create a word problem for a given addition or subtraction number sentence.</td>
<td></td>
</tr>
</tbody>
</table>
General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Performance**

- Have students 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. *(1N9.4, 9.5)*

- 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. 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. *(1N9.3)*

- 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. *(1N9.4, 9.5, 9.7)*

- Have students use the overhead, whiteboard, felt board, counters, etc., to create story problems for a variety of addition and subtraction number sentences. *(1N9.6)*

- Double Dice - Students 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.) *(1N9.6)*

**Resources/Notes**

*Math Makes Sense 1*

Lesson 2 (Continued): Addition Stories

1N9, 1PR4

TG pp. 21 - 25
Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

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

[C, CN, PS, V]

Achievement Indicators:

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

PR4.2 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:

\[
\begin{align*}
8 &= 8 \\
5 + 3 &= 8 \\
5 + 3 &= 6 + 2
\end{align*}
\]

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

\[
5 + 3 = 8
\]

\[
5 + 3 = 6 + 2
\]

As students develop confidence with this concept, they may move on to represent the equalities using pictures.
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 colors to represent parts of a number on the either side of the balance.

![Balance Scale with Snap Cubes](image)

(1PR4.2)

- Students should represent the following equations using two colors 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 6 red and 1 green and the other with 4 red and 3 green.

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

\[
\begin{align*}
7 & = 7 \\
6 + 1 & = 4 + 3 \\
6 + 1 & = 7 \\
7 & = 4 + 3
\end{align*}
\]

(1PR4.2)

**Resources/Notes**

*Math Makes Sense 1*

Lesson 2 (Continued): Addition Stories

1N9, 1PR4

TG pp. 21 - 25
Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

1PR4 Continued

Elaborations—Strategies for Learning and Teaching

Working with number combinations to 10 is critical for children in building a strong foundation for working with larger numbers. Begin working with number combinations to 6. Do not move on to numbers from 7 to 10 until children have a strong understanding of numbers to 6.

When a child can confidently break up a number to 10 and put the parts together again, then they will be able to work with larger numbers.

Memorizing basic math facts is very different from internalizing number combinations.

Introducing the recording of number combinations should be done in three stages. In the first stage, the teacher models 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, the students record the number combinations by copying what the teacher has written. In the final stage, students record the number combinations independently.

Students should read number sentences from left to right and from right to left.
**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., 6) of cubes of one color. On the signal, “break it” children 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 0.

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., 4 and 2, 5 and 1 ...) 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 colors for the specified number. They record their work by coloring 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 7. The number train could be 3 red cubes and 4 blue cubes.

Ask students to represent the number train using numbers. Their answers may look like this:

\[ 4 + 3 = 7 \text{ or } 7 = 4 + 3 \]

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

*Resources/Notes*

*Math Makes Sense 1*

Lesson 2 (Continued): Addition Stories

1N9, 1PR4

TG pp. 21 - 25

*Unit Centres:*

TG p. 13

Addition Stories

1PR4.3 is not covered by the text.
Strand: Number

Outcomes

Students will be expected to

1N10 Describe and use mental mathematics strategies (memorization not intended), such as:

- counting on and counting back
- making 10
- using doubles
- using addition to subtract

to determine the basic addition facts to 18 and related subtraction facts.

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

Achievement Indicators:

1N10.1 Use and describe a personal strategy for determining a given sum.

Elaborations—Strategies for Learning and Teaching

When students’ thinking has developed to the point where they are counting on from the large number, strategy learning should begin. 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 we focus on over-practicing or rote practicing without ensuring that students understand the process, they often forget or incorrectly remember computational methods. It is not intended that students recall the basic facts but become familiar with the strategies to mentally determine sums and differences. 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.

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

- Develop their own strategies for determining a given sum or difference
- Invent 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

Student-Teacher Dialogue

- 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 their answer

Performance

- Simon Says – Play the game Simon Says, giving directions that involve using strategies to solve a mathematical equation. Examples include: Simon says:
  - Do 7 and 6 more jumping jacks
  - Do 7 and 7 and 1 more bunny hops
  - Do 5 and 3 toe touches
  
  Students solve the additive action mentally, explain the strategy they used, and complete the action.

- Give students a bag with 8 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.

- 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.
  - If I put 5 counters in the bag and then added 3 more, how many counters would be in the bag? How do you know?

Resources/Notes

Math Makes Sense 1
Lesson 3: Using Doubles to Add
1N9, 1N10
TG pp. 26 - 29

The text focuses on doubles. Attention needs to be given to all the strategies.
Outcomes

Students will be expected to

1N10 Continued

Achievement Indicator:

1N10.1 Continued

Elaborations—Strategies for Learning and Teaching

An addition table might be useful to help students visualize relationships. For example, all the sums for 4 can be found by taking a known fact (e.g., $4 + 0 = 4$) and reducing one number while the other is increased (e.g., $3 + 1 = 4$). Notice that all of these are along a diagonal of the table.

|   | 0 | 1 | 2 | 3 | 4 | 5 
|---|---|---|---|---|---|---
| 0 | 0 | 1 | 2 | 3 | 4 | 5 
| 1 | 1 | 2 | 3 | 4 | 5 | 6 
| 2 | 2 | 3 | 4 | 5 | 6 | 7 
| 3 | 3 | 4 | 5 | 6 | 7 | 8 
| 4 | 4 | 5 | 6 | 7 | 8 | 9 
| 5 | 5 | 6 | 7 | 8 | 9 | 10

The use of strategies provide a foundation for mental mathematics. Solving problems mentally provides opportunities for students to focus on the relationships between numbers and operations.

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. Eventually, it is helpful to the student to have instant recall, but it is not essential that all facts be recalled in Grade 1.

By using facts frequently in games and problems, most students will commit them to memory.

Problem Solving

• Guess and Check

The student makes a guess and checks to see if they are correct. If it does not work they revise their initial guess based on what was tried and learned. This continues until the correct answer is found. Students do not like to be wrong, therefore it is important to be cognizant of your language and not refer to a guess as incorrect or correct. It is important that they learn to be risk takers and learn from the initial guess.

Place 14 snap cubes of the same color in a paper bag. Reach in and remove 5 cubes. Ask students: *If I had 14 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 9. Write $5 + 9 = 14$. That is the number we were looking for. So there are 9 cubes still in the bag. Count the remaining cubes in the bag to confirm the guess.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Cover Up – Prepare a variety of 3 X 3 cards with the numbers 0 to 20. Call out addition and subtraction facts where students use their mental strategies to solve. E.g.

<table>
<thead>
<tr>
<th>6</th>
<th>9</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Students cover the sum with a counter. The first player to cover all of the numbers on their card is the winner. (1N10.1, 10.2, 10.3)

- Pose a task such as the following to the class: “If you did not know the answer to 9 + 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. (1N10.1, 10.3)

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

```
  yellow  blue  red  green  brown
```

Ask: Can you pick up 4 (5 or 6)?

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

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. (1N10.1)

Resources/Notes

Math Makes Sense 1

Lesson 3 (Continued): Using Doubles to Add

1N9, 1N10

TG pp. 26 - 29

Lesson 4: Strategy Toolkit

TG pp. 30 - 31
Strand: Number

Outcomes

Students will be expected to

1N9 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
- modeling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.

Achievement Indicators:

N9.1 Act out a given problem presented orally or through shared reading.

N9.3 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

As with addition, the development of the meaning of subtraction 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 which involve the physical separating of sets.
  
  I had 8 pencils. I gave 4 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 7 red and green cars parked on the road. Four of them are red. 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 2 parts that make up the whole)

As with joining problems, separating problems have three quantities: initial, change, and result amounts. In separate 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.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Present subtraction stories for each structure. Have students act out the problem and represent the problem concretely, pictorially and/or symbolically.

  Separate Problems
  - Result Unknown – Five children are sitting on the story mat. Two children left the circle to go back to their seats. How many children stayed on the mat?
  - Change Unknown – Five children are sitting on the story mat. Some of the children left the circle to go back to their seats. There are three children left sitting on the mat. How many children went back to their seats?
  - Initial Unknown - Some children are sitting on the story mat. Two children left the circle to go back to their seats and there are 3 children left sitting on the mat. How many children were on the mat in the beginning?

  Compare Problems
  - Difference Unknown - Mark has 12 stickers. Julia has 8 stickers. How many more stickers does Mark have than Julia?
  - Comparing Quantity Unknown - Mark has 4 more stickers than Julia. Mark has 12 stickers. How many stickers does Julia have?
  - Referent Quantity Unknown - Mark has 4 more stickers than Julia. Julia has 8 stickers. How many stickers does Mark have?

(1N9.1, 9.2, 9.3)

<table>
<thead>
<tr>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Math Makes Sense 1</em></td>
</tr>
<tr>
<td>Lesson 5: Subtraction Stories</td>
</tr>
<tr>
<td>1N9, 1PR4</td>
</tr>
<tr>
<td>TG pp. 32 - 36</td>
</tr>
</tbody>
</table>
Strand: Number

Outcomes

Students will be expected to

1N9 Continued

Achievement Indicators:

1N9.5 Create a story problem for subtraction that connects to personal experience, and simulate the action with counters.

1N9.6 Create a word problem for a given addition or subtraction number sentence.

Elaborations—Strategies for Learning and Teaching

In each of the structures, keep in mind that there may be several interpretations to a situation. For example: There are 9 children. Three are boys. How many are girls? Some students see this as an addition. (Three “and” how many more make 9?). Others see it as a subtraction. (There are 9 in all. Remove the 3 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 other operation is implicit.

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. It is important that students realize the connections between subtraction as taking away, subtraction as comparing, and subtraction as missing addend.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

• Have students create their own story problems for subtraction and demonstrate the subtractive action with counters. Incorporate the use of manipulatives, such as dominoes and dice, to generate numbers for story problems. (1N9.4, 9.5)

• 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 8 ½ 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. (1N9.4, 9.5, 9.7, 1PR4.1, 4.2)

• Have students use the overhead, whiteboard, felt board, counters, etc., to create word problems for a variety of subtraction number sentences. (1N9.6)

Resources/Notes

Math Makes Sense 1
Lesson 5 (Continued): Subtraction Stories
1N9, 1PR4
TG pp. 32 - 36
### Strand: Patterns and Relations (Variables and Equations)

**Outcomes**

*Students will be expected to*

1PR4 Continued

**Achievement Indicators:**

<table>
<thead>
<tr>
<th>1PR4.1 Represent a given equality using manipulatives or pictures.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1PR4.2 Represent a given pictorial or concrete equality in symbolic form.</td>
</tr>
<tr>
<td>1PR4.3 Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).</td>
</tr>
</tbody>
</table>

**Elaborations—Strategies for Learning and Teaching**

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 “take away”. 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 7. The number train could be 3 red cubes and 4 blue cubes.

Ask students to show this using numbers. Their answers may look like this:

\[ 7 - 4 = 3 \quad \text{or} \quad 3 = 7 - 4 \]

Ensure that students learn to read number sentences from left to right.

(1PR4.2, 4.3)

#### Resources/Notes

*Math Makes Sense 1*

Lesson 5 (Continued):
Subtraction Stories

1N9, 1PR4

TG pp. 32 - 36

Unit Centres:
TG p. 13
Make a Number Fact

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1PR4.3 is not covered by the text.
Strand: Number

Outcomes

Students will be expected to

1N10 Describe and use mental mathematics strategies (memorization not intended), such as:

- counting on and counting back
- making 10
- using doubles
- using addition to subtract
to determine the basic addition facts to 18 and related subtraction facts.

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

Achievement Indicators:

1N10.1 Use and describe a personal strategy for determining a given sum.

1N10.2 Use and describe a personal strategy for determining a given difference.

1N10.3 Refine personal 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
- Invent 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.

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

<table>
<thead>
<tr>
<th>Subtraction Strategy</th>
<th>Explanation and Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counting On</td>
<td>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</td>
</tr>
<tr>
<td>Counting Back</td>
<td>Start with the minuend (larger number) and count back: $8 - 2$ think 8... 7, 6 the answer is 6</td>
</tr>
<tr>
<td>Doubles</td>
<td>We have $12 - 6$ think $6 + 6$</td>
</tr>
<tr>
<td>Using Addition to Subtract</td>
<td>We see $7 - 5$, we think of the related addition fact $5 + 2 = 7$ so $7 - 5 = 2$</td>
</tr>
</tbody>
</table>
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Student-Teacher Dialogue**

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

  - count on from the smaller number
  - count 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 their answer

**Performance**

- Think About It! – Provide children with a number of scenarios in which they visualize the action that is taking place and mentally solve each problem.

  If I have 12 counters in a bag and I remove 4. How many counters remain in the bag?

- Cover Up – Prepare a variety of 3 X 3 cards with the numbers 0 to 20. Call out subtraction facts where students use their mental strategies to solve. E.g.

<table>
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<td>10</td>
</tr>
</tbody>
</table>

  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.

**Resources/Notes**

- **Math Makes Sense 1**
  - Lesson 6: Another Way to Use Subtraction
  - 1N9, 1N10
  - TG pp. 37 - 40

- **Lesson 7: Mental Math**
  - 1N8, 1N9, 1N10
  - TG pp. 41 - 45
### Strand: Number

#### Outcomes

*Students will be expected to*

1N9 Continued

#### 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. Therefore, present a variety of addition and subtraction problems, alternating mathematical terms and everyday language. The use of everyday language helps children make connections between the real work and the mathematical concepts they are learning. For example:

- **Mathematical Language:** Mary stacked 13 books on the table. She added 4 more books to the stack. How many books are in the stack altogether?
- **Everyday Language:** Mary stacked 13 books on the table. She piled 4 more books to the stack. How many books are in the stack now?

#### Achievement Indicators:

1N9.2 Indicate if the scenario in a given story problem represents additive or subtractive action.

1N9.3 Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.

1N9.7 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Performance**

- Using everyday experiences and the names of your students will make math meaningful. Give students the opportunity to use pencil and paper and/or manipulatives to solve everyday problems.
- Jimmy has 12 marbles. Amy takes 7. How many marbles does Jimmy have left? Students will represent and solve the problem pictorially and symbolically. (1N9.2, 9.3, 9.7)

<table>
<thead>
<tr>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Math Makes Sense 1</strong></td>
</tr>
<tr>
<td><strong>Lesson 8: Combining and Separating Stories</strong></td>
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<tr>
<td>1N3, 1N9</td>
</tr>
<tr>
<td>TG pp. 46 - 50</td>
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<tr>
<td><strong>Audio CD 2:</strong></td>
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<tr>
<td>Selection 17</td>
</tr>
<tr>
<td><strong>Unit Centres:</strong></td>
</tr>
<tr>
<td>TG p. 13</td>
</tr>
<tr>
<td>Toy Store</td>
</tr>
</tbody>
</table>
Measurement

Suggested Time: 4 Weeks

This is the first explicit focus on measurement, but as with other outcomes, it is ongoing throughout the year.
Unit Overview

Focus and Context
In this unit, students compare two or more objects using a single attribute. In Kindergarten, children used direct comparison to compare two objects based on a single attribute of length, 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.

Math Connects
Measurement is a fundamental mathematical process that pervades all branches of mathematics, as well as many other disciplines and everyday activities. Early measurement experiences enable students to make connections to their own experiences and their environment by using concrete materials to solve real world problems. Measurement can be easily integrated into other subject areas in the grade one curriculum, such as social studies, science, language arts and health.
### Process Standards Key

<table>
<thead>
<tr>
<th></th>
<th>Communication</th>
<th>Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>[C]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[CN]</td>
<td>Connections</td>
<td>Reasoning</td>
</tr>
<tr>
<td>[ME]</td>
<td>Mental Mathematics and Estimation</td>
<td>Technology</td>
</tr>
<tr>
<td>[T]</td>
<td>Technology</td>
<td></td>
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<tr>
<td>[V]</td>
<td>Visualization</td>
<td></td>
</tr>
</tbody>
</table>

### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape and Space</strong></td>
<td>1SS1 Demonstrate an understanding of measurement as a process of comparing by:</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td>(Measurement)</td>
<td>• identifying attributes that can be compared</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ordering objects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• making statements of comparison</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• filling, covering or matching</td>
<td></td>
</tr>
<tr>
<td><strong>Patterns and Relations</strong></td>
<td>1PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td>(Variables and Equations)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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]

Elaborations—Strategies for Learning and Teaching

Measurement involves identifying and comparing similar attributes. Through measurement activities 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. Measuring activities will enable students to better incorporate both computational skills and make the connection between basic geometric concepts and number concepts.

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.

Provide two books and ask students 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 children.

The students should recognize that there are certain size objects that are best suited for measuring certain things. For example, it would not be efficient to use a penny 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

Student-Teacher Dialogue

- Ask students to make two snakes using plasticine. Ask: “Which snake is longest? How do you know?” (1SS1.4)

Performance

- Provide students with two objects such as an eraser and a book. Ask: Can you tell which of these two objects is longer? (1SS1.1)

- Have students 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. (1SS1.3)

- Have students prepare a set of ribbons for first, second, and third places in a race, so that the first place runner gets the longer ribbon and the third place runner gets the shortest ribbon. (1SS1.2)

- Provide students with hands-on activities to order length and height. Explain their reasoning. The following tasks may be used:

  Length – Provide students with “trains” of various lengths made from interlocking cubes. Have students order the trains from shortest to longest.

  Height - Ask five or more children to line-up at the front of the room. Have them order themselves from tallest to shortest or shortest to tallest. Repeat this activity using different children. (1SS1.2)

Resources/Notes

Math Makes Sense 1
Launch
Teacher Guide (TG) p. 11

Lesson 1: Comparing Lengths
1SS1
TG pp. 12 - 15

Unit Centre:
TG p. 9
Comparing Lengths

Lesson 2: Ordering Lengths
1SS1
TG pp. 16 - 19

Unit Centre:
TG p. 9
Ordering Lengths
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

Problem Solving

• Use an Object

Elaborations—Strategies for Learning and Teaching

‘Use an Object’ to help solve a problem. This is similar to ‘Make a Model’. Students use simple objects such as string, paper clips, snap cubes or any non-standard measuring tool to solve the problem.

1SS1 Continued

Achievement Indicators:

1SS1.1 Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.

Students should recognize that area tells about the amount of space taken up by an object. You may wish to use tangrams, pentominoes or pattern blocks to cover the area of given objects.

1SS1.2 Order a set of objects by length, height, mass, capacity or area, and explain their ordering.

Students should order objects that cover the least amount of space to the most amount of space.

1SS1.3 Compare two given objects, and identify the attributes used to compare.

Provide two objects and ask students to compare the area.

1SS1.7 Determine which of two or more objects has the greatest or least area by covering, and explain the reasoning.

To compare areas, students examine the amount of space taken up by an object. For example, one book might take up more of the desk than another. Direct measurement involves placing one surface on top of another similar object to see which “sticks out”. 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**

<table>
<thead>
<tr>
<th>Performance</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working in pairs, students are directed to compare the length of their forearms from the wrist to the elbow. Give students paper clips or string 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.</td>
<td></td>
</tr>
<tr>
<td><em>Math Makes Sense 1</em></td>
<td></td>
</tr>
<tr>
<td>Lesson 3: Strategy Toolkit</td>
<td></td>
</tr>
<tr>
<td>TG pp. 20 - 21</td>
<td></td>
</tr>
<tr>
<td>• Provide students with hands-on activities to order area and explain their reasoning.</td>
<td></td>
</tr>
<tr>
<td><em>Lesson 4: Comparing by Covering</em></td>
<td></td>
</tr>
<tr>
<td>1SS1</td>
<td></td>
</tr>
<tr>
<td>TG pp. 22 - 23</td>
<td></td>
</tr>
<tr>
<td>Area - Provide students with three books. Ask students 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).</td>
<td></td>
</tr>
<tr>
<td>Unit Centre:</td>
<td></td>
</tr>
<tr>
<td>TG p. 9</td>
<td></td>
</tr>
<tr>
<td>Exploring Area with Pattern Blocks</td>
<td></td>
</tr>
<tr>
<td>• Give students a trapezoid, or other shape. Ask them to draw another shape with a larger area. As them to explain their thinking. (1SS1.7)</td>
<td></td>
</tr>
<tr>
<td><em>Audio CD 2:</em></td>
<td></td>
</tr>
<tr>
<td>Selection 18</td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>• Provide students with two objects. Ask: Can you tell which of these two objects takes up the most space? (1SS1.3, 1.2)</td>
<td></td>
</tr>
<tr>
<td>• Have students work in pairs to trace and cut out their shoe print. Using colored tiles the students will cover their shoe print and count the number of tiles used in order to compare the area of both prints. (1SS1.1, 1.3)</td>
<td></td>
</tr>
<tr>
<td>• Provide each student with two equal amounts of plasticine. Students will roll one piece “the hotdog way” (long and skinny) and the other piece “the hamburger way” (short and fat). Cover each piece with counters to determine which piece holds the most. (1SS1.3, 1.7)</td>
<td></td>
</tr>
</tbody>
</table>
Outcomes

Students will be expected to

1SS1 Continued

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.

1SS1.6 Determine which of two or more objects holds the most or least by filling, and explain the reasoning.

Elaborations—Strategies for Learning and Teaching

Using two objects of different sizes, ask student how they could compare the objects. For example, two glasses could be compared by height as well as capacity. Working with a variety of objects will allow many opportunities for students to make comparisons relating to measurement, using many attributes.

Students should order objects from those that hold least to those that hold most. Include containers that have the same height but different capacities.

Students should recognize that capacity tells how much something will hold. 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. While developing measurement skills for capacity, students should use terms such as holds more, holds less, holds the same, full and empty.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

**Performance**

- Provide students with two objects. Ask:
  Can you tell which of these two objects holds more? (Students should recognize that 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 hands-on activities to order capacity.
  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/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)

**Resources/Notes**

*Math Makes Sense 1*

**Lesson 5: Comparing by Filling**

1SS1

TG pp. 24 - 27

**Unit Centre:**

TG p. 9

At the Water Table
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to
1SS1 Continued

Achievement Indicators:

<table>
<thead>
<tr>
<th>1SS1.1 Identify common attributes, such as length, height, mass, capacity and area that could be used to compare two given objects.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1SS1.2 Order a set of objects by length, height, mass, capacity or area, and explain their ordering.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1SS1.3 Compare two given objects, and identify the attributes used to compare.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1SS1.5 Determine which of two or more objects is heaviest or lightest by comparing, and explain the reasoning.</th>
</tr>
</thead>
</table>

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.

When comparing the mass of two objects it is important that students have experiences with objects that are smaller but have a greater mass.

Students should explore direct methods to compare and order masses. Direct measurement involves placing two objects on a balance simultaneously and comparing the mass of one with that of the other.

The most conceptual way for children to compare the mass of objects is to hold the objects in their hands and compare. Have the students 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 pan balance to confirm their predictions. 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 children 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. (1SS1.5)

- Ask students to make two balls out of play dough, predict which ball is the heaviest by placing one in each hand, and confirm their predictions using a pan balance. (1SS1.5)

- Have students predict which is heaviest - a large bag of cotton balls or a small ball bearing. (1SS1.3, 1.5)

- Show the students three balls of similar size but different mass. Ask them to predict which ball has the greatest mass. Verify the predictions using a pan balance. (1SS1.2, 1.5)

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**Resources/Notes**

- *Math Makes Sense 1*
  - Lesson 6: Comparing Mass
  - 1SS1, 1PR3
  - TG pp. 28 - 31

- **Investigation 2: At the Fire Hall**
  - *Optional*
  - Audio CD 3: Selections 1 & 2
Numbers to 100

Suggested Time:  4 Weeks

This is the first explicit focus, but as with other outcomes, number sense is ongoing throughout the year
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 practice 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.

Math Connects

Number sense develops naturally as students connect numbers to their own real life experiences and use numbers as benchmarks and referents. Making connections is the heart of doing mathematics. With larger numbers, students will make connections to their prior knowledge and experiences working with smaller numbers. They will make connections with other mathematical concepts and procedures. As well, students will make connections with their daily life experiences and see connections with mathematics across the curriculum. As students make these connections, they will build a deeper, richer understanding of number concepts.
### Process Standards Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Curriculum Outcomes</th>
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</thead>
<tbody>
<tr>
<td>[C] Communication</td>
<td>[PS] Problem Solving</td>
</tr>
<tr>
<td>[CN] Connections</td>
<td>[R] Reasoning</td>
</tr>
<tr>
<td>and Estimation</td>
<td>[V] Visualization</td>
</tr>
</tbody>
</table>

### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
</table>
| Number | N1. 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] |
| Number | N3 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] |
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.

[CN, ME, V]

Achievement Indicators:

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

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

N3 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

[CN, ME, R, V]

Achievement Indicator:

1N3.2 Identify and correct errors in a given counting sequence.

Elaborations — Strategies for Learning and Teaching

Students have worked on counting forwards and backwards to 20 in a previous unit. At this time, many of the same outcomes are addressed but now we will be extending the numbers to 100.

Throughout daily counting activities, where objects are counted meaningfully, make errors in counting sequences for children 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 0-20. Have students line up in order. Have students count the number sequence (lowest to highest or highest to lowest). This activity can be modified counting forward with larger numbers. (1N1.1, 1.2)

- 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. (N3.2)

### Resources/Notes

- **Math Makes Sense 1**
  - **Launch**
    - Teacher Guide (TG) p. 15
  - **Lesson 1: Counting to 50**
    - 1N1
    - TG pp. 16 - 17
  - Audio CD 3:
    - Selection 3

- **Lesson 2: Counting Sets to 50**
  - 1N1, 1N3, 1N6
  - TG pp. 18 - 21
Strand: Number

Outcomes

Students will be expected to
1N3 Continued

Achievement Indicators:

1N3.6 Count quantity, using groups of 2, 5 or 10 and counting on.

1N3.7 Record the number of objects in a given set (up to 100).

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 2, 5, or 10. Provide students with a collection of objects such as counters, snap cubes, or pennies. 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, have students sort the collection into groups of 5 or 10, and then count the collection by touching the groups (e.g., 5, 10, 15, 20 or 10, 20, 30, 40). For collections that cannot be sorted evenly into groups of 5 or 10, students should be able to sort the items into groups of 2, 5, or 10 and then count on to find the total. For example, if provided with a set of 34 counters, students should make three groups of 10 and one group of 4, and count, “10, 20, 30, 31, 32, 33, 34.”

1N1 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.

At this time students record numerals to 50. Later in this unit, they will be given opportunities to record numerals to 100. 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 10. As students acquire a deeper understanding of number, students should count and record numbers up to 100.

Provide counting opportunities for various number sequences including:

- multiples of 2, beginning at zero (e.g., 2, 4, 6, 8, 10, 12, 14, 16, 18, 20)
- multiples of 5, beginning at zero (e.g., 5, 10, 15, 20, 25, 30, 35, 40, 45, 50)

At this point, students will skip count to 20 and to 50. Later, opportunities to skip count to 100 will be provided.
# 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. Have students illustrate or demonstrate to the class how they counted and decide which way of counting was the most efficient.

  \[ (1N3.6, 1N1.5, 1.6) \]

- Provide students with a hundred chart. Ask them to colour the numbers they land on when they count by 5 and 10. (A number strip from 0 to 20 can be used when counting by 2s).

  \[ (1N1.6) \]

- Use pennies to have students practice counting by 1s and 2s. Have students drop the coins into a transparent piggy bank or container as they count. For example, when counting by 2s, students can count on every second penny dropped into the bank. Using a transparent bank provides a visual and auditory means for students as they count.

  \[ (1N1.5, 1.6) \]

- Have students count the number of eyes at their table by 2s and the number of fingers by 5s and the number of toes by 10s.

  \[ (1N1.5, 1.6) \]

*Student-Teacher Dialogue*
- 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?

  \[ (1N1.5, 1.6) \]

*Pencil and Paper*
- Many counting activities can be extended to meet this indicator by having children record their answers.

  \[ (1N3.7) \]

## Resources/Notes

*Math Makes Sense 1*

Lesson 2 (Continued): Counting Sets to 50

1N1, 1N3, 1N6

TG: pp. 18 - 21

Unit Centres:

TG p. 13

Picture Perfect

Lesson 3: Skip Counting

1N1

TG pp. 22 - 25

Audio CD 3:

Selections 4, 5, 6, 7, 8, 9 & 10
## 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. Have students listen for, identify, and/or record the missing or incorrect number and explain their answer.

1N3 Continued

**Achievement Indicator:**

1N3.6 Count quantity, using groups of 2, 5 or 10 and counting on.

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 2, 5, or 10. Provide students with a collection of objects such as counters, snap cubes, or pennies. 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, have students sort the collection into groups of 5 or 10, and then count the collection by touching the groups (e.g., 5, 10, 15, 20 or 10, 20, 30, 40). For collections that cannot be sorted evenly into groups of 5 or 10, students should be able to sort the items into groups of 2, 5, or 10 and then count on to find the total. For example, if provided with a set of 34 counters, students should make three groups of 10 and one group of 4, and count, “10, 20, 30, 31, 32, 33, 34.”

### Problem Solving

- **Draw a Picture**

Students have already been introduced to the strategies of ‘Guess and Check’ and ‘Use an Object’ and have had many opportunities throughout the previous units to practice these strategies. In addition to these strategies consider having 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. Students draw a representation of the problem.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**
- Have students 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. Have the students 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., link-its, beans, macaroni, counters). Students grab a handful of objects from one bag and sort into groups of 2, 5 or 10. Have students record how many groups of 2 / 5 / 10. How many are left over and how many in all. (1N3.6)

- Model this problem for the students:
  There are 5 dogs in my neighbour’s back garden. When I look over the fence how many dog legs do I see? Discuss how many legs are on one dog and draw the five dogs. Count the number of legs.

<table>
<thead>
<tr>
<th>A.</th>
<th>How many groups of 2 / 5 / 10?</th>
<th>How many left over?</th>
<th>How many in all?</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Resources/Notes

- *Math Makes Sense 1*
  - Lesson 4: The 100 - Chart
    1N1
    TG: pp. 26 - 27
  - Unit Centres:
    - 100 Chart Puzzle
      TG p. 13
  - Lesson 5: Grouping Sets
    1N3
    TG: pp. 28 - 31
  - Unit Centres:
    - Number Mix-Up
      TG p. 13
  - Lesson 6: Groups of 10
    1N3
    TG: pp. 32 - 35
  - Audio CD 1:
    - Selection 17
  - Unit Centres:
    - Roll it and Build it
      TG p. 13
  - Lesson 7: Strategies Toolkit
    TG pp. 36 - 37
In this unit students will further develop their personal strategies for addition and subtraction to 20. Continue practice throughout the remainder of the year.
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.

Math Connects

Problem solving should be the central focus of the mathematics curriculum as it is a primary goal of all mathematical activities. It is not a distinct topic but a process that should permeate the entire program and provide the context in which concepts and skills can be learned. (Curriculum and Evaluation Standards for School Mathematics, NCTM, p.23). Students learn to add and subtract in order to solve problems that make sense to them. As well, they must be able to interpret the problem to know what the problem is asking. They must have the skills and understanding of number to solve the problem. Students should be encouraged to discuss their representations and strategies used to solve problems to help deepen their understanding of number and operations.
### Process Standards Key

<table>
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### Curriculum Outcomes

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<th>OUTCOME</th>
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<tr>
<td>Number</td>
<td>1N9 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.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>1N10 Describe and use mental mathematics strategies (memorization not intended), such as: • counting on and counting back • making 10 • using doubles • using addition to subtract to determine the basic addition facts to 18 and related subtraction facts.</td>
<td>[C, CN, ME, PS, R, V]</td>
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<tr>
<td>Patterns and Relations</td>
<td>1PR4 Record equalities, using the equal symbol (0 to 20)</td>
<td>[C, CN, PS, V]</td>
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<tr>
<td>(Variables and Equations)</td>
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</table>
Strand: Number

Outcomes

Students will be expected to

1N10 Describe and use mental mathematics strategies (memorization not intended), such as:

- counting on and counting back
- making 10
- using doubles
- using addition to subtract to determine the basic addition facts to 18 and related subtraction facts.

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

Elaborations—Strategies for Learning and Teaching

Students will have worked with addition and subtraction to 12. They will build on their prior knowledge and strategies to work with numerals to 20. Students need to be proficient when working with numbers to 10 before we can expect them to see relationships with larger numbers. When they begin working with numbers to 20 many students will solve problems by counting. The focus in this unit is to see that the relationships between numbers and the strategies they develop when working with smaller numbers can be applied when working with larger numbers. New strategies will be introduced to help students build their repertoire of strategies for mathematical computations.

Make Ten - Give students flash cards with the addition facts where at least one addend is 8 or 9. Students choose a card and build on the 8 or 9 to think “10 and so many more”.

E.g.,

\[
\begin{array}{c}
8 \\
+ 5
\end{array}
\]

Make the 8 a ten so you have 10 and 3 more is 13.

Achievement Indicators:

1N10.1 Use and describe a personal strategy for determining a given sum.

1N10.2 Use and describe a personal strategy for determining a given difference.

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**
- Double your Die - Using a 4 to 9 number cube (or spinner), students roll the die and double the number shown on the die. Students record the number sentence and solve.  
  \( (1N10.1) \)

- 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 and solve the problem. As an extension, students can also do “Double less One”.  
  \( (1N10.1, 10.2) \)

**Student-Teacher Dialogue**
- 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 students:
  - solve problems involving numbers to 10 in a different way than numbers to 20
  - can explain the strategy used
  - is confident in their answer  
  \( (1N10.1, 10.2) \)

#### Resources/Notes

*Math Makes Sense 1*
- Launch
  - Teacher Guide (TG) p. 15
- Lesson 1: Addition and Subtraction Facts to 18
  - 1N10
  - TG pp. 16 - 17
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]

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.

Achievement Indicators:

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

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

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

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 “the same as” for the equal sign will help them further understand this relation.
General Outcome: Represent Algebraic Expressions in Multiple Ways

Suggested Assessment Strategies

**Performance**

- Students sit in a circle. Each student is given a chain of the specified number (e.g., 17) of links of one color. 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, 4.2, 4.4)

- What is in the bag? Using a balance scale and counters students work in pairs. Partner one puts 15 counters on one side of the scale. And on the other side, a brown paper bag with 9 counters inside. Partner two must add counters to the side of the scale holding the bag (not in the bag) until both sides are balanced. Partner two then figures out how many counters were in the bag and explains their strategy. Both partners record the equality. Partners then switch roles and record a different equality for the same number (15).  
  
  (1PR4.4)

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<td>Selection 13 &amp; 14</td>
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Addition and Subtraction to 20

Outcomes

Students will be expected to

1N10 Continued

Elaborations—Strategies for Learning and Teaching

Previously, in this unit, students have worked through addition and subtraction sentences and problems. At this point, students may already be starting to refine their strategies. As students begin to take more risks with different strategies, encourage them to compare their known strategies with the new ones, asking which they think is better and why. A discussion about using strategies that help students find the sums and differences quickly may be needed. 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 work best for them.

It is important that students recognize that every addition problem can also be viewed as a subtraction problem and vice versa. Fact families 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 given subtraction sentence: 18 - 6 = 12. Ask students to join the groups together and write the related addition sentence.

Create two “link it” chains, one with 14 red links and one with 6 blue links. Have students join the two together and give them the addition sentence: 14 + 6 = 20.

Ask students to separate the two colors and write the related subtraction sentence.
General Outcome: Develop Number Sense

**Suggested Assessment Strategies**

**Performance**
- Tell me how - As 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 a think-pair-share approach. (1N10.3)

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<td>Connect It!</td>
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<td>TG p. 13</td>
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</table>

- Ask students to write a related addition/subtraction fact for the following facts:
  - $12 + 6 = 18$
  - $14 + 3 = 17$
  - $16 - 9 = 7$
  - $12 - 8 = 4$ (1N10.4, 10.5)

- 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. (1N10.4, 10.5)

- 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 one covers their eyes while partner two splits the counters into two parts, placing them on the two part mat. Partner two covers one side of the mat with a piece of paper. Partner one then has to find the hidden number and record it as either an addition or subtraction sentence depending on the strategy they used. (1N10.4, 10.5)
Strand: Number

Outcomes

Students will be expected to

1N9 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
- modeling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.

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

Elaborations—Strategies for Learning and Teaching

In the demonstration of 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)

Achievement Indicators:

1N9.4 Create a story problem for addition that connects to personal experience, and simulate the action with counters.

1N9.5 Create a story problem for subtraction that connects to personal experience, and simulate the action with counters.

1N9.7 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Performance**

- Have students create their own story problems for addition and subtraction and demonstrate the additive or subtractive action with counters. Incorporate the use of manipulatives, such as dominoes and dice, to generate numbers for story problems. (1N9.4, 9.5)

- 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 8 ½ 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. (1N9.4, 9.5, 9.7)

**Joining Problems**

- Result Unknown - There are 7 children in line at the water fountain. 6 more join the line. How many students are in the line now?
- Change Unknown - There are 7 children lined up at the water fountain. More children join the line. There are now 13 children in the line. How many children joined the line?
- Initial Unknown - There are some children lined up at the water fountain. 6 children join the line. There are now 13 children in the line. How many children were there first?

**Separate Problems**

- Result Unknown - There are 14 candles on Julie's birthday cake. Chris blows 5 of the candles out. How many candles are still burning?
- Change Unknown - There are 14 candles on Julie's birthday cake. Chris blows some of the candles out. There are 8 candles still burning. How many candles did Chris blow out?
- Initial Unknown - There are candles on Julie's birthday cake. Chris blows 5 of the candles out. Now there are 8 candles still burning. How many candles were first burning on the cake?

**Compare Problems**

- Difference Unknown - Bob has 18 stickers. Julie has 9 stickers. How many more stickers does Bob have?
- Larger Unknown - Bob has 8 more stickers than Julie. Julie has 9 stickers. How many stickers does Bob have?
- Smaller Unknown - Julie has 10 fewer stickers than Bob. Bob has 15 stickers. How many stickers does Julie have? (1N9.7)

### Resources/Notes

*Math Makes Sense 1*

Lesson 6: Creating and Solving Story Problems

1N9, 1PR4

TG pp. 31 - 32
### Strand: Number

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<td><strong>Students will be expected to</strong></td>
<td>Students need to be exposed to a variety of word problems from the three categories of problems:</td>
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<tr>
<td><strong>1N9 Continued</strong></td>
<td><strong>Join Problems</strong></td>
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<tr>
<td><strong>Achievement Indicators:</strong></td>
<td><strong>Separate Problems</strong></td>
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<tr>
<td>1N9.6 Create a word problem for a given addition or subtraction number sentence.</td>
<td><strong>Compare Problems</strong></td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
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</table>

### Problem Solving

- Choose a Strategy

Students have been introduced to the problem solving strategies:

- Act it Out
- Make a Model
- Find a Pattern
- Draw a Picture
- Guess and Check
- Use an Object

Review these strategies and help them determine the best strategy for them to use to solve the given problem.

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?

Students can choose to ‘Act it Out’, ‘Make a Model’, ‘Draw a Picture’, ‘Guess and Check’, or “Use an Object’. The strategy they 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.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Have students create their own story problems for addition and subtraction and demonstrate the additive or subtractive action with counters. Incorporate the use of manipulatives, such as dominoes and dice, to generate numbers for story problems. (1N9.6)

- Storytellers - In a container put simple number sentences

\[
\begin{align*}
9 + 2 & \\
11 + 3 & 
\end{align*}
\]

Students draw a card and then must develop two different stories for the same sentence. Students can be asked to act out their story. (1N9.6)

Resources/Notes

- Math Makes Sense 1
  Lesson 7: Further Strategies for Solving Story Problems
  1N9, 1N10
  TG pp. 33 - 36

- Unit Centres: Word Problems
  TG p. 13

- Lesson 8: Strategies Toolkit
  TG pp. 37 - 38

- Investigation 3: Classroom Plants
  TG pp. 41 - 45
  Use as time permits.
Geometry

Suggested Time: 4 Weeks

Although geometry concepts have been explored, this is the first explicit focus.
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.

Math Connects
Geometry enables us to describe, analyze, and understand our physical world and therefore, requires a focus throughout the Math curriculum. It also complements and supports the study of other aspects of mathematics such as number and measurement. Geometry offers powerful tools for representing and solving problems in all areas of mathematics.
### Process Standards Key

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### Curriculum Outcomes

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<td>1SS2 Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule.</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td>Shape and Space (3D Objects and 2D Shapes)</td>
<td>1SS3 Replicate composite 2-D shapes and 3-D objects.</td>
<td>[CN, PS, V]</td>
</tr>
<tr>
<td>Space and Shape (3D Objects and 2D Shapes)</td>
<td>1SS4 Compare 2-D shapes to parts of 3-D objects in the environment.</td>
<td>[C, CN, V]</td>
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</table>
## 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

The study of two dimensional shapes and three dimensional objects is essential as we strive to describe, analyze, and understanding the world we live in. 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. As pattern blocks are regularly used for geometric inquiry, it would seem reasonable that students become familiar with the terms that describe them which include circle, triangle, square and rectangle. Students should be comfortable using such terms as cylinder, sphere, cone, and cube, and may extend their exploration to rectangular prisms and square pyramids.

### Achievement Indicators:

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

Attributes of 3-D objects that children might explore include:
- the number of edges
- the number of vertices
- the number of faces
- Will it roll? Stack? Slide?

With this knowledge, the 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 alike?
- How are these objects 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 to generate their own sorting rules.
## Suggested Assessment Strategies

### Performance

- Seat the 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. Have the students explain their sorting rule to the class.  (1SS2.2)

### Resources/Notes

- *Math Makes Sense 1*
  - *Launch*
  - Teacher Guide (TG) p. 13

- *Lesson 1: Sorting 3-D Objects*
  - 1SS2
    - TG pp. 14 - 15
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

1SS3. Replicate composite 2-D shapes and 3-D objects.

[CN, PS, V]

Achievement Indicators:

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

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

Elaborations—Strategies for Learning and Teaching

Experimentation, including free play, with 2-D shapes and 3-D objects provide students with opportunities to explore the attributes of shapes, and how they can be put together and taken apart to make other shapes. Pattern blocks, attribute blocks, and tangram pieces are useful tools with which students can explore these relationships.

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

Students will use their knowledge of the properties of 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 shape/object and compare the two sets.
**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 the partner replicates the object. (1SS3.2, 3.4)

- 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, 3.4)

**Resources/Notes**

*Math Makes Sense 1*

Lesson 2: Replicating Composite Objects

1SS3

TG pp. 16 - 19

Unit Centres:

Build This!

TG p. 11
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]

Achievement Indicators:

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

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

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.

Elaborations—Strategies for Learning and Teaching

Attributes of 2-D shapes that children might explore include:

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

With this knowledge, the 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 2-D shapes by asking questions such as:

- How are these objects alike?
- How are these objects different?
- How many sides and corners does this object have?
- Can you find another example of this 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 2-D shapes to generate their own sorting rules.

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.

Problem Solving

- Choose a Strategy to solve the problem

Students have been introduced to the problem solving strategies:

- Act it Out
- Make a Model
- Find a Pattern
- Draw a Picture
- Guess and Check
- Use an Object

Review these strategies and help them to determine the best strategy for them to use to solve the given problem.
General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

**Performance**

- Seat the 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

  \[(1SS2.1)\]

- Provide students with a set of familiar 2-D shapes to sort based on a single attribute. Have the students explain their sorting rule to the class.

  \[(1SS2.3)\]

- Provide sets of shapes that have been pre-sorted into two groups. Ask students to determine the sorting rule and explain how they know.

  \[(1SS2.4)\]

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

**Resources/Notes**

*Math Makes Sense 1*

Lesson 3: Sorting 2-D Shapes

1SS2

TG pp. 20 - 23

Unit Centres: Sort and Match

TG p. 11

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

Lesson 4: Strategies Toolkit

TG pp. 24 - 25
Strand: Shape and Space (3-D Objects and 2-D Shapes)

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Elaborations — Strategies for Learning and Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be expected to</strong> 1SS3. Replicate composite 2-D shapes and 3-D objects.</td>
<td>Students should develop the ability to replicate composite 2-D shapes. It is through such replication that students become familiar with the attributes of various 2-D shapes as well as 3-D objects.</td>
</tr>
<tr>
<td><strong>Achievement Indicators:</strong> 1SS3.1 Select 2-D shapes from a set to reproduce a composite 2-D shape.</td>
<td>Students will use their knowledge of the properties of 2-D shapes to predict and select which shapes are necessary to produce a composite shape. To verify their predictions and selections they will then deconstruct the original shape and compare the two sets.</td>
</tr>
<tr>
<td>1SS3.3 Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.</td>
<td>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.</td>
</tr>
<tr>
<td>1SS4. Compare 2-D shapes to parts of 3-D objects in the environment.</td>
<td>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.</td>
</tr>
<tr>
<td>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).</td>
<td>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.</td>
</tr>
</tbody>
</table>

Grade 1 Mathematics Curriculum Guide - Interim
General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

### Suggested Assessment Strategies

**Performance**

- 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)

- Use pattern blocks to make an animal such as a pet cat. Show this design to the students and ask them to use the set of pattern blocks provided to replicate the design.  
  (1SS3.1)

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

<table>
<thead>
<tr>
<th>Shape I Looked For</th>
<th>Things I Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>○</td>
<td></td>
</tr>
<tr>
<td>△</td>
<td></td>
</tr>
<tr>
<td>□</td>
<td></td>
</tr>
</tbody>
</table>

  (1SS4.1)

- Before going to lunch, ask students to open 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)

### Resources/Notes

**Math Makes Sense 1**

- Lesson 5: Replicating Composite Shapes  
  1SS3  
  TG pp. 26 - 30

- Unit Centres: Shape Patterns and Pictures  
  TG p. 11

- Lesson 6: Comparing 3-D Objects and 2-D Shapes  
  1SS4  
  TG pp. 31 - 34

- Unit Centres: Sand Prints  
  TG p. 11
Appendix A
Outcomes by Strand
(with page references)
**Strand:** Number  

**Specific Outcomes**  
*It is expected that students will:*  

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
</table>
| **1N1** Say the number sequence 0 to 100 by:  
• 1s forward between any two given numbers  
• 1s backward 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]  
*pp. 32, 128* | **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).  
**1N1.3** Record a given numeral (0 to 100) symbolically when it is presented orally.  
**1N1.4** Read a given numeral (0 to 100) symbolically.  
**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 forward by 10s to 100, starting at 0.  
**1N1.8** Identify and correct errors/omissions in a given number sequence and explain. |
| 1N2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects, dots or pictures.  
[C, CN, ME, V]  
*p. 46* | 1N2.1 Look briefly at a given familiar arrangement of objects, dots or pictures and identify the number represented without counting.  
1N2.2 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. |
| 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]  
*pp. 36, 40, 50, 88, 128* | 1N3.1 Answer the question, “How many are in the set?”, using the last number counted in a given set.  
1N3.2 Identify and correct counting errors in a given counting sequence.  
1N3.3 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.  
1N3.4 Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction.  
1N3.5 Determine the total number of objects in a given set, starting from a known quantity and counting on.  
1N3.6 Count quantity, using groups of 2, 5 or 10 and counting on.  
1N3.7 Record the number of objects in a given set (up to 100). |
| 1N4 Represent and describe numbers to 20, concretely, pictorially and symbolically.  
[C, CN, V]  
*pp. 38, 40, 52, 58* | 1N4.1 Represent a given number up to 20, using a variety of manipulatives, including ten frames and base ten materials.  
1N4.2 Read given number words to 20.  
1N4.3 Partition any given quantity up to 20 into 2 parts, and identify the number of objects in each part.  
1N4.4 Model a given number, using two different objects; e.g., 10 desks represents the same number as 10 pencils.  
1N4.5 Place given numerals on a number line with benchmarks 0, 5, 10 and 20. |
### Strand: Number (Continued)

**General Outcome:** Develop number sense

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>Achievement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is expected that students will:</td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome.</td>
</tr>
<tr>
<td>1N5 Compare and order sets containing up to 20 elements to solve problems, using:</td>
<td>1N5.1 Build a set equal to a given set that contains up to 20 elements.</td>
</tr>
<tr>
<td>• referents (known quantities)</td>
<td>1N5.2 Build a set that has more elements than, fewer elements than or as many elements as a given set.</td>
</tr>
<tr>
<td>• one-to-one correspondence to solve problems.</td>
<td>1N5.3 Compare two given sets, using one-to-one correspondence, and describe them, using comparative words such as more, fewer or as many.</td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V] p. 64</td>
<td>1N5.4 Solve a given story problem (pictures and words) that involves the comparison of two quantities.</td>
</tr>
<tr>
<td>1N6 Estimate quantities to 20 by using referents.</td>
<td>1N6.1 Estimate a given quantity by comparing it to a given referent (known quantity).</td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V] p. 62</td>
<td>1N6.2 Select an estimate for a given quantity from at least two possible options, and explain the choice.</td>
</tr>
<tr>
<td>1N7</td>
<td>No Outcome</td>
</tr>
<tr>
<td>1N8 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] pp.44, 60</td>
<td>1N8.1 Name the number that is one more, two more, one less or two less than a given number, up to 20.</td>
</tr>
<tr>
<td>1N9 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:</td>
<td>1N9.1 Act out a given problem presented orally or through shared reading.</td>
</tr>
<tr>
<td>• using familiar and mathematical language to describe additive and subtractive actions from their personal experience</td>
<td>1N9.2 Indicate if the scenario in a given story problem represents additive or subtractive action.</td>
</tr>
<tr>
<td>• creating and solving problems in context that involve addition and subtraction</td>
<td>1N9.3 Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.</td>
</tr>
<tr>
<td>• modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically. [C, CN, ME, PS, R, V] pp. 90, 102, 110, 144</td>
<td>1N9.4 Create a story problem for addition that connects to personal experience, and simulate the action with counters.</td>
</tr>
<tr>
<td>1N9.5 Create a story problem for subtraction that connects to personal experience, and simulate the action with counters.</td>
<td>1N9.6 Create a word problem for a given addition or subtraction number sentence.</td>
</tr>
<tr>
<td>1N9.7 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.</td>
<td>1N9.8 Represent a given story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.</td>
</tr>
</tbody>
</table>
### Strands: Number (Continued)

<table>
<thead>
<tr>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Outcomes</strong>&lt;br&gt;It is expected that students will:</td>
</tr>
</tbody>
</table>

1N10 Describe and use mental mathematics strategies (memorization not intended), such as:
- counting on and counting back
- making 10
- using doubles
- using addition to subtract
to determine the basic addition facts to 18 and related subtraction facts.<br>[C, CN, ME, PS, R, V]<br>pp. 98, 108, 138, 142

<table>
<thead>
<tr>
<th>Achievement Indicators</th>
</tr>
</thead>
</table>
| (It is not intended that students recall the basic facts but become familiar with strategies to mentally determine sums and differences.)
1N10.1 Use and describe a personal strategy for determining a given sum.
1N10.2 Use and describe a personal strategy for determining a given difference.
1N10.3 Refine personal strategies to increase their efficiency.
1N10.4 Write the related subtraction fact for a given addition fact.
1N10.5 Write the related addition fact for a given subtraction fact. |
<table>
<thead>
<tr>
<th>Strand: Patterns and Relations (Patterns)</th>
<th>General Outcome: Use patterns to describe the world and to solve problems.</th>
<th>Achievement Indicators</th>
</tr>
</thead>
</table>
| **Specific Outcomes**  
*It is expected that students will:* |  |
| 1PR1 Demonstrate an understanding of repeating patterns (two to four elements) by:  
• describing  
• reproducing  
• extending  
• creating patterns using manipulatives, diagrams, sounds and actions. | 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 Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.  
1PR1.5 Reproduce and extend a given repeating pattern using manipulatives, diagrams, sounds and actions.  
1PR1.6 Describe, using everyday language, a repeating pattern in the environment, e.g., in the classroom, outdoors.  
1PR1.7 Identify repeating events; e.g., days of the week, birthdays, seasons. | |
| [C, PS, R, V]  
p. 76 | |
| 1PR2 Translate repeating patterns from one representation to another. | 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, … | |
<table>
<thead>
<tr>
<th>Strand: Patterns and Relations  (Variables and Equations)</th>
<th>General Outcome: Represent Algebraic Expressions in Multiple Ways.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Achievement Indicators</strong></td>
</tr>
<tr>
<td><em>It is expected that students will:</em></td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome.</td>
</tr>
</tbody>
</table>
| 1PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). [C, CN, R, V] *p. 68* | 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. |
| 1PR4 Record equalities, using the equal symbol (0 to 20) [C, CN, PS, V] *pp. 70, 94, 106, 140* | 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. |
<table>
<thead>
<tr>
<th>Strand: Shape and Space (Measurement)</th>
<th>General Outcome: Use direct or indirect measurement to solve problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Outcomes</td>
<td>Achievement Indicators</td>
</tr>
<tr>
<td>It is expected that students will:</td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome.</td>
</tr>
<tr>
<td>1SS1 Demonstrate an understanding of measurement as a process of comparing by:</td>
<td>1SS1.1 Identify common attributes, such as length, height, mass, capacity and area, that could be used to compare two given objects.</td>
</tr>
<tr>
<td>• identifying attributes that can be compared</td>
<td>1SS1.2 Order a set of objects by length, height, mass, capacity or area, and explain their ordering.</td>
</tr>
<tr>
<td>• ordering objects</td>
<td>1SS1.3 Compare two given objects, and identify the attributes used to compare.</td>
</tr>
<tr>
<td>• making statements of comparison</td>
<td>1SS1.4 Determine which of two or more objects is longest or shortest by matching, and explain the reasoning.</td>
</tr>
<tr>
<td>• filling, covering or matching.</td>
<td>1SS1.5 Determine which of two or more objects is heaviest or lightest by comparing, and explain the reasoning.</td>
</tr>
<tr>
<td>[C, CN, PS, R, V]</td>
<td>1SS1.6 Determine which of two or more objects holds the most or least by filling, and explain the reasoning.</td>
</tr>
<tr>
<td>pp. 116, 120</td>
<td>SS1.7 Determine which of two or more objects has the greatest or least area by covering, and explain the reasoning.</td>
</tr>
</tbody>
</table>
Strand: Shape and Space (Measurement) | General Outcome: Use direct or indirect measurement to solve problems.
---|---
**Specific Outcomes**<br>It is expected that students will: | **Achievement Indicators**<br>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.<br>[C, CN, R, V]<br>pp. 152, 156 | 1SS2.1 Sort a set of familiar 3-D objects or 2-D shapes, using a given sorting rule.<br>1SS2.2 Sort a set of familiar 3-D objects using a single attribute, determined by the student, and explain the sorting rule.<br>1SS2.3 Sort a set of 2-D shapes using a single attribute, determined by the student, and explain the sorting rule.<br>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 Replicate composite 2-D shapes and 3-D objects.<br>[CN, PS, V]<br>pp. 154, 158 | 1SS3.1 Select 2-D shapes from a set to reproduce a composite 2-D shape.<br>1SS3.2 Select 3-D objects from a set to reproduce a composite 3-D object.<br>1SS3.3 Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.<br>1SS3.4 Predict and select the 3-D objects used to produce a composite 3-D object, and verify by deconstructing the composite object.
---
1SS4 Compare 2-D shapes to parts of 3-D objects in the environment.<br>[C, CN, V]<br>p. 158 | 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).
Appendix B
References
REFERENCES


Computation, Calculators, and Common Sense. May 2005, NCTM.


Richardson, K.  Counting comparing and pattern. Pearson Education, Inc. 1999


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