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Acknowledgements

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We would also like to thank the provincial Grade 2 Mathematics curriculum committee, the Alberta Department of Education, the New Brunswick Department of Education, and the following people for their contribution:

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Every effort has been made to acknowledge all sources that contributed to the development of this document. Any omissions or errors will be amended in final print.
Foreword

The *WNCP Common Curriculum Frameworks for Mathematics K – 9 (WNCP, 2006)*, formed the basis for the development of this curriculum guide. While minor adjustments have been made, the outcomes and achievement indicators established through the WNCP Common Curriculum Framework are used and elaborated on for teachers in this document. Newfoundland and Labrador has used the WNCP 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.
INTRODUCTION

Purpose of the Document

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.

Beliefs About Students and Mathematics Learning

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.

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.

<table>
<thead>
<tr>
<th>STRAND</th>
<th>GRADE</th>
<th>K</th>
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<td>- 3-D Objects and 2-D Shapes</td>
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</tbody>
</table>

**Mathematical Processes** - Communication, Connections, Mental Mathematics and Estimation, Problem Solving, Reasoning, Technology, Visualization

**Nature of Mathematics**
- Change, Constancy, Number Sense, Patterns, Relationships, Spatial Sense, Uncertainty
Mathematical Processes

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

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.
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 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.

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.

**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.

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

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

**Statistics and Probability**
- Collect, display and analyze data to solve problems.

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

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

### General Outcomes

*General outcomes* 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.

### Specific Outcomes

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

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

### Achievement Indicators

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

## 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 2 (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 2 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 2 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 17–29)

This section presents the general and specific outcomes for each strand, for Grade 1, 2 and 3.

Refer to Appendix A for the general and specific outcomes with corresponding achievement indicators organized by strand for Grade 2.

GENERAL AND SPECIFIC OUTCOMES WITH ACHIEVEMENT INDICATORS (beginning at page 31)

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

(Grades 1, 2 and 3)
Number

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
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</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>
</tbody>
</table>
| 1. 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] | 1. Say the number sequence from 0 to 100 by:  
  - 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively  
  - 10s, using starting points from 1 to 9  
  - 2s, starting from 1.  
  [C, CN, ME, R] | 1. Say the number sequence 0 to 1000 forward and backward by:  
  - 5s, 10s or 100s, using any starting point  
  - 3s, using starting points that are multiples of 3  
  - 4s, using starting points that are multiples of 4  
  - 25s, using starting points that are multiples of 25.  
  [C, CN, ME] |
| 2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects or dots.  
  [C, CN, ME, V] | 2. Demonstrate if a number (up to 100) is even or odd.  
  [C, CN, PS, R] | 2. Represent and describe numbers to 1000, concretely, pictorially and symbolically.  
  [C, CN, V] |
| 3. 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] | 3. Describe order or relative position, using ordinal numbers (up to tenth).  
  [C, CN, R] | 3. Compare and order numbers to 1000.  
  [C, CN, R, V] |
| 4. Represent and describe numbers to 100, concretely, pictorially and symbolically.  
  [C, CN, V] | 4. Represent and describe numbers to 100, concretely, pictorially and symbolically.  
  [C, CN, V] | 4. Estimate quantities less than 1000, using referents.  
  [ME, PS, R, V] |
Number

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<th>Grade 2</th>
<th>Grade 3</th>
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<tr>
<td><strong>General Outcome</strong></td>
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</tr>
<tr>
<td>Develop number sense.</td>
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</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
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<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 and order numbers up to 100. [C, CN, ME, R, V]</td>
<td>5. Illustrate, concretely and pictorially, the meaning of place value for numerals to 1000. [C, CN, R, V]</td>
</tr>
<tr>
<td>5. Compare and order sets containing up to 20 elements to solve problems, using: • referents (known quantities) • one-to-one correspondence. [C, CN, ME, PS, R, V]</td>
<td>6. Estimate quantities to 100, using referents. [C, ME, PS, R]</td>
<td>6. Describe and apply mental mathematics strategies for adding two 2-digit numerals, such as: • adding from left to right • taking one addend to the nearest multiple of ten and then compensating • using doubles. [C, CN, ME, PS, 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. Describe and apply mental mathematics strategies for subtracting two 2-digit numerals, such as: • taking the subtrahend to the nearest multiple of ten and then compensating • thinking of addition • using doubles. [C, CN, ME, PS, 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></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>
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<td></td>
</tr>
</tbody>
</table>
### Number

<table>
<thead>
<tr>
<th>Grade 1</th>
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<th>Grade 3</th>
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<tbody>
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<tr>
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</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:</td>
<td>9. Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:</td>
<td>8. Apply estimation strategies to predict sums and differences of two 2-digit numerals in a problem-solving context.</td>
</tr>
<tr>
<td>• using familiar mathematical language to describe additive and subtractive actions from their experience</td>
<td>• using personal strategies for adding and subtracting with and without the support of manipulatives</td>
<td>[C, ME, PS, R]</td>
</tr>
<tr>
<td>• creating and solving problems in context that involve addition and subtraction</td>
<td>• creating and solving problems that involve addition and subtraction</td>
<td>9. Demonstrate an understanding of addition and subtraction of numbers with answers to 1000 (limited to 1-, 2- and 3-digit numerals), concretely, pictorially and symbolically, by:</td>
</tr>
<tr>
<td>• modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.</td>
<td>• using the commutative property of addition (the order in which numbers are added does not affect the sum)</td>
<td>• using personal strategies for adding and subtracting with and without the support of manipulatives</td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V]</td>
<td>• using the associative property of addition (grouping a set of numbers in different ways does not affect the sum)</td>
<td>• creating and solving problems in context that involve addition and subtraction of numbers.</td>
</tr>
<tr>
<td></td>
<td>• 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>
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<td><strong>Specific Outcomes</strong></td>
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</tr>
</tbody>
</table>
| 10. Describe and use mental mathematics strategies (memorization not intended), such as:  
• counting on and counting back  
• making 10  
• using doubles  
• thinking addition for subtraction to determine the basic addition facts and related subtraction facts to 18.  
[C, CN, ME, PS, R, V] | 10. Apply mental mathematics strategies, such as:  
• counting on and counting back  
• making 10  
• using doubles  
• using addition to subtract for basic addition facts and related subtraction facts to 18.  
[C, CN, ME, PS, R, V] | 10. Apply mental mathematics strategies and number properties, such as:  
1. using doubles  
2. making 10  
3. using addition to subtract  
4. using the commutative property  
5. using the property of zero for basic addition facts and related subtraction facts to 18.  
[C, CN, ME, PS, R, V] |
| 11. Demonstrate an understanding of conservation of number.  
[C, R, V] | | |
# Number

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<thead>
<tr>
<th>Grade 1</th>
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<tr>
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<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
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<tr>
<td>11. Demonstrate an understanding of multiplication to $5 \times 5$ by:</td>
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<td></td>
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<tr>
<td>- representing and explaining multiplication using equal grouping and arrays</td>
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<td></td>
</tr>
<tr>
<td>- creating and solving problems in context that involve multiplication</td>
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<tr>
<td>- modelling multiplication using concrete and visual representations, and recording the process symbolically</td>
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<tr>
<td>- relating multiplication to repeated addition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- relating multiplication to division.</td>
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</tbody>
</table>

[C, CN, PS, R]
### General and Specific Outcomes by Strand

- Communication (C)
- Connections (CN)
- Mental Mathematics and Estimation (ME)
- Problem Solving (PS)
- Reasoning (R)
- Technology (T)
- Visualization (V)

### Number

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<td>Develop number sense.</td>
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<tr>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
<td>Specific Outcomes</td>
</tr>
<tr>
<td>12. Demonstrate an understanding of division (limited to division related to multiplication facts up to 5 × 5) by:</td>
<td></td>
<td>13. Demonstrate an understanding of fractions by:</td>
</tr>
<tr>
<td>• representing and explaining division using equal sharing and equal grouping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• creating and solving problems in context that involve equal sharing and equal grouping</td>
<td></td>
<td></td>
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<tr>
<td>• modelling equal sharing and equal grouping using concrete and visual representations, and recording the process symbolically</td>
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<tr>
<td>• relating division to repeated subtraction</td>
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<tr>
<td>• relating division to multiplication.</td>
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<tr>
<td>[C, CN, PS, R]</td>
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</table>

13. Demonstrate an understanding of fractions by:
- explaining that a fraction represents a part of a whole
- describing situations in which fractions are used
- comparing fractions of the same whole with like denominators.

[C, CN, ME, R, V]
### Patterns and Relations

(Patterns)

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
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<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>
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<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>1. Demonstrate an understanding of repeating patterns (two to four elements) by:</td>
<td>1. Demonstrate an understanding of repeating patterns (three to five elements) by:</td>
<td>1. Demonstrate an understanding of increasing patterns by:</td>
</tr>
<tr>
<td>• describing</td>
<td>• describing</td>
<td>• describing</td>
</tr>
<tr>
<td>• reproducing</td>
<td>• extending</td>
<td>• extending</td>
</tr>
<tr>
<td>• extending</td>
<td>• comparing</td>
<td>• comparing</td>
</tr>
<tr>
<td>• creating</td>
<td>• creating</td>
<td>• creating</td>
</tr>
<tr>
<td>patterns using manipulatives, diagrams, sounds and actions. [C, PS, R, V]</td>
<td>patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]</td>
<td>patterns using manipulatives, diagrams, sounds and actions (numbers to 1000). [C, CN, PS, R, V]</td>
</tr>
<tr>
<td>2. Translate repeating patterns from one representation to another. [C, CN, R, V]</td>
<td>2. Demonstrate an understanding of increasing patterns by:</td>
<td>2. Demonstrate an understanding of decreasing patterns by:</td>
</tr>
<tr>
<td></td>
<td>• describing</td>
<td>• describing</td>
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<tr>
<td></td>
<td>• reproducing</td>
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<td></td>
<td>patterns using manipulatives, diagrams, sounds and actions (numbers to 100). [C, CN, PS, R, V]</td>
<td>patterns using manipulatives, diagrams, sounds and actions (numbers to 1000). [C, CN, PS, R, V]</td>
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### Patterns and Relations
(Variables and Equations)

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<tr>
<td><strong>General Outcome</strong>&lt;br&gt;Use patterns to describe the world and to solve problems.</td>
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<td><strong>General Outcome</strong>&lt;br&gt;Use patterns to describe the world and to solve problems.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong>&lt;br&gt;4. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). [C, CN, R, V]&lt;br&gt;5. Record equalities (0-20), using the equal symbol. [C, CN, PS, V]</td>
<td><strong>Specific Outcomes</strong>&lt;br&gt;3. Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0 – 100) [C, CN, R, V]&lt;br&gt;4. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V]</td>
<td><strong>Specific Outcomes</strong>&lt;br&gt;3. Solve one-step addition and subtraction equations involving symbols representing an unknown number. [C, CN, PS, R, V]</td>
</tr>
</tbody>
</table>
## General and Specific Outcomes by Strand

<table>
<thead>
<tr>
<th>Grade 1</th>
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<tbody>
<tr>
<td><strong>General Outcome</strong>&lt;br&gt;Use direct or indirect measurement to solve problems.</td>
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<td><strong>General Outcome</strong>&lt;br&gt;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. Demonstrate an understanding of measurement as a process of comparing by:&lt;br&gt;• identifying attributes that can be compared&lt;br&gt;• ordering objects&lt;br&gt;• making statements of comparison&lt;br&gt;• filling, covering or matching. [C, CN, PS, R, V]</td>
<td>1. Relate the number of days to a week and the number of months to a year in a problem-solving context. [C, CN, PS, R]&lt;br&gt;2. Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass. [C, CN, ME, R, V]&lt;br&gt;3. Compare and order objects by length, height, distance around and mass, using nonstandard units, and make statements of comparison. [C, CN, ME, R, V]&lt;br&gt;4. Measure length to the nearest nonstandard unit by:&lt;br&gt;• using multiple copies of a unit&lt;br&gt;• using a single copy of a unit (iteration process). [C, ME, R, V]</td>
<td>1. Relate the passage of time to common activities, using nonstandard and standard units (minutes, hours, days, weeks, months, years). [CN, ME, R]&lt;br&gt;2. Relate the number of seconds to a minute, the number of minutes to an hour and the number of days to a month, in a problem solving context. [C, CN, PS, R, V]&lt;br&gt;3. Demonstrate an understanding of measuring length (cm, m) by:&lt;br&gt;• selecting and justifying referents for the units cm and m&lt;br&gt;• modelling and describing the relationship between the units cm and m&lt;br&gt;• estimating length, using referents&lt;br&gt;• measuring and recording length, width and height. [C, CN, ME, PS, R, V]</td>
</tr>
</tbody>
</table>

**Shape and Space**

*(Measurement)*
## General and Specific Outcomes by Strand

<table>
<thead>
<tr>
<th>C</th>
<th>Communication</th>
</tr>
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<tr>
<td>CN</td>
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</tr>
<tr>
<td>ME</td>
<td>Mental Mathematics and Estimation</td>
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<td>PS</td>
<td>Problem Solving</td>
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<td>R</td>
<td>Reasoning</td>
</tr>
<tr>
<td>T</td>
<td>Technology</td>
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<tr>
<td>V</td>
<td>Visualization</td>
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### Shape and Space

**Measurement**

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**Specific Outcomes**

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<tr>
<td>Specific Outcomes</td>
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</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>4. Demonstrate an understanding of measuring mass (g, kg) by: • selecting and justifying referents for the units g and kg • modelling and describing the relationship between the units g and kg • estimating mass, using referents • measuring and recording mass [C, CN, ME, PS, R, V]</td>
<td>5. Demonstrate an understanding of perimeter of regular and irregular shapes by: • estimating perimeter, using referents for cm or m • measuring and recording perimeter (cm, m) • constructing different shapes for a given perimeter (cm, m) to demonstrate that many shapes are possible for a perimeter. [C, ME, PS, R, V]</td>
</tr>
</tbody>
</table>

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GRADE 2 MATHEMATICS CURRICULUM GUIDE - INTERIM 27
### Grade 1
**General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

**Specific Outcomes**
1. Sort 2-D shapes and 3-D objects, using one attribute, and explain the sorting rule.
   \[C, \text{CN, R, V}\]
2. Replicate composite 2-D shapes and 3-D objects.
   \[CN, \text{PS, V}\]
3. Compare 2-D shapes to parts of 3-D objects in the environment.
   \[C, \text{CN, V}\]

### Grade 2
**General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

**Specific Outcomes**
1. Sort 2-D shapes and 3-D objects, using one attribute, and explain the sorting rule.
   \[C, \text{CN, R, V}\]
2. Replicate composite 2-D shapes and 3-D objects.
   \[CN, \text{PS, V}\]
3. Compare 2-D shapes to parts of 3-D objects in the environment.
   \[C, \text{CN, V}\]
4. Describe 3-D objects according to the shape of the faces and the number of edges and vertices.
   \[C, \text{CN, PS, R, V}\]
5. Sort regular and irregular polygons, including:
   • triangles
   • quadrilaterals
   • pentagons
   • hexagons
   • octagons
   according to the number of sides.
   \[C, \text{CN, R, V}\]

### Grade 3
**General Outcome**
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

**Specific Outcomes**
1. Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.
   \[C, \text{CN, R, V}\]
2. Describe, compare and construct 3-D objects, including:
   • cubes
   • spheres
   • cones
   • cylinders
   • pyramids.
   \[C, \text{CN, R, V}\]
3. Identify 2-D shapes as parts of 3-D objects in the environment.
   \[C, \text{CN, R, V}\]
4. Describe, compare and construct 2-D shapes, including:
   • triangles
   • squares
   • rectangles
   • circles.
   \[C, \text{CN, R, V}\]
5. Identify 2-D shapes as parts of 3-D objects in the environment.
   \[C, \text{CN, R, V}\]
## Statistics and Probability (Data Analysis)

<table>
<thead>
<tr>
<th>Grade 1</th>
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<th>Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome: Collect, display and analyze data to solve problems.</td>
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<td>General Outcome: Collect, display and analyze data to solve problems.</td>
</tr>
<tr>
<td>Specific Outcomes</td>
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<td>Specific Outcomes</td>
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<tr>
<td>1. Gather and record data about self and others to answer questions. [C, CN, PS, V]</td>
<td>1. Collect first-hand data and organize it using: • tally marks • line plots • charts • lists to answer questions. [C, CN, PS, V]</td>
<td>2. Construct, label and interpret bar graphs to solve problems. [C, PS, R, V]</td>
</tr>
<tr>
<td>2. Construct and interpret concrete graphs and pictographs to solve problems. [C, CN, PS, R, V]</td>
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</tbody>
</table>
Patterning

Suggested Time:  $3 - 3\frac{1}{2}$ 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 Two, students are formally introduced to increasing patterns. They learn that increasing 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 patterns exist all around us and can be used to solve a variety of everyday problems. In Grade One, students were exposed to repeating patterns of two to four elements. This patterning concept is essential to help students understand repeating patterns as they continue to study patterning up to five elements and work with double attributes in Grade Two. Students will continue working with increasing patterns in Grade Three, but will also extend this knowledge and explore decreasing patterns as well.

Math Connects

Working with patterns helps young students recognize order and gives them the skills to help organize their world. These experiences are important in all aspects of mathematics at this age. 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 and growing patterns. Looking for patterns is natural for young children. Pattern experiences at this grade level give students the opportunity to explore repeating and increasing patterns. It is these experiences that are the foundation of the development of algebraic thinking that will be built upon during the year. A student’s ability to create, recognize and extend patterns is important for making generalizations, identifying relationships, and understanding the order and logic of mathematics. Students need various opportunities experimenting with different patterns, modes and materials to gain a thorough conceptual understanding of how they work. Increasing patterns introduce students to a higher level of algebraic thinking which will be essential for developing all other strands of mathematics.
## Process Standards

**Curriculum Outcomes**

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>2PR1 Demonstrate an understanding of repeating patterns (three to five elements) by:</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>• describing</td>
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<td></td>
<td>• extending</td>
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<td></td>
<td>• comparing</td>
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<td></td>
<td>• creating</td>
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</tr>
<tr>
<td></td>
<td>pattern using manipulatives, diagrams, sounds and actions.</td>
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</tr>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>2PR2 Demonstrate an understanding of increasing patterns by:</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>• describing</td>
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<td>• creating</td>
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</tr>
<tr>
<td></td>
<td>patterns using manipulatives, diagrams, sounds and actions (numbers to 100).</td>
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</tbody>
</table>
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR1 Demonstrate an understanding of repeating patterns (three to five elements) by:

• describing
• extending
• comparing
• creating

patterns using manipulatives, diagrams, sounds and actions.

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Students begin by reviewing repeating patterns, using a variety of manipulatives in a variety of ways. This may come in the form of teacher-directed, partner and independent activities. Some suggested manipulatives for creating patterns include:

• Snap cubes  • Pattern blocks
• Counters  • Link-Its
• Color tiles  • Stickers
• Rubber stamps  • Collections of small items

In Grade One, students have had experiences transferring patterns to other modes, such as letters. For example, the pattern red, blue, green, red, blue, green, could be also written as ABCABC. Students in Grade Two will continue using different modes to transfer patterns, including using letters.

Use different strategies to activate students’ prior knowledge about patterning such as asking them to identify different patterns in their home or classroom environment.

As students identify the ‘core’ of a pattern in activities throughout this unit, be sure to use appropriate patterning vocabulary with students, such as core (the repeating part of the pattern), and elements (the actual objects used in the pattern). These words can be added to a math word wall, if you have one. It is important to create patterns that have the core repeating at least three times. E.g. 1:

The core of this pattern is – circle, square, triangle. There are three elements in this pattern, namely a circle, a square, and a triangle.

The pattern below is also a three element pattern. E.g. 2:

The core of this three element pattern is – heart (1st element), heart (2nd element), square (3rd element).

To help students identify the pattern core, it is suggested students highlight, or isolate, the core each time it repeats. It is also important to encourage students to make predictions and extend their patterns to confirm their predictions.

Try incorporating patterning as a part of morning/daily routines or as a “Problem of the Day”. Use visual, auditory and kinesthetic patterns to accommodate diverse learning styles. Consider a game called “Guess My Pattern”, where you create a pattern and students identify the core.
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Performance

- As an on-going unit activity, require students to create a pattern booklet. Students can make a pattern booklet that includes double attribute patterns, repeating patterns, and non-numerical repeating patterns. Once 2PR2 is addressed, students may include increasing patterns. Students may leave their booklets at the math center where other students can identify the patterns. (2PR1, 2PR2)

- Play ‘Pattern Whackers’ - Display several different repeating patterns around the room (or on the board). Divide the class into two teams, giving each team a fly swatter. Ask students questions based on the displayed patterns. The first team to swat the correct pattern gets one point. (2PR1.1)

Student – Teacher Dialogue

- Ask students to listen to you clap, stamp, snap, play, etc. a pattern, having them identify the core and then repeat the pattern by extending it. (2PR1.1)

Resources/Notes

Math Makes Sense 2
Investigation 1: Grandma Helps (optional)
Teacher Guide (TG) pp. 10 - 17
Audio CD 1:
Selections 1 & 2

Launch
TG p.19
This is an optional introduction to the unit.

Lesson 1: Describing and Extending Repeating Patterns
2PR1 (1.1, 1.2)
TG pp. 20 - 24
Audio CD 1:
Selections 3 - 6

Little Book:
Which One is Next

Additional Readings:
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR1 Continued

Achievement Indicators:

2PR1.2 Describe and extend a given double attribute pattern.

Although students have had experiences with repeating patterns in earlier grades, it is important to provide them with more challenging repeating patterns at this level.

A double attribute pattern (or a two attribute pattern) is a pattern that consists of like objects with two different attributes, such as color and size, or shape and position. Here is an example of like objects (2D shapes) with two different attributes (size and shape):

In describing this pattern about size we see an ABB pattern - small, big, big. In describing it according to shape we see an ABCABC pattern - square, circle, triangle, square, circle, triangle.

Here is another example of a double attribute with 'like objects' (straws) with two different attributes (color and length):

Introduce double attribute patterns with your class by using student attributes as the elements of the pattern. You may wish to create a pattern by using students with blonde, brown and black hair, as well as, students with glasses and no glasses. Ask students to describe the pattern and invite them to choose a classmate to extend the pattern.

2PR1.3 Explain the rule used to create a given repeating non-numerical pattern.

Explaining is a key component in all achievement indicators. Explanations may take the form of a written, verbal or kinesthetic response. This is particularly important for students with diverse needs. Students are encouraged to explain their reasoning in activities by increasingly incorporating appropriate mathematical language (e.g., ‘core’ and ‘element’). Keep in mind that students may explain their thinking in a variety of ways. Students should explain how the pattern is repeating by identifying the core of the pattern and the particular way the pattern repeats.

To help students identify the pattern, ask students questions such as “What comes first in your pattern?” and “What comes next?”. 
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Performance
- Ask students to create two different repeating patterns using pattern blocks, focusing on using two attributes of the blocks. (2PR1.2)

Journal
- Show students a double attribute pattern. Have them identify the two attributes in the pattern and extend it, repeating the core at least two more times. (2PR1.1, 2PR1.2)

Paper and Pencil
- Draw a repeating pattern with three to five elements in the core. Have students identify their rule used to create this repeating pattern. (2PR1.3, 2PR1.7)

Portfolio
- Collect pictures and drawings that show repeating patterns. Have them identify the pattern and explain why it is a repeating pattern. (2PR1.1, 2PR1.3)

Resources/Notes

Math Makes Sense 2
Lesson 1 (Continued): Describing and Extending Repeating Patterns
2PR1 (1.1, 1.2)
TG pp. 20 - 24

Lesson 2: Creating Repeating Patterns
2PR1 (1.3, 1.6, 1.7)
TG pp. 25 - 28

Audio CD 1:
Selections 7 & 8
Outcomes

Students will be expected to

2PR1 Continued

Achievement Indicators:

2PR1.6 Compare two given repeating patterns, and describe how they are alike/different.

2PR1.7 Create a repeating pattern where the core has three to five elements.

Elaborations—Strategies for Learning and Teaching

When comparing patterns, students describe the similarities and differences between:

- number of elements
- attributes of the elements
- core of the pattern

Students might say that the similarities between the two above patterns would be that they both have squares, circles and triangles, and they both have big squares and big triangles.

The differences between the two patterns would be pattern 1 has four elements in the core and pattern 2 has three elements. Pattern 1 has rectangles, and big and small shapes.

It is suggested that students first be engaged in several sessions of guided practice comparing patterns, where you model and verbalize the comparison. This can then be extended to partner work and independent work, where students are asked to communicate similarities and differences in a variety of ways.

Students should be involved in creating many forms of repeating patterns. Examples of patterns Grade Two students should describe, extend, compare and create include:

- Sound Patterns
  E.g., clap, snap, tap, clap, snap, tap, clap, snap, tap
- Action Patterns
  E.g., Sit, sit, stand, hop, sit, sit, stand, hop, sit, sit, stand, hop.
- Diagrams
  E.g., □ △ △ □ □ △ △ □ □ △ △ □
- Manipulatives
  E.g., Red block, red block, yellow block, blue block, green block. Red block, red block, yellow block, blue block, green block. Red block, red block, yellow block, blue block, green block. Red block, red block, yellow block, blue block, green block.

(This pattern is an example of a five element pattern even though red is repeated in the core.)
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Journal

- Ask students to create two different repeating patterns. Ask them to find at least two ways in which the patterns are alike and different. (2PR1.6)

- Ask the students to create two patterns which are similar, but not exactly the same. Ask them to talk about how they are alike and different. (2PR1.1, 2PR1.3, 2PR1.6, 2PR1.7)

Performance

- Provide students with the beginning of a repeating pattern. Ask them to identify the core, extend the pattern at least two more times and create the same pattern using different manipulatives. (2PR1.1, 2PR1.7)

- Record an auditory pattern and have students reproduce these patterns in the same or different mode.
  E.g., Recorded pattern: clap, clap, snap
  Students: clap, clap, snap OR tap, tap, clap (different mode) (2PR1.1, 2PR1.7)

- Place the following items in a zippered bag: an index card identifying a pattern core and the materials required to complete three or more repetitions of the pattern. Students are required to use the entire contents of the bag to complete the pattern. (2PR1.7)

- Create a chant or rap with a repeating pattern. Students can use different percussion instruments to aid them. (2PR1.7)

Resources/Notes

Math Makes Sense 2
Lesson 2 (Continued): Creating Repeating Patterns
2PR1 (1.3, 1.6, 1.7)
TG pp. 25 - 29
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR1 Continued

Achievement Indicators:

2PR1.7 Continued

Engage students in representing their learning by creating a repeating pattern in an art activity, or viewing art where a repeating pattern is present. Students may write about what they see and create.

As students line up for recess, have them create a repeating pattern using their own attributes.

Using the board or overhead projector, show several examples of repeating patterns and demonstrate how to use the A, B, C method to read these patterns. Ask half of the class to close their eyes and the other half will repeat a pattern in a way to auditorily represent the pattern (E.g., clap, stamp, snap). The students with their eyes closed will then open their eyes and examine the patterns on the board or overhead and decide which pattern was read.

Some of the strategies you may encourage students to use to predict an element of the pattern would be:

- Build the pattern with manipulatives,
- Identify the core of the pattern before they predict the element
- Say the pattern aloud
- Act out the pattern (if applicable)

This can be done through teacher modeling so that students can see and hear the repeating part of the pattern (the core).

This indicator does not necessarily mean students only predict an element at the end of the repeating pattern. Students should have experiences predicting missing elements within the pattern. However, it is important that students have practice predicting the next element in the pattern before they begin to identify the missing elements within the pattern.
## General Outcome: Use Patterns to Describe the World and Solve Problems

### Suggested Assessment Strategies

**Presentation**

- Have students create and design a poster/visual or a frame/border that has repeating patterns within it. This could be part of cross-curricular activity. (2PR1.7)

**Performance**

- Show students a repeating snap cube pattern with one or more elements missing. Have them predict the missing elements and explain their thinking. Have students then create the snap cube pattern to verify their predictions. (2PR1.7)

- Have students create a repeating pattern where the fifth element is a large blue square. (2PR1.4)

- For each group of 4 students, provide paper for recording and a collection of concrete materials such as: pattern blocks, variety of counters, stickers or link-its. Have each student create a pattern of 3 to 5 elements using any of the materials provided. Students will record their pattern and describe their pattern rule on the back of their recording sheet or under their pattern.

  Have the students find a pattern, similar to theirs, that another student created. Ask: How are they similar? (When comparing patterns, students describe the similarities and differences between number of elements, attributes of the elements and the core of the pattern).

  Next, have students find a pattern that another student created that is different from theirs. Ask: How are they different? Finally, have students choose another student’s pattern and extend it by adding the next five elements. Consider: How do students explain how the patterns are similar or different? What mathematical language (repeating, growing, first) do the students use when describing patterns? What strategies do students use to extend the pattern? (2PR1.4)

### Resources/Notes

- **Math Makes Sense 2**
  - Lesson 2 (Continued): Creating Repeating Patterns
  - 2PR1 (1.3, 1.6, 1.7)
  - TG pp. 25 - 29

- **Unit Centres:**
  - TG p. 9
  - Stamp It Out

- **Lesson 3: Predicting Elements of a Repeating Pattern**
  - 2PR1 (1.4, 1.5)
  - TG pp. 30 - 35

- **Unit Centres:**
  - TG p. 9
  - Action Patterns
Problem Solving

Students will be expected to

Elaborations—Strategies for Learning and Teaching

A child’s earliest experiences with mathematics are 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 across all content areas and it is not an isolated part of the mathematics program. To find solutions, students must draw on knowledge, and through this process they will often develop new mathematical understandings. By engaging in problem solving tasks, students will acquire ways of thinking, perseverance, curiosity and confidence with unfamiliar situations. Good problem solvers are able to tackle everyday situations effectively.

An effective problem solving activity asks 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. They should be comprised of problems arising from daily routines as well as non-routine tasks. Problem solving requires and builds depth of conceptual understanding and student engagement. 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 where activities are built around problems and exploration is essential in providing students with these opportunities. Problems can be presented orally, visually or by a 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.

Students have already been introduced to strategies such as: Act it Out, Make a Model, Draw a Picture, Look for a Pattern, Using Objects, Guess and Check, and Choose a Strategy.

At this grade level problem solving strategies introduced in the previous grade should be reviewed and extended. It is important to explicitly discuss problem solving strategies with students, preferably as they come up naturally in classroom activities and discussions. There is value in naming the strategies so that students can discuss and recall them readily. (You may consider posting these different strategies in your classroom as they are taught).

(Continued)
General Outcome: Use Patterns to Describe the World and Solve Problems

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*This is the first general focus with respect to specific problem solving strategies. You may wish to refer back to this general talk as you come to Strategies Toolkits in each unit.*

*Also, refer to p. 61 in TG for assessing problem solving skills.*
## Strand: Patterns and Relationships

### Outcomes

*Students will be expected to*

Problem Solving Strategy (Continued):

- Guess and Check
- Use Objects

### Elaborations—Strategies for Learning and Teaching

Each unit will focus on one or two specific problem solving strategies with suggested ideas to practice. Although certain strategies are highlighted in specific units, students are essentially ‘filling their toolboxes’ with problem solving tools that can be used at any time. Here is a list of strategies covered and their corresponding units of focus:

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<tr>
<th>Strategy</th>
<th>Units of Focus</th>
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<td></td>
<td>Addition and Subtraction to 18</td>
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<td>Geometry</td>
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<tr>
<td>Guess and Check</td>
<td>Patterning</td>
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<td>Numbers to 100</td>
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<td></td>
<td>Data Analysis</td>
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<td>Measurement</td>
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<td>Addition and Subtraction to 100</td>
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<td></td>
<td>Addition and Subtraction to 100</td>
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<td></td>
<td>Geometry</td>
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<tr>
<td>Draw A Picture</td>
<td>Addition and Subtraction to 100</td>
</tr>
<tr>
<td>Make A Graph</td>
<td>Data Analysis</td>
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</tbody>
</table>

As students engage in patterning activities, they are involved in identifying, analyzing, comparing, extending, predicting and confirming. The development of these patterning skills is a natural way to prepare students for further work with problem solving strategies. There is a focus on using the strategies, ‘Guess and Check’ and ‘Using Objects’ to help solve the problem. The ‘Guess and Check’ strategy is one in which a student guesses an answer and then checks to see if this works. If it does not work, the student revises their initial guess based on what was tried and learned. This continues until the correct answer is found. If students decide to ‘Use Objects’ to help solve a problem, this is similar to ‘Acting it Out’ except students use simple objects such a counters to represent the problem situation. As students begin to work out a plan to go about finding solutions to the problem, they may need encouragement to refine their plans. If students are having difficulty creating the pattern, or are not confident with the problem solving process, they should be encouraged to ask questions. Questions students may think about in re-examining the problem may include “What if…?, Do you think it might…?, Have you thought about…?, I wonder…?.
### General Outcome: Use Patterns to Describe the World and Solve Problems

#### Suggested Assessment Strategies

**Performance**

- *Guess and Check Jumping Rules* (Adapted from NCTM Navigation Series – Navigating through Algebra Pre-K to 2). Create a number line on the floor (masking tape or rope may be used). The distance between the numbers should be large enough for students to jump from one number to the next. Engage students in a variety of activities whereby they are kangaroos or rabbits having them skip count and jump along the number line, creating patterns as they go. (Students may jump from various starting points skipping by one’s, two’s or three’s.) Pose problems such as the following:

  Fuzzy Bunny lives in Garden number 3. She/he wants to visit his/her friend at Garden number 21. If Fuzzy Bunny skips 2 Gardens at a time, how many hops will Fuzzy Bunny need to jump to reach his/her friend’s Garden?

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</table>
| *Math Makes Sense 2*
| *Lesson 4: (Continued) Strategies* |
| *Tool Kit* |
| TG pp. 36 - 38 |
Outcomes

Students will be expected to

2PR2 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]

Elaborations—Strategies for Learning and Teaching

Increasing patterns is a new concept to Grade Two students. An increasing pattern is a ‘growing’ pattern where each element is increasing by a specific quantity. The following pattern is increasing by one each time:

\[
\begin{array}{c}
1 \\
2 \\
3 \\
\end{array}
\]

Show students how an increasing pattern is different from a repeating pattern by providing several examples and discussing each. A growing pattern involving numbers should not exceed the number 100.

It is common for students to sometimes be confused when the word ‘element’ is used. In repeating patterns, such as AABBCAABBC each letter is an element of the pattern and the core of the pattern is AABBC. In increasing patterns, there are differing quantities within each element.

For example, \( F \quad FFF \quad FFFFF \quad FFFFFF \)

Here the pattern grows as 1, 3, 5, 7, F’s in succession. F is the first element of the pattern and FFF is the second element of the pattern and FFFFF is the third element. Expose students to language which they may use when describing a pattern or pattern rule (e.g., ‘increase’, ‘element’, ‘grow’, ‘pattern’), but more focus should be on how the pattern grows rather than on the language. You may add these words to your math word wall if you have one, however it is more important for you to focus on students’ understanding rather than on their recollection of vocabulary.

There are a variety of contexts in which increasing patterns can be demonstrated:

• On a number line, you can identify a start number and a jump number. For example, the start number could be 2, and the jump number could be 3. Students would mark the start number on the number line and then ‘jump’ three places marking the number they land on each time.

Students should be encouraged to look for the pattern in these numbers (an increase of three).

Continued
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Performance

• Have students build a concrete pattern using simple shapes and objects such as pattern blocks, coins or buttons. Next, instruct students to fold a piece of paper length wise at least 4 times to make sections for drawing. Then have students draw the increasing pattern in each section as shown below. (2PR2.1)

![Pattern diagram]

• For this activity, you will need at least 16 students, recording paper, and concrete materials. Ask students to form groups so that the first group has only 1 member, the second group has 3 members and the third group has 5 members. Students can come to the front of the class to form these groups. Have the remaining students decide how many should come up and form the fourth group so that it extends this pattern. This may require some discussion from the whole class. Ask students what would be the number of students in the fifth group. Form this group if there are enough students in the class. Ask students to return to their seats and draw a picture of the pattern they just created and record this pattern using numbers. Ask them to describe how the pattern grows. Ask students to select a manipulative and use it to replicate this pattern. Ask them to extend this pattern to the tenth element to determine how many students in all would be required. Are there enough students in your school to extend this pattern to the 10th element? How many classes of students do you think it would take to create the pattern to the 10th element? Consider: Are the students recognizing the pattern? Are they able to extend the pattern? Are they able to represent the pattern using pictures and numbers? Are they able to describe how the pattern grows? Are they able to replicate this pattern using other materials? (2PR2.1)

Audio CD 1:
Selection 9

Resources/Notes

Math Makes Sense 2
Lesson 5: Describing and Extending Increasing Patterns
2PR2 (2.1, 2.4, 2.8, 2.9)
TG pp. 39 - 43
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR2 Continued

Achievement Indicators:

2PR2.1 Continued

2PR2.4 Explain the rule used to create a given increasing pattern.

Elaborations—Strategies for Learning and Teaching

- On a hundred chart, students could color start-and-jump sequences, making a visual pattern. Students can be encouraged to investigate how patterns change when only the start number changes, or which skip counts make diagonal patterns and/or column patterns.

- On the 10-frame, build an increasing pattern by placing counters on the 10-frame and have students identify how the pattern is growing. E.g., Pattern - 5, 10, 15, 20...

  These 10-frames show that the numbers increase by 5 because another full row of 5 is filled each time.

- On a calendar, students can be shown how the days of the week form an increasing pattern of 1, by looking at the rows, and an increasing pattern of 7 by looking at the columns.

When describing the rule of an increasing pattern student should identify the starting number and how it is increasing. Without indicating this, the pattern rule is incomplete. Students should learn that a pattern rule must describe how each and every element of the pattern is increasing. The following block pattern starts at 2 and increases by 2 each time.

Students are given many opportunities to explain the rule of an increasing pattern in all subsequent lessons.
### General Outcome: Use Patterns to Describe the World and Solve Problems

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<th>Suggested Assessment Strategies</th>
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<tbody>
<tr>
<td><strong>Performance</strong></td>
<td><strong>Math Makes Sense 2</strong></td>
</tr>
<tr>
<td>• Using a hundreds chart, ask students to color all numbers that have five. Have them describe the patterns they see. Encourage students to find other increasing patterns on the hundreds chart.</td>
<td>Lesson 5 (Continued): Describing and Extending Increasing Patterns</td>
</tr>
<tr>
<td></td>
<td>2PR2 (2.1, 2.4, 2.8, 2.9)</td>
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<td>TG pp. 39 - 43</td>
</tr>
<tr>
<td>• Ask students: How many ears are on ten dogs? Use a T-chart to show how this problem can be solved. Others questions might include: How many legs are on five cats? How many ears and noses do eight students have? How many legs are on four spiders?</td>
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<tr>
<td></td>
<td>(2PR2.1)</td>
</tr>
<tr>
<td>• Using a hundred chart and counters, one student covers an increasing pattern. The other student must identify what numbers are covered and then predict which number would come next. They then state the pattern rule. Record the pattern and pattern rule.</td>
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<td></td>
<td>(2PR2.4)</td>
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<tr>
<td><strong>Journal</strong></td>
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<tr>
<td>• Provide students with a choice of 3 increasing patterns. Have students explain the rule used to create one of the patterns.</td>
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<td>(2PR2.4)</td>
</tr>
</tbody>
</table>
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR2 Continued

Achievement Indicators:

2PR2.8 Identify and describe increasing patterns in the environment; e.g., house/room numbers, book pages, calendar, pine cones, leap years.

Patterns occur in everyday life. Give students opportunities to recognize naturally occurring patterns in their world.

Although this indicator is not directly addressed in this lesson, there is an activity entitled “Look Around” that can be completed after this lesson is complete. Also, it is suggested that students are made aware of patterns in their environment throughout the entire unit.

Bring students on a pattern scavenger hunt around the school. Invite them to be pattern detectives observing and recording patterns that they find.

Discuss how leap years only occur every four years and predict when the next leap year will happen.

Have students look for increasing patterns using the page numbers in their math books. Ask: What do you notice about the page numbers on the left side of the book? On the right side? Record their observations. Ask: How is this an increasing pattern?

2PR2.9 Determine missing elements in a given concrete, pictorial or symbolic increasing pattern, and explain the reasoning.

To help students determine missing elements of an increasing pattern encourage students to:

- find the pattern rule
- find how much the number grows each time
- make sure each element grows by the same number each time

Students can get practice finding missing elements by making patterns, covering a step and asking a partner ‘What’s missing?’ This type of activity can also be done as a whole class activity using an overhead projector.
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Portfolio

- Have students collect pictures or drawings of patterns (increasing and repeating) in their environment. They may present these with an explanation about what makes them patterns. (2PR2.1)

- If available, have students use a digital camera to take pictures of different increasing patterns in their environment as well as photograph patterns they have produced. (2PR2.1)

Presentation

- Take students on a nature walk. Have them look for increasing patterns in nature. A digital camera may be used to take pictures of patterns seen, or students may draw a picture of the patterns they see. They may collect items such as leaves, pebbles, twigs, etc., and make a Pattern Collage with a nature theme. (2PR2.8)

Performance

- Model a series of cube towers that demonstrate an increasing pattern. The students are required to close their eyes as one element of the pattern is removed. Students must then identify which element is missing and explain how they know that they have identified the correct tower. (2PR2.9)

- Show students an increasing pattern that contains an error. Ask students to identify the error and explain their reasoning. Have them recreate the pattern correctly to confirm their prediction. (2PR2.9)

Resources/Notes

Math Makes Sense 2
Lesson 5 (Continued): Describing and Extending Increasing Patterns
2PR2 (2.1, 2.4, 2.8, 2.9)
TG pp. 39 - 43
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR2 Continued

Achievement Indicator:

2PR2.2 Represent a given increasing pattern, concretely and pictorially.

2PR2.3 Identify errors in a given increasing pattern.

Elaborations—Strategies for Learning and Teaching

Students will need many concrete experiences representing increasing patterns before they begin to represent them pictorially (using pictures, numbers and words on paper). It is suggested that teachers first create patterns as a whole class and model how to pictorially represent the given pattern.

Provide students with base ten rods. Have students make the capital letter T with two rods. Challenge them to make their letter grow bigger by using more base ten rods. Students can add one more rod to the top of the T and one to the bottom.

Make it grow again by adding one more rod to the top and one more to the bottom. Ask how is this pattern increasing? Have students record the numbers in a chart to show how the pattern increases. Have them make a prediction as to how big the T will be on day seven if every day it increases by 2. Challenge students by asking them to find other letters or numbers they could use to create an increasing pattern.

Students may find it easier to begin creating increasing patterns using small increments of one or two. Encourage students to first build their pattern and then record. When explaining the rule, remind students the pattern rule should state the start number and by what amount the pattern increases.

Students need to see that they are able to recreate patterns using different materials, and in different ways (modes). For example, a student could make an increasing pattern using numbers and then show this pattern using hand clapping.

One clap, three claps, five claps …
General Outcome: Use Patterns to Describe the World and Solve Problems

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<tr>
<td><strong>Performance</strong></td>
<td><strong>Math Makes Sense 2</strong></td>
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<tr>
<td>• Using pattern blocks, students create and record an increasing pattern. Have them explain the rule used to create their pattern. (2PR2.5)</td>
<td><strong>Lesson 6: Creating Increasing Patterns</strong></td>
</tr>
<tr>
<td>• Provide green pattern blocks to students working in pairs. Ask them to work together to produce an increasing pattern of triangles. (2PR2.5)</td>
<td>2PR2 (2.2, 2.4, 2.5, 2.6)</td>
</tr>
<tr>
<td>• Create a Lego design, such as a town, that includes increasing patterns. This may include things such as buildings of increasing height, cars and trucks of increasing sizes, etc. (2PR2.1, 2PR2.2, 2PR2.7)</td>
<td>TG pp. 44 - 48</td>
</tr>
<tr>
<td>• <strong>Make a Bug</strong> - Using base ten blocks, have students make a bug. Tell them their bug comes from a family of 4 and each bug in the family is a “ten” bigger than the one before. Make the whole family and record how much the bug family grows each time. (2PR2.6)</td>
<td><strong>Unit Centres</strong></td>
</tr>
<tr>
<td>• Provide the start of an increasing pattern. Ask the student to continue the pattern and to describe the pattern rule in each case. Ask students to then represent this pattern in another way, using a different mode. (2PR2.6)</td>
<td>TG p. 9</td>
</tr>
<tr>
<td>• In pairs, students will play a barrier game whereby one student will clap, snap, chant, or play a pattern and the other student has to reproduce this pattern using concrete objects. Students will then remove the barrier checking for accuracy. (2PR2.6)</td>
<td>Extending Pattern</td>
</tr>
<tr>
<td>• Ask students to use an identified pattern in the hundreds chart and represent it in a different way (mode). Eg., Base 10 blocks, snap cubes, etc. (2PR2.6)</td>
<td>Making Patterns in Different Ways</td>
</tr>
<tr>
<td>• <strong>Same Pattern, Different Stuff</strong> - In pairs, have one student make an increasing pattern with one set of materials. Have the other student make the same pattern using a different material. (2PR2.6)</td>
<td></td>
</tr>
</tbody>
</table>
Strand: Patterns and Relationships

Outcomes

Students will be expected to

2PR2 Continued

Achievement Indicators:

2PR2.7 Solve a given problem, using increasing patterns.

2PR2.3 Identify errors in a given increasing pattern.

Elaborations—Strategies for Learning and Teaching

Give students many opportunities to solve problems using increasing patterns. For some students, this real world connection of solving problems using increasing patterns may help them to better understand this concept.

Encourage students to identify the pattern rule, or see how the pattern is increasing to help identify errors in the pattern. Once this happens, students can then go back to ensure each element is increasing by the stated rule.

Having students identify the error is a good way to assess understanding of the pattern.
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Pencil – Paper

- Ask students to solve the following problem: Katie wants to make an increasing pattern out of her 20 pencils. How many different ways can Katie make an increasing pattern out of her 20 pencils? She does not have to use all of her pencils. (2PR2.7, 2PR2.5)

- Tell a student that the first two numbers in a pattern are 5 and 10. Ask for different ways in which the pattern might be continued. (2PR2.5)

- Create an increasing pattern where the fourth element is 12. (2PR2.5)

- Create a pattern that grows, but not by the same amount each time. (2PR2.5)

Resources/Notes

Math Makes Sense 2
Lesson 7: Solving Problems using Increasing Patterns
2PR2 (2.3, 2.7)
TG pp. 50 - 55

Identifying errors in the resource is taught through problem solving. However, having students identify an error in a pattern can be done throughout all other lessons in this unit.
Numbers to 100

Suggested Time: 6 - 7 Weeks

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

Focus and Context

Prior to Grade Two these number concepts have been explored using numbers 0-20. Students will continue to learn and practice approaches to counting, estimating, and grouping objects into sets. Equality and inequality will be explored using balance scales to consider and manipulate sets.

Students will extend their sense of the number 10 as they explore place value for tens and ones. It is important for students to have many experiences using a variety of manipulatives in order to develop a solid understanding of place value that can be expanded in later years.

Students participate actively in mathematics as they continue to further develop these number concepts. They will need to communicate their thinking to demonstrate their level of understanding.

Math Connects

‘Number sense’ has been described as: ‘Good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts and relating them in ways that are not limited by traditional algorithms.’ (Van de Walle, 2006)

True number sense goes beyond the skills of simply counting, memorizing facts and the use of algorithms.

Number sense develops naturally when students connect numbers to their own real life experiences and use benchmarks and referents.

Daily life experiences provide opportunity for students to draw upon their knowledge of number.

Engage students in activities that can help them connect numbers to real life situations. In doing so this marks the beginning of making sense of the world in a mathematical manner.
### Process Standards Key

<table>
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<tr>
<th>Communication</th>
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<tr>
<td>[C]</td>
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<td>Connections</td>
<td>Reasoning</td>
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<tr>
<td>[CN]</td>
<td>[R]</td>
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<tr>
<td>Mental Mathematics and Estimation</td>
<td>Technology</td>
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<td>[ME]</td>
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<td></td>
<td>Visualization</td>
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<td>[V]</td>
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</table>

### Curriculum Outcomes

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<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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<tr>
<td><strong>Number</strong></td>
<td>2N1 Say the number sequence from 0 to 100 by:</td>
<td>[C, CN, ME, R]</td>
</tr>
<tr>
<td></td>
<td>• 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 10s, using starting points from 1 to 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2s, starting from 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N2 Demonstrate if a number (up to 100) is even or odd.</td>
<td>[C, CN, PS, R]</td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N3 Describe order or relative position, using ordinal numbers (up to tenth).</td>
<td>[C, CN, R]</td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N4 Represent and describe numbers to 100, concretely, pictorially and symbolically.</td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N5 Compare and order numbers up to 100.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N6 Estimate quantities to 100, using referents.</td>
<td>[C, ME, PS, R]</td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>2N7 Illustrate, concretely and pictorially, the meaning of place value for numbers to 100.</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td><strong>Patterns and Relations (Patterns)</strong></td>
<td>2PR2 Demonstrate an understanding of increasing patterns by:</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>• describing</td>
<td></td>
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<td></td>
<td>• reproducing</td>
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<tr>
<td></td>
<td>• extending</td>
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<tr>
<td></td>
<td>• creating patterns using manipulatives, diagrams, sounds and actions (numbers to 100).</td>
<td></td>
</tr>
<tr>
<td><strong>Patterns and Relations (Patterns)</strong></td>
<td>2PR3 Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0-100).</td>
<td>[C, CN, R, V]</td>
</tr>
</tbody>
</table>
**Strand: Number**

**Outcomes**

_Students will be expected to_

2N1 Say the Number sequence from 0 to 100 by:

- 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively
- 10s, using starting points from 1 to 9
- 2s, starting from 1.

[C, CN, ME, R]

**Elaborations—Strategies for Learning and Teaching**

In Grade Two, students will be building on their previous understanding of number sense. This understanding about numbers will continue to be developed throughout the school years and will serve as a foundation for further studies in Mathematics.

Daily/morning routines are an effective, on-going way to reinforce number sense to 100 throughout the year. Consider using some of the following on a daily basis: calendar math, ten-frame flashcards (representing numbers to 100), number lines, hundred chart, money, and base ten materials.

Throughout this unit, centres may be set up to allow for further investigation, discovery and practice. Hands-on, concrete, self-directed learning is a natural way for students to make discoveries and connections about mathematics and their world around them.

The use of individual math baggies would be beneficial throughout this unit. Each baggie could include: counters, hundred charts, number-line, ten frames, dice, sticky notes, a variety of small manipulatives, coins, pencil and crayons.

Providing a mathematics word wall is one way to build number vocabulary. Words can be added as they occur in classroom activities. Consider using a simple graphic with each word to provide additional support. If you decide to display a word wall, have students interact with it frequently, to reinforce concepts.

Have students visually represent skip counting on a hundred chart. Ask them to colour each number that they land on as they count by various intervals. Every skip count produces an interesting pattern on the chart.

Being able to skip count with ease is an important building block for students. As they move into higher levels, skip counting will help them be able to recall the multiplication facts more readily. Making skip counting a routine part of everyday, is advisable.

Throughout the day, at appropriate times, call out a number and ask for a volunteer to count forwards or backwards by 10s. As you carry out daily morning routines, it is important to keep good anecdotal records of students’ responses and participation. These records are a very important part of individual assessment.

Skip count a given pattern aloud, intentionally making an error or omission. Students can make corrections as needed. As the year progresses, the activity should be done repeatedly with more complex patterns.

**Achievement Indicators:**

- **2N1.1** Extend a given skip counting sequence (by 2s, 5s or 10s) forward and backward.
- **2N1.2** Skip count by 10s given any number from 1 to 9 as a starting point.
- **2N1.4** Identify and correct errors and omissions in a given skip counting sequence.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

• Interactive number line activity - Give students a number line and pose a story problem for the student to solve, using a skip counting rule. E.g., Place a house on a given point of the number line and a store on another given point. Say, ”Flippy the Frog has to go to the store from his house. If each hop covers two spaces, how many hops will he make to get to the store?” (2N1.1)

• Fractured Hundred Chart Pieces - Distribute blank 100 charts and have students cut out a random section containing 8-10 squares (as shown). Students should print a numeral somewhere on their section such that all other squares can be filled in according to their placement on the hundred chart. Collect and redistribute randomly for students to complete with the appropriate numerals. Some students may need to refer to a hundred chart to complete this activity.

Collect students’ completed Fractured Chart Pieces and ask them to explain how they concluded which numbers went in the empty squares. (2N1.1, 1.2, 5.3)

• Prepare cards labeled +2, +5, +10, -2, -5, -10 and place in a bag. Provide a pom-pom or cotton ball, a hundred chart and recording sheet as shown. The student removes a card from the bag and prints the rule on the recording sheet. Then the student drops the pom-pom on the hundred chart to determine the starting number. Next to the rule he/she writes the starting number and extends the number pattern forward or backward as determined by the rule. He/she returns the card to the bag and repeats with a new pattern rule card. (2N1.1)

Resources/Notes

Math Makes Sense 2
Launch
Teacher Guide (TG) p. 15

Lesson 1: Counting on a Number Line
2N1 (1.1, 1.4)
2PR2 (2.1, 2.3)
TG pp. 16 - 18

Audio CD 1:
Selections 10 - 18

Lesson 2: Counting on a 100-Chart
2N1 (1.1, 1.2, 1.3, 1.4)
2PR2 (2.1, 2.3)
TG pp. 19 - 23

Audio CD 1:
Selections 19 & 20
Audio CD 2:
Selection 1

In mathematics education, technology has been recognized as a good teaching and learning tool. There are several websites on which students can practice skip counting. The following is one recommended website: http://www.dynamicgeometry.com
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

2PR2 Demonstrate an understanding of increasing patterns by:
- describing
- reproducing
- extending
- creating

patterns using manipulatives, diagrams, sounds and actions (numbers to 100).

[A, CN, PS, R, V]

Achievement Indicators:

2PR2.1 Identify and describe increasing patterns in a variety of given contexts; e.g., hundred chart, number line, addition tables, calendar, tiling pattern or drawings.

2PR2.3 Identify errors in a given increasing pattern.

Elaborations—Strategies for Learning and Teaching

Reinforce number patterns by having student respond with a physical movement to prompts. E.g.,
- raise your hand when you hear an even/odd number
- stand up/sit down when you hear a number that you would say when you count forward/backward by 10s.
- jump in place when you hear a number that you would say when you count forward/backward by 5s.

“Guess My Rule” Game - During morning routines, randomly begin counting aloud forward or backward according to a ‘secret’ pattern rule. Have students raise their hand when they figure out your pattern rule.

A hundred chart is a very valuable tool to use with students and should be readily available to each student for exploration. It is beneficial for students to learn their way around a hundred chart as it is a very quick visual aid in which groups of numbers can be seen. Other tools such as number lines, etc are also valuable. depending on the task.

Extend on the “Guess My Rule” game (described above) by making a mistake in your pattern. Have students indicate when they recognize an error.
**General Outcome: Use Patterns to Describe the World and Solve Problems**

**Suggested Assessment Strategies**

**Performance**

- Give each pair of students a hundred chart and a die. Player 1 rolls the die and places a colored tile on that number on the hundred chart. From that space he/she counts on the number of spaces on the die and covers that space. This continues until reaching the end of the chart. He/she removes the counters, one by one, recording each number on the recording sheet as shown below.

- Make an “increasing pattern book” - Before starting this task, have students research their favorite insect or animal to find out information about number of body parts. For example, ants have 6 legs, 3 body sections, and 2 eyes; butterflies have 3 body sections, 6 legs, 4 wings, 2 eyes, and 1 proboscis. Give each student a long strip of paper which he/she will fold into four equal pages. On the first page, record the information for one insect or animal as shown. On the second page draw two insects or animals and record the information. The third and fourth pages continue to create more number patterns.

**Resources/Notes**

**Math Makes Sense 2**

Lesson 1 (Continued): Counting on a Number Line
- 2N1 (1.1, 1.4)
- 2PR2 (2.1, 2.3)
- TG pp. 16 - 18

Lesson 2 (Continued): Counting on a 100-Chart
- 2N1 (1.1, 1.2, 1.3, 1.4)
- 2PR2 (2.1, 2.3)
- TG pp. 19 - 23
### Strand: Number

#### Outcomes

Students will be expected to

2N1 Continued

**Achievement Indicator:**

2N1.3 Count by 2s starting from 1 or from any odd number.

2N2 Demonstrate if a number (up to 100) is even or odd.

[C, CN, PS, R]

**Achievement Indicators:**

2N2.1 Determine if a given number is even or odd by using concrete materials or pictorial representations.

2N2.2 Identify even and odd numbers in a given sequence, such as in a hundred chart.

2N2.3 Sort a given set of numbers into even and odd.

2N1.5 Count a given sum of money with pennies, nickels or dimes (to 100 cents).

#### Elaborations—Strategies for Learning and Teaching

Counting by 2s is not only a representation of even numbers. Students also need to know that skip-counting by 2s can begin at any number and can produce odd numbers. E.g., 5, 7, 9, 11...

The concept of ‘evenness’ can be shown using counters. If the counters can be paired up, the number is even; if the counters cannot be paired up, then the number is odd.

Even Rectangles - Provide concrete materials (Cheerios, macaroni, etc.) and have students select a number card, and the corresponding number of items. Students then line up the items in partners. If all items have a partner (forms a rectangle), then the number is even. Odd numbers will not partner well. Students can paste their ‘Even Rectangles’ of materials onto construction paper to show how an even number of items will form a rectangle. They can display their work in the classroom under headings of “Even” or “Odd”, according to the number they have shown.

Pass out musical instruments such as triangles, drums, maracas, sticks, etc. While counting slowly by 1s, have, for example, students with drums strike their instruments every time they hear an even number. Then have the group with maracas (or sticks, etc) shake their instrument every time they hear an odd number. When both groups feel confident with their task, combine both groups to create a dynamic rhythm. While students are performing in the rhythm band, take note of those students who play their instrument at the correct time and those who do not. Caution: Some students may not be musically or rhythmically inclined, while still understanding even/odd numbers.

“Race to 100 Cents” - Students work in groups of three. One student is designated as the ‘banker’, while the other two students will be ‘racing’ to 100 cents. One student rolls a die, and collects corresponding pennies. Play continues back and forth. When a student has enough coins to trade for a nickel, dime or quarter, they must ask the banker to make the trade for them. This continues until one student has 100 cents. That player then becomes the banker and the game begins again.

Observe students as they play “Race to 100 Cents”. Question them to assess their understanding of the ‘trading’ concept.
**General Outcome: Develop Number Sense**

**Suggested Assessment Strategies**

**Performance**

- Calculator Skip Counting - Show students how to make their calculators skip count by 2s to represent odd and even number patterns. For example, have students press $1 + 2 =, =, =$ to show an odd number pattern. Encourage them to start with a greater odd number: e.g., $27 + 2 =, =, =$. This same activity can be used with even numbers. As an added challenge have students work in pairs to guess what the next number will be in the pattern before the equal sign is pressed.

(2N1.3)

- Have students work in pairs. They decide that one student is ODD and the other is EVEN. Use a T-chart to record results. Each student puts one hand behind his/her back and when one of the students says GO they each bring that hand to the front, with any number of fingers held up. The students add/combine the two numbers and if the sum is even, the student who is ‘EVEN’ scores a point. If the number if odd, the student who is ‘ODD’ scores a point. The first to score 10 points wins. Extension: Both students use both hands. This will allow the sum to go to 20. Assessment Observations: Are the students able to make quick decisions on whether a number is odd or even? How are the students combining the two numbers? For example, are they counting ‘all seven fingers’ to know that 4 and 3 make 7? Are they counting on from the larger number to get the sum? Are they able to look at 4 and 3 and immediately say 7?

(2N2.1, 2.3)

**Student-Teacher Dialogue**

- I say “5, 10, 15, 16, 17.” What coins am I counting? Repeat for different coins.

(2N1.5)

- Play “What’s in the Can?” Tell the student that you are going to drop nickels (or pennies, or dimes) into a can. Have the student listen as the coins drop and count to find the total. As an extension, tell the student that there is, for example, 45 cents in the can. Tell him/her that you are going to add dimes (or pennies) and ask him/her to keep track to find the total.

(2N1.5)

**Resources/Notes**

*Math Makes Sense 2*

**Lesson 3: Odd and Even Numbers**

2N1 (1.1, 1.3)

2N2 (2.1, 2.2, 2.3)

TG pp. 24 - 29

**Lesson 4: Counting with Money**

2N1 (1.1, 1.2, 1.5, 1.6)

2PR2 (2.1, 2.2)

TG pp. 30 - 34

Audio CD 2:

Selection 2
Strand: Patterns and Relations (Patterns)

**Outcomes**

*Students will be expected to*

2PR2 Continued

**Achievement Indicator:**

2PR2.2 Represent a given increasing pattern, concretely and pictorially.

**Elaborations—Strategies for Learning and Teaching**

Provide task cards with increasing number patterns and have students use coins (dimes, nickels) to represent the pattern.

E.g.

10, 20, 30, 40, 50

5, 10, 15, 20, 25
General Outcome: Use Patterns to Describe the World and Solve Problems

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<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
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<td>Lesson 4 (Continued): Counting with Money</td>
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<tr>
<td>2N1 (1.1, 1.2, 1.5, 1.6)</td>
<td></td>
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<tr>
<td>2PR2 (2.1, 2.2)</td>
<td></td>
</tr>
<tr>
<td>TG pp. 30 - 34</td>
<td></td>
</tr>
</tbody>
</table>
Strand: Number

### Outcomes

Students will be expected to

2N3 Describe order or relative position using ordinal numbers (up to tenth).

[C, CN, R]

### Elaborations — Strategies for Learning and Teaching

There are many opportunities throughout the day to reinforce ordinal number and relative position:

- Discussing calendar: e.g., 4th day of the week, 3rd Wednesday of the month, etc.
- Line students up to go to the gym, music, etc. according to given ordinal position.

Use ordinal language when giving instructions/directions or retelling the events of the day.

Train Activity - Ask students to build a train using 10 link-its, snap cubes, beads, etc. They can only use one yellow. Have each student tell the ordinal position of his/her yellow object. Repeat.

Shoe Line-up - Have 10 students remove their shoes to make 2 rows (Row A, and Row B). Each student should place one shoe in each row, and in a different ordinal position. Students can tell about the position of their shoes. E.g., “In Row A, my shoe is in the 4th position. In Row B, my shoe is in the 8th position.”

Note: A graphing mat may be used as an organizational aid for this activity.

### Achievement Indicators:

#### 2N3.1 Indicate a position of a specific object in a sequence by using ordinal numbers up to tenth.

#### 2N3.2 Compare the ordinal position of a specific object in two different given sequences.

#### 2N1 Continued

### Achievement Indicator:

#### 2N1.6 Count quantity, using groups of 2s, 5s or 10s and counting on.

“As students get older, the numbers they deal with in their everyday lives become more complex. Students need strategies for representing and making sense of these greater numbers. Although it is possible to count, say, 87 items individually, it is not practical. When items are grouped, counting is made easier and probably more accurate.” (Small, Making Math Meaningful, 2008, p. 138)
General Outcome: Develop Number Sense

**Suggested Assessment Strategies**

**Student-Teacher Dialogue**
- Display a row of items, up to 10. Ask the student to point to the 4th (or 2nd, or 8th, etc.) cube. Conversely, describe an object in the row and ask the student to tell you its position. E.g. “Tell me the position of the yellow link-it.”  

**Journal**
- After completing the Train Activity described on the previous page, have students draw their train, and write about the ordinal position of the yellow object.  

**Performance**
- Provide a variety of small objects for students to count by 2s, 5s and 10s. Students need opportunity to talk about their strategies for ease of counting. “The most productive discussions around mathematical ideas seem to happen in classrooms where questioning is an almost spontaneous part of the way students talk to one another about their work.” (*Teaching Children Mathematics, October, 2008, p. 146-147*)

**Resources/Notes**

*Math Makes Sense 2*

**Lesson 5: Ordinal Numbers**
2N3 (3.1, 3.2)
TG pp. 35 - 39

*This is the only lesson in the text where ordinal numbers are addressed. It is important to give it adequate time and to revisit as necessary.*

**Audio CD 2:**
Selection 3

**Lesson 6: Estimating and Counting to 50**
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N6 (6.1, 6.2, 6.3)
TG pp. 40 - 43

**Lesson 7: Estimating and Counting to 100**
2N1 (1.1, 1.6)
2N4 (4.1, 4.3, 4.4, 4.6, 4.7)
2N6 (6.1, 6.2, 6.3)
TG pp. 44 - 48

*Lessons 6 and 7 deal with the same outcomes.*
## Strand: Number

### Outcomes

Students will be expected to

<table>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2N4</td>
<td>Represent and describe numbers to 100, concretely, pictorially and symbolically. [C, CN, V]</td>
</tr>
</tbody>
</table>

### Elaborations—Strategies for Learning and Teaching

Morning routine is an excellent opportunity to continually build students’ understanding of how numbers are represented. For example, add a popsicle stick to a jar each morning. Count the popsicle sticks together. As it becomes increasingly time-consuming to count by 1s, ask the students to suggest ways to make the counting easier. Guide the discussion such that the decision is made to group the sticks in bundles of 10 (with an elastic band).

Popsicle Stick Activity - Using the bundles of popsicle sticks from morning routine, have students show other ways of representing the ‘number of the day’. This is an excellent opportunity to show the students the connection to base ten materials (e.g., each bundle of popsicle sticks can be represented by a rod, while the extra sticks are represented by units). Students can also represent the ‘number of the day’ using ten frames.

There are many opportunities for using tallies. They may include morning routines such as counting the weather days in the month (sunny, cloudy, rainy, etc.).

What’s My Number? Provide baskets of rods and units. Have students secretly choose a number less than 100 to build with their manipulatives. Label each representation with a letter card. Students will then label their math journals with the letters A, B, C, …..etc. They will then circulate around the classroom, looking at each representation, and record symbolically the secret number represented.

Students should be given lots of exposure to the written form of numerals. This may be in the form of written instructions on how to complete tasks, charts displayed in the classroom with pictorial and symbolic representations, or as entries into a personal math dictionary or on a classroom math word wall.

Provide ample opportunities for students to record number words. Number words are often used in writing about concepts in other subject areas and opportunities to write them in contexts of language arts, science, etc are good opportunities.

### Achievement Indicators:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2N4.1</td>
<td>Represent a given number, using concrete materials such as ten frames and base ten materials.</td>
</tr>
<tr>
<td>2N4.3</td>
<td>Represent a given number using tallies.</td>
</tr>
<tr>
<td>2N4.4</td>
<td>Represent a given number pictorially and symbolically.</td>
</tr>
<tr>
<td>2N4.6</td>
<td>Read a given number (0-100) in symbolic or word form.</td>
</tr>
<tr>
<td>2N4.7</td>
<td>Record a given number (0-20) in words.</td>
</tr>
</tbody>
</table>
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance Task
Ask the student to use base ten materials to represent a number in 3 different ways. (2N4.1)

Performance
Invite students to make a robot with base ten blocks and record its value. E.g.,

Math Makes Sense 2
Lesson 6 (Continued): Estimating and Counting to 50
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N6 (6.1, 6.2, 6.3)
TG pp. 40 - 43

Lesson 7 (Continued): Estimating and Counting to 100
2N1 (1.1, 1.6)
2N4 (4.1, 4.3, 4.4, 4.6, 4.7)
2N6 (6.1, 6.2, 6.3)
TG pp. 44 - 48

Audio CD 2:
Selection 4 - 6
### Strand: Number

#### Outcomes

*Students will be expected to*

<table>
<thead>
<tr>
<th>2N6 Estimate quantities to 100, using referents.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[C, ME, PS, R]</td>
</tr>
</tbody>
</table>

#### Achievement Indicators:

- **2N6.1** Estimate a given quantity by comparing it to a referent (known quantity).
- **2N6.2** Estimate the number of groups of ten in a given quantity, using 10 as a referent.
- **2N6.3** Select between two possible estimates for a given quantity, and explain the choice.

#### Elaborations—Strategies for Learning and Teaching

The ability to estimate, a key reasoning skill in mathematics, should develop with regular practice over the course of the year.

To develop estimation skills, students should be provided with collections of objects and asked to estimate the size of the group, using a referent. A referent, or known quantity, is useful as a benchmark or anchor in development of estimation skills.

To estimate quantities to 100, use 10 as a referent. Provide students with lots of opportunities to practice estimating throughout the year.

One strategy for using referents to improve one estimate is to know the quantity in a smaller group, and then use that knowledge to estimate the number of objects in a larger group.

Spill up to 50 items (beans, etc.) on an overhead projector. Count 10 of the items as a referent. Guide students’ thinking in estimating by asking them, “About how many groups of 10 are there? About how many beans are there?” Record student estimates on chart paper.

Count the total amount and determine which estimates were most reasonable. Have students whose estimates were closest to the actual count share how they arrived at their estimates.

Repeat the overhead activity several times throughout the year using a variety of objects representing quantities up to 100.

Estimation Station - Fill a jar with items (less than 100) to display. Students make estimates throughout the week and record them. As the process continues, a known referent (another identical jar with a known quantity of the same objects) should be placed next to the jar. Encourage students to refine their estimate throughout the week using the ‘referent’ as a guide. At the end of the week the student with the closest estimate takes the jar home and refills it for the following week.
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Journal**
- Using the ‘Estimation Station’ format, display two possible estimates for a jar full of items. Have the student choose which estimate is most reasonable and explain their choice. Extension: Ask the student what they could do to further refine the estimate (compare to a known referent, etc.). (2N6.1, 6.2, 6.3)

### Resources/Notes

**Math Makes Sense 2**
- **Lesson 6 (Continued): Estimating and Counting to 50**
  - 2N1 (1.1, 1.6)
  - 2N4 (4.1, 4.4, 4.6, 4.7)
  - 2N6 (6.1, 6.2, 6.3)
  - TG pp. 40 - 43

- **Lesson 7 (Continued): Estimating and Counting to 100**
  - 2N1 (1.1, 1.6)
  - 2N4 (4.1, 4.3, 4.4, 4.6, 4.7)
  - 2N6 (6.1, 6.2, 6.3)
  - TG pp. 44 - 48

**Little Book:**
- Jelly Bean Contest
**Strand: Number**

**Outcomes**

*Students will be expected to*

2N1 Say the Number sequence from 0 to 100 by:
- 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively
- 10s, using starting points from 1 to 9
- 2s, starting from 1.

[C, CN, ME, R]

**Elaborations—Strategies for Learning and Teaching**

The early work on place-value must focus on the development of an understanding of base-ten groupings and a knowledge of how these groupings are recorded. Students should notice how much easier it is to count when the numbers are grouped. As with many topics presented at this level, it is important that this development not be rushed. Later problems related to number can often be traced back to an improper introduction to this concept.

The foundation for the development of place value is built through working with grouping activities. Students should have experiences with different sized groupings. Place value focuses on groupings of ten.

Counting Coins - Use a hundred chart to help students count coins. For instance, given 3 dimes and 1 nickel, students would place dimes on 10, 20, 30 and the nickel on 35. The placement of the last coin tells students how much money they have altogether. This method is effective for having students figure out which coins to use to pay for an item.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Prepare several baggies of varying amounts of coins (dimes, nickels, pennies). Have students use a hundred chart to determine and record the value of several sets of coins. (2N1.5)

- Present the following situation to students: Mitch finds a quarter under a sofa cushion. He then finds 5 nickels. Have students use a hundred chart to find the total he now has. (2N1.5)

- Ask 8 students to stand in a line. Ask them to count the number of fingers they have, in all, by putting up both hands and saying 10, 20, 30, ... as they move along the line.

  Repeat the same activity but this time count the number of hands in all, by saying 2, 4, 6, ...

  Repeat activity but this time ask each student to hold up their left hand with fingers spread. Ask them to count the number of fingers in the left hand for all 8 students by saying 5, 10, 15, ... (2N1.6)

- Create number cards from 1 - 20. Arrange students on two sides of a pretend street where the odd numbers are on one side and the even numbers are on the other side. Ask students to skip count the odd numbers on one side of the street and the even numbers on the other side. Have students start at various 'houses' so as to count from a variety of starting points. (2N1.6)

Resources/Notes

Math Makes Sense 2
Lesson 8: Using 10s and 1s
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4)
TG pp. 49 - 52

Unit Centres:
TG p. 13
  What's My Number
  Show the Number

Lesson 9: Place Value: Tens and Ones
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.1, 7.2, 7.3, 7.4, 7.5, 7.6)
TG pp. 53 - 58

Lesson 10: Representing and Describing Numbers
2N1 (1.1, 1.5, 1.6)
2N4 (4.1, 4.2, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4, 7.5)
TG pp. 59 - 64
Strand: Number

Outcomes

Students will be expected to

2N4 Represent and describe numbers to 100, concretely, pictorially and symbolically.

[C, CN, V]

Elaborations—Strategies for Learning and Teaching

Who Has? Base Ten Activity - This activity is designed for students to practice place value by associating the base ten block representation of two-digit numbers with the numerals. This activity is meant to follow and complement the use of the base ten blocks in mathematical instruction, not to replace students’ use of these manipulatives. See:

http://www.mathwire.com/numbersense/placevalue.html

2N4.1 Represent a given number, using concrete materials such as ten frames and base ten materials.

2N4.2 Represent a given number using coins (pennies, nickels, dimes and quarters).

Achievement Indicators:

Build a Class Memory Game - Distribute two blank index cards per student, and assign a two-digit number to each student. Provide samples of rods and units (use rubber stamps or hand-drawn pictures - the previous Quest 2000 contains a BLM of base ten materials), and copies of numerals. Each student then makes ‘matching’ cards – a numeral card, and/or a base ten stamped card and a ten frame card. Combine sets of cards to make a “memory game” for the class.

Clean Up the Money! Game - Play begins with students alternate placing a variety of quarters, dimes, nickels and pennies on the gameboard. Students use 2 dice - a regular die and a special die which you can label (A-B-C-D-E-F). Player 1 tosses the dice and removes it from the proper space on the game board (if a coin is there). After each play, the student records the value of his/her coins on a recording sheet (shown below). The winner of the game is the student with the greatest value of coins when all coins have been removed from the game board.

![Clean Up the Money! Game Board](image-url)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance Task**

- Provide ten frames and counters. Have students represent a given number using these manipulatives. E.g.,

  24:

  ![Ten Frames](image)

  (2N4.1)

- Give students a collection of coins. Name a number such as 31. Ask students to find at least 3 different ways to represent 31 using coins. Ask them to discuss how to find all the possibilities. [Making a table would help]

  ![Coins](image)

  (2N4.2)

- Ask students to find a way to represent 31 using:
  - exactly 3 coins
  - exactly 27 coins

  (2N4.2)

**Student-Teacher Dialogue**

- Ask student how many ten-frames he/she would need to represent the number 23. Continue with other numbers and questions such as: How many full frames will you have? Will there be any counters left over that would not fit on those frames?

  (2N4.1)

**Resources/Notes**

*Math Makes Sense 2*

**Lesson 8 (Continued): Using 10s and 1s**

2N1 (1.1, 1.6)

2N4 (4.1, 4.4, 4.6, 4.7)

2N7 (7.2, 7.3, 7.4)

TG pp. 49 - 52

**Unit Centres:**

TG p. 13

- What's My Number
- Show the Number

**Lesson 9 (Continued): Place Value: Tens and Ones**

2N1 (1.1, 1.6)

2N4 (4.1, 4.4, 4.6, 4.7)

2N7 (7.1, 7.2, 7.3, 7.4, 7.5, 7.6)

TG pp. 53 - 58

**Lesson 10 (Continued): Representing and Describing Numbers**

2N1 (1.1, 1.5, 1.6)

2N4 (4.1, 4.2, 4.6, 4.7)

2N7 (7.2, 7.3, 7.4, 7.5)

TG pp. 59 - 64
Strand: Number

Outcomes

Students will be expected to

2N7 Illustrate, concretely and pictorially, the meaning of place value for numbers to 100.

[C, CN, R, V]

Achievement Indicators:

2N7.1 Explain and show with counters the meaning of each digit for a given 2-digit numeral with both digits the same; e.g., for the numeral 22, the first digit represents two tens (twenty counters) and the second digit represents two ones (two counters).

2N7.2 Count the number of objects in a given set using groups of 10s and 1s, and record the result as a 2-digit numeral under the headings 10s and 1s.

Elaborations—Strategies for Learning and Teaching

As students begin to represent numbers pictorially, it is important to model the correct pictorial representation of flats, rods, and units. Students may have difficulty with accurate proportions and shape.

While working with two-digit numbers, it is important to point out the difference of the values of digits in a two-digit number when the digits are the same. E.g., In the number 22, The 2 means 2 tens and has a value of 20.

Use an overhead spinner labeled 11, 22, 33, …99. Spin the spinner and have the students represent the number with counters, beans, macaroni, etc. Then point to one of the digits and ask for volunteers to explain the meaning/value of that digit.

Provide place-value mats and a variety of small objects for students to count. (popsicle sticks and elastic bands, buttons and small baggies, beans and cups, etc) As students count ten objects, they group them as a ten, and move it to the tens column on the mat.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Display 22 (or 33, 44, 55, etc.) beans. Print the number below the beans. Circle one of the digits, and ask the student to circle the correct number of beans that is represented by that digit. Do the same for the other digit, and ask the student to explain their thinking.

Observe students as they represent two-digit numbers, and engage them in a discussion about their responses. (2N7.1, 7.2)

Student-Teacher Dialogue

- As students are working with manipulatives, making groups of ten, and representing them on their place value mats, a close observation can easily assess students’ understanding of place value. Question the students while they work and ask them to explain their thinking and demonstrate their counting. (2N7.1, 7.2)

Resources/Notes

Math Makes Sense 2
Lesson 8 (Continued): Using 10s and 1s
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4)
TG pp. 49 - 52

Unit Centres:
TG p. 13
What’s My Number
Show the Number

Lesson 9 (Continued): Place Value: Tens and Ones
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.1, 7.2, 7.3, 7.4, 7.5, 7.6)
TG pp. 53 - 58

Lesson 10 (Continued): Representing and Describing Numbers
2N1 (1.1, 1.5, 1.6)
2N4 (4.1, 4.2, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4, 7.5)
TG pp. 59 - 64
Strand: Number

Outcomes

Students will be expected to

2N7 Continued

Achievement Indicators:

2N7.3 Describe a given 2-digit numeral in at least two ways; e.g., 24 as two 10s and four 1s, twenty and four, two groups of ten and four left over, and twenty-four ones.

2N7.4 Illustrate, using ten frames and diagrams, that a given numeral consists of a certain number of groups of ten and a certain number of ones.

2N7.5 Illustrate, using base ten materials, that a given numeral consists of a certain number of tens and a certain number of ones.

2N7.6 Explain why the value of a digit depends on its placement within a numeral.

Elaborations—Strategies for Learning and Teaching

Base ten blocks are an efficient and valuable model, as they are proportional in size. For example, the rod is ten times as big as the unit, and the flat is ten times as big as the rod, and one hundred times as big as the unit. This helps with developing number sense as a number like 80 is ten times as big as the number 8.

When working with numbers, students should always have base ten blocks and ten frames available and be encouraged to use them to support their thinking. This consistent use of manipulatives solidifies their understanding of number.

It is essential that students be provided plenty of opportunity to manipulate and work with base ten blocks and ten frames. For example, they could be used daily in morning routine throughout the year thus reinforcing base ten concepts such as representing/modeling numbers (calendars, number of the day, etc.)

How Many Ways? Have students model 2-digit numbers in various ways, for example, 46 as 46 ones, or 4 tens and 6 ones, or 3 tens and 16 ones. Ask students to find out how many ways he/she can make the number using base ten materials. (Note: This last example is useful with respect to the regrouping in the subtraction algorithm.) Ask students to record their models in a journal.

Give students a set of number cards (0-9). Each student chooses 2 cards and proceeds to make the smallest 2-digit number, and the largest 2-digit number possible. They then explain their reasoning.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Have students use a die to play ‘Race For a Ten’. They roll the die and count out the number of unit cubes. When they get exactly ten, they trade them in for a rod. Play ‘Race For a Fifty’ or ‘Race For a Hundred,’ using the same rules. Observe students as they play ‘Race for a Ten/Hundred’. Question them to assess their understanding of the ‘trading’ concept.

(2N7.3, 7.5)

- Have students play ‘Race for Zero’. Give each student 5 rods and one die. Students take turns rolling the die and taking away the amount shown on the die, trading blocks as necessary, until someone reaches 0. Variation: Start with a flat and use two dice to race for zero.

(2N7.3, 7.5)

- Show the student:

![Base Ten Blocks](image)

Ask him/her to show at least one other way of representing the same number with base ten materials.

(2N7.3, 7.5)

- Give the student a number of counters. As him/her to make groupings of ten counters and to represent the number both symbolically and with base ten materials.

(2N7.5)

Resources/Notes

Math Makes Sense 2
Lesson 8 (Continued): Using 10s and 1s
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4)
TG pp. 49 - 52

Unit Centres:
TG p. 13

What’s My Number
Show the Number

Lesson 9 (Continued): Place Value: Tens and Ones
2N1 (1.1, 1.6)
2N4 (4.1, 4.4, 4.6, 4.7)
2N7 (7.1, 7.2, 7.3, 7.4, 7.5, 7.6)
TG pp. 53 - 58

Lesson 10 (Continued): Representing and Describing Numbers
2N1 (1.1, 1.5, 1.6)
2N4 (4.1, 4.2, 4.6, 4.7)
2N7 (7.2, 7.3, 7.4, 7.5)
TG pp. 59 - 64
Strand: Number

Outcomes

Students will be expected to

Problem Solving Strategy:  
Guess and Check
Use Objects

Elaborations—Strategies for Learning and Teaching

As in the previous unit, there is a focus on using the strategies, 'Guess and Check' and 'Using Objects' to help solve problems. In the context of working with numbers to 100, the student guesses an answer and then checks to see if this works. If it does not work, the student revises the initial guess based on what was tried and learned. This continues until the correct answer is found.

Students may decide to 'Use Objects' to help solve a problem. This is similar to 'Acting it Out', except students use manipulatives, such as counters, to represent the problem situation. For example, a student may use the white side of two-sided counters to represent boys and the red side to represent girls.

Communication should be intertwined with problem solving throughout all areas of mathematics. Invite children to talk about their work as they investigate the process of how to find solutions to the problem. As students reflect on, explain and justify their reasoning, they may revise their answers, thus leading to and confirming their own understanding. This allows opportunities for meaningful assessment.
### General Outcome: Develop Number Sense

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Math Makes Sense 2&lt;br&gt;Lesson 11: Strategies Toolkit&lt;br&gt;TG pp. 65 - 67</td>
</tr>
<tr>
<td></td>
<td>Audio CD 2:&lt;br&gt;Selection 7</td>
</tr>
</tbody>
</table>

Refer to p. 61 in TG for assessing problem solving skills.
Strand: Patterns and Relations (Variables and Equations)

**Outcomes**

Students will be expected to

2PR3 Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0-100).

[C, CN, R, V]

**Elaborations—Strategies for Learning and Teaching**

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 on a playground. Place an equal sign between the two arms on 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.

Now is a great time to point out that the equal sign means that what’s on one side is the same, or balances with the other side. In this case, it means the same number quantity is on both sides and as a result both sides have the same mass. A clear understanding of the equal sign is critical to the students’ ability to solve for variables in future work. Too many students deduce that the equal sign means that the answer comes next or to do something. As a result of these misconceptions, they are not able to solve for variables when the variable is placed on either side of the equal sign.

Using a balance scale, place an equal number of snap cubes on both sides. Ask, Is the number of cubes on each side the same? (Yes) How do you know? (The scale is balanced/equal.)

Then place an unequal number of cubes on each side of the scale and discuss how we know that the sets are unequal. (The scale does not balance.)

Provide a variety of small objects and balance scales and give students the opportunity to explore equal and unequal sets.

Ask students to balance the scale in a situation where there is an unequal number on each side. Ask them how they were able to determine the answer.

### Achievement Indicators:

- **2PR3.1** Determine whether two given quantities of the same object (same shape and mass) are equal by using a balance scale.
- **2PR3.2** Construct and draw two unequal sets, using the same object (same shape and mass), and explain the reasoning.
- **2PR3.3** Demonstrate how to change two given sets, equal in number, to create inequality.
- **2PR3.4** Choose from three or more given sets the one that does not have a quantity equal to the others, and explain why.
General Outcome: Represent Algebraic Equations in Multiple Ways

Suggested Assessment Strategies

Journal
- Give the students counters and ask them to show two equal or unequal sets. Draw a picture of the sets and explain how they know if they are equal or unequal. (2PR3.2)

Performance
- Using balance scales and manipulatives such as snap cubes, show the student 3 sets, two of which are equal and one which is not. Ask the students to pick out the one that is unequal and explain why. (2PR3.4)

- Ask students if these situations below are balanced and how they know. This can be done pictorially or with concrete materials. If the situation is not balanced, ask them to re-draw the balance the way it should look [one side higher than the other].

\[
\begin{align*}
\text{a)} & \quad \begin{array}{c}
\square \quad \square \\
\end{array} & = & \begin{array}{c}
\square \quad \square \quad \square \\
\end{array} \\
\end{align*}
\]

\[
\begin{align*}
\text{b)} & \quad \begin{array}{c}
\square \quad \square \\
\end{array} & = & \begin{array}{c}
\square \quad \square \quad \square \\
\end{array} \\
\end{align*}
\]

\[
\begin{align*}
\text{c)} & \quad \begin{array}{c}
\square \quad \square \quad \square \\
\end{array} & = & \begin{array}{c}
\square \quad \square \quad \square \\
\end{array} \\
\end{align*}
\]


Resources/Notes

Math Makes Sense 2
Lesson 12: Equal and Unequal Sets
2PR3 (3.1, 3.2, 3.3, 3.4)
TG pp. 68 - 72

Audio CD 2:
Selection 8
Strand: Number

Outcomes

Students will be expected to
2N5 Compare and order numbers up to 100.
[C, CN, ME, R, V]

Achievement Indicators:

2N5.1 Order a given set of numbers in ascending or descending order, and verify the result, using a hundred chart, number line, ten frames or by making references to place value.

2N5.2 Identify and explain errors in a given ordered sequence.

2N5.3 Identify missing numbers in a given hundred chart.

2N5.4 Identify errors in a given hundred chart.

Elaborations—Strategies for Learning and Teaching

Who Am I? Use a number line labeled 0 and 100 at opposite ends. Mark a point with a (?) that corresponds to a secret number. Have students estimate what number they think the (?) represents. After several guesses, guide students in folding the line in half to mark the 50 point. Fold again to mark 25 and 75. Students can use this information to modify their guesses.

Show a number line with some numbers placed incorrectly. Have students identify the errors, explain their reasoning, and place the numbers correctly.

Morning Routine - As another activity for morning routine, randomly pull several numbers from the hundred chart, leaving gaps. Have students come up one at a time and identify a missing number. Ask “How do you know?” The student can then choose the correct number card, and return it to its correct place on the hundred chart.
General Outcome: Develop Number Sense

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance</strong></td>
<td><strong>Math Makes Sense 2</strong></td>
</tr>
<tr>
<td>• Using base ten materials, have students show why, for instance, 43 is less than 67, and explain.</td>
<td>Lesson 13: Comparing Numbers&lt;br&gt;2N5 (5.1, 5.2, 5.3, 5.4)</td>
</tr>
<tr>
<td>• Distribute blank number lines with endpoints 0 and 100. Provide students with a variety of number cards (0-100) and have them compare and order the numbers from least to greatest. Students use sticky notes then place them on the number line. Explain their reasoning.</td>
<td>2PR3 (3.1, 3.2)&lt;br&gt;TG pp. 73 - 76</td>
</tr>
<tr>
<td></td>
<td><strong>Unit Centres</strong></td>
</tr>
<tr>
<td></td>
<td>TG p. 13&lt;br&gt;Spinning Numbers</td>
</tr>
<tr>
<td></td>
<td><strong>Lesson 14: Ordering Numbers</strong></td>
</tr>
<tr>
<td></td>
<td>2N5 (5.1, 5.2)&lt;br&gt;TG pp. 77 - 81</td>
</tr>
</tbody>
</table>
Data Analysis

Suggested Time: 3 Weeks

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

Focus and Context  Students should be given various opportunities throughout the year to practice their skills in data analysis. Naturally occurring seasonal changes provide many ideal opportunities (Back to School, Halloween, Christmas, etc). Data analysis can also be integrated across several curriculum areas. E.g., What activity would you prefer to play during recess today? Skipping? Freeze Tag? Soccer? Graphing the day’s weather is an effective, on-going way to reinforce data analysis skills throughout the year.

Throughout this unit, centres may be set up to allow for further investigation, discovery and practice. Hands-on, concrete, self-directed learning is a natural way for students to make discoveries about their world around them.

It would be useful to have individual math baggies accessible at all times during this unit. Each baggie could include: counters, graphing mats (horizontal and vertical), sticky notes for labelling, a variety of small manipulatives, and pencil and crayons. Students should feel free to use these materials for free exploration.

Providing a mathematics word wall is a good way to build graphing vocabulary. Words can be added as they occur in classroom activities. Consider using a simple graphic with each word to provide additional support. Use word walls frequently to reinforce concepts.

Data collection is meant to be used as a tool to answer questions or solve problems, rather than an end in itself.

Math Connects  In Grade Two, students are being introduced to Data Analysis and have had no formal instruction in previous grades. Prior to Grade Two, however, students have had many opportunities to classify and sort. Such awareness is an essential foundation in order to record, analyze and interpret results and answer questions.

Data Analysis provides an excellent means for students to develop questions about the world around them and creates an inner motivation to seek answers to questions they formulate.

It is important that students decide how to best organize and display data. To save time teachers often make decisions as to how data will be displayed. Allowing students to take the time to grapple with data organization is an important process in and of itself.
### Process Standards

**Key**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
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### Curriculum Outcomes

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<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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<tr>
<td>Statistics and Probability (Data Analysis)</td>
<td>2SP1 Gather and record data about self and others to answer questions.</td>
<td>[C, CN, PS, V]</td>
</tr>
<tr>
<td>Statistics and Probability (Data Analysis)</td>
<td>2SP2 Construct and interpret concrete graphs and pictographs to solve problems.</td>
<td>[C, CN, PS, R, V]</td>
</tr>
</tbody>
</table>
Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

2SP1 Gather and record data about self and others to answer questions.

[C, CN, PS, V]

Elaborations—Strategies for Learning and Teaching

Use a journal activity to assess students background knowledge of data analysis. This can guide your instruction throughout this unit. E.g., What do you know about graphs? When do we use graphs? Why do we use graphs? What does a graph look like? Draw a graph and tell about it.

Graphs, using real objects to represent the data, are called concrete graphs. Students should first be introduced to graphs that are arrangements of the actual objects being sorted. Later, other concrete materials can be used to represent the real objects. ‘Representational objects’ such as clothes pins or cubes can be used to answer the question. For example, ask: What color are your eyes? Have students show the data in another concrete way, such as clothes pins attached to brown, blue, and green ribbon, or brown, blue or green cubes stacked on a table.

When students formulate questions of interest to themselves, the data they gather will be more meaningful.

Encourage young students to start with questions that require a yes/no answer as this data is much easier to collect and organize. E.g., Do you have a pet?

It is suggested to go beyond classroom limits when formulating questions and gathering data. Surveying neighbouring classes, parents, and siblings can be a great source of information. Also, questions about things in your community can lead to interesting investigations. E.g., Is your house a two-storey house?

When meaningful questions are generated, and data is collected, students’ organization of the data will be more purpose-driven. The method of data collection and organization should suit the question.

Before students start to collect their data, they should be aware of the importance of giving their graph a title and adding appropriate labels.

At this point, questions should be geared towards data collected in concrete form. This understanding will form the foundation for further investigation using concrete graphs and pictographs.
General Outcome: Collect, Display and Analyze Data to Solve Problems.

Suggested Assessment Strategies

Performance

- Using data brought from home, students can create a collaborative graph to answer questions. E.g., What kind of cereal do you have in your cupboard? (Be sensitive to any socio-economic issues that may exist in your class.)  
  
- Using a large floor graph, have the students stand on the floor graph labeled ‘long sleeves’ and ‘short sleeves’ to answer a simple question about themselves (Are you wearing long sleeves or short sleeves?) A masking tape grid or marked lines on a solid colour shower curtain or sheet of plastic make good floor graphs.

- Sometimes previously collected data can answer new questions. Encourage students to generate other questions they could answer if they knew:
  - The number of students in the class, and the number of girls in the class;
  - The number of students who bought milk for recess, and the number of boys who bought milk for recess;
  - The number of students in the class, and the number of students who have a pet. (Be sure to discuss why this information may not be used to determine the number of pets owned by students in the class.)

Resources/Notes

- *Math Makes Sense 2*
  - **Launch**
  - Teacher Guide (TG) p. 11

- **Lesson 1: Exploring Concrete Graphs**
  - 2SP1 (1.1, 1.2, 1.3)
  - 2SP2 (2.3, 2.4, 2.6)
  - TG pp. 12 - 15

- **Lesson 2: Creating and Interpreting Concrete Graphs**
  - 2SP1 (1.1, 1.2, 1.3)
  - 2SP2 (2.1, 2.3, 2.4, 2.6)
  - TG pp. 16 - 20
Outcomes

Students will be expected to

2SP2 Construct and interpret concrete graphs and pictographs to solve problems.

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

When constructing concrete graphs and pictographs, model and discuss the importance of aligning objects accurately.

When interpreting concrete graphs and pictographs, model good questioning that require students to think on both a literal level (How many students have a dog? How many students have a cat?) and on interpretive/evaluative levels (How many more cats than dogs are there? Or If dog treats come in bags of ten, how many bags would we need to buy? Would we have any treats left over?).

It is important to draw students’ attention to the different layouts / formats of graphs. Some graphs are horizontal, others are vertical. It would be helpful to show the same data in two different formats.

Achievement Indicator:

2SP2.1 Determine the common attributes of concrete graphs by comparing a given set of concrete graphs.

When students have created their own concrete graphs, encourage them to discuss the similarities and differences, that they can see, between graphs. Ask students to circulate around the classroom to observe and discuss the differences they notice.
General Outcome: Collect, Display and Analyze Data to Solve Problems.

<table>
<thead>
<tr>
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<th>Resources/Notes</th>
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<tr>
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</tbody>
</table>
Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

2SP2 Continued

Achievement Indicators:

2SP2.3 Answer questions pertaining to a given concrete graph or pictograph.

2SP2.4 Create a concrete graph to display a given set of data, and draw conclusions.

2SP2.6 Solve a given problem by constructing and interpreting a concrete graph or pictograph.

Elaborations—Strategies for Learning and Teaching

When answering questions about data, encourage students to provide support for their answers by referring to the data. E.g., How do you know?

Students relate best to hands-on, concrete activities. It is strongly suggested that initial concrete graphing experiences be as physically engaging as possible. If classroom space does not permit, an alternative would be to use the gymnasium space for whole-group graphing.

Have the students arrange themselves on a floor graph according to lace up or Velcro shoes. Take a photo of the graph created by the students. Display the photo allowing students to see themselves from a different viewpoint. (It is often difficult for students to see the whole picture when they are standing in the middle of the graph.) This will give a deeper understanding of the graph they created.

At this point, students have been introduced to concrete graphs only, and will only be constructing parts of a graph. They will be adding data only. Titling and labelling graphs will be introduced later in the unit.

Graphs using pictures or symbols to represent the data are called pictographs. Sometimes the same symbol can be used throughout to represent the data. Other times, different symbols can be used to represent different elements of the data.

Students enjoy making a pictograph using photographs of themselves to represent the data.

A pictograph can also be created using the same symbol (happy face) to represent the data.
General Outcome: Collect, Display and Analyze Data to Solve Problems.

### Suggested Assessment Strategies

**Observation**
- Listen to students as they discuss each other's graphs. Make note of the types of questions they ask, and the similarities and differences that they discover. (2SP 1.1, 1.3)

**Performance**
- Read a book about sisters or brothers, such as *A Very Special Sister* by Dorothy Hoffman Levi. This book tells the story of Laura, a young deaf student. Laura is excited about becoming a big sister. She is worried, however, that because her new sibling might be able to hear, she or he might be more loved by their mother. Have students construct a pictograph to show how many sisters each student in the class has. Provide students with a variety of materials for collection and recording of data (blank paper, graph paper, sticky notes, linking cubes, chain links, or crayons). Students should decide individually how best to collect the data, and be given them ample time to do so. Have class lists available so that the students can use them to keep track of the students who have been surveyed. After the students have collected their data, let them decide how best to record and present their data. Encourage students to ask questions such as, “What does this graph show?”, “Which graph best shows how many sisters each of us has?” Which graph do you think is easiest to read?” These questions are not intended to imply that one display is best. Rather, they help the students realize that different graphs have different advantages. Encourage students to justify their choices by explaining why they chose a particular graph.

Variation/Extension: This activity could be repeated to find out how many brothers each student has, and extended to find out the number of siblings each student has. If no student suggests combining the two sets of data, prompt them by asking questions such as, “Could our data collected in our previous two graphs help us

### Resources/Notes

**Math Makes Sense 2**
- Lesson 1 (Continued): Exploring Concrete Graphs
  - 2SP1 (1.1, 1.2, 1.3)
  - 2SP2 (2.3, 2.4, 2.6)
  - TG pp. 12 - 15

- Lesson 2 (Continued): Creating and Interpreting Concrete Graphs
  - 2SP1 (1.1, 1.2, 1.3)
  - 2SP2 (2.1, 2.3, 2.4, 2.6)
  - TG pp. 16 - 20

- Unit Centres:
  - TG p. 9
  - Our Concrete Graphs
  - Sort and Graph

- Lesson 3: Interpreting Pictographs
  - 2SP2 (2.3, 2.5, 2.6)
  - TG pp. 21 - 23

- Lesson 4: Creating and Comparing Pictographs
  - 2SP2 (2.2, 2.3, 2.5, 2.6)
  - TG pp. 24 - 28
## Strand: Statistics and Probability (Data Analysis)

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<td></td>
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</tbody>
</table>

### 2SP2 Continued

**Achievement Indicators:**

- **2SP2.2** Determine the common attributes of pictographs by comparing a given set of pictographs.
- **2SP2.5** Create a pictograph to represent a given set of data, using one-to-one correspondence.

When students have created their own pictographs, encourage students to discuss the similarities and differences between graphs that they can see. Completed pictographs can be circulated and/or displayed in a centre.

There are many ways to create pictographs. As an introduction to this type of graph, here are some suggestions….

- Magnetic board and pictures
- Felt board and pictures
- Cutting pictures out of magazines
- Using student’s photos
General Outcome: Collect, Display and Analyze Data to Solve Problems.

Suggested Assessment Strategies

Performance

- Divide students into groups of 3-4. Provide 40 multi-link cubes (ten each of four colours) mixed together in one tub. Have students take a large handful of blocks and organize their blocks next to the appropriate colour card, as shown:

![Image](Red Blue Yellow Green)

It would be beneficial to engage students in a discussion about displaying data both horizontally and vertically. Have students also create a horizontal concrete graph using the same data, as indicated:

![Image](Red Blue Yellow Green)

Each group will combine their data to create a large pictograph to display the group’s combined data.

Variation: Provide a variety of materials for this activity (link-its, crayons, pattern blocks, coloured counters, etc.)

(2SP1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6)

Resources/Notes

[Math Makes Sense 2
Lesson 3 (Continued): Interpreting Pictographs
2SP2 (2.3, 2.5, 2.6)
TG pp. 21 - 23

Lesson 4 (Continued): Creating and Comparing Pictographs
2SP2 (2.2, 2.3, 2.5, 2.6)
TG pp. 24 - 28]
Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

2SP2 Continued

Achievement Indicator:

2SP2.6 Solve a given problem by constructing and interpreting a concrete graph or pictograph

Elaborations—Strategies for Learning and Teaching

Bring a potato in a paper bag, and ask students to try to identify this mystery object by asking you yes/no questions about its attributes. Once the students have guessed the mystery item, brainstorm a list of ways that potatoes can be prepared. Choose three or four of these suggestions and have students choose their favourite type of prepared potato (mashed, fries, baked, hash browns). Give students a sticky note to draw a picture to represent their choice. Have students stick their picture on a large, prepared potato made from butcher paper.

Discuss the data displayed in a random, unorganized manner. This discussion should lead students to suggest organizing the data more clearly. Suggestions may include:

• displaying data on a chart with headings
• groups of ten circled on a chart
• horizontal pictograph with data shown on sticky notes
• vertical graph using cubes to represent the data
• vertical object graph with clothespins to represent the data
• tally chart

Students further organize this data by constructing their own pictographs. In their journals, students write all that they know about the graph they constructed.
General Outcome: Collect, Display and Analyze Data to Solve Problems.

Suggested Assessment Strategies

**Student/Teacher Dialogue**

- Provide students with the following completed pictograph:

![Pictograph of Favorite Fruits](image)

Use the graph Our Favourite Fruit. Ask students to write all that they can about the data displayed on the graph.

(2SP2.4, 2.6)

**Performance**

- What Difference Does a Day Make? Create a pictograph to answer a question such as “What colour socks are you wearing today?” After completing the graph and discussing the data, ask: “Would this graph stay the same tomorrow? Why or why not?” Discuss graphs that would remain the same such as, Our Class Pets, Hair Colour, Eye Colour, Birthday Month, etc.

(2SP2.6)

**Resources/Notes**

- Math Makes Sense 2
  - Lesson 3 (Continued): Interpreting Pictographs
  - 2SP2 (2.3, 2.5, 2.6)
  - TG pp. 21 - 23

- Lesson 4 (Continued): Creating and Comparing Pictographs
  - 2SP2 (2.2, 2.3, 2.5, 2.6)
  - TG pp. 24 - 28
Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

Problem Solving

- Look for a Pattern
- Guess and Check
- Use Objects
- Make a Graph

Elaborations—Strategies for Learning and Teaching

Problem solving is an important component of the mathematics curriculum. Problems can be powerful tools for engaging young students in mathematics and many students enjoy making sense of them. Honoring students’ problem solving approaches is important. As a teacher, you can capitalize on opportunities that come from rich problem solving experiences by talking with the student and observing, listening and questioning the student. Allow ample time for students to wrestle with a challenging problem over a few days. These opportunities encourage an attitude of persistence. As students move through the problem solving process, it should be an experience that ‘stretches’ the students’ thinking. Support and challenge the students’ thinking before giving the correct answer. Make sure the students understand the problem. You may need to adjust the mathematics in the problem to fit the students’ understanding or you may remind them of other strategies that may be tried.

The third strategy focuses on ‘Make a Graph’. Sometimes it is useful to make a graph to organize and make sense of the information given, and to find a solution.

When creating charts and lists, it is important to provide tables to ensure proper alignment of data. This will guard against misrepresentation of data caused by varying penmanship and size of student’s printing.

- Provide chart paper with the words to the song Row, Row, Row Your Boat. Below the words, make a separate vertical chart listing each word that occurs in the song:

<table>
<thead>
<tr>
<th>Row</th>
<th>III</th>
<th>Merrily</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>your</td>
<td></td>
<td>Life</td>
<td></td>
</tr>
<tr>
<td>boat</td>
<td></td>
<td>is</td>
<td></td>
</tr>
<tr>
<td>Gently</td>
<td></td>
<td>but</td>
<td></td>
</tr>
<tr>
<td>down</td>
<td>a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the</td>
<td>dream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stream</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After group singing of the song a couple of times, engage the students in creating a tally to represent how often each word occurs in the song. Ask the students what questions can be answered from the data collected.

Variation: Using any poem or song, throughout the year ask students to create a similar chart to reinforce this outcome on a regular basis.

(2SP1.1, 1.2, 1.3)
General Outcome: Collect, Display and Analyze Data to Solve Problems.

Suggested Assessment Strategies

Performance

- Have students work in pairs to create Mystery Graphs. Students will need to decide on a question that can be answered by collecting data within the classroom. They will then collect the necessary data, and record the data in the form of a pictograph. There will not be any words or numbers recorded as this is a 'mystery graph’. On a separate sheet of paper students will write the title of their graph. Collect the titles and graphs and display them separately. Allow ample time for the students to analyze the graphs and make connections to appropriate titles. Encourage students to discuss their reasoning. As a group, match the titles with the correct graph, making note of students’ reasoning and mathematical vocabulary. (2SP1.2)

Journal

- Provide students with the same journal prompt as in the Opening Assessment. Compare responses as an indicator of student learning. Journal Prompt: What do you know about graphs? When do we use graphs? Why do we use graphs? What does a graph look like? Draw a graph and tell about it. (2SP1.1, 1.2)

Portfolio

- Students formulate their own question that can be answered by gathering information within the school. They will write their question, gather their data, display their information in the form of a pictograph, and write about what they have learned. (2SP1.2)

Self-Assessment

The following self-assessment chart could be used as a component of overall student assessment. Represent and write about something you have learned about graphs.

<table>
<thead>
<tr>
<th>Draw a checkmark (√) in the box that describes your work</th>
<th>Yes, on my own</th>
<th>Yes, with help</th>
<th>Not Yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I can make a concrete graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I can make a pictograph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I can answer questions about a graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I can make a tally chart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I can solve a problem by making a graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I can make up questions for a survey and show what people answer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Resources/Notes

Math Makes Sense 2
Lesson 5: Strategies Toolkit
TG pp. 29 - 31

Lesson 6: Exploring Collecting Data
2SP1 (1.1, 1.2, 1.3)
TG pp. 32 - 35

Unit Centres
TG p. 9
Using Tallies

Lesson 7: Collecting Data Using Charts and Lists
2SP1 (1.1, 1.2, 1.3)
TG pp. 36 - 40

Unit Centres
TG p.9
My Question Is…

Investigation 4: Turtle Tank
TG pp. 45 - 49
This is a culminating activity for units 6 and 7. Use it at your own discretion according to student need, and as time permits.
Addition and Subtraction to 18

Suggested Time: 6 Weeks

This is the first explicit focus on addition and subtraction, but as with other outcomes, it is ongoing throughout the year. Addition and subtraction of larger numbers to 100 will be addressed later in the year.
Unit Overview

Focus and Context
In Grade One, students had many opportunities to develop a strong sense of numbers to 20. A good understanding of number provides a foundation for learning to compute. Students have had experience composing and decomposing numbers and started to develop their own personal strategies for addition and subtraction. This work continues in Grade Two, as students first work on addition and subtraction to 18 and then go on to work with adding and subtracting numbers to 100 where they apply mental math strategies they are developing. They will use a variety of models and manipulatives such as number lines, ten frames and base ten blocks to model part-part whole relationships, adding to, taking away from and comparing inequality situations to develop understandings of the meanings of addition and subtraction and strategies to solve such problems. Having students invent and use their own personal strategies to add and subtract before introducing them to standard algorithms will enable them to meaningfully construct a strong sense of number. Although students’ invented strategies may very closely resemble the standard algorithms, this beginning work sets the stage for learning and understanding these more traditional ways of computing.

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. Through the use of real life, everyday problems, students will be challenged to use the pre-existing knowledge about number and connect it with new ideas and concepts they are forming. Allowing students to engage in real-world problems not only challenges and extends their mathematical thinking and reasoning, it also allows them multiple opportunities to connect math with their own lives. These meaningful connections help students to make sense of the math they are learning which leads them to a deeper understanding of mathematical content.
### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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<tbody>
<tr>
<td>Number</td>
<td>2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number.</td>
<td>[C, R]</td>
</tr>
</tbody>
</table>
| Number                        | 2N9 Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:  

- using personal strategies for adding and subtracting with and without the support of manipulatives  
- creating and solving problems that involve addition and subtraction  
- explaining that the order in which numbers are added does not affect the sum (Commutative Property)  
- explaining that the order in which numbers are subtracted may affect the difference.  | [C, CN, ME, PS, R, V] |
| Number                        | 2N10 Apply mental mathematics strategies, such as:  

- counting on and counting back  
- making 10  
- using Doubles  
- using addition to subtract  
  for basic addition facts to 18 and related subtraction facts.  | [C, CN, ME, PS, R, V] |
| Patterns and Relations (Variables and Equations) | 2PR4 Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.  | [C, CN, R, V] |
Strand: Number

Outcomes

Students will be expected to

2N9 Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

- using personal strategies for adding and subtracting with and without the support of manipulatives
- creating and solving problems that involve addition and subtraction
- explaining that the order in which numbers are added does not affect the sum (Commutative Property)
- explaining that the order in which numbers are subtracted may affect the difference.

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

Achievement Indicator:

2N9.1 Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically.

Elaborations—Strategies for Learning and Teaching

Students are first introduced to addition and the corresponding subtraction of 1 and 2 digit numbers with answers to 18. (Addition with answers to 100 and the corresponding subtraction will be covered later in the year).

To help students develop an understanding of addition and subtraction of numbers to 18, students can be involved in activities where they are modeling, acting out, building, drawing, and hearing appropriate math language while they are engaged in creating and solving number stories and sentences. In doing this, students will begin to develop personal strategies of addition and subtraction. New vocabulary words can be added to the math word wall to reinforce the use of appropriate terminology, which may include: together, part, sum, difference, add, subtract, take away.

When possible, use children's literature to create addition and subtraction problems based on these stories. Alternately, have students use their favourite stories to create problems. They may be given time to dramatize the books and the addition/subtraction situation. Their presentations can involve problems for their classmates to solve.

As students create their own number stories they may use different materials, such as snap cubes, ten frames, link-its, toys, other students, etc., to model the situation. As they begin to develop a concrete understanding of the concept of addition and subtraction, using these concrete materials may help students to more successfully record the process symbolically.

Story boards may also be one way to help students model addition and subtraction situations using materials as they create their own number stories and related sentences. E.g., An ocean storyboard such as the one below can be used after students read “Swimmy” and create stories representing addition.
**General Outcome: Develop Number Sense**

### Suggested Assessment Strategies

**Performance**
- Show students a story board that depicts an addition or subtraction situation. Have them create, model and record a number story and sentence that reflects the visual. *(2N9.1)*

**Journal**
- Show students a simple addition or subtraction sentence either in vertical or horizontal forms. Have them draw a picture to represent this addition/subtraction sentence. Students may also wish to write/talk about how their picture represents the number sentence. *(2N9.1)*

### Resources/Notes

*Math Makes Sense 2*

**Launch:**
- TG p. 19

**Lesson 1: Creating and Solving Number Problems**
- 2N8 (8.1, 8.2)
- 2N9 (9.1, 9.2, 9.9)
- 2N10 (10.2, 10.3)
- TG pp. 20 - 23
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicator:

2N9.9 Solve a given problem, using horizontal and vertical forms.

2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number.

[C, R]

Elaborations—Strategies for Learning and Teaching

As students become more comfortable creating their own number stories and solving others, they begin to record the related number sentences. It is strongly encouraged that students be exposed to and use horizontal forms for recording number sentences as this method reinforces important place value concepts and is well suited to the use of personal strategies. However, students can be exposed to both methods to demonstrate the idea that there are component parts to the situation which, when added, produces one whole (9 + 8 = 17).

Students may begin using zero in their number stories and sentences at the beginning of this unit of work. Although this concept reappears in later work in the unit, it may be necessary to discuss with students the effect of adding and subtracting zero at this time. Students should recognize that zero has a value, but when added to or subtracted from a number, there is no effect.

When discussing the concept of adding zero to and subtracting zero from a number, the value of zero should be emphasized. Using the part-part whole concept with the use of manipulatives, it may be helpful to show two parts with one part being empty. Simple real life story problems would be a good tool to illustrate the effect of adding or subtracting zero from a number. Sometimes students may think that when you add a number the sum must change and when subtracting a number, the difference must be less.

Using dot plates, show students a plate representing 5, (containing 5 dots). Show students other plates with different numbers having them name the number. Show them a plate with no dots, zero, where they will see that zero is a number but it means there are no dots on the plate.

When zero is added to a number, the number doesn't change. A useful model to reinforce this concept is to use a “Walk On” number line. You can make a walk on number line using a shower curtain and permanent marker or masking tape on the floor:
**General Outcome: Develop Number Sense**

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<td>- Prepare a die by covering one side with a label and marking it with “0”. Have students play a game involving rolling a die to determine how many spaces to move. Change one of the numbers to a 0, so that when zero is rolled they will have to stay in the same space.</td>
<td>Lesson 1 (Continued): Creating and Solving Number Problems</td>
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</table>
Strand: Number

Outcomes

Students will be expected to

2N8 Continued

Achievement Indicators:

2N8.2 Subtract zero from a given number, and explain why the difference is the same as the given number

Elaborations—Strategies for Learning and Teaching

Have students perform the operations as you call out number sentences. For example, say: $3 + 1$. The student starts on the 3 and steps 1 space forward to end up on 4. Then, give another student one that includes a zero such as $4 + 0$. This means start at 4 and step 0 spaces forward, staying at 4.

Through practice and modeling with manipulatives, students can be shown the sum of $12 + 0$ for example. Using 'part-part-whole mats' (shown on opposite page) students will see that there are 12 blocks in one part with no blocks in the second part. Students will eventually realize that when you are adding or subtracting with zero, the number in the addend and minuend remains the same.

In subtraction, the minuend is the whole, the number on the top in the vertical form or the first number in the horizontal form. For example, in $12 - 5 = 7$, 12 is the minuend.

In addition, the two parts that make up the whole are the addends. For example, in $4 + 6 = 10$, the 4 and 6 are the addends. It is not necessary to expect students to use these terms, however, it is may be a nice idea to use this language as it gives students a name for these particular numbers.

As students continue working on addition and subtraction concepts, they may discover that it makes no difference in which order two numbers are added. There is value in spending time helping students see this relationship as it is useful in mastering basic facts, mental mathematics and problem solving.

(Continued)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Write zero facts on the board, some with zero first and some with zero second. Discuss how all the facts are alike. Have students use counters and part-part whole mats to model the facts. For example, 3+0=3. Have students then create a problem that involves adding or subtracting a zero to show what they understand about this concept. Part-part whole mats can be made and laminated using two different colors of construction paper:

![Part-part whole mats](image)

(2N8.1, 2N8.2)

Performance

- Addition/Subtraction Curling - Have students play addition/subtraction curling. Using masking tape, create different sized squares, one inside the others on the floor. Students, in teams, would slide a bean bag into different sections of the squares where each section would have a particular number sentence for them to solve. If they solve it correctly, they get that many points, if not, they lose their turn. The middle square would have a greater value where the outside squares would have a lesser value.

![Addition/Subtraction Curling](image)

(2N8.1, 2N8.2, 2N9.9, 2N10.3)

Resources/Notes

Math Makes Sense 2

Lesson 2 (Continued): Relating Addition and Subtraction

2N8 (8.1, 8.2)

2N9 (9.1, 9.2, 9.5, 9.9)

2N10 (10.2, 10.3)

TG p. 24 - 29
Outcomes

Students will be expected to

2N9 Continued

Elaborations—Strategies for Learning and Teaching

As students begin to understand the commutative property, they are ultimately beginning work on fact families. Knowing the fact family is one way to remember which addition facts can help a student solve a subtraction problem.

A fact family is a list of related facts.

For example,

To help students understand that order in addition does not effect the sum (the commutative property) use dot cards/plates that shows two addends in different colors. For example, a dot plate or card may show 3 red dots and 4 blue dots. Show students this card or plate and have them say or record the number sentence. Then turn the plate or card up-side down where the second addend is now the first. For example, if the plate or card showed 3 red dots first and the 4 blue dots second, when the plate or card is turned, the 4 blue dots would be first and the 3 red dots, second. Students may then see that the sum does not change.

Students will need to understand that the commutative property is applicable to addition but not to subtraction. Students will need to engage in many experiences where they begin with the whole and practice ‘taking away’ one part leaving the difference (the other part of the whole). Though there is a relationship between 2, 3 and 5, 5 – 2 is not the same as 5 – 3.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Provide students with a number sentence like $7 + 5$. With a partner, ask students to act out a situation that would give a sum or difference of 12. Students should be encouraged to use a variety of situations that are meaningful to their own experiences rather than copying a familiar form over and over. (2N9.1, 2N9.2, 2N10.2)

- Place a pre-determined number of two coloured counters in paper cups. Students will shake and spill the counters on their desk. Have them record two addition sentences and two related subtraction sentences.

  $3 + 5 = 8$
  $5 + 3 = 8$
  $8 - 3 = 5$
  $8 - 5 = 3$

(2N9.1, 2N9.9, 2N10.2)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 2 (Continued): Relating Addition and Subtraction

2N8 (8.1, 8.2)

2N9 (9.1, 9.2, 9.5, 9.9)

2N10 (10.2, 10.3)

TG p. 24 - 28
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicators:

2N9.1 Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically.

2N9.2 Create an addition or a subtraction number sentence and a story problem for a given solution.

2N10 Apply mental mathematics strategies, such as:

- Counting on and counting back
- Making 10
- Using Doubles
- Using addition to subtract

for the basic addition and related subtraction facts to 18

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

Elaborations—Strategies for Learning and Teaching

When modeling addition and subtraction, it is important to give students time to construct their own understanding. Students should be provided with a variety of manipulatives, to discover approaches to solving an addition and subtraction problems. The use of manipulatives will help them visually represent their work and lead to the recording of the process symbolically.

Provide opportunities where students can use manipulatives to illustrate a number sentence and provide a story problem for a given solution. A ‘given’ solution means a student is provided with a sum or difference and they are asked to create a problem or number sentence that would make it true. This can be done through games and small group/whole group activities and discussions.

The focus of this early work in addition and subtraction is to engage students in experiences where they are beginning to create and use their own personal strategies. At this time it is not necessary to begin teaching the specific mental math strategies as this will be the focus of later work. Grade Two students have already been exposed to some mental math strategies in Grade One, but work here will be focused on helping students build upon these strategies and on developing more of their own. Some students may already be comfortable with using certain mental math strategies, but now the focus is on refining these strategies and looking for more efficient ways to add and subtract.

It is not intended that students, at this time recall the basic facts but become familiar with these strategies in order to apply them, mentally, when determining sums and differences. This will lead to efficiency in recalling the facts.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Connect Four - Create a 4 X 4 game board with different sums inside each block. In teams, students take turns saying a number sentence that would produce a particular sum in the board. If the team calls out the correct number sentence, they cover the block that has the corresponding sum. The first team to get four blocks in a row, or to “connect 4”, wins. (2N8.1, 8.2, 2N9.9, 2N10.3)

```
  9  7  3  11
  5  1 13 17
  7  1 11  9
  3  5  5  9
```

- Give students a specific number of counters, snap cubes, link its, etc. Have them create as many number sentences as possible using this number. Have them use one of their own number sentences to create a story problem, and illustrate, build, create or act it out. (2N8.1, 8.2, 2N9.1, 9.2, 9.9, 2N10.2, 10.3)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 2 (Continued): Relating Addition and Subtraction

2N8 (8.1, 8.2)

2N9 (9.1, 9.2, 9.5, 9.9)

2N10 (10.2, 10.3)

TG p. 24 - 28

Activity Bank:

TG p. 29

  Toss It

  Pattern Block Pictures
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<td>The focus of this outcome is to have students interpret the = sign as a point of balance. It may be easier balancing one addition (or subtraction) sentence first, such as 10 + 4 = 14, (12 – 7 ≠ 7) and then moving to balancing two addition/subtraction sentences. For example, 1 + 4 ≠ 7 + 3, (5 – 2 ≠ 6 – 3). Finally students may be ready to deal with combining addition and subtraction sentences. E.g., 3 + 9 = 12 – 0.</td>
</tr>
<tr>
<td>2PR4 Record equalities and inequalities symbolically, using the equal symbol.</td>
<td>At the beginning of this topic, you may wish to write a number sentence on the board that contains an inequality. For example, 2 + 4 = 5. Have students work with a partner to confirm or reject the number sentence. Using manipulatives, have them demonstrate their thinking as they explain how they know this solution is correct or incorrect. After students have a chance to disprove this number sentence, it may be a good time to introduce the 'not equal' phrase and symbol. During this discussion, you could rewrite the number sentence as 5 ≠ 2 + 4 and write the words 'five is not equal to two plus four'.</td>
</tr>
<tr>
<td>[C, CN, R, V]</td>
<td>Model other number sentences using the equal and not equal symbols allowing students to confirm each sentence.</td>
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<tr>
<td></td>
<td>Present equal and unequal number sentences. Have students show if the number sentences are equal or unequal by, for example, raising their hands in the air for equal number sentences, and touching their toes for unequal sentences.</td>
</tr>
<tr>
<td></td>
<td>Manipulatives such as ten frames, snap cubes, balance scales, marbles, etc. can all be used to help students develop an understanding of equal and unequal number sentences. Allowing students to model number sentences and situations, using manipulatives, gives them a visual to see whether or not the two sides of the number sentence are equal.</td>
</tr>
</tbody>
</table>
General Outcome: Represent Algebraic Expressions in Multiple Ways

Suggested Assessment Strategies

Performance

- Play “Balance”. Have students work in pairs. Give each pair a game board and a deck of numbered cards. Have one student deal out 6 cards each and place the remaining deck between the game boards. The object of the game is to create equal/unequal sets. For example, if one player has an 8, 3, 4, 2, 6 in his/her hand, the player could use the 4 and 2 together to add to 6. These three cards could then be placed on the balanced part of the game board. Students can only lay one set of cards per turn. Once a set of cards have been laid, the play goes to the other player. If this player does not have a pre-existing set in his/her hand, he/she can choose to either pick from the deck or to ask the opposing player for a particular card. If no matches are possible, the player loses his/her turn. The player that gets rid of all his/her cards first wins.

- Invite students to play a game of concentration. Provide 18 cards with 9 different sums (2 different facts for each sum) which have to be matched. For example, 9 + 5 and 7 + 7. Students turn over cards to find matches, or cards.  

Resources/Notes

* Math Makes Sense 2
  Lesson 3: Equality and Inequality
  2PR4 (4.1, 4.2, 4.3)
  TG pp. 30 - 33

* Audio CD 2:
  Selection 10

(2N8.1, 2N8.2, 2N9.5, 2N9.9, 2N10.2)
Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

2PR4 Continued

Achievement Indicators:

2PR4.1 Determine whether two sides of a given number sentence are equal (=) or not equal (≠). Write the appropriate symbol and justify the answer.

2PR4.2 Model equalities, using a variety of concrete representations, and record the equality symbolically.

2PR4.3 Model inequalities, using a variety of concrete representations, and record the inequality symbolically.

Elaborations—Strategies for Learning and Teaching

Give students one snap cube each. Show them two different bags, one marked with the word “yes” and one with “no”. Ask the whole class a question that would elicit a response of either yes or no, such as “Do you have a pet?”. Have students place their cube in the appropriate bag. Once all students had a chance to place their cubes, take one bag and snap all of the cubes together to create a train. Count the number of cubes and then have students decide how many cubes must be in the other bag. For example, if there are 6 cubes in the “no” bag, and there are 14 students in class, then how many cubes must be in the “yes” bag. Once students determine this, confirm their answer by snapping the second group of cubes together and counting. Stand each train up on its end, giving students a concrete visual to compare. Ask students various questions about these two towers such as:

- What can you tell me about these two stacks of cubes?
- How can we use these two stacks of cubes to tell how many students are in the class?
- What can we say about the number of students with pets and those without?
- How many more students have pets than no pets?

Record the equality or inequality symbolically.
General Outcome: Represent Algebraic Expressions in Multiple Ways

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*Math Makes Sense 2*

Lesson 3 (Continued): Equality and Inequality

2PR4 (4.1, 4.2, 4.3)

TG pp. 30 - 33

Activity Bank:

TG p. 38

- Equal Romp
- Make it Equal
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicator:

2N9.8 Add a given set of numbers in two different ways and explain why the sum is the same; e.g., \(2 + 5 + 3 + 8 = (2 + 3) + 5 + 8\) or \(5 + 3 + (8 + 2)\).

Elaborations—Strategies for Learning and Teaching

The focus, at this point is on the commutative property by presenting a problem that have the same two addends but can be added in different orders. Note at this point, only two addends are used. (Later in this unit students will use the commutative property for adding 3 or 4 addends).

Divide the class in half and give students examples of real life situations in which addition is required. Have the two groups add the numbers in different orders and report their answer. Discuss why the answers are the same and guide students to discover the commutative property (it is not necessary that students use the vocabulary “commutative property”). Ask if anyone notices how these problems are alike. Students should conclude that in addition, the addends can be added in any order and the result will be the same. E.g.:

- Tom has 3 dollars in his piggy bank. His mom made a deal with him! She said she would give him 13 more dollars at the end of the week, if he made his bed every day. How much money will Tom have in his piggy bank at the end of the week (providing he makes his bed, of course!)?
- The cafeteria sent up 12 cartons of milk for recess. At lunch time 5 more cartons of milk were delivered from the cafeteria to the classroom. How many cartons of milk did the students in that class drink that day?
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Students can shake and spill a specified number of two-sided counters on a paper plate. For each spill, the student will record and draw two addition sentences. For example, if there are 2 red counters and 5 white, the student would draw what they see and record the number sentences of $2 + 5 = 7$ and $5 + 2 = 7$. This task may also be extended to 3 and 4 addends by using colored cubes instead of two-sided counters.

- Give students 4 colored links and have them pick their favorite of the four colors. Next sort the colors into groups. List the results and have students choose to add the numbers in any order and report their sentence to the rest of the class.

Resources/Notes

* Math Makes Sense 2
  Lesson 4: Order in Addition
  2N8 (2N8.1, 8.2)
  2N9 (2N9.1, 9.2, 9.8, 9.9)
  2N10 (2N10.2, 10.3)
  TG pp. 34 - 37

* Activity Bank:
  TG p. 38
  Secret Cups
  Cube Trains
Outcomes

Students will be expected to

2N9 Continued

Elaborations—Strategies for Learning and Teaching

It is important, at this point, to have students work with numbers they are most comfortable with, in order to find the missing part of the whole. Using manipulatives will give students an opportunity to make this abstract concept more concrete. They should have a lot of practice constructing and deconstructing different numbers and in different ways. This part – part whole relationship, where students see that all the parts combined is instrumental in developing the concept of missing addends.

Providing students with opportunities to see real world examples of finding a missing addend will help make this concept more relevant. For example, if you know you have invited 10 people to your birthday party and there are 5 people already there, you will know that there are 5 more people left to come because $5 + 5 = 10$. Or if you have 10 cents and a candy costs 12 cents, then you would need 2 more cents to buy the candy.

This concept will also help students understand how addition is related to subtraction, as some may see how using subtraction helps in finding the missing addend.

Place a ‘magic’ number on the board, for example 7. Using a can (coffee or soup can), drop a specific number of marbles into the can so the students can hear the number of marbles drop. (Drop a number less than your magic number), Have students tell you how many more marbles need to be dropped in the can to reach the magic number.

Ask students various questions where they can use different strategies and manipulatives to solve the problem. For example, ask students to find the number of books Mary read if Bill read 11 and altogether they read 16. Tools such as ten frames, snap cubes, number lines, pictures, real objects (books) could all be used to help students solve the problem. Have students present their solutions to explain how they were able to come up with their answers.
General Outcome: Develop Number Sense

**Suggested Assessment Strategies**

*Student – Teacher Dialogue*

- Using dot plates, ten frames, or counters, begin with a number in which the student is comfortable with, for example, 9. Show the student the 9 on the dot plate, ten frames or counter and then hide one part of the whole. Ask the student to tell you how many are hidden. Repeat with different amounts removed. If the student responds quickly and correctly and is clearly not counting in any way, call that a mastered number. If a number is mastered, move on to a higher number. (2N9.3, 9.5, 2N10.2)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 5: Missing Parts – Addition

2N9 (9.1, 9.2, 9.3, 9.6)

2N10 (10.2, 10.3)

TG pp. 39 - 41
### Strand: Number

#### Outcomes

*Students will be expected to*

2N9 Continued

#### Achievement Indicators:

| 2N9.2 Create an addition or a subtraction number sentence and a story problem for a given solution. |
| 2N9.3 Solve a given problem involving a missing addend, and describe the strategy used. |
| 2N9.6 Match a number sentence to a given missing addend problem. |

#### Elaborations—Strategies for Learning and Teaching

Ask students to create a number sentence with a missing addend and create stories to solve them, either by acting them out or modeling with manipulatives. Students should show how they were able to solve the missing addend. To begin this activity, story boards may be used to help students become more familiar with thinking about and writing the number sentences.

Provide students with opportunities to practice solving different types of problems involving missing addends.

The two types of addition problems that have missing addends are:

- **Change Unknown:**
  
  Donald had 11 pennies. Sonya gave him some more. Now Donald has 17 pennies. How many did Sonya give him?
  
  \[
  11 + \_\_\_ = 17
  \]

- **Initial Number Unknown:**
  
  Donald had some pennies. Sonya gave him 6 more. Now Donald has 17 pennies. \((\_\_\_ + 6 = 11)\). How many pennies did Donald have to begin with?
  
  (Van de Walle and Lovin, 2006, p. 67-69)

As a part of Morning Routine activities, display five or six number sentences on the board or on chart paper. Tell students a story problem that includes a missing addend, have them match the appropriate number sentence with the problem. Encourage students to discuss their strategies to solve the problem.

For example, on the board write

\[
\begin{align*}
9 + 3 &= 12 \\
6 + 3 &= 9, \\
3 + 3 &= 6, \\
9 + 6 &= 15.
\end{align*}
\]

Then present a story problem:

There were 9 students that drank milk during recess. If 3 students drank white milk, how many had chocolate milk?
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Tell the following story to the students: Billy wanted to play his favourite math game. When he set up the addition game he quickly realized that some of his game cards had gotten wet and the ink disappeared. Help Billy fill in the missing numbers.

\[
\begin{align*}
5 + _ & = 10 \\
_ + 3 & = 1 \\
10 + _ & = 15 \\
7 + 8 & = _ \\
9 + 3 & = _ \\
_ + 4 & = 13
\end{align*}
\]

(2N9.2, 9.3)

Resources/Notes

Math Makes Sense 2
Lesson 5 (Continued): Missing Parts – Addition
2N9 (9.1, 9.2, 9.3, 9.6)
2N10 (10.2,10.3)
TG pp. 39 - 41

Activity Bank:
TG p. 46
- The Missing Piece
- Quick Glance
- Hoop to Hoop

Unit Centres:
TG p. 17
- Cover Up!
## Strand: Number

### Outcomes

*Students will be expected to*

2N9 Continued

### Achievement Indicator:

| 2N9.2 Create an addition or a subtraction number sentence and a story problem for a given solution. |

### Elaborations—Strategies for Learning and Teaching

In a part – part whole model, when the whole and one of the parts are known, subtraction names the other part. This definition is in agreement with the drastically over used language of ‘take away’. (Van de Walle, 2006, p. 73)

Subtraction is a more complex operation than addition. Most simply, it is the opposite of addition, but there are many nuances. (Small 2009, p.105). Before students develop an understanding to find missing parts of subtraction sentences, they need to understand what subtraction is. There are three different meanings of subtraction.

- **Taking away - separating situation.** I have 12 cookies and eat 7 which leaves 5 cookies. $12 - 7 = 5$.

- **Comparing – comparing two quantities involves subtracting one from the other.** For example, 12 is 5 more than 7.

- **Missing Addend – involves finding out how much or how many to add.** For example, you have 12 eggs in a carton and you used some to bake brownies. There are now 7 eggs in the carton. How many did you use? $12 - ? = 7$ or $7 + 5 = 12$
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- Barrier game - Sit facing the student for this task. Select an appropriate number of counters (sum) and shows them to the student. After the student is satisfied that he/she knows the number of counters in the sum, erect a barrier so that the student cannot see the counters. Place some of the counters under the container and leaves some out in view. Remove the barrier and ask student to determine how many counters are under the container. In the example below, if 13 is the whole and 4 is the part showing, what part of the set is under the container? The student may say “four and nine are thirteen”.

\[ \text{Performance} \]

- Hold out a set of counters or a number line showing a number less than your desired number. Tell students a story. Say: You are having a family birthday party for your nan and you have 18 aunts, uncles and cousins coming to your house. Your nan loves the color purple so you want to have purple party hats for everyone to wear to surprise her! You have a pack with 5 purple hats in it but you really wish you had 18 purple hats. Ask students to respond by telling you how many more you need to make up the 18. This number can change each time.

Resources/Notes

Math Makes Sense 2

Lesson 6: Missing Parts – Subtraction

2N9 (9.1, 9.2, 9.4, 9.7)
2N10 (10.2, 10.3)

TG pp. 42-45
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicator: 2N9.4 Solve a given problem involving a missing minuend or subtrahend, and describe the strategy used.

Elaborations—Strategies for Learning and Teaching

It is important for students to realize that the varying meanings for subtraction are related. It would make sense to apply the same operation, subtraction, in each situation. Therefore, connections must be explored and opportunities for presenting various types of meaningful problems be used to help construct a firm understanding of subtraction. It is important for students to decode and interpret number stories and not just rely on looking for clue words, such as ‘altogether’, ‘left’, ‘in all’, etc., to decide what operation to perform.

A minuend is the whole, the number on the top in the vertical form or the first number in the horizontal form.

The subtrahend is the part that is being ‘taken away’. It is the number on the bottom, or the second number in the horizontal form.

E.g., 10 - 3 = 7

The minuend is 10, the subtrahend is 3 and the difference is 7.

It is not necessary to use these terms with students.

Although some students may already be using some of the intended mental math strategies as they explain their thinking, it is not necessary at this time to introduce or expect students to use them. The focus is still on students developing their own personal strategies.

As students work through solving the missing minuend or subtrahend, it is important to give them a context for these problems. E.g., rather than writing a number sentence on the board such as 12 - ? = 5, it may be more effective to provide students with a context for this problem. Asking students to use manipulatives to model, or act out the problem as it is presented may help to develop a good understanding of the part-part-whole relationship. For example, you start out with 12 crayons at the beginning of the year, and now there are 5 left in your crayon box. Find out how many crayons were lost during the year.
### Suggested Assessment Strategies

**Performance**

- Tell students that you plan to plant 15 young trees in your new backyard. You planted 7 of them along the back. The rest will be planted on the two sides. Ask them to draw a picture to help you find how many were planted on the sides.  

(2N9.4)

### Resources/Notes

- **Math Makes Sense 2**
- **Lesson 6 (Continued): Missing Parts – Subtraction**
- 2N9 (9.1, 9.2, 9.4, 9.7)
- 2N10 (10.2, 10.3)
- TG pp. 42 - 45
### Strand: Number

#### Outcomes

*Students will be expected to*

2N9 Continued

#### Achievement Indicators:

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<th>2N9.1 Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically.</th>
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<th>2N9.7 Match a number sentence to a given missing subtrahend or minuend problem.</th>
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#### Elaborations—Strategies for Learning and Teaching

Students can be shown different number sentences and then be asked to listen to a problem or a story that can be represented by one of the number sentences. Students can then be asked to tell which of the number sentences it is and explain their choice.

Create a class book that shows different number problems where there is a missing part in the sentence. Have students come up with their own page where they will create and illustrate a number problem and write the related number sentence. This completed book can be put in the class library where students can read it and solve each others problems.

Subtraction is different than addition in that the order of the minuend and subtrahend does matter. Students need to realize that in subtraction the minuend names the whole, the combination of the two parts. It is important to try and guide students to talk about problems, using natural language, to focus on what makes sense and what does not make sense. For example, I can't take away 4 pencils from my pencil case when there are only 2 in it. Putting subtraction number sentences in context may help students understand why the whole, or the greater number, is presented first in the number sentence.

As students play with the idea that you can not subtract a greater number from a number that is smaller, 5 – 7, for example, it will be important to have students use manipulatives frequently. Also, through the use of the appropriate language, when modeling these subtraction stories, students begin to see why you can not take 7 away from 5. Model these stories in a variety of ways, including the use of manipulatives and drawing pictures.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Difference War - Gather a pile of about 50 counters and deal out a pack of number cards to a pair of students. In turn students will turn over one card from the top of their deck. The player with the greater number on the card gets to take as many counters from the pile as the difference between the two cards. For example, if player one turns up an 8 and player two turns up a 6, than player one will receive 2 counters. \((8 - 6 = 2)\). The play continues until all the counters are gone. The player with the most counters at the end of the game wins.

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**Activity Bank:**

- TG p. 46
  - Undercover

Lesson 7: Order in Subtraction

- 2N9 \((9.1, 9.5, 9.9)\)
- TG pp. 47 - 49

**Activity Bank:**

- TG p. 54
  - Reverse It!
  - Number Line Hop
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicator:

2N9.1 Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically.

Elaborations—Strategies for Learning and Teaching

Subtracting using the comparison model is having students find the difference between two set quantities. This is a very difficult idea to show students if they are not given opportunities to construct the idea themselves. It is not immediately clear how you would associate either the addition or subtraction operations with a comparison situation. Again, language use is very important in helping to construct these ideas. The word difference is already familiar to students as the answer to a subtraction sentence. When talking about comparing two set quantities, students will now be asked to find the difference between the two sets, or to find how many more or less one set is than another.

Given a situation such as:

John has 15 coins and Bill has 7 coins.

Show students the different questions, based on this situation, that leads to subtraction. E.g.:

- What is the difference between the amount John has and the amount Bill has?
- How many more does John have than Bill?
- How many less does Bill have than John?

Have students make two towers of different heights. Discuss the difference in height between the two towers to help reinforce the idea that when comparing two numbers you are really finding the difference.

- E.g., If the student makes a tower of height 13 and a tower of height 7, then the difference is 6. Ask students to think about what number sentences they could write to illustrate this difference.

Provide students with various problems and situations involving comparison of two sets. Have them use concrete materials, such as snap cubes, number lines, ten frames, etc., to represent the two quantities. Through the use of these materials, students should see that one set is greater than the other. Students then have something concrete to write about when recording the number sentences.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Play “Store”. Make items in the store different prices, not exceeding 18 cents/dollars. Have students choose two items and find the difference in price. (2N9.1, 9.5, 9.9, 2N10.2)

- Find two different objects to measure using a maximum of 18 snap cubes, or link its. Measure each item and build a tower out of the snap cubes (to represent the item’s height), or a snake (to represent the item’s length). Have students compare each measure by looking at the difference in height or length of the connected snap cubes. Have students write about what they found out in their journal. (2N9.1, 9.5, 9.9, 2N10.2)

- Put 15 beans in a jar and 8 in another. Ask students to predict which jar has the most/least. Have students count out the contents of each jar and find out how much more/less the other jar contains. Have them record the process symbolically. (2N9.1, 9.5, 9.9, 2N10.2)

- Have students compare the number of letters in their names. Decide which student has the most letters, vowels, consonants and so on. Students can then decide how many more letters the longest name has than the shortest name. (2N9.1, 9.5, 9.9, 2N10.2)

Resources/Notes

Math Makes Sense 2
Lesson 8: Subtracting to Compare
2N9 (9.1, 9.5, 9.9)
2N10 (10.2, 10.3)
TG pp. 50 - 53

Audio CD 2:
Selection 11

It is suggested that you supplement the work in the student work book with other activities.

Activity Bank:
TG p. 54
Eggs by the Dozen
Teacher, Teacher
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicator:

2N9.5 Refine personal strategies to increase their efficiency

Elaborations—Strategies for Learning and Teaching

Previously, in this unit seen, students worked through addition and subtraction sentences and problems. At this point, students may be already 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 that work best for them.

The calculator can be an exciting tool to practice the relationships of more than, two more than, one less than, and two less than. One way to model this concept could be to play a game such as “A Calculator Two-More-Than Machine” Here students could be taught how to make a calculator into a two-more-than machine. Press $0 + 2 =$. This makes the calculator a two-more-than machine. Now press any number, for example, 5. Students hold their finger over the $=$ and predict the number that is two more than 5. Then they press $=$ to confirm. If they do not press any of the operation keys (+, −, ×, ÷) the “machine” will continue to perform in this way. (Van de Walle, 2006, page 41)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Make a Two-More-Than Set - Provide students with about six dot cards. Their task is to construct a set of counters that is two more than the set shown in the card. Similarly, spread out eight to ten dot cards, and find another card for each that is two less than the card shown. (This activity can be modified to make a one more than set) (Van de Walle, 2006, p. 45) (2N9.1, 9.9, 2N10.1)

- Real Counting On - This “game” for two students requires a deck of cards with numbers 7 to 12, a die, a paper cup, and some counters. The first player turns over the top number card and places the indicated number of counters in the cup. The card is placed next to the cup as a reminder of how many are there. The second student rolls the die and places that many counters next to the cup. Together, they decide how many counters in all by using the counting on strategy. Have students record their turns on a recording sheet.

Resources/Notes

Math Makes Sense 2
Lesson 9: Mental Math: 1 More, 2 More
2N9 (9.1, 9.9)
2N10 (10.1)
TG pp. 55 - 57

(This specific lesson may be optional. Other activities may be better suited to cover this outcome.)

(Watch how students determine the total amounts in this activity. Students who are not yet counting on may want to count the counters from the cup or will count up from 1 without dumping the counters. Permit these strategies. As students continue to play they will eventually count on as that strategy becomes meaningful and efficient.) (Van de Walle, 2006)
Outcomes

Students will be expected to

2N10 Apply mental mathematics strategies, such as:

- Counting on and counting back
- Making 10
- Using Doubles
- Using addition to subtract

for the basic addition and related subtraction facts to 18

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

Elaborations—Strategies for Learning and Teaching

Students will need ample opportunity to make a strategy become their own. Some students may not be ready to use an idea when it is first introduced but after some reflection, they will make connections and the strategy will become their own.

In order to achieve mental math strategies, practice should be meaningful. This practice is important to develop fluency in basic number operations and strategies.

Provide motivating activities that involve both mental math and pencil and paper tasks using manipulatives.

Practice should be purposeful and focused on the development of thinking strategies and the knowledge of number relationships.

Students in Grade Two should have had many opportunities counting on and counting back. The strategy of using one more and two more is an extension on counting on and counting back. “Walk on” number lines and hundred charts may be a great resource to help students make this strategy their own. Providing a lot of practice and modelling of this strategy, as with all strategies, is suggested to help students make these strategies more automatic.

Achievement Indicator:

2N10.1 Explain or demonstrate the mental math strategy that could be used to determine the basic fact, such as:

1a. Using one more, two more; e.g., for 6 + 2 start at 6 and count on 2, so 6, 7, 8.

1b. Using one less, two less; e.g., for 6 – 2, start at 6 and count back 2, so 6, 5, 4

2a. Making 10; e.g., for 7 + 5, think 7 + 3 + 2

3a. Using Doubles; e.g., 4 + 6, think 5 + 5

3b. Using Doubles plus one, plus two; e.g., 4 + 5, think 4 + 4 + 1

3c. Using Doubles subtract one, subtract two; e.g., for 4 + 5, think 5 + 5 – 1

4a. Using addition to subtract; e.g., for 7 – 3, think 3 + ? = 7
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- **One/Two More Than Dice** - Make a die labelled +1, +2, +1, +2, “one more” and “two more”. Use with another die labelled 4, 5, 6, 7, 8, 9.

![Die with +1 and +2](image)

After each roll have students say the complete fact “Four and two is six.” (Van de Walle, 2006, p. 100) (2N9.1, 9.9, 2N10.1)

- **One-/Two-More-Than Match** - In a matching activity, students can begin with a number, match that with the one that is two more, and then connect that with the corresponding basic fact. (Van de Wall, 2006, p. 100) (2N9.1, 9.9, 2N10.1)

![Matching activity](image)

- **Lotto for +1/+2** - A lotto-type board can be made on a file folder. Small fact cards can be matched to the numbers on the board. The back of each fact card can have a small answer number to use as a check. (2N9.1, 9.9, 2N10.1)

Portfolio

- **Have students create a “Wanted” poster.** Here students could choose a number that has “disappeared”. The poster would describe the number using everything the student can say about the number. For example, in constructing a poster for the number 5, a student may say things like:
  - Last seen one step ahead of 4
  - Two steps behind 7
  - It looks the same as the number of fingers on one hand
  - It is half of 10
  - It can take the form of a nickel
  - It can be found on the clock and my hockey jersey
  - It is a part of my phone number ….. (2N9.1, 9.9, 2N10.1)

Resources/Notes

**Math Makes Sense 2**

- **Lesson 9 (Continued): Mental Math: 1 More, 2 More**
- 2N9 (2N9.1, 9.9)
- 2N10 (10.1)
- TG pp. 55 - 57

(This specific lesson may be optional. Other activities may be better suited to cover this outcome.)

Activity Bank:

- TG p. 62
- Getting to 12
Strand: Number

Outcomes

Students will be expected to

2N10 Continued

Achievement Indicator:

2N10.1 Continued

Elaborations—Strategies for Learning and Teaching

One way to help students build their skills and confidence in counting and developing number relationships is to play a game using dot plates. Dot plates can be created by dotting paper plates using bingo markers or circular stickers of different colors.

Modified from Van de Walle and Lovin, Teaching Students-Centred Mathematics, K-3, 2006 p.44. Briefly hold up a dot plate. Ask students to ‘look’ at the plate, ‘think’ about what you see, and then ‘say’ how many dots were on the plate. Then, ask students to describe what was seen and how this helped them to know how many dots were there. You may use two different colors of dots. For example, a student may see 4 red dots and 1 blue dot. They would say “I see 4 dots plus and 1 dot, I see 5”.

This game can be easily adapted to meet the counting on and counting back outcome as students can be asked to give a number that is one more than the number of dots they see on the plate.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- ‘One-Less-Than’ Dominoes - Use the dot pattern dominoes, or a standard set, to play ‘One-Less-Than’ Dominoes. Play in the usual way, but instead of matching ends, a new domino can be added if it has an end that is one less-than the end on the board. A similar game can be played for two less, one more or two more. (Van de Walle and Lovin, 2006, 44)  
  (2N9.1, 2N10.1)

- Make sets of more/less/same - At a table, provide about 8 cards with sets of 4 to 12 objects, a set of small counters or blocks, and some word cards labelled more, less and same. Next to each card have students make three collections of counters; a set that is more, one that is less and one that is the same. Have them place the appropriate labels next to the sets. (Van de Walle and Lovin, 2006, p. 38)  
  (2N9.1, 9.9, 2N10.1)

- Using addition flash cards, (cards made with different number sentences on them involving adding 0, 1 and 2) students choose a card on top of the pile, perform the operation and find the corresponding number card that is spread on the table. If correct, the student gets the two cards. The player with the most cards at the end of the game, wins. (2N9.1, 9.9, 2N10.1)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 10: Mental Math: 1 Less, 2 Less  
2N9 (2N9.1, 9.9)  
2N10 (10.1)  
TG pp. 58 - 61

(This lesson is optional depending on the needs of students. Other work may be supplemented for this lesson)

**Activity Bank:**

TG p. 62

- Cover the Numbers
- Down from 11
- Transforming Dominoes
Strand: Number

Outcomes

Students will be expected to

2N10 Continued

Achievement Indicator:

2N10.1 Continued

Elaborations—Strategies for Learning and Teaching

The ‘Make 10’ strategy is based on students already having a good understanding of using ‘10’ as an anchor or benchmark. For example, students being able to look at $10 + 3$ and quickly know that it is 13. To be successful in applying this strategy, it is helpful for students to be very familiar with facts that make 10. For example, to be able to recognize that $8 + 2$, $5 + 5$, $3 + 7$, $4 + 6$, $9 + 1$ all equal 10.

The use of a ten frame becomes instrumental in helping students understand how this strategy works. One way to aid in this development is to present a number sentence such as $8 + 5$. Using the ten frame, students would place 8 counters on one ten frame and 5 more counters on a second. To ‘make 10’ students will use the counters on the partially filled frames to create a full frame, or make 10. Through modeling and practice, students may come to realize that it is more efficient to take 2 counters from the 5 and add it to the 8 to make 10. They will see that $8 + 5$ can be thought of as $10 + 3$ which is 13.

Students benefit from a lot of practice with manipulatives before applying this strategy mentally to solve addition problems. Some students, at this time, may not be ready to move on to applying this strategy without the use of manipulatives.

Engage students in activities that will strengthen their computational skills of making 10. Having students decompose the number 10 to find all the sums of 10 could be one way to do this. Students could also be shown, or flashed, various configurations of ten frames with already placed counters or dots where they would then tell how many more counters would be needed to fill the frame, or make 10. Incorporate into morning routines, or as a way to have students get out of their seats to line up for gym, for example.

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

• Make 10 on the Ten-Frame - Give students a mat with two ten-frames. Flash cards are placed next to the ten frames, or a fact can be given orally. The students should first model each number in the two ten frames and then decide on the easiest way to show (without counting) what the total is. The obvious (but not the only) choice is to move one counter into the frame showing 9. Have students explain what they did. Focus especially on the idea that 1 can be taken from the other number and put with the 9 to make 10. Then you have 10 and whatever is left. (Source: Modified from Van de Walle and Lovin, Teaching Students-Centred Mathematics, K-3, 2006. Page 103)

• Say the 10 fact - Hold up a ten-frame card, and have students say the “ten fact”. For a card with 7 dots, the response is “seven and three is ten”. Later with a blank ten frame drawn on the board, say a number less than 10. Students will start with that number and complete the “ten fact”. If you say “four”, they say “four plus six is ten”. (2N9.1, 9.5, 2N10.1)

• Building up Through the Ten Frame - On the board or overhead, draw a ten frame with 9 dots. Discuss how you could build numbers between 11 and 18, starting with 9 in the ten frame. Stress the idea of one more to get to 10 and then the rest of the number. Repeat for a ten frame showing 8. Next, with either the 8 or 9 ten frame in view, call out numbers from 11 to 18, and have students explain how they can figure out the difference between that number and the one on the ten frame. Later, use the same approach, but show fact cards to connect this idea with the symbolic subtraction fact. (2N9.1, 9.5, 2N10.1)
Strand: Number

Outcomes

Students will be expected to

2N10 Continued

Achievement Indicator:

2N10.1 Continued

Elaborations—Strategies for Learning and Teaching

Before students can begin using the strategy of ‘using doubles’, they need to understand what a double is. One way to help students understand doubles is to connect it to visual ideas. For example,

- Double 3 is the bug double: three legs on each side
- Double 4 is the spider double: four legs on each side
- Double 5 is the hand double: two hands
- Double 6 is the egg carton double: two rows of 6 eggs
- Double 7 is the two-week double: two weeks on the calendar is 14 days
- Double 8 is the crayon double: two rows of eight crayons in a box
- Double 9 is the 18-wheeler double: two sides, nine wheels on each side. (Van de Walle, 2006, 56)

Students can draw pictures or make posters that illustrate the double for a given number. There is no reason the images have to be restricted to the ideas here.

When there is a difference of 2 such as 4 + 6, go to the middle number and double it.

As students become comfortable with using the doubles strategy, others, such as double plus one, plus two, subtract one, subtract two can be introduced. Students can be given problems to solve that would have them use these strategies.

As students gain proficiency using these strategies, students could engage in daily oral tasks where a number is said and students tell what the double is. For example, a student can be asked “What is 14?” Students respond “double 7” When students can do this well, use numbers up to 18. Students could also be asked to how to make a number that can not be made from an even number (or a double). For example, ask “What is 17?” Students could respond with “Double 8 and one more, or double 9 subtract 1.”

It is important to monitor the type of strategy that students are using. While you should be accepting of students personal strategies, when those strategies are inefficient, facilitate the students transition to more efficient strategies. These efficient strategies serve them better as they move to more complex situations.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Have students use different visuals and/or manipulatives, to create different models to represent double facts. For example, they could use snap cubes to represent double 5 by connecting five cubes in one tower and five cubes in another to show that they are the same height and the total is 10. Similarly, a number line can be used to show, for example, double 4 where a spider could jump four places starting at 0 and then jump four more places landing on 8.

(2N9.1, 9.5, 9.9, 2N10.1)

- Have students locate, talk about and draw other natural doubles that occur in their world. For example, four legs on a chair (two on each side), 13 letters on each side of the word wall (26 letters altogether).

(2N9.1, 9.9, 2N10.1)

- Ask students to think about how to find the sum of 8 + 6 if they did not already know the answer. Encourage students to come up with different ways of using doubles to figure out this sum. (For example, use double 8 then subtract 2, use double 6 and add 2, use double 7 – where you would take one from the 8 and add it to the 6).

(2N9.1, 9.9, 2N10.1)

- Have students play “Practicing Doubles plus 1”. Create a 4 x 4 game board with different doubles plus 1 sums on it. Players take turns rolling the dice, doubling and adding one. If the answer is on the board, the player can use a counter to cover it up. The first player to get all four counters on the board, wins. This can also be adapted for doubles plus two.

(2N9.1, 9.9, 2N10.1)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 12: Mental Math: Doubles and Near Doubles

2N9 (2N9.1, 9.5, 9.9)

2N10 (10.1)

TG pp. 66 - 69

*This lesson uses the term “near doubles” which is the same as doubles plus one, plus two, subtract one and subtract two strategies.*

*Audio CD 2:*

Selection 12

*Unit Centres:*

TG p. 17)

Quick Subtraction

*Activity Bank:*

TG p. 76

Doubles Monster
Outcomes

Students will be expected to

Problem Solving

• Look for a Pattern

2N9 Continued

Achievement Indicator: 2N9.8 Add a given set of numbers in two different ways and explain why the sum is the same; e.g., \(2 + 5 + 3 + 8 = (2 + 3) + 5 + 8\) or \(5 + 3 + (8 + 2)\).

Elaborations—Strategies for Learning and Teaching

Students have already worked with the “Look for a Pattern” strategy and should be given many opportunities to apply this strategy on problem solving situations. Discuss strategies that students can remember as a whole group and guide your students.

Students already had experience adding, in different orders, numbers with two addends. The focus now is finding the sum of addition sentences that contain more than two addends and to explore adding them in different ways. E.g. \(3 + 4 + 7\) or \(2 + 5 + 3 + 1\).

At this point, students have been given many opportunities to learn, develop and apply addition strategies that are meaningful and relevant to them. When students have to add numbers that have more than two addends, they will need to learn how to adjust and apply their own strategies to fit the numbers in a given addition sentence. It is important to reinforce with Grade Two students that a good strategy is one that helps to make the thinking easier; if it does not, then it is not a good strategy for them to use. Using Doubles and Making Ten are two addition strategies that students may find useful in solving problems involving more than two addends. When students are able to adjust a strategy to solve a number problem, then they are on the road to computational fluency.

Give students six sums to find involving 3 or 4 addends. Prepare these on one page divided into six sections so that there is space to write beneath each sum. Within each, include at least one pair with a sum of ten or perhaps a double; e.g. \(4 + 7 + 6,\) \(5 + 9 + 9,\) or \(3 + 4 + 3 + 7\). Students should show how they added the numbers. Allow students to find the sums without any other directions. (Van de Walle, 2006, pg. 76)

As students share their solutions, it will become quickly apparent that some students will have added the numbers in different orders but got the same sum thus reinforcing the Commutative or Order Property of addition. Finding combinations of ten or using doubles to help find the answer are both efficient ways of applying learned strategies and ones which should be encouraged and modelled. As these strategies are learned and applied, students will begin to look for compatible or friendly numbers when grouping for addition.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Give students situations such as the following: Divide students into groups and ask each group to come up with one order for adding the numbers together and the sum. Allow each group to present their addition sentence. Students will see that although some groups added the numbers in different orders, the sum was the same. E.g.,

  Ms. Jones asked students to bring in reusable beverage containers to use in a math center. 4 students brought in pop bottles, 1 brought orange juice containers, 6 brought apple juice containers and 9 brought in fruit punch containers. Some possible answers include:

  \[6 + 9 + (4 + 1) = 17\]
  \[(6 + 4) + 5 + 9 = 17\]
  \[(9 + 1) + 4 + 6 = 17\]

  The cafeteria sent up 4 cartons of milk for the breakfast club, 13 cartons of milk for recess and at lunch time, 3 more cartons were delivered. The students drank all of the milk. How many cartons of milk did the students drink that day? \(2N9.8\)

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Measurement

Suggested Time:  4 Weeks

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

### Focus and Context

Students are given the opportunity to work with units of time, (days, weeks and months). They also learn about measuring length, height, distance around and mass using non-standard units such as snap cubes, paper clips, parts of the body, etc. Students will move from previous work where they have engaged in identifying days of the week and seasons of the year as repeating events, to reading dates on a calendar and solving problems related to the calendar. In Grade One, students were involved in comparing lengths, areas, capacities and masses by matching, covering and filling; however, in Grade Two students will estimate, measure, compare and order objects using a variety of non-standard units. It is important that students be familiar with and understand the actual attribute they are using to compare and measure.

Estimation in measurement is a skill that is worked on throughout this unit. Estimation activities should focus on helping students come to a realization that different non-standard units will have different measurements depending on the size of the unit. For example, a desk could be two math books wide or 50 paper clips wide. Students need to have a lot of practice using non-standard units to come to this realization. Engage students in careful observation and comparison of objects, and develop appropriate questioning and predicting skills as they estimate how big, how tall, how heavy an object is.

### Math Connects

Students are naturally curious about measurement. They are interested in how tall, how big, and how heavy things are. They accept answers that describe comparisons. Students are able to make connections to their own experiences and their environment by using concrete materials to solve real world problems. The activities in this unit also involve students in using other mathematical concepts such as comparing and ordering numbers, addition and subtraction, graphing, etc. Measurement can be easily integrated into other subject areas in the grade two curriculum, such as social studies, science, language arts and health. Many worthwhile activities that will engage student interest can be created through the use of measurement. The study of measurement also offers opportunities for learning and applying other mathematics, including number operations, geometric ideas and statistical concepts. Over time, students see that measurement is a tool that can help answer questions more precisely. Measurement is about assigning a numerical value to an attribute of an object, relative to another object, called a unit. A greater measurement implies that one object has more of a particular attribute than another.
### Process Standards Key

<table>
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<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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</thead>
<tbody>
<tr>
<td>Shape and Space (Measurement)</td>
<td>2SS1 Relate the number of days to a week and the number of months to a year in a problem-solving context.</td>
<td>[C, CN, PS, R]</td>
</tr>
<tr>
<td>Shape and Space (Measurement)</td>
<td>2SS2 Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Shape and Space (Measurement)</td>
<td>2SS3 Compare and order objects by length, height, distance around and mass, using nonstandard units, and make statements of comparison.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Shape and Space (Measurement)</td>
<td>2SS4 Measure length to the nearest nonstandard unit by: • using multiple copies of a unit • using a single copy of a unit (iteration process).</td>
<td>[C, ME, R, V]</td>
</tr>
<tr>
<td>Shape and Space (Measurement)</td>
<td>2SS5 Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.</td>
<td>[C, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>2PR2 Demonstrate an understanding of increasing patterns by: • describing • reproducing • extending • creating patterns using manipulatives, diagrams, sounds and actions (numbers to 100).</td>
<td>[C, CN, PS, R, V]</td>
</tr>
</tbody>
</table>
Strand: Shape and Space

Outcomes

Students will be expected to

2SS1 Relate the number of days to a week and the number of months to a year in a problem-solving context.

[C, CN, PS, R]  

Elaborations—Strategies for Learning and Teaching

It is important to involve students in daily problem solving activities with the calendar in order to help students gain a deeper understanding of how the days of the week and months of the year are organized. These problem solving activities should allow students to see, more clearly, patterns that exist in the calendar and how these patterns can help them read the calendar more effectively.

The calendar is one of the first places where young students are exposed to a ready made pattern (i.e., the days of the week form a seven element repeating pattern, and the months of the year is the core of a 12 element repeating pattern). Work with the calendar is a good opportunity for students to experience work with patterns therefore calendar tasks should be incorporated on a daily basis at the primary level. Learning the days of the week and months of the year can be taught simultaneously and not as separate entities. It is also important for students to see the relevance of calendar activities in their personal and daily lives by tracking important dates such as holidays and birthdays. You may move beyond identifying just the day by engaging students in problem solving activities involving the calendar. Involve questioning students about the various patterns that are found within the calendar. For example: If today is the 10th of March, what would the date be a week from now? Two weeks from now?

These types of problem solving activities help make deeper connections between the calendar, patterning, and their own life.

It is recognized that it is important that Grade Two students be given opportunities to explore different calendar units (days, weeks and months). Students should have daily interactions with a calendar, making connections between their experiences and real world scenarios. If students are engaged in daily calendar activities, this outcome would simply be a further reinforcement of calendar skills. Although calendar activities are a focus in this unit, it is an ongoing topic, and should be integrated throughout the school year. It is expected that students will communicate their understanding of calendar skills through questioning, games, problem solving, journal writing, group discussions, etc.
### General Outcome: Use Direct or Indirect Measurement to Solve Problems

#### Suggested Assessment Strategies

**Performance**
- Have students play in pairs using a one-month or two-month calendar as a game board as seen below):

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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</tbody>
</table>

Students take turns rolling the dice and moving forward on the game-board to see who reached the end of the board first. Player A rolls the two dice and counts from February 1. Student B continues in the same manner. Apply some rules such as the following:
- If you land on a Wednesday, jump ahead one week.
- If you land on a Sunday, go back three spaces.
- If you land on a Friday, skip the weekend and go to the next Monday.

#### Resources/Notes

**Math Makes Sense 2**

**Launch**
TG p. 15

**Lessons 1: Days of the Week**
2SS1 (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9)
2PR2 (2.1, 2.8)
TG pp. 16 - 20

Some students will have acquired this knowledge at grade one even if it is not formally a part of the curriculum as many teachers do calendar activities as part of their morning routines.

**Lessons 2: Months of the Year**
2SS1 (1.3, 1.4, 1.7, 1.8, 1.9)
TG pp. 21 - 25

**Audio CD 2:**
Selection 17

You may chose to integrate Lesson 1 and 2 into calendar activities, throughout the year as part of daily routines. These two lessons can be taught together and not as separate entities.
Strand: Shape and Space

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be expected to</td>
<td>Some students will have some previous knowledge as many grade one teachers do calendar activities as part of their morning routines. Calendar activities should continue to be incorporated into morning routines and can be applied to real life contexts. This might include finding today’s date, locating a birthday or special event on the calendar. A useful activity is having a “Question of the Day” where class helpers pick from a bank of calendar questions to ask the class. Examples:</td>
</tr>
<tr>
<td>2SS1 Continued</td>
<td>• What will be the date a week from today?</td>
</tr>
<tr>
<td>Achievement Indicators:</td>
<td>• How many days before Saturday?</td>
</tr>
<tr>
<td>2SS1.1 Read a date on a calendar.</td>
<td>• What day will it be three days from today?</td>
</tr>
<tr>
<td>2SS1.2 Name and order the days of the week.</td>
<td>• If Christmas vacation begins on December 19th and ends on January 5th, how many weeks will you be on vacation?</td>
</tr>
<tr>
<td>2SS1.3 Identify the day of the week and the month of the year for an identified calendar date.</td>
<td>• If Easter vacation begins on April 14th and ends on April 23rd, how many weeks/days will you be on vacation?</td>
</tr>
<tr>
<td>2SS1.4 Communicate that there are seven days in a week and twelve months in a year.</td>
<td>• If you went to the cottage with your family on Wednesday and arrived back home on the following Tuesday, would that be more or less than a week?</td>
</tr>
<tr>
<td>2SS1.5 Determine whether a given set of days is more or less than a week.</td>
<td>At the beginning of the month, engage students in a teacher directed activity where students build and create their own monthly calendar. They will need to write the days of the week in order, number the days, and fill in any special dates for that month.</td>
</tr>
<tr>
<td>2SS1.6 Identify yesterday’s/ tomorrow’s date.</td>
<td>Chants, songs, poetry and literature are good methods to teach students the days of the week in order and months of the year. For example, chant:</td>
</tr>
<tr>
<td>2SS1.7 Identify the month that comes before and the month that comes after a given month.</td>
<td>Apples, oranges, peaches, plum, jump right up when your birthday comes. (Have the students say the months in order) January, February, March, April, May, June, July, August, September, October, November, December.</td>
</tr>
</tbody>
</table>
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

**Performance**
- Play “I Spy” using the class calendar as a whole group activity or you can divide the class into “teams”. Ask five clues such as “The date I see is an odd number. It is a two digit number. It is three more than twenty.” Then ask: “What date am I”? (2SS1.1-1.8)
- Make a “Step Book” to show the activities a child does during a week, month, or year.
  E.g., “On Monday I…”, “In October I…” (2SS1.1 - 1.8)

**Journal**
- Ask students to complete a journal entry based on one of the following:
  - Write what you know about days of the week.
  - How many weeks are in a year? How did you get your answer?
  - If today is Tuesday, what day of the week will be in seven days?
  - Today is (Friday, February 6th), what date will it be 10 days from today?
    How might you use a calendar to subtract 14 from a number? (2SS1.1 - 1.8)
  - Using student agendas or personal calendars, have students view a calendar and identify any special days within the month. Have students identify the day and write why the day is special. (2SS1.1-1.8)

**Presentation**
- Have students work in pairs. Have them do a collage/storyboard on the days of the week/month/year. They can use old magazines, the internet, and catalogues for images that represent things they would do. (2SS1.1 - 1.8)

Resources/Notes

**Math Makes Sense 2**
Lessons 1 (Continued): Days of the Week
2SS1 (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9)
2PR2 (2.1, 2.8)
TG pp. 16 - 20

Lessons 2 (Continued): Months of the Year
2SS1 (1.3, 1.4, 1.7, 1.8, 1.9)
TG pp. 21 - 25
Strand: Shape and Space

Outcomes

Students will be expected to
2SS1 Continued

Achievement Indicator:

2SS1.9 Solve a given problem involving time that is limited to the number of days in a week and the number of months in a year.

Elaborations—Strategies for Learning and Teaching

The following problem solving situations would allow students to see patterns that exist in the calendar and how these patterns can help them read the calendar more effectively. Some questions that could be asked of students are:

- Susie has been gone on vacation for 14 days, how many weeks is that?
- Johnny was in hospital for three weeks, how many days was he there?
- There are three months until the end of the school year. About how many days are left until summer vacation?
- It is the 80th day of the school year. What month will we celebrate the 100th day?
- If today is Wednesday, March 3rd, what day will it be in three weeks? What will the date be?
- You are invited to Joshua’s birthday party 10 days from today. What date is Joshua’s birthday?
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

• Create a set of “Who has?” cards, using calendar type questions. For example, one card may say “I have September, Who has the month after July?” I have Friday, Who has the day before Tuesday?” Give each student a card from the deck. The beginning card would have the word “start” on it. The starting student would stand and read his statement and question, s/he would then sit down. The student who has the answer to the question, would then stand up and read the answer and pose the new question. The game continues until all students have had a chance to read their cards.

(2SS1.2, 1.3, 1.7, 1.8)

Resources/Notes

Math Makes Sense 2
Lesson 1 (Continued): Days of the Week
2SS1 (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9)
2PR2 (2.1, 2.8)
TG pp. 16 - 20

Lesson 2 (Continued): Months of the Year
2SS1 (1.3, 1.4, 1.7, 1.8, 1.9)
TG pp. 21 - 25
**Outcomes**

*Students will be expected to*

2PR2 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]

**Achievement Indicators:**

2PR2.1 Identify and describe increasing patterns in a variety of given contexts; e.g., hundred chart, number line, addition tables, calendar, tiling pattern or drawings.

2PR2.8 Identify and describe increasing patterns in the environment; e.g., house/room numbers, book pages, calendar, pine cones, leap years

**Elaborations—Strategies for Learning and Teaching**

Patterns are very important to the teaching of calendar skills. The calendar can be used to find number patterns such as repeating numbers, skip counting, and patterns in rows, columns and diagonals. This outcome has already been addressed, however, this would be a good time to revisit and further reinforce patterning skills using the calendar.

Calendar Patterns that your students might discover:

- **Months of the Year:**
  As you go through the years, there is a pattern of months that repeat: January, February, March, April, May, June, July, August, September, October, November, December is the core of a 12 element repeating pattern of months. Students are not expected to use 12 element patterns in grade 2 however, it can be pointed out in this instance.

- **Days of the Week:**
  The days of the week form a 7 element repeating pattern with a core of Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.

- **Row Patterns - always add 1 when going across a row**

- **Days-of-the-Week Pattern - add 7 when going down a column**

- **Diagonal Patterns such as:**
General Outcome: Use Patterns to Describe the World and Solve Problems

Suggested Assessment Strategies

Performance

- Each day a student selects the number card for the day’s date and posts it on the calendar. Alternatively, the student may write the number on a post-it note to add to a blank calendar. You may use colored “post-its” to initiate pattern work, beginning with a color pattern of “post-its” so that students have to identify both the number and the color to complete the pattern. The student completes the activity by leading the class in reading the complete date for the day: Today is ______________________ [day of week/month/day/year].

(2PR2.1, 2.8)

- Give students cut outs from a simple calendar white out some numbers that are on a diagonal:

  a) 
  b)

  OR

  Ask: What pattern did you see? Explain why this pattern occurs.
  Student might say:
  a) the diagonal shows dates which are one week and 1 day apart so that’s why they are 8 days apart.
  b) Students may say, in this case, that the diagonals shows dates which are 1 week subtract 1 day apart so they are 6 days apart.

(2PR2.1, 2.8)

Resources/Notes

Math Makes Sense 2
Lesson 1 (Continued): Days of the Week
2SS1 (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.9)
2PR2 (2.1, 2.8)
TG pp. 16 - 20

Lesson 2 (Continued): Months of the Year
2SS1 (1.3, 1.4, 1.7, 1.8, 1.9)
TG pp. 21 - 25

Unit Centres:
TG p. 13
Calendar Creations
## Strand: Shape and Space

### Outcomes

*Students will be expected to*

**2SS3** Compare and order objects by length, height, distance around and mass, using nonstandard units, and make statements of comparison.

[C, CN, ME, R, V]

### Elaborations—Strategies for Learning and Teaching

It is necessary that Grade Two students be given the opportunity to compare and order objects using the attributes, length and height. These attributes can be measured using non-standard units. Students need to recognize that the length and height of an object is consistent whether an object is standing or lying down (changing orientation). Students are encouraged to compare and order the length and height using appropriate mathematical vocabulary (length, height, longer than, shorter than, how many units, etc.). Students also need to relate their knowledge of measurement to real world experiences. Using non-standard units will later be followed by the stage when students use standard units (grade 3). If it is clear that students have already mastered the concept of measurement using non standard units then you may want to expose them to centimetres as a unit of measure. This will be a good lead in to work in measurement work in grade three.

**Achievement Indicators:**

1. **2SS3.1** Estimate, measure and record the length, height, distance around or mass of a given object, using non-standard units.

2. **2SS3.2** Compare and order the measure of two or more objects in ascending or descending order, and explain the method of ordering.

Students should use everyday classroom objects such as paper clips, crayons, pencils, etc. to compare and order by length and height. Exposure to measuring larger objects in the classroom can also be used (doors, windows, white boards, etc.) to help students further visualize and compare length and height attributes.

Students will measure length and height using non-standardized units. Use objects that show large differences, (i.e. desk and pencil) moving then towards using objects similar in length or height (pencil and straw). Students should be given opportunities to rank measurements from smallest to biggest and biggest to smallest. They should be able to explain why and how they have ordered the measurements.

Consider making a ‘sorting-by-length station’ or center whereby students estimate, sort, compare and order objects by length. Provide students with some sort of non-standard unit or have them choose their own. They can confirm their predictions by measuring the objects.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

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<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
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<tbody>
<tr>
<td><strong>Performance</strong></td>
<td></td>
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<tr>
<td>• Measurement Search - Give students strips of scrap paper, construction paper or string cut to a particular length to use as a non-standard unit. Have students find objects in the classroom to measure. Students should estimate the length of the objects and check their estimation by measuring. Students record their estimates and measures of objects. (2SS3.1)</td>
<td><strong>Math Makes Sense 2</strong></td>
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<tr>
<td></td>
<td><strong>Lesson 3: Measuring and Comparing Lengths</strong></td>
</tr>
<tr>
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<td>2SS3 (3.1, 3.2)</td>
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<td>2SS4 (4.1)</td>
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<td>2SS5 (5.1)</td>
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<td>TG pp. 26 - 29</td>
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<tr>
<td>• Ask students to each make a ‘worm’ from plasticine. Divide the students into groups of 4 and ask them to arrange their ‘worms’ from shortest to longest. Ask each student to then make a new ‘worm’ using a different color plasticine. Adjust the new worms length until each of the new worms fit between the old ones to make a two-part pattern. Arrange from shortest to longest and also alternating colors. (2SS3.2)</td>
<td><strong>Comparing and ordering objects by distance around and mass will be addressed later in this unit.</strong></td>
</tr>
</tbody>
</table>
Strand: Shape and Space

Outcomes

Students will be expected to

2SS4 Measure length to the nearest nonstandard unit by:
• using multiple copies of a unit
• using a single copy of a unit (iteration process).
[C, ME, R, V]

Elaborations—Strategies for Learning and Teaching

It is suggested when using non-standard units to measure, students are first provided with multiple copies of a non-standardized unit before using a single copy of a unit. Below, a student has placed cubes along the edge of the table to determine that the table is 8 cubes long.

Achievement Indicator:

2SS4.1 Explain why overlapping or leaving gaps does not result in accurate measures.

Explain and model how to place a single unit against the object to be measured, ensuring students understand why there cannot be gaps and/or overlaps of the unit in order to get an accurate measurement.

Activities should be provided where students are shown measurements where obvious gaps and overlapping occur, explaining to them that this will result in inaccurate measures. Give students cut outs of feet and ask them to find the length of the classroom.

Show students an example where you measured an object but have the unit of measure overlapping or include gaps in the measurement. Tell students that the measure of this object is, for example, 15 snap cubes. Ask them to explain how they know this answer is correct or incorrect. Then have students show how they would appropriately measure the object.
**General Outcome:** Use Direct or Indirect Measurement to Solve Problems

**Suggested Assessment Strategies**

**Performance**

- Have students create their own questions regarding measuring objects. Students will then find a partner to pose their question to and have the other student answer the question. For example, a student may ask “How many pencils long is the teacher’s desk?” The other student would then measure the desk with a pencil while their partner checks for overlapping and gaps. (2SS4.1)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 3 (Continued): Measuring and Comparing Lengths.

- 2SS3 (3.1, 3.2)
- 2SS4 (4.1)
- 2SS5 (5.1)

TG pp. 26 - 29

Lesson 3 addresses using multiple copies of a unit, whereas it is not until lesson 5 that students are exposed to using a single copy of the unit of measure.

**Activity Bank:**

TG p. 35

- Scavenger Hunt
- Measuring Sticks

**Unit Centres:**

TG p. 13

- The Three Bears
- Estimation Station!
Strand: Shape and Space

Outcomes

Students will be expected to

2SS2 Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass.

[C, CN, ME, R, V]

Elaborations—Strategies for Learning and Teaching

Students need to understand that the size of the non-standard unit used to measure an object’s length will affect the results of the measurement. To demonstrate this idea, have each student measure the top of his/her desk using two different non-standard units (e.g., paper clips and straws). Students will discover that more paper clips were used than straws because straws are a larger unit. Repeat with other classroom objects and with other different sized units.

Have students make a class measurement riddle book. Students secretly measure an object of choice within the classroom with a non-standard unit. They would then individually write a riddle that could take on the following form:

• I measured _____________.
• It is _________ units long.
• What unit did I use?

Or, students can identify what non-standard unit they used to measure something telling the measurement, but keeping the object that was measured a secret. For example:

• I measured something in my classroom.
• It is _ (10 pencils)_____ long.
• What did I measure?

Provide a selection of non-standard measuring tools for students to explore. Have them work in pairs to choose appropriate non-standard units to measure various objects found in their environment. Ask students to present their findings to their classmates, telling what was measured, the non-standard unit used and whether it was an appropriate unit to use.

Achievement Indicators:

2SS2.1 Explain why one of two given non-standard units may be a better choice for measuring the length of an object.

2SS2.3 Select a nonstandard unit for measuring the length or mass of an object, and explain why it was chosen.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- Have a jumping contest in the class. Discuss what non-standard units can be used to measure the jumping distance. Then have students measure the distance jumped using these units of measure. Students can complete a journal entry to discuss what they found out. Look for ideas such as “the longer the unit was, the easier it was to measure the jump”. (2SS2.1)

- Ask students to work in pairs and cut a string that matches their height. Then find different non-standard units to measure the string. Ask:
  - Tell two different ways you can measure your height
  - Which unit was easier to use and why? (2SS2.3, 2.4)

- Ask students the following question: Would it take more paper clips or popsicle sticks to measure the length of your arm? Ask students to tell you how they know. (2SS2.1)

- Ask students the following question: Would it take more popsicle sticks to measure the width of your desk, the width of your door or the height of your door knob. Ask students to check their estimate. (2SS2.1)

Journal

- Give students the following prompts and ask them to respond in a journal:
  - If you were going to measure the length of the school, what non-standard unit would you use? Why?
  - If you were going to measure the length of your math book, what non-standard unit would you use? Why?
  - Ask if you wanted to know the measurement of the room without using a ruler, would it be best to use paper clips or baseball bats? Why? (2SS2.3)

Resources/Notes

Math Makes Sense 2
Lesson 4: Estimating Length and Choosing Units
2SS2 (2.1, 2.3, 2.4, 2.5)
2SS3 (3.1)
TG pp. 32 - 35

Audio CD 2:
Selection 18 & 19
Strand: Shape and Space

Outcomes

Students will be expected to

2SS2 Continued

Achievement Indicators:

2SS2.4 Estimate the number of nonstandard units needed for a given measurement task.

2SS2.5 Explain why the number of units of a measurement will vary depending upon the unit of measure used.

Elaborations—Strategies for Learning and Teaching

In measurement, we often use approximations. There is always value to use estimation in teaching measurement. There are times when an estimate is all you need, whereas other times it is a useful check on the reasonableness of a more precise answer. When talking to students try to use phrases such as the desk is about 3 unsharpened pencils long or the tile is a 'little less' than two unsharpened pencils. Estimation is an effective way to get students to focus on the attribute being measured.

Have students work in pairs to measure a book. One student measures using pennies and the other measures the same book using toothpicks. Have them record their answer on paper and compare the number. The number of units used will be different. Have students discuss why that might have happened (the smaller the unit the larger the quantity, the bigger the unit the smaller the quantity).
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- As a whole group activity have students estimate and then measure (using non-standard units) the lengths of objects brought from home. Create and complete a T-Chart with one column for recording the estimate and the other column for recording the measurement.  
  \[(2SS2.4)\]

- An activity that can be used to reinforce estimation is to have students partially measure the length (or some other attribute) of an object and then estimate the full measurement.  
  \[(2SS2.4, 3.1)\]

- Give each student two types of non-standard units of measurement which clearly differs in size such as straws and mini marshmallows. Instruct them to measure the length of their desk using both and record their answers. Discuss what students discovered during this activity.  
  \[(2SS2.5)\]

- Have students make a non-standard ruler. Next, have students trace their own feet and have them use this to measure various objects. Discuss why someone with smaller feet, maybe someone in Kindergarten, would need more feet to measure the same object. The same discussion could be had with students that have bigger feet and why they would need less feet.  
  \[(2SS2.5)\]

Student-Teacher Dialogue

- Have students measure the length of a side on a cereal box using a non-standard measure, such as a snap cube. Ask them to explain why, when using a popsicle stick, they would need less popsicle sticks to measure the side of the box.  
  \[(2SS2.5)\]

- Have students stand just behind a line and throw a small soft object, such as a cotton or foam ball. Estimate how many units away the object has landed. Measure and record. An extension of this activity would be to have students record their measure on a sticky note and place it in a relative position on a class number line.  
  \[(2SS2.4)\]

Resources/Notes

\[\text{Math Makes Sense 2}\]

Lesson 4 (Continued): Estimating Length and Choosing Units  
\[2SS2 (2.1, 2.3, 2.4, 2.5)\]
\[2SS3 (3.1)\]

TG pp. 32 - 35

Activity Bank:

TG p. 35

- Measures from the Past

Little Book:

- Long Jump by Bernadette Kelly
Strand: Shape and Space

Outcomes

Students will be expected to

2SS4 Measure length to the nearest non-standard unit by:
- using multiple copies of a unit
- using a single copy of a unit (iteration process).
[C, ME, R, V]

Elaborations—Strategies for Learning and Teaching

Earlier students used multiple copies of a unit to measure length of an object. Now they will use one unit but use it repeatedly as illustrated below:

To introduce the process of iteration (repetition), give students one toothpick and ask them to measure length of their desktop (assuming all desktops are the same size). Encourage them to independently explore how to accurately complete this task. At this stage, do not emphasize the importance of the toothpick starting where the previous one ended as they move it along the length of the desktop. Display a class chart and as students complete the task, have them record their results. Most likely, they will see that there are a variety of answers! Use the chart as a springboard for discussion about the importance of not overlapping or leaving gaps in order to get an accurate answer.

Students should be given many opportunities to use non-standard units with the iteration process.

When measuring objects, counting with one-to-one correspondence will be necessary for accuracy.

Give students modeling clay, one paper clip, one toothpick, and one link-it. Instruct them to measure two objects of varying lengths. Using their modeling clay, have students make “snakes” the same length as the objects to be measured. Take one of their non-standard units, have them make an impression in the snake each time they use that unit. Students can draw the object and record the length in their journals.

Achievement Indicators:

2SS4.2 Count the number of nonstandard units required to measure the length of a given object, using a single copy or multiple copies of a unit.

2SS4.3 Estimate and measure a given object, using multiple copies of a non-standard unit and using a single copy of the same unit many times, and explain the results.
## General Outcome: Use Direct or Indirect Measurement to Solve Problems

### Suggested Assessment Strategies

**Performance**
- Have students work in pairs (girl/girl, boy/boy) to trace each other’s body. After tracing, each student should then cut out their own body shape to be used in upcoming measurement tasks. Ask students to estimate and record their height using paper clips or some other non-standard unit. Next students measure their body length using only one copy of the non-standard unit. Finally, students are provided with multiple copies of the measuring unit to find their body length. Ask students to compare the results and ask some volunteers to present their findings. If the measurements are different, ask them to explain why this might have happened.  
  \((2SS4.2, 4.3)\)

- Have students measure an object with a single copy of a non-standard unit of choice. Note if the student is correctly placing the unit each time during the measurement process.  
  \((2SS4.2)\)

### Resources/Notes

*Math Makes Sense 2*

Lesson 5: Using One Copy of a Unit

2SS4 (4.2, 4.3, 4.4)

TG pp. 36 - 39
### Strand: Shape and Space

**Outcomes**

*Students will be expected to*

**2SS4 Continued**

**Achievement Indicator:**

| 2SS4.4 Estimate and measure, using non-standard units, a given length that is not a straight line. |

**Elaborations—Strategies for Learning and Teaching**

Give students common objects found in the classroom that can be bent easily into curvy lines, i.e., pipe cleaners, modeling clay, wool. Have students first measure the objects straight and then curvy.

![Diagram](image1.png)

Sticker to Sticker - The student places a sticker in the top left corner of her paper and another sticker in the bottom right corner. The student then draws a zigzag path between the two stickers, making sure that the path has at least three parts. Using non-standard units estimate and then measure the length of each line. Record the results.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- Group students in pairs. Give them dice, counters, and paper. Have students draw a curvy line on their paper without crossing over their line. Students can then estimate how many counters it would take to cover the entire line. Students take turns rolling the dice and placing the corresponding number of counters along the line. Students continue rolling the dice, placing counters along the line until it is covered. The student who has the closest estimate to the actual number of counters, wins the game.

  (2SS4.4)

- Draw three curvy lines on a page each with the same starting point. Estimate and then measure using non-standard units to see which line is longest.

(2SS4.4)

- Show a straight piece of yarn, and a curved piece that is shorter (but extends further). E.g.

Ask which piece of yarn is longer and why. How would you find out which is longer?

(2SS4.2, 4.4)

Resources/Notes

Math Makes Sense 2
Lesson 5 (Continued): Using One Copy of a Unit
2SS4 (4.2, 4.3, 4.4)
TG pp. 36 - 39
Strand: Shape and Space

Outcomes

Students will be expected to

2SS5 Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.

[C, R, V]

Achievement Indicator:

2SS5.1 Measure a given object, change the orientation, re-measure, and explain the results.

2SS3 Compare and order objects by length, height, distance around and mass, using non-standard units, and make statements of comparison.

[C, CN, ME, R, V]

Achievement Indicators:

2SS3.1 Estimate, measure and record the length, height, distance around or mass of a given object using non-standard units.

2SS3.2 Compare and order the measure of two or more objects in ascending or descending order, and explain the method of ordering.

Elaborations—Strategies for Learning and Teaching

It is important to provide many opportunities for students to play with and measure different objects in different orientations (position and direction). By providing students with this type of practice, students will have opportunity to conclude that orientation does not change the measurement of the object.

Have students work in pairs to measure each other. First students measure each other lying on the floor in different directions and record the measurements. Next have them measure each other standing up. They will see that the height of each student stays the same even though their orientation is different.

Distance around refers to perimeter and circumference. ‘Distance around’ is a term that Grade Two students may be more comfortable using instead of the formal terminology, perimeter.

Initially, students will learn to measure the perimeter of a shape such as their desk by fitting a string around the desk and cutting the string to that length. Once students are comfortable measuring the distance around a linear object (one that has straight edges) students are more capable of understanding the notion of measuring around curves. When measuring round or curvy objects is first introduced, students should use string, ribbon, wool, etc.

Provide students with various round objects. Have them estimate and predict the order from smallest distance around to the largest distance around. Students should measure each object, recording each measure and then confirm their predictions, altering the order if necessary. Have them explain why they needed to change the order, if they did.

Provide students with some round objects. Using non-standard units, create a non-standard ruler (E.g., 6 blocks, 4 paper clips, 7 counters, 3 footprints, etc.) Have students measure the distance around of each round object and create a T-chart with the headings ‘Longer’ and ‘Shorter’. Under each heading have students record what objects are longer or shorter than the non-standard ruler.
# General Outcome: Use Direct or Indirect Measurement to Solve Problems

## Suggested Assessment Strategies

### Journal

- Explain what you would discover (using pictures, numbers or words) if you measured your pencil lying flat on your desk and then measured it standing up. (2SS5.1)  

### Performance

- Have students choose two different objects, one with straight edges and one that is round or with curvy edges. Students can predict which of the two objects has the greatest distance around and explain their prediction. They can then measure the distance around each object to confirm their predications. (2SS3.1)  

- Estimate how long a string you will need to fit around the widest part of a globe or some other round object. Cut the string and test your prediction. Encourage students to make statements of comparison by asking “Was your string too long, too short, or just right?” (2SS3.1)  

- Play “Closest Estimate” - Ask students to bring a variety of round objects from home. Place a number of the objects at each table. Instruct Student A to select an object and place it at the center of the table. All four students estimate the distance around the object by cutting a piece of string to show their estimate. Student A then measures the distance around the object. All students compare their estimate with the actual measure by laying the pieces of yarn side-by-side on a table. The person with the closest estimate, scores a point. They continue until all objects on the table have been used. The student scoring the most point wins the title “Best Estimator for Today!” (2SS3.1)  

- Find two square or rectangular objects in the classroom. Estimate and record how many non-standard units each will be. Measure and record the distance around. How do your measurements compare? (2SS3.2)  

- Ask groups of students to explore ways to compare the height of the waste paper basket (or any similar shape) to the distance around its top. Present their findings to the class. Supply students with non standard units such as string, wool, ribbon, blocks, etc. (2SS3.2)  

## Resources/Notes

- **Math Makes Sense 2**  
- **Lesson 5 (Continued): Using One Copy of a Unit**  
  - 2SS4 (4.2, 4.3, 4.4)  
  - TG pp. 36 - 39  

- **Activity Bank:**  
  - TG p. 45  
  - Wacky Units  
  - Beads, Beads, Beads  

- **Lesson 6: Distance Around**  
  - 2SS3 (3.1, 3.2)  
  - 2SS5 (5.1)  
  - TG: pp. 40 - 44  

- **Activity Bank:**  
  - TG p. 45  
  - How Far Around?  
  - Measuring Ribbons  

- **Unit Centres:**  
  - TG p. 13  
  - The Three Bears  
  - Estimation Station!
### Strand: Shape and Space

**Outcomes**

*Students will be expected to*

**Problem Solving**

- Guess and Check
- Using an Object

**Elaborations—Strategies for Learning and Teaching**

As students engage in measurement activities, they are involved in estimating, comparing, ordering, predicting and confirming, using non-standard units. The problem solving strategy in this unit again focuses on using the strategy ‘Guess and Check’ and using objects to help the problem.

2SS2 Relate the size of a unit of measure to the number of units (limited to nonstandard units) used to measure length and mass. [C, CN, ME, R, V]

When introducing this concept, note that the terms ‘mass’ and ‘weight’ are similar, but they are not the same. ‘Weight’ measures how heavy an object is (measured with a scale), while ‘mass’ measures the amount of matter in an object (measure with a balance). Students should be exposed to the correct term ‘mass’.

The most conceptual way for students to compare the mass of two objects is to hold one in each hand, extend their arms, and experience the relative downward pull on each – effectively communicating to a young student, what the terms “heavier” means.

To help students conceptualize ‘mass’, have them create their own simple balance scale using a coat hanger, string and two cups. This is one way to introduce a balance scale but may lack accuracy so cannot be used for more advanced work. Students can then use this balance to compare masses of objects.

Students should be familiar with how a balance scale works and be able to identify the object whose mass is greater is the side of the balance that is pulled down more. Describe a balance scale as being like a teeter-totter in the playground.
**General Outcome: Use Direct or Indirect Measurement to Solve Problems**

**Suggested Assessment Strategies**

*Performance:*

- Read a book about ladybugs, such as *Ladybug on the Move* by Richard Fowler - A ladybug flew into our classroom and landed on an object. The object was 15 cubes long, what could the object be? If the object was 25 cubes long, what do you think it could be?

- Mystery Object (center activity) - Have a collection of objects available for exploration and several “clue cards”, e.g., “This object is longer than 5 cubes but shorter than 10 cubes” and “It is heavier than the class stapler”, etc. Students measure to determine the object after reading the clues. Each group investigates using various tools to determine the “mystery” object.

- Have students make a “fish” by putting crumpled scrap paper as well as a variety of other objects with different masses, into a sock. Tie the end of the sock. Have students work in pairs to take turns weighing their fish (using non-standard units) on a balance scale. First have them use smaller units such as toothpicks and then bigger units such as blocks. Students should observe that it took more toothpicks than blocks to balance the scale. Children’s literature can be used to support this activity such as *Fishy Scales*, written by Calvin Irons. ISBN: 0 7327-3196-8

**Resources/Notes**

*Math Makes Sense 2*

Lesson 7: Strategies Toolkit

TG: p. 46 - 50

Lesson 8: Measuring Mass

2SS2 (2.2, 2.3)

2SS5

TG pp. 48 - 50

Activity Bank:

TG p. 55

Search and Find

Unit Centres:

TG p. 13

The Three Bears

Estimation Station!
Strand: Shape and Space

Outcomes

Students will be expected to

2SS2 Continued

Achievement Indicators:

2SS2.2 Explain why one of two given nonstandard units may be a better choice for measuring the mass of an object.

2SS2.3 Select a nonstandard unit for measuring the length or mass of an object, and explain why it was chosen.

2SS5 Continued

Achievement Indicator:

2SS5.1 Measure a given object, change the orientation, re-measure, and explain the results.

Elaborations—Strategies for Learning and Teaching

Students need to see the relationship between the mass of the object that is being measured and the mass of the non-standard measuring unit. For example, if a child wants to find the mass of their pet rock, they must first understand their rock is a heavy object and it would be best to choose a non-standard unit that is also heavy, such as a marble as opposed to a toothpick.

Provide students with an opportunity to discover why certain non-standard units may be more efficient and accurate in measuring the mass of an object. Through guided instruction and exploration, students can further develop their thinking about choosing appropriate non-standard units of measure. Give groups of students two types of non-standard units of measurement which clearly differs in size, such as toothpicks and blocks. Instruct them to measure the mass of their eraser using both and record their answers. Discuss what students discovered during this activity. Ask if you wanted to know the mass of your shoe, would it be best to use toothpicks or blocks and why.

Students need to recognize that whether an object is standing up, lying flat, or tilted, the mass of the object will remain the same.

Divide an equal mass of play doh, or snap cubes among all students. Call upon pairs of students to weigh their portions on the balance scale to ensure each group has an equal amount. Invite all students to create something interesting using their materials. After five minutes, bring students together to share their creations. Ask students to tell which creation has a greater mass than another. Have them explain their reasoning and check on the balance scale to confirm their thinking.
**General Outcome: Use Direct or Indirect Measurement to Solve Problems**

**Suggested Assessment Strategies**

**Journal**
- In the previous “fish” activity encourage students to write a journal entry explaining why blocks (or the heavier non-standard unit) were a better choice for measuring the mass of their “fish”. (2SS2.2)

**Performance**
- Provide a selection of non-standard measuring tools for students to explore. Have them work in pairs to choose appropriate non-standard units to measure various objects found in the classroom environment. Ask students to present their findings to their classmates, telling what was measured, the non-standard unit used and whether it was an appropriate unit to use. (2SS2.2, 2.3)

**Resources/Notes**

*Math Makes Sense 2*
Lesson 8 (Continued): Measuring Mass
2SS2 (2.2, 2.3)
2SS5
TG pp. 48 - 50
### Strand: Shape and Space

#### Outcomes

*Students will be expected to*

2SS3 Continued

#### Elaborations—Strategies for Learning and Teaching

Use vocabulary such as “lighter than”, “heavier than”, “second heaviest”, etc to model how to describe and compare masses.

As a whole class choose objects that have obvious differences in mass. Rank them from heaviest to lightest or lightest to heaviest, using non-standard units.

In measurement, approximations are important. When talking to students try to use phrases such as the eraser’s mass is about 3 blocks. Students need to be given ample opportunity to measure with non-standard units before estimating using non-standard units. When students have a good grasp of estimation, they will be better focused on measuring and recording certain attributes.

Students should be given opportunities to rank objects by mass from heaviest to lightest and lightest to heaviest. They should be able to explain why and how they have ordered the objects.

<table>
<thead>
<tr>
<th>Achievement Indicators:</th>
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</thead>
<tbody>
<tr>
<td><strong>2SS3.1</strong> Estimate, measure and record the length, height, distance around or mass of a given object, using nonstandard units.</td>
</tr>
<tr>
<td><strong>2SS3.2</strong> Compare and order the measure of two or more objects in ascending or descending order, and explain the method of ordering.</td>
</tr>
</tbody>
</table>
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

**Performance.**

- Bring in a schoolbag/tub filled with different items. Have students compare the mass of each item. Record the results and choose a way to rank them (e.g., heaviest to lightest, lightest to heaviest). This could also be used as a center activity. (2SS3.1, 3.2)

- Sports is an interest of many students. Discuss various sports and types of equipment used. Ask students to compare the masses of different types of balls, such as soft balls, ping pong balls, footballs, etc. Are the sport balls that are bigger, usually heavier? (2SS3.2)

- Can something that is small be heavier than something that is large? Find two objects to demonstrate and use a balance scale to prove your thinking. (2SS3.2)

Resources/Notes

*Math Makes Sense 2*

Lesson 9: Comparing by Mass
2SS3 (3.1, 3.2)
2SS5 (5.1)
TG pp.51 - 55

Audio CD 2:
Selection 20

Activity Bank:
TG p. 55
Play Ball!
Riddle Me, Riddle Me
Addition and Subtraction to 100

Suggested Time:  5 Weeks
Unit Overview

Focus and Context

Earlier work in Grade Two focused on addition and subtraction situations with 1 and 2-digit numbers with answers to 18 and on learning how to represent numbers to 100. Through this early work, students have been given opportunities to develop basic concepts needed to begin the study of addition and subtraction to 100.

Students will use their previous experiences to add and subtract 1-digit and 2-digit numbers, investigate/create story problems and develop/refine personal strategies.

As students continue to work with numbers, they will be given opportunities to gain a better understanding of the base ten numeration system. This understanding is encouraged through the work with concrete materials, such as base ten blocks, ten frames, number lines, linking cubes, etc. It is important that the manipulatives are available to students. They will be encouraged to group and regroup units and rods. They also learn to interpret and explain numbers and understand various ways to write a number symbolically. Throughout the unit, estimation and experiences checking for reasonableness of an answer will be modeled.

Math Connects

In Kindergarten and Grade One, students were provided with problems that may have involved addition and subtraction, but often without using any formal addition or subtraction language. In fact, these problems may seem like counting problems to the students, not addition or subtraction, particularly since they tended to solve these problems by counting. Young students will naturally then, develop their own strategies for solving these types of problems. In this way, students in the lower grades work with difficult tasks, in many contexts, they also build an understanding of operations of numbers. Suitable contexts may arise through student-initiated activities, teacher-created stories and real-world situations. As students become more proficient at thinking about numbers in these ways, introduce them to terminology such as add, take-away, subtract, sum, difference, etc. When students enter grade two they may have been exposed to these terms, and may be using them as part of their everyday mathematical vocabulary. The challenge then, at the grade two level, is to build on students’ natural problem-solving inclinations and to preserve and encourage an attitude towards learning that values problem-solving. Through this process children will naturally develop more efficient problem-solving strategies. Working with the concepts of addition and subtraction will form the basis needed for further work in number sense throughout the higher grades.
### Process Standards Key

<table>
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<tr>
<th>Key</th>
<th>Communication</th>
<th>Connections</th>
<th>Mental Mathematics and Estimation</th>
<th>Problem Solving</th>
<th>Reasoning</th>
<th>Technology</th>
<th>Visualization</th>
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<tr>
<td>[C]</td>
<td></td>
<td>[CN]</td>
<td>[ME]</td>
<td>[PS]</td>
<td>[R]</td>
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<td>[V]</td>
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### Curriculum Outcomes

<table>
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<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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<tr>
<td>Number</td>
<td>2N4 Represent and describe numbers to 100, concretely, pictorially and symbolically.</td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td>Number</td>
<td>2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number.</td>
<td>[C, R]</td>
</tr>
<tr>
<td>Number</td>
<td>2N9 Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by: • using personal strategies for adding and subtracting with and without the support of manipulatives • creating and solving problems that involve addition and subtraction • explaining that the order in which numbers are added does not affect the sum (Commutative Property) • explaining that the order in which numbers are subtracted may affect the difference.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>2PR3 Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0-100).</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>2PR4 Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.</td>
<td>[C, CN, R, V]</td>
</tr>
</tbody>
</table>


Strand: Number

Outcomes

Students will be expected to

2N9 Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

• Using personal strategies for adding and subtracting with and without the support of manipulatives.

• Creating and solving problems that involve addition and subtraction.

• Explaining that the order in which the numbers are added does not affect the sum (commutative property).

• Explaining the order in which numbers are subtracted may affect the difference.

(C, CN, ME, PS, R, V)

Elaborations—Strategies for Learning and Teaching

In Grade 2, students begin to work at combining and separating numbers in a wide variety of ways as they solve 2-digit addition and subtraction problems. Allowing students to invent their own computational strategies, will enhance their understanding of place value and provide a solid foundation for flexible methods of computation. Place value and computation need not be separated.

Using models is essential in helping students to relate the physical action of joining and/or separating two groups. Base ten blocks are a great way to do this. In previous work, students have had many opportunities to practice representing numbers using base ten blocks and joining or separating them. Give students many opportunities to model addition and subtraction using concrete materials. This can extend to representing pictorially and symbolically.

(Continued)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Ask students to choose a number from the hundred chart and record it. Show what happens to this number when you add or subtract 10, or multiples of 10. (Ensure manipulatives are available to students as they complete this problem.) (2N9.1, 9.5)

- Using a hundred chart, ask students to choose a number less than 20. E.g. Someone chooses the number 6.
  - Then ask students to add 10 to 6 and color the sum on their hundred chart.
  - Ask students to add 40 to 6 and color the sum.
  - Ask students to add 20 to 6 and color the sum.

Ask students to color the sum of other multiples of 10. Have them write about the patterns they see in their colored hundreds chart (Observe students conceptual understanding of adding 10. Some may not have a recognizable pattern). (2N9.1, 9.2, 9.5)

Performance

- Have students represent a given number using base 10 blocks. Ask students to show what happens when you add 10 or multiples of 10 to the number. Have them symbolically record the number sentence showing the sum. (2N9.1, 9.5)

Resources/Notes

Math Makes Sense 2
Launch:
TG p. 17
This is a good introduction to the unit.

Unit Centre:
TG. p. 15
My Number Is

Lesson 1: Adding 10’s
2N9 (9.1, 9.5, 9.9)
TG p. 18

Audio CD 3:
Selection 1
Outcomes

Students will be expected to

2N9 Continued

Achievement Indicators:

2N9.1 Continued

Elaborations—Strategies for Learning and Teaching

Number of the Day - As a part of the morning/daily routine, use a hundred chart and indicate a ‘Number of the Day’. Use this number to pose questions such as:

- What is 10 more than this number? What is 20 more?
- What is 10 less?
- Is there a number that is 50 less?

Present the base ten model of the number and then physically show how to add 10 more, 20 more etc., as you engage students in a conversation about the process.

Through this daily practice, students should come to realize that only the tens place is changing, when adding or subtracting 10, whereas the ones place is remaining the same.

Adding 10’s is a good place to reinforce money concepts formally introduced in previous units. Students can practice adding or subtracting 10’s using dimes.

To allow for differentiation in student learning, provide choice within tasks that will accommodate all levels of ability. Simply choosing different numbers in a question for students to add, subtract or represent may allow all students the ability to access the problem and challenge them.

Research has shown that students gain a greater understanding of concepts if they have been given ‘hands on’ opportunities to develop their own strategies. Talking and discussing are important aspects in refining a student’s personal strategy to solving problems. As students talk about their thinking or engage in partner and small group discussions, they are able to organize their thoughts, but also hear how others are making sense of the task. This sharing of ideas helps to solidify understanding for some students, and for others, helps them to think about the problem in a new way. This helps them to refine their own personal strategies. Asking students the following questions can help facilitate discussion:

“Tell me what you were thinking when you did that.”

“Why or how does that work?”

“What would happen if...?”

“How does that make sense to you?” This type of questioning allows students to make connections needed to refine their own strategies.

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Resources/Notes</th>
</tr>
</thead>
</table>
| • Collect samples of student work throughout the unit. Note whether students have refined their strategies to include more efficient methods. | Math Makes Sense 2  
Lesson 1 (Continued): Adding 10’s  
2N9 (9.1, 9.5, 9.8, 9.9)  
TG pp. 18 - 20 |

Activity Bank:  
TG. p. 26  
Tens Attack!  
Add a Ten

Lesson 2: Adding 1-Digit and 2-Digit Numbers  
2N8 (8.1)  
2N9 (9.2, 9.5, 9.9)  
TG pp. 21 - 25

Continue to encourage the ‘counting on’ strategy as an efficient way of adding a small 1-digit number to a 2-digit or multi-digit number.
Outcomes

Students will be expected to

2N9 Continued

Achievement Indicators:

2N9.9 Solve a given problem, using horizontal and vertical forms.

2N9.5 Continued

2N9.9 Solve a given problem, using horizontal and vertical forms.

Elaborations—Strategies for Learning and Teaching

It is important to monitor the type of strategy students are using as they solve problems. Be accepting of student’s personal strategies and give them sufficient time to work with their strategy; however, when strategies are inefficient and students are given time to realize why they are inefficient, they can be guided to find more efficient ways to solve the problem. More efficient strategies serve students better as they move to more complex situations. Refrain from showing and telling students how to solve problems (focusing on a procedural method) rather, encourage students to invent their own strategies, and guide students to discover more efficient methods.

Use what students already know about strategies to help them create other personal strategies. Encourage them to use previously learned strategies to add and subtract 1 and 2-digit numbers, such as doubles and doubles plus one. At this point, it may be important that the ‘counting-on’ strategy be brought forward as an efficient way of adding a small 1-digit number to a 2- or multi-digit number.

As students work through solving addition and subtraction problems, make a conscious effort to present problems using both forms. In the past there has been a stronger emphasis on using vertical forms, however, vertical forms tend to make students think about the actual algorithm of working from left to right. When numbers are placed horizontally, however, it supports the idea of what addition is – that of joining.

Sometimes adding zero can be a stumbling block for students; therefore, it is important that there are many discussions and activities involving the number ‘zero’ to further their understanding of this concept.

2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number.

[2N8.1 Add zero to a given number, and explain why the sum is the same as the addend]
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Write a variety of two-digit numbers on small pieces of paper, and place them in a paper bag. Have students draw two pieces of paper, record the appropriate addition sentence horizontally and/or vertically, and use personal strategies to solve their problem. Ensure that students are using both horizontal and vertical forms.
  
  (2N9.1, 9.5, 9.9)

- Using a walk-on hundred chart, present students with various addition sentences, including some with zero. Students move appropriately along the hundred chart to represent the problem. (Note: A walk-on hundred chart can be made by using a white vinyl tablecloth or shower curtain and a permanent marker.)
  
  (2N8.1, 2N9.1, 9.5)

Resources/Notes

Math Makes Sense 2
Lesson 2 (Continued): Adding 1-Digit and 2-Digit Numbers
2N8 (8.1)
2N9 (9.2, 9.5, 9.9)
TG pp. 21 - 25

Activity Bank:
TG p. 26
Square Sums
Number Match
**Strand: Number**

**Outcomes**

_Students will be expected to_

2N9 Demonstrate an understanding of addition (limited to 1-and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

- using personal strategies for adding and subtracting with and without the support of manipulatives.
- creating and solving problems that involve addition and subtraction.
- explaining that the order in which the numbers are added does not affect the sum (commutative property).
- explaining the order in which numbers are subtracted may affect the difference.

(C, CN, ME, PS, R, V)

**Elaborations—Strategies for Learning and Teaching**

It is important that students be given various opportunities to develop their own personal strategies for solving addition and subtraction problems. Students experience greater success with problem solving when they have opportunity to create their own strategy.

Many students may have no difficulty developing their own problem-solving strategy, but may experience difficulty with recording their ‘thinking story’, especially those involving many steps.

After students have had opportunity to explore and discover their own strategies for solving problems, have one student share his/her thinking to solve the problem. As a class, discuss how this thinking can be recorded. Repeat this procedure for other students with different strategies. Feel free to discuss the efficiency of the strategies.

**Achievement Indicator:**

2N9.8 *Add a given set of numbers in two different ways, and explain why the sum is the same.*

The associative property tells us that to add three numbers, you can add the first two numbers and then add the last number to the sum. Or, you can add the last two numbers and then add the first number to the sum. For example, to add 15 +14 +13, you can add 15 +14 to get 29 and then add 13, or you can add 14 +13 to get 27 and then add 15 to get your answer. Provide an example such as:

\[ 14 + 38 + 6 \]

Ask: Which two numbers would you add together first to make adding on the third number easier? Explain your choice.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Journal**

- Have students grab two handfuls of counters, count the counters in each group and have them create and solve a number sentence to represent the quantity of counters. Have students record their thinking as they solve their problem.  
  \( (2N9.1) \)

- Have students create a real-world story problem using groups of counters. Solve their problem, and record their thinking.  
  \( (2N9.1, 9.2, 9.5, 9.9) \)

**Performance**

- Spin and Solve Game - A student spins a spinner and writes the number he spins as a digit in the first problem. Alternating with a partner, they repeat this four times to complete both 2-digit addends. They solve the addition problems to find the sum. The player with the greatest sum is the winner of that round. Continue the game in this manner while keeping a tally of rounds won. Note: Students with strong mathematical thinking will quickly discover the value of placing greater numbers in the tens place, and lesser numbers in the ones place to produce a greater sum. Ask the student with the largest sum to explain his/her strategy.  
  \( (2N9.1, 9.5, 9.9) \)

- Have students work with a partner to choose two 2-digit numbers from a hundred chart. One student writes an addition sentence, while the other student writes the corresponding ‘turn-around’. Students then solve their problem individually and compare answers.  
  \( (2N9.1, 9.5, 9.8, 9.9) \)

- Arrange students in groups of three. Have each student measure his/her foot from heel to toe in centimeters. Students then record the three measurements and create and solve a number sentence to find the total length of their three feet.  
  \( (2N9.1, 9.2, 9.5, 9.8, 9.9) \)

**Resources/Notes**

*Math Makes Sense 2*

Lesson 3: Adding 2-Digit numbers using personal strategies.  
\( 2N9 (9.5, 9.8, 9.9) \)  
TG pp. 27 - 30

Audio CD 3:
Selection 2

Activity Bank: Reach 100  
TG: p. 38

Unit Centres:  
TG: p. 15  
Store Front

Lesson 4: Adding More than 2 Numbers  
\( 2N9 (9.1, 9.2, 9.5, 9.8) \)  
TG pp. 31 - 38

Audio CD 3:  
Selection 3

Activity Bank:  
TG: p. 38  
Reach 100  
Pick up Sticks
Strand: Number

Outcomes

Students will be expected to
2N9 Continued

Achievement Indicators:

2N9.2 Create an addition or subtraction number sentence and a story problem for a given solution.

2N9.3 Solve a given problem involving a missing addend, and describe the strategy used.

Elaborations—Strategies for Learning and Teaching

It is important that students be involved in solving meaningful and worthwhile addition and subtraction tasks that are engaging and interesting. Creating activities that are relevant and personal, such as using student names within questions, interesting facts about people, world records, playing games, etc., are examples of how to make classroom work more meaningful.

Addends are the numbers you add together and the result is the sum (answer).

E.g. 32 + 11 = 43

The numbers 32 and 11 are addends, and 43 is the sum.

Introducing the concept of finding the missing addend could be approached from the idea that a number is made up of two parts. Students have had practice with this concept in Grade One and may need some review. Making ‘Number Trains’ (a train comprised of two colored cubes) may be a good starting point for teaching missing addends.

12 + __ = 16

Addition and subtraction problems can be categorized based on the kinds of relationships they represent. It is important that different 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
• Part-Part-Whole Problems: whole unknown, part unknown
• Compare Problems: difference unknown, larger unknown, smaller unknown

(Van de Walle and Lovin, 2006, pp. 67 - 69)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Provide students with a complete addition or subtraction sentence and have them create a real-world problem. (2N9.2, 9.5)

Performance

- Present addition and subtraction stories for each of the four structures. Have students create and represent the problems either concretely (using manipulatives), pictorially (using sketches), and/or symbolically (recording number sentences). The following examples may be used:

Join Problems

- Result Unknown- Sarah placed 24 pencils on the table. Steven placed 37 more pencils on the table. How many pencils are on the table altogether?
- Change Unknown- Sarah placed 24 pencils on the table. Steven placed some pencils on the table. There are 61 pencils altogether. How many pencils did Steven place on the table?
- Initial Unknown- Sarah placed some pencils on the table. Steven placed 31 more pencils on the table. There are 61 pencils altogether. How many pencils did Sarah place on the table?

Separate Problems

- Result Unknown- 35 children are playing soccer on the field. 12 children went home. How many children are still on the field?
- Change Unknown- 35 children are playing soccer on the field. Some went home. There are 23 children left on the field. How many children went home?
- Initial Unknown- Some children are playing soccer on the field. 12 children went home. There are 23 children left. How many children were playing soccer in the beginning?

Continued
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicators:

2N9.3 Continued

When students see addition and subtraction as simply “put together” and “take-away”, they often have difficulty with more complex structures. Students should be presented with a variety of problems in which they are working with these different structures.

2N9.6 Match a number sentence to a given missing addend problem.

Using hundred charts and arrows is another effective way to teach addition and subtraction of 1- and 2-digit numbers. Use the arrow to represent a starting point and an end point. Together, write a number sentence that is represented. E.g., $23 + \square = 69$. Engage the students in a discussion about how a vertical arrow means adding/subtracting 10, while a horizontal arrow means adding/subtracting 1.

2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number.

[C, R]

2N8.2 Subtract zero from a given number, and explain why the difference is the same as the given number.

It is important for students to think of subtracting 10s as simply the inverse or opposite of adding 10s, rather than as a separate idea.

Sometimes subtracting zero can be a difficult for some students, therefore, it is important that children engage in discussion and activities involving the number ‘zero’ to further their understanding of this concept.

Encourage children to use the mental math strategy of ‘counting back’ for subtraction of a smaller number from a larger number. This is particularly effective for subtraction of 1, 2 or 3.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

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#### Compare Problems

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- Whole Unknown- Mark has 14 purple balloons and 28 yellow balloons. How many balloons does he have altogether?
- Part Unknown- Mark has 42 balloons. 14 of his balloons are purple and the rest are yellow. How many yellow balloons does Mark have?

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- Difference Unknown- Mark has 42 stickers. Julia has 28 stickers. How many more stickers does Mark have than Julia?
- Larger Unknown- Mark has 14 more stickers than Julia. Mark has 42 stickers. How many stickers does Julia have?
- Smaller Unknown- Mark has 14 more stickers than Julia. Julia has 28 stickers. How many stickers does Mark have?

(2N9.1, 9.2, 9.3, 9.4, 9.5, 9.9)

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Strand: Number

Outcomes

Students will be expected to
2N9 Continued

Achievement Indicators:

2N9.5 Refine personal strategies to increase their efficiency.

Be cautious when teaching subtraction strategies. Traditionally, students were taught to subtract 2-digit numbers using a vertical algorithm. This rote method often lacked deep understanding. It is most effective for students to discover their own personal strategies. This is best done through many and varied experiences working individually and collaboratively with peers. Always ensure that manipulatives are readily available for students to use. After students have had opportunity to explore and discover their own strategies for solving subtraction problems, have one student share his/her thinking to solve the problem. As a class, discuss how this thinking can be recorded. Repeat this procedure for other students with different strategies. Feel free to discuss the efficiency of the strategies.

2N9.4 Solve a given problem involving a missing minuend or subtrahend and describe the strategy used.

A minuend is the whole amount in subtraction, the top or first number. A subtrahend is the part taken away in subtraction, the bottom or second number. The difference is the answer in a subtraction sentence.

For example,

\[ 56 - 22 = 34 \]

The minuend is 56, the subtrahend is 22, and the difference is 34.

Students must have a firm understanding of the part, part whole concept in order to have success with this indicator. Continued practice with combining and separating wholes is encouraged throughout this unit using concrete experiences.

Students should be able to describe that when the whole group is missing, you can figure out what it is by adding the parts. When one part is missing, you can either add on to the part you know to get the whole, or subtract the part from the whole.

Please note: It is not necessary for children to use the terms minuend and subtrahend.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

- Toss It! Game - A student tosses two counters into a box lid which has been prepared with a grid with numbers less than 100. He records the numbers the counters land on as a subtraction problem on his paper. After he solves the problem the turn then passes to his partner. The student with the greatest answer is the winner for that round. Students keep a tally of how many rounds they win. The first person to win 10 rounds is the overall winner. (2N9.1, 9.5, 9.9)

- Spin and Solve Game - A student spins a spinner and writes the number he spins as a digit in the first problem. Alternating with a partner, they repeat this four times to complete both 2-digit addends. They solve the subtraction problems to find the difference. The player with the greatest difference is the winner of that round. Continue the game in this manner while keeping a tally of rounds won. If students arrange the digits such that the problem cannot be solved, their turn is “busted”! (e.g. 53 - 80 cannot be solved) Note: Students with strong mathematical thinking will quickly discover the value of placing greater numbers in the minuend, and lesser numbers in the subtrahend to produce a greater difference. If students have not discovered this, you may want to guide the discussion for them to realize this.

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(2N (9.1, 9.5, 9.9)

Resources/Notes

Math Makes Sense 2

Lesson 8: Subtracting 2-Digit Numbers Using Personal Strategies
2N9 (9.5)
TG pp. 48 - 51

Activity Bank:
TG p. 56
Scrambled Letters
Snakes and Ladders My Way

Unit Centres:
TG p. 15
Greatest Difference

Lesson 9: Creating and Solving Subtraction Problems
2N9 (9.4, 9.9)
TG pp. 52 - 55

Activity Bank:
TG p. 56
Storyteller

Unit Centres:
TG p. 15
Build It
Strand: Number

Outcomes

Students will be expected to

2N9 Continued

Achievement Indicators:

2N9.7 Match a number sentence to a given missing subtrahend or minuend problem.

Elaborations—Strategies for Learning and Teaching

Subtraction as “think-addition” is a key component for mastering subtraction facts. Because the unknown part is left hidden, when students do these activities they are encouraged to think about the hidden part. “What goes with the part I see to make the whole?” For example, if the total or whole number of counters is 23, and 14 are removed, the child is likely to think of “14 and what makes 23?” or “What goes with 14 to make 23?” The mental activity is ‘think-addition’ instead of a ‘count what’s left’ approach. This same approach can be used when working on subtraction facts to 18.

2N4 Represent and describe numbers to 100, concretely, pictorially and symbolically.
[C, CN, V]

Achievement Indicators:

2N4.4 Represent a given number pictorially.

2N4.5 Represent a given number, using expressions.

A key element of this lesson is the use of the pan-balance scale to show equality and inequality. For example, place 24 counters on the left side of the balance, and 30 counters on the right side. They are not equal. Discuss how many counters will need to be removed from the right side to make the pans balance. This example can be represented as $24 = 30 - 6$. This same procedure can be followed to represent addition, such as $30 = 24 + 6$.

At this point in the year, students will be becoming more proficient at drawing various representations of a given number using manipulatives such as base ten blocks, ten frames, popsicle sticks (in groups of ten), etc.

This would be a good opportunity to reinforce the concept of money. For example 43 can be represented in various ways including:

- $10¢ + 10¢ + 10¢ + 1¢ + 1¢ + 1¢$
- $5¢ + 5¢ + 5¢ + 5¢ + 5¢ + 5¢ + 5¢ + 1¢ + 1¢ + 1¢$
- $25¢ + 10¢ + 5¢ + 1¢ + 1¢ + 1¢$
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- **Guess What’s Missing?** - In pairs, one student makes a number using rods and units. The other student looks at the number and closes his/her eyes. The student who made the number removes part of the number. The other student then must determine what part of the number is missing. To extend this activity, have students record these number sentences.

(2N9.1, 9.4, 9.5, 9.7, 9.9)

Resources/Notes

**Math Makes Sense 2**

*Lessons 10 and 11 can be completed together since it is important for students to distinguish between addition and subtraction situations.*

**Lesson 10: Missing Numbers in Addition**

2N9 (9.3, 9.6)

TG pp. 57 - 59

**Lesson 11: Missing Number in Subtraction**

2N9 (9.4, 9.7)

TG pp. 60 - 62

Audio CD 3:

Selection 3

Activity Bank:

TG, p. 68

Transformers

Coupon Savings

**Lesson 12: Expressing Numbers Different Ways**

2N4 (4.4, 4.5)

2PR3

2PR4

TG pp. 63 - 67

Activity Bank:

TG, p. 68

Target Number

Match Up
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

2PR3 Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0-100).

[C, CN, R, V]

2PR4 Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.

[C, CN, R, V]

Problem Solving Strategies:

- Guess and Check
- Use Objects
- Draw a Picture

Students have already been introduced to the strategies of ‘Guess and Check’ and ‘Use Objects’ 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 picture to solve a problem is easy, the thought that goes into creating a picture is important to the success of the investigation and is helpful in presenting the solution.
### General Outcome: Use Patterns to Describe the World and to Solve Problems

#### Suggested Assessment Strategies

**Student-Teacher Dialogue**

- What's in My Bag? - Say to the students, “I have 73 cents in my bag. What coins might I have?” Encourage students to represent as many different possible coin combinations that they can think of. Reveal the coins in your bag.  
  
  (2N9.1, 9.2, 9.5, 9.9)

#### Resources/Notes

*Math Makes Sense 2*

Lesson 12 (Continued): Expressing Numbers Different Ways

2N4 (4.4, 4.5)

2PR3

2PR4

TG pp. 63 - 67

Although the resource lists these 2PR3 and 2PR4 as a curriculum focus for this lesson, they are better covered in Unit 3, Lesson 3. However, they may be used to extend student understanding of the possibility that different number sentences can equal one another.

Lesson 13: Strategies Toolkit

TG pp. 69 - 70
Geometry

Suggested Time: 4 Weeks
Unit Overview

Focus and Context

This unit provides students with experiences sorting, comparing, describing, constructing and representing 2-D and 3-D shapes. In Grade One, students compared two objects using only one attribute whereas in this unit, students will use two attributes when comparing shapes. As students use mathematical language such as cube, sphere, cone and faces to describe the various shapes in their many hands on experiences, they will move from using informal language such as box to the more formal language. The focus is not on identifying 2-D and 3-D shapes but on using the attributes such as number of faces or vertices to compare the various shapes and objects. It is beneficial to have students compare 2-D shapes to other 2-D shapes, 3-D shapes to other 3-D shapes as well as 2-D shapes to 3-D shapes to see similarities and differences which will enable students to classify shapes in later grades.

Math Connects

Geometry is an important branch of mathematics, the one most visible in the physical world. Having spatial sense is necessary for interpreting and understanding our geometric world. Spatial sense connects to students’ everyday life through objects in their environment, shapes in books, architectural designs and artwork. In some subject areas, it is easy to make direct links to geometry. This is especially so in art, technology education and industrial arts. Geometry contributes to the development of number and measurement concepts such as congruency, estimating and drawing models to solve problems. As students explore patterns and relationships with blocks, models, graph paper and geoboards, they continue to learn the attributes of shapes.
### Process Standards Key

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### Curriculum Outcomes

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<td>2SS6 Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.</td>
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<td>Shape and Space (3-D Objects and 2-D Shapes)</td>
<td>2SS9 Identify 2-D shapes as parts of 3-D objects in the environment.</td>
<td>[C, CN, R, V]</td>
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Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

2SS8 Describe, compare and construct 2-D shapes, including:

• triangles
• squares
• rectangles
• circles.

[C, CN, R, V]

Elaborations—Strategies for Learning and Teaching

A student’s ability to conceptualize shape, develops gradually. Initially, younger students identify and name shapes on an intuitive level. For example, they know something is a “ball” or a “box” as opposed to a sphere or a rectangular prism. As students develop mathematically, they are able to name shapes according to properties and use higher levels of reasoning.

When comparing and constructing 2-D shapes, it is important for students to first have many opportunities to engage in hands-on activities. “The use of manipulatives is crucial. Sorting and classifying geometric figures in many ways provides students with informal analyses of the properties of these figures before the more formal work in later grades” (Curriculum and Evaluation Standards, Addenda Series, Second-Grade Book, p. 25). Using geoboards and elastics, construction paper cut-outs and everyday objects that can be found at home or school are good ways of engaging students in thinking about geometric shapes. Expressing their ideas orally, in small groups or with partners, makes writing or describing their ideas much easier.

Achievement Indicator:

2SS8.2 Identify common attributes of triangles, squares, rectangles and circles from given sets of the same 2-D shapes.

An attribute is defined as a property that applies to all the shapes of a certain class. For example, a square is a 4-sided shape made up of 4 straight line segments. The three attributes that make up 2-D shapes are straight sides, curves and angles. It is the recognition of attributes of shapes and the implications of those attributes that help students more effectively use shapes in their lives.

When students are identifying attributes, accept the language they use. Be prepared for students to notice features that may not be traditionally thought of as attributes of a shape. For instance, students may call something “curvy” or “pointy”. This is a good time to model the proper geometric terms. Say “Yes, that shape is pointy. This point is called a vertex.” Through this modeling of proper geometric language, students are learning and hearing the appropriate mathematical language.

Listening to the language that students use when they describe shapes is a good clue to their level of thinking.

One way to focus students’ attention on geometric attributes is to have them participate in a sorting activity. Give students a collection of reproduced circles, squares, triangles and rectangles. Instruct them to sort the shapes into groups and describe their sorting rule. Some children will sort shapes based on straight lines and curved lines. Others will sort the shapes based on number of sides in a shape. From this activity, a classroom attribute chart can be developed and displayed.

Continued
**General Outcome:** Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

### Suggested Assessment Strategies

**Journal**
- Have students participate in a “Shape Walk”. Working independently, students locate examples of triangles, squares, rectangles and circles in the classroom and/or school. Students draw the shape they have found, identify it and then describe it (writing the attributes of the shape). *(2SS8.2)*

**Student -Teacher Dialogue**
- Give the student pre-sorted shapes of triangles, circles, rectangles and squares. Have the student identify common attributes of the given sets. *(2SS8.2)*

### Resources/Notes

- *Math Makes Sense 2*
  - Launch
  - Teacher Guide (TG) p. 11

- *Lesson 1: Describing 2-D Shapes*
  - 2SS8 (8.2, 8.3, 8.4)
  - TG pp. 13 - 17

- *Audio CD 3:*
  - Selection 7, 8, 9 & 10
# Strand: Shape and Space (3-D Objects and 2-D Shapes)

## Outcomes

*Students will be expected to*

2SS8 Continued

### Achievement Indicator:

2SS8.2 Continued

Engaging students in an activity using “Secret Shape” folders may be a motivating activity to identify common attributes of 2-D shapes. Inside a file folder, glue a variety of similar shapes (e.g., all triangles or all rectangles). One student is designated as the holder of the secret shape folder. Other students have to guess the mystery shape by asking questions which can only have a “yes” or “no” answer. Using their own copies of the possible shapes, the guessing group can eliminate those that do not fit the responses to their questions. Students continue to ask questions until they guess the correct shape.

Have students create a class or personal 2-D Shape Riddle Book. Using the attribute chart generated and displayed in the classroom, students write their own riddles using the attributes as clues to the answer. An example of such a riddle might be:

What am I?

- I have curved sides.
- I have no straight edges or points.
- Sometimes I can be found at home or at school.
- I am the same shape as the wheel on your bike.

2SS8.3 Identify given 2-D shapes with different dimensions.

This achievement indicator refers to the students’ ability to identify two shapes as the same but having different dimensions (size).

As students grow in their ability to identify shapes and recognize them in their environment, they come to realize that shapes can appear in many different sizes, orientations and differ, somewhat, in appearance. This knowledge is acquired through repeated practice and exposure to identifying attributes of 2-D shapes. For example, a rectangle is a four-sided, straight lined shape. It may be large or small. However, a triangle has three sides composed of straight lines but it can have sides of different lengths and appear to look different.
## General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

### Suggested Assessment Strategies

**Journal**

- Pose the questions;
  
  What makes a circle a circle? Draw two circles that look different.
  What makes a triangle a triangle? Draw two triangles that look different.
  What makes a square a square? Draw two squares that look different.
  What makes a rectangle a rectangle? Draw two rectangles that look different.
  What makes a square different from a rectangle? (2SS8.2, 8.3)

### Resources/Notes

*Math Makes Sense 2*

Lesson 1 (Continued): Describing 2-D Shapes

2SS8 (8.2, 8.3, 8.4)

TG pp. 13 - 17
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

2SS8 Continued

Achievement Indicators:

2SS8.3 Continued

Instruct students to create a triangle on their geoboard. Once completed, permit students to find a partner whose triangle appears to be different from the one they have constructed. These students would then discuss how their triangles are alike and different.

Ask:

- How are these two triangles different? (students may notice lengths of sides, number of pegs per side, the distance from one side to the other i.e. angle.)
- Are they both still triangles?
- How do you know?

2SS8.4 Identify given 2-D shapes with different orientations.

This achievement indicator refers to two similar shapes presented in different positions in space. It is important to be aware of how shapes are presented to students. Most times they are represented in stereotypical ways. For instance, a triangle always looks like a witch’s hat and squares are usually presented as boxes rather than as diamonds. After repeated exposure to the same representations, students come to see these common shapes as the only visual prototypes. By presenting shapes in various orientations, students will develop deeper geometric understandings as they attend to the attributes of the shapes.

Working with concrete models like pattern blocks or attribute blocks helps students see that although shapes can be oriented in different ways they still maintain the same properties of that shape. Flipping or turning a triangle does not change its shape.

Students often think that the way a shape is oriented is part of what defines it.

Distribute a variety of attribute blocks. Have students choose one shape (triangle, circle, square or rectangle) and ask them to trace the shape onto their paper in as many different ways as they can.

Discuss, with students, the Shreddies cereal ad campaign about changing from the square to the diamond shape.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

**Portfolio**
- Have students create a Shape Collage using their favorite shape. Students would be required to represent their collage using a variety of:
  - Materials
  - Sizes
  - Positions

**Performance**
- Students create a robot using squares, circles, triangles and rectangles. Encourage them to use a variety of sizes and positions. On an index card, have students identify the total number of each shape used in the creation of their illustration. Display the robots on the bulletin board and each day draw an index card, asking students to identify the mystery robot described.

Resources/Notes

*Math Makes Sense 2*
Lesson 1 (Continued): Describing 2-D Shapes
2SS8 (8.2, 8.3, 8.4)
TG pp. 13 - 17

(2SS8.4)
### Strand: Shape and Space (3-D Objects and 2-D Shapes)

#### Outcomes

Students will be expected to

2SS6 Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.

[C, CN, R, V]

#### Elaborations—Strategies for Learning and Teaching

3-D objects are objects that have length, width and depth. They include cubes, spheres, cones, cylinders and pyramids. Through exploration, students should come to understand that the faces of a 3-D object are made up of 2-dimensional shapes. When discussing 3-dimensional objects with students it is important to refer to them as simply “objects” or “solid figures”. This will assist students in differentiating between 2-D shapes and 3-D objects.

It is important for students to realize that every 3-D object and 2-D shape has many attributes. These may include straight sides, curved sides, corners, and length of sides. Representing shapes, taking them apart, and putting them together are ways to encourage students to explore more carefully the attributes of those shapes.

Sorting rules for 2-D shapes should have an emphasis on geometric attributes such as:

- Straight sides/curved sides
- Large shapes /small shapes
- Shapes with/without points
- 4 sided shapes/3 sided shapes
- Squares/rectangles

To help focus attention on these attributes, careful consideration should be given to the materials that are used in creating the pre-sorted set. For instance, if a set were comprised of 2-dimensional attribute blocks, students might automatically focus on color and shape as attributes as opposed to observing the sides or corners of the shape. Another learning material to use would be same color paper cut-outs.

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<tbody>
<tr>
<td>2SS6.1 Determine the differences between two given pre-sorted sets, and explain the sorting rule.</td>
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</table>
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

**Performance**
- Play ‘Shape Relay’ - Prepare a variety of presorted shape cards that are large enough to display on a wall. You may wish to play this in the gymnasium. Divide the class into two teams and have them sit in two straight lines on the floor. Each team is given a folder with a variety of pre-cut shapes. At the start of the game, the first student in each team randomly draws a shape from their folder and must race to the wall to place the shape in the appropriate group. That student then tags the next student on their team and goes to the end of the line. Play continues until the entire contents of the shape folder is sorted and the team is seated. As students gain mastery with this concept, the folders could include a variety of shapes that may not fit the pre-sorted groups. In this case, the game would have a discard pile.

**(2SS6.3)**

**Student-Teacher Dialogue**
- Display a set of pre-sorted shapes. Have the student explain the sorting rule.

**(2SS6.1)**

**Resources/Notes**

*Math Makes Sense 2*
Lesson 2: Comparing and Sorting 2-D Shapes
2SS6 (6.1, 6.2, 9.3)
TG pp.18 - 22
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to
2SS6 Continued

Achievement Indicator:

2SS6.2 Identify and name two common attributes of items within a given sorted group.

2SS6.3 Sort a given set of 2-D shapes (regular and irregular), according to two attributes, and explain the sorting rule.

Elaborations—Strategies for Learning and Teaching

On a geoboard, instruct students to make a triangle, square or rectangle using one rubber band. When completed, invite 8-12 students to place their geoboards in an area for all to see (for example, the ledge of the whiteboard). Students then attempt to sort the shapes into two groups. Once completed they identify two common attributes of each group. Students can then be challenged to sort the same set of geoboards in another way, possibly identifying different attributes for each group. Another modification to this activity is to have the groups swap geoboards.

A more challenging activity would be to have partners play “One of these shapes is not like the other.” One student creates a set based on two common attributes and then adds one other shape that does not fit the sorting rule. The other student must identify the two common attributes that was used to complete the sort but must also identify which shape does not belong and tell why.

A regular 2-D shape refers to a shape with all sides the same length and all angles the same measure. A square would be a regular shape as would an equilateral triangle.

An irregular 2-D shape is one whose sides are not all the same length.

Students are not expected to know the definitions of regular and irregular shapes but should be exposed to sorting and identifying attributes of these shapes.

Students have already had many experiences with sorting shapes and naming common attributes. They are now ready to further explore sorting shapes using more irregular patterns. To further solidify their conceptual understanding of sorting and naming common attributes, it is important to include shapes that are not considered to be the norm such as hearts, arrows, stars, etc.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

**Performance**

- Have students identify two common attributes then create a set that would fit the description. For instance, a student may like to create a set of objects that have straight sides and vertices. They would include shapes such as squares, triangles and rectangles. (2SS6.2, 6.3)

- Have students choose two attributes that they would like to work with. Using attribute or pattern blocks that fit that sorting rule, have them create a picture/design using regular and irregular shapes. For example, using vertices and straight lines students would create a picture/design using only shapes that contain those attributes.

During whole class instruction, draw a variety of regular and irregular shapes. (Insert diagram). Have students identify two common attributes shared amongst some of the shapes. Invite students to identify which shapes fit the sorting rule by having them place an R on those that fit the rule and an X on those that do not. Continue this activity using different shapes.

- As an extension to this activity, digital photos may be taken of each design to be displayed in a class book. Students could write about their photographed design including information about the shapes and attributes used. (2SS6.2, 6.3)

**Resources/Notes**

* Math Makes Sense 2
  Lesson 2 (Continued): Comparing and Sorting 2-D Shapes
  2SS6 (6.1, 6.2, 9.3)
  TG pp.18 - 22

* Lesson 2 does not address regular and irregular shapes. This lesson will need to be supplemented.
Outcomes

*Students will be expected to*

2SS8 Describe, compare and construct 2-D shapes, including:

- triangles
- squares
- rectangles
- circles.

[C, CN, R, V]

**Achievement Indicator:**

**2SS8.5 Create a model to represent a given 2-D shape**

Describing, comparing and constructing skeletons of 2-D shapes helps students to see familiar shapes in a different way. Through the process of constructing, they can look at and touch the edges and the vertices of a shape. This helps to develop a stronger focus and understanding of the attributes which assists students with describing and visualizing the shapes.

Students may use a variety of media to create models of 2-D shapes. Suggested materials would include yarn, fabric, pipe cleaners, stir sticks, tooth picks, straws, plasticine, etc. Give students many opportunities to create various 2-D shapes using different materials. This may be completed as centre activities or as partner work.

A concrete way for students to explore the attributes of 2-D shapes is to form the vertices of the shapes with their bodies. Provide a group of students with a large piece of yarn or string. Ask 4 students to hold the yarn and tell what shape they have made. Have them move along the yarn to create a different shape. (For example, changing from a square to a rectangle or vice versa). Ask one student to leave the group. What shape can you make now? Have the group explore different kinds of triangles by moving their bodies in different positions along the yarn.

Have students look at pieces of art such as those created by various artists. Engage students in a discussion about the shapes that they see: How are the shapes that you see alike? How are they different?

Ask students to follow these instructions:

- draw two different triangles
- cut one rectangle and one square
- cut a square from construction paper; cut a larger square from construction paper; cut a smaller square from construction paper.

Ask: How do you know they are still square?

Have students share and discuss their drawings/cutouts.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

Journal

- Draw a triangle, circle, square or rectangle on the whiteboard. Instruct students to copy the shape into their Math Journals. Tell them to now draw a shape that is different from the copied shape in one way, but the same in another way. Have students write how the shapes are different and how they are alike. (2SS8.5, 8.6)

Performance

- As a cross-curricular activity that integrates Language Arts, Art and Mathematics, create “I Spy” group books. Divide students into groups of 4 or 5 and identify a specified shape for each group (I Spy Squares, I Spy Circles, I Spy Triangles or I Spy Rectangles). Challenge students to create pages for their group book by making their shapes with materials and then hiding them inside a drawn and colored picture. As an extension, students can share their books with younger students. (2SS8.5, 8.6)

- Have students create their own artwork using a specified shape. E.g.,

An internet search on Webmuseum will assist with finding art work on various artists.

Resources/Notes

Math Makes Sense 2
Lesson 3: Constructing 2-D Shapes
2SS8 (8.5, 8.6)
TG pp. 23 - 26

Audio CD 3:
Selection 9

Unit Centres:
TG p. 9
What Is My Shape
Stamp a Pattern

Students may base their own creations on the artwork they have observed. Have students count how many shapes they have used in their picture. Have them challenge a friend to do the same. (2SS8.6)
## Strand: Shape and Space (3-D Objects and 2-D Shapes)

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<tr>
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</table>
| **Students will be expected to**

2SS7 Describe, compare and construct 3-D objects, including:
- cubes
- spheres
- cones
- cylinders
- pyramids.

[C, CN, R, V] |

In order to describe, compare and construct 3-D objects, students must first have multiple opportunities to explore concrete models of cubes, spheres, cones, cylinders, and pyramids. As part of the exploration process, students will need to be able to touch, feel, build, and observe a wide variety of geometric solids in the classroom as well as familiar 3-D objects in their home and school environment.

Through exploration in a hands-on method students will discover the various components used to classify 3-D solids. These components would include faces, curved surfaces, edges and vertices. It is important to accept the language that students use to describe these components however, you should consistently model the appropriate mathematical terminology and display these words in the classroom environment i.e. math wall, bulletin board, etc.

Achievement Indicator:

**2SS7.1 Sort a given set of 3-D objects, and explain the sorting rule**

In any sorting activity students should decide how to sort the objects as opposed to the teacher making this decision. This allows students to use their own ideas and understandings about the properties of 3-D objects. Listening to the language used is a valuable assessment tool as it gives insight into what the student knows and how they think about 3-D figures.

Provide students with a set of 3-D geometric solids. This could be the suggested math manipulatives traditionally found in classrooms and/or a set of 3-D figures such as cups, balls, tissue boxes, ice cream cones, paper towel rolls, etc. that are found in the student’s environment. Real world examples of pyramids are difficult to find and so may need to be constructed out of paper or clay for the students. Provide students with opportunities to work with a partner and in small groups to sort the sets and discuss their sorting rules.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

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<td><strong>Observation</strong></td>
<td><strong>Math Makes Sense 2</strong></td>
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<tr>
<td>• Have students work with partners or in small groups, sorting and discussing sorting rules. Make direct observations of how students sort their sets, the kind of language that students use to describe their sets, and the level of confidence that is demonstrated in working with the concept.</td>
<td><strong>Lesson 4: Describing 3-D Objects</strong></td>
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<td>Selection 7 and 8</td>
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<td></td>
<td><strong>You may wish to begin Lesson 4 with achievement indicator 2SS7.6.</strong></td>
</tr>
</tbody>
</table>
Outcomes

Students will be expected to

2SS7 Continued

Achievement Indicator:

2SS7.2 Identify common attributes of cubes, spheres, cones, cylinders and pyramids from given sets of the same 3-D objects.

Elaborations—Strategies for Learning and Teaching

Many of the attributes that apply to 2-D shapes also apply to 3-D shapes. Attributes that students may observe in 3-D figures are:

- square or triangle faces
- number of faces or edges
- identical or congruent faces
- number of vertices
- round or curved parts
- more vertices than faces
- slide/roll/stack

Engage students in creating an individual 3-D Dictionary. As students continue to sort and work on identifying figures, they can illustrate and write a detailed description of the attributes that describe each solid.

![Cube]

- It has 6 faces
- It has 8 vertices
- It has 12 edges
- It can slide
- It looks like a box

Pictures of each solid can be provided for students who are not proficient at drawing 3-D solids.

2SS7.3 Identify and describe given 3-D objects with different dimensions.

Dimensions refers to the lengths of the sides of a geometric figure and the number of ways a figure can be measured. It is not necessary to engage students in physically measuring the lengths of the sides. Students are only visually comparing similar solids.
### General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

### Suggested Assessment Strategies

**Student-Teacher Dialogue**
- Present students with a sample of each of the 3-D geometric solids (cube, sphere, cone, cylinder and pyramid). Ask:
  - How is a cube like/different from a sphere?
  - How is a pyramid like/different from a cone?

For students who may struggle with open-ended questions, ask more direct questions such as:
- How many faces/edges/vertices are on a cone?
- Which figures slide/stack/roll? *(2SS7.2)*

- Provide brown lunch bags with a geometric solid in each bag. Pass them to the students randomly. Ask each student to look into the bag to see the solid and describe it, in writing, in riddle form. Have students exchange bags, read the riddles, write his/her answer and check inside the bag to confirm.

### Resources/Notes

- **Math Makes Sense 2**
- **Lesson 4 (Continued): Describing 3-D Objects**
- **2SS7 (7.1, 7.2, 7.3, 7.4, 7.6)**
- **TG pp. 27 – 31**
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to
2SS7 Continued

Achievement Indicator:

2SS7.4 Identify and describe given 3-D objects with different orientations.

Elaborations—Strategies for Learning and Teaching

In class discussion, present students with a wide variety of 3-D objects that vary in size and orientation. This could include the class set of geometric solids as well as objects from the classroom environment. Ask students to identify, for example, all of the cylinders or cones. Have them tell you what makes these figures the same.

Students can participate in a “Barrier Game”. Pairs of students would sit opposite each other with a barrier between them i.e. book open and standing. Each student would have an identical collection of solids. The starting student would choose one object, lay it on his/her side of the barrier, and then provide clues to their partner regarding the attributes of that object, as well as the orientation of that object on the desk. For example, if a student has chosen a cylinder as his mystery object, he may tell his partner;

- My object has two faces.
- My object is placed so that it cannot roll.
- etc.

The barrier is then removed and the students check for accuracy. This game could be played in a variety of ways. Students could draw pictures using 2-D shapes as opposed to 3-D solids.

The basic understanding that students need to gain from these achievement indicators is that the dimensions and orientation of the solid does not change its name or its attributes. For instance, a bead and a basketball are both spheres even though they are different sizes. A tire and a paper towel roll are both cylinders even though they are oriented differently.

As students are engaged in observing the objects in their environment they begin to see that much of what surrounds them is actually 3 dimensional. Visualization is a skill that is developed over time and assists students in helping them to understand their physical world.

Take students on a "Solid Walk" around the school and school grounds using a paper towel roll as a spy glass. A leader would record any examples of cubes, spheres, cones, cylinders, and pyramids that they “spy” on their walk. Upon returning to the classroom, students will share their findings and create a bulletin board entitled “I Spy Solids”.

2SS7.6 Identify examples of cubes, spheres, cones, cylinders and pyramids found in the environment.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Using a variety of magazines, newspapers, pictures, etc. and ask students to create a poster of a 3-D object of their choice that includes a variety of dimensions. (2SS7.3)

Journal

- Present students with pictures of an ice-cream cone and a party hat, for example. Have them identify the solid and describe how they are the same and/or different. (2SS7.4)

- Make a cube and label each side with “cube”, “sphere”, “cone”, “cylinder”, “pyramid” and “free choice”. Roll the cube and find, in a catalogue or in the environment, an example of something that is the shape shown on the cube. (2SS7.6)

Presentation

- Using a digital camera (or a disposable camera) students take photos of 3-D objects in their environment. Print photos. Each student will use their pictures to create a page called 3-D Objects In _____’s environment. All pages can be compiled into a class book or displayed on a bulletin board for all to see. (2SS7.4)

Resources/Notes

* Math Makes Sense 2
* Lesson 4 (Continued): Describing 3-D Objects
  
  2SS7 (7.1, 7.2, 7.3, 7.4, 7.6)
  
  TG pp. 27 – 31

* Unit Centres
  
  TG p. 9
  
  Who Am I?
# Strand: Shape and Space (3-D Objects and 2-D Shapes)

## Outcomes

*Students will be expected to*

**2SS6** Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.

[C, CN, R, V]

### Achievement Indicator:

**2SS6.4** Sort a given set of 3-D objects, according to two attributes, and explain the sorting rule.

## Elaborations—Strategies for Learning and Teaching

When engaging students in sorting 3-D objects with two attributes, it is possible to go beyond the physical characteristics of the solid (faces, edges and vertices). Encourage students to consider how the solid moves (slide or roll) and if it can be stacked.

When presented with a set of 3-D objects, students should be challenged to identify different sorting rules for the same set of objects. For example, the sorting rule for a set of spheres and cylinders could be those that roll and have curved edges or those that don't stack and have no vertex.

By making models of 3-D shapes, students focus on the shape attributes of different solids.

Describing shapes allows children to focus on their basic characteristics. Use questioning to focus student thinking; for example:

- What other shapes are similar to this one? In what way are they alike?
- What does this object look like?
- Does your shape have vertices or corners?
- Does the object have flat or curved faces?
- Pick two of the shapes and tell how they are alike and how they differ.

**2SS7 Continued**

### Achievement Indicator:

**2SS7.5** Create and describe a representation of a given 3-D object, using materials such as modelling clay.
**GEOMETRY**

**General Outcome:** Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

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<tr>
<td>• Present a reproduced copy of a set of 3-D objects. Write a sorting rule, identifying two common attributes. Students can be encouraged to think of a different sorting rule, identifying two common attributes, for the same set.</td>
<td><strong>Lesson 5: Comparing and Sorting 3-D Objects</strong></td>
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<tr>
<td><strong>Performance</strong></td>
<td>2SS6 (6.4)</td>
</tr>
<tr>
<td>• Provide students with various building materials such as modeling clay, pipe cleaners, foam blocks, unifix cubes, toothpicks, straws, paper, tag board and have them build 3-D shapes.</td>
<td><strong>TG pp. 32 - 36</strong></td>
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<tr>
<td>Ensure models are available so that students have a model to follow if necessary.</td>
<td><strong>Lesson 6: Constructing 3-D Objects</strong></td>
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<td>Have students present their shape to a partner explaining how they made it, how it is the same as the solid their partner made or how it is different.</td>
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<td><strong>Student-Teacher dialogue</strong></td>
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<td>• Ask a student to choose a 3-D object and tell how he/she would describe the solid to someone who does not know what it is.</td>
<td><strong>Unit Centres:</strong></td>
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Strand: Shape and Space (3-D Objects and 2-D Shapes)

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<td>In earlier grades, students will have had opportunities to explore shapes through sorting, patterning, and building activities. Considering the attributes of various 2-D shapes and 3-D objects allows students to identify, compare and sort them, using different criteria. Students in the early grades need many varied opportunities to manipulate both 2-D shapes and 3-D objects. This enables them to make connections to objects in their environment. For example, when a student sees a transport truck they will identify the shape of the box as a rectangle.</td>
</tr>
<tr>
<td>2SS9 Identify 2-D shapes as parts of 3-D objects in the environment.</td>
<td>Many of the 3-D shapes students see or explore have flat faces (pyramids and cubes), but others have curved surfaces (cylinders, spheres, and cones). Students should begin to relate the description of a 3-D shape to a description of the surfaces and faces that make it up. For example, a cylinder has 2 flat faces and a curved surface and a sphere has one curved surface. Through experiences with solids, students should be comfortable using such terms as ‘cylinder’, ‘sphere’, ‘cone’, and ‘cube’.</td>
</tr>
<tr>
<td>[C, CN, R, V]</td>
<td>Place a number of different 3-D shapes such as a small juice can, tennis ball, die, etc. in a bag. Have students name or show a particular 2-D shape to the class and ask a student to find a 3-D shape with the corresponding shape by feeling the objects within the bag.</td>
</tr>
<tr>
<td></td>
<td>Present drawings or pictures of a variety of 3-D objects from the environment. Have students match them with the 2-D shapes that are part of the 3-D shapes.</td>
</tr>
<tr>
<td></td>
<td>Place a 3-D shape on the overhead projector and ask students to predict what shape they will see when the projector is turned on. Students might project onto paper and trace around the image. This will enable students to see the relationship between the 2-D and the 3-D object.</td>
</tr>
</tbody>
</table>

**Achievement Indicator:**

2SS9.1 Compare and match a given 2-D shape, such as a triangle, square, rectangle or circle, to the faces of 3-D objects in the environment.
### General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

#### Suggested Assessment Strategies

<table>
<thead>
<tr>
<th>Performance</th>
<th>Resources/Notes</th>
</tr>
</thead>
</table>
| • Have students work in small groups to make class books shaped like a triangle, a square and a circle. Have them fill each book with pictures (cut out or drawn) of objects from the environment that have the same shape as the book. | *Math Makes Sense 2*
| | Lesson 7: Identifying 2-D Shapes in 3-D Objects |
| | 2SS9 (9.1, 9.2) |
| | TG pp. 41 - 45 |
| • Provide drawings of a variety of 3-D shapes. Ask the students to match these with the actual solid models. | |

**Student-Teacher Dialogue**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use a variety of picture books that include illustrations of objects shaped like cubes, cones, pyramids, cylinders and spheres to allow students to see how the illustrators depict 3-D objects in the real world. Ask students to find 2-D shapes represented in the illustrations.</td>
<td></td>
</tr>
<tr>
<td><strong>Journal</strong></td>
<td></td>
</tr>
<tr>
<td>• Have students cut out a picture of a 3-D object from a magazine, paste it in their journal and describe it using mathematical language such as curves, flat faces, and shapes, etc.</td>
<td></td>
</tr>
<tr>
<td>• Provide playdough or clay. Have students flatten the clay. The student chooses a solid, presses it into the clay to make a print of the figure's faces. In his/her journal, the student draws the figure labeling it with its name and then draws and lists the names of the faces.</td>
<td></td>
</tr>
</tbody>
</table>

A cube has 6 square faces.
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

2SS9 Continued

Achievement Indicator:

2SS9.2 Name the 2-D faces of a given 3-D object.

Elaborations—Strategies for Learning and Teaching

Working with 3-D objects and 2-D shapes enables students to understand that most 3-D objects are made up of 2-D faces.

Play a game of ‘What Am I?’

Choose a 3-D object and describe it to the class using clues such as, “My solid has all flat faces. What Am I?”

“My solid has one square face. What Am I?” After modeling this game, students can play the game in small groups.

Place three 3-D objects in a bag, two of which are the same and one different. Invite students to feel the objects inside the bag to identify the odd one and to tell how it is different.

Problem Solving

• Looking for a Pattern
• Guess and Check
• Using Objects

These strategies have been a previous focus. Spend some time reviewing this strategy as well as others that students have been introduced to and practicing throughout the year.
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Provide students with different solids that have at least one flat face and have students trace the faces. Students then give their drawing to a partner to guess which solid they traced. (2SS9.2)

- Provide students with a spinner containing pictures of the geometric solids. (shown below) Students take turns spinning and describing the faces of the solid on which they landed. (2SS9.2)

Student-Teacher Dialogue

- Show students a picture of a 2-D shape (circle, square or triangle). Make several 3-D objects available and ask the student to choose one or more, that has a face that matches the picture. (2SS9.2)

- Provide a cylinder and a cone. Ask the student to describe how they are alike and how they differ. (2SS9.2)

Resources/Notes

Math Makes Sense 2
Lesson 7 (Continued):
Identifying 2-D Shapes in 3-D Objects
2SS9 (9.1, 9.2)
TG pp. 41 - 45

Little Book:
What Am I
by Sophia Baker

Lesson 8: Strategies Toolkit
Appendix A

Outcomes by Strand

(with page references)
Strand: Number

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>It is expected that students will:</strong></td>
<td><strong>Achievement Indicators</strong></td>
</tr>
<tr>
<td><strong>2N1</strong> Say the number sequence from 0 to 100 by:</td>
<td><strong>The following set of indicators help determine whether students have met the corresponding specific outcome:</strong></td>
</tr>
<tr>
<td>• 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively.</td>
<td>2N1.1 Extend a given skip counting sequence (by 2s, 5s or 10s) forward and backward.</td>
</tr>
<tr>
<td>• 10s, using starting points from 1 to 9.</td>
<td>2N1.2 Skip count by 10s, given any number from 1 to 9 as a starting point.</td>
</tr>
<tr>
<td>• 2s, starting from 1.</td>
<td>2N1.3 Count by 2’s starting from 1 or from any odd number.</td>
</tr>
<tr>
<td>[C, CN, ME, R] pp. 60, 64, 68, 74</td>
<td>2N1.4 Identify and correct errors and omissions in a given skip counting sequence.</td>
</tr>
<tr>
<td><strong>2N2</strong> Demonstrate if a number (up to 100) is even or odd.</td>
<td>2N1.5 Count a given sum of money with pennies, nickels or dimes (to 100¢).</td>
</tr>
<tr>
<td>[C, CN, PS, R] p. 64</td>
<td>2N1.6 Count quantity, using groups of 2s, 5s or 10s and counting on.</td>
</tr>
<tr>
<td><strong>2N3</strong> Describe order or relative position, using ordinal numbers (up to tenth).</td>
<td>2N2.1 Determine if a given number is even or odd by using concrete materials or pictorial representations.</td>
</tr>
<tr>
<td>[C, CN, R] p. 68</td>
<td>2N2.2 Identify even and odd numbers in a given sequence, such as in a hundred chart.</td>
</tr>
<tr>
<td><strong>2N4</strong> Represent and describe numbers to 100, concretely, pictorially and symbolically.</td>
<td>2N2.3 Sort a given set of numbers into even and odd.</td>
</tr>
<tr>
<td>[C, CN, V] pp. 70, 76, 198</td>
<td><strong>2N3.1 Indicate a position of a specific object in a sequence by using ordinal numbers up to tenth.</strong></td>
</tr>
<tr>
<td><strong>2N5</strong> Compare and order numbers up to 100.</td>
<td><strong>2N3.2 Compare the ordinal position of a specific object in two different given sequences.</strong></td>
</tr>
<tr>
<td>[C, CN, ME, R, V] p. 86</td>
<td><strong>2N4.1 Represent a given number, using concrete materials such as ten frames and base ten materials.</strong></td>
</tr>
<tr>
<td><strong>2N5.1 Order a given set of numbers in ascending or descending order, and verify the result, using a hundred chart, number line, ten frames or by making references to place value.</strong></td>
<td>2N4.2 Represent a given number, using coins (pennies, nickels, dimes and quarters).</td>
</tr>
<tr>
<td><strong>2N5.2 Identify and explain errors in a given ordered sequence.</strong></td>
<td>2N4.3 Represent a given number, using tallies.</td>
</tr>
<tr>
<td><strong>2N5.3 Identify missing numbers in a given hundred chart.</strong></td>
<td>2N4.4 Represent a given number pictorially and symbolically.</td>
</tr>
<tr>
<td><strong>2N5.4 Identify errors in a given hundred chart.</strong></td>
<td>2N4.5 Represent a given number, using expressions; e.g., 24 + 6, 15 + 15, 40 – 10.</td>
</tr>
<tr>
<td>2N4.6 Read a given number (0–100) in symbolic or word form.</td>
<td>2N4.7 Record a given number (0–20) in words.</td>
</tr>
<tr>
<td><strong>Strand:</strong> Number (Continued)</td>
<td><strong>General Outcome:</strong> Develop number sense</td>
</tr>
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<td>-------------------------------</td>
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</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Achievement Indicators</strong></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>2N6 Estimate quantities to 100, using referents. [C, ME, PS, R] p. 72</td>
<td>2N6.1 Estimate a given quantity by comparing it to a referent (known quantity). 2N6.2 Estimate the number of groups of ten in a given quantity, using 10 as a referent. 2N6.3 Select between two possible estimates for a given quantity, and explain the choice.</td>
</tr>
<tr>
<td>2N7 Illustrate, concretely and pictorially, the meaning of place value for numbers to 100. [C, CN, R, V] p. 78</td>
<td>2N7.1 Explain and show with counters the meaning of each digit for a given 2-digit numeral with both digits the same; e.g., for the numeral 22, the first digit represents two tens (twenty counters) and the second digit represents two ones (two counters). 2N7.2 Count the number of objects in a given set, using groups of 10s and 1s, and record the result as a 2 digit numeral under the headings 10s and 1s. 2N7.3 Describe a given 2-digit numeral in at least two ways; e.g., 24 as two 10s and four 1s, twenty and four, two groups of ten and four left over, and twenty-four ones. 2N7.4 Illustrate, using ten frames and diagrams, that a given numeral consists of a certain number of groups of ten and a certain number of ones. 2N7.5 Illustrate, using base ten materials, that a given numeral consists of a certain number of tens and a certain number of ones. 2N7.6 Explain why the value of a digit depends on its placement within a numeral.</td>
</tr>
<tr>
<td>2N8 Demonstrate and explain the effect of adding zero to, or subtracting zero from, any number. [C, R] pp. 110, 188, 194</td>
<td>2N8.1 Add zero to a given number, and explain why the sum is the same as the addend. 2N8.2 Subtract zero from a given number, and explain why the difference is the same as the given number.</td>
</tr>
<tr>
<td>Strand: Number (Continued)</td>
<td>General Outcome: Develop number sense</td>
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<tr>
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<th>General Outcome: Develop number sense</th>
</tr>
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<tbody>
<tr>
<td>2N9 Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:</td>
<td>2N9.1 Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically.</td>
</tr>
<tr>
<td>• using personal strategies for adding and subtracting with and without the support of manipulatives</td>
<td>2N9.2 Create an addition or a subtraction number sentence and a story problem for a given solution.</td>
</tr>
<tr>
<td>• creating and solving problems that involve addition and subtraction</td>
<td>2N9.3 Solve a given problem involving a missing addend, and describe the strategy used.</td>
</tr>
<tr>
<td>• explaining that the order in which numbers are added does not affect the sum (Commutative Property)</td>
<td>2N9.4 Solve a given problem involving a missing minuend or subtrahend, and describe the strategy used.</td>
</tr>
<tr>
<td>• explaining that the order in which numbers are subtracted may affect the difference.</td>
<td>2N9.5 Refine personal strategies to increase their efficiency.</td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V]</td>
<td>2N9.6 Match a number sentence to a given missing addend problem.</td>
</tr>
<tr>
<td>pp. 108, 112, 122, 144, 184, 190, 196</td>
<td>2N9.7 Match a number sentence to a given missing subtrahend or minuend problem.</td>
</tr>
<tr>
<td>2N9.8 Add a given set of numbers in two different ways, and explain why the sum is the same; e.g., 2 + 5 + 3 + 8 = (2 + 3) + 5 + 8 or 5 + 3 + (8 + 2).</td>
<td>2N9.9 Solve a given problem, using horizontal and vertical forms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
<tbody>
<tr>
<td>2N10 Apply mental mathematics strategies, such as:</td>
<td>2N10.1 Explain or demonstrate the mental mathematics strategy that could be used to determine a basic fact, such as:</td>
</tr>
<tr>
<td>1. Counting on and counting back</td>
<td>1.1 Using one more, two more; e.g., for 6 + 2 start at 6 and count on 2, so 6, 7, 8.</td>
</tr>
<tr>
<td>2. Making 10</td>
<td>1.2 Using one less, two less; e.g., for 6 – 2, start at 6 and count back 2, so 6, 5, 4</td>
</tr>
<tr>
<td>3. Using Doubles</td>
<td>2.1 Making 10; e.g., for 7 + 5, think 7 + 3 + 2</td>
</tr>
<tr>
<td>4. Using addition to subtract for basic addition facts to 18 and related subtraction facts.</td>
<td>3.1 Using Doubles; e.g., 4 + 6, think 5 + 5</td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V]</td>
<td>3.2 Using Doubles plus one, plus two; e.g., 4 + 5, think 4 + 4 + 1</td>
</tr>
<tr>
<td>pp. 116, 138</td>
<td>3.3 Using Doubles subtract one, subtract two; e.g., for 4 + 5, think 5 + 5 – 1</td>
</tr>
<tr>
<td>2N10.2 Use and describe a personal strategy for determining a sum to 18 and the corresponding subtraction.</td>
<td>4.1 Using addition to subtract; e.g., for 7 – 3, think 3 + ? = 7</td>
</tr>
<tr>
<td>2N10.3 Refine personal strategies to increase their efficiency.</td>
<td>2N10.4 Use and describe a personal strategy for determining a sum to 18 and the corresponding subtraction.</td>
</tr>
</tbody>
</table>
### Strand: Patterns and Relations (Patterns)

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

#### Specific Outcomes

*It is expected that students will:*

<table>
<thead>
<tr>
<th>Specific Outcome</th>
<th>Achievement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2PR1</strong> Demonstrate an understanding of repeating patterns (three to five elements) by:</td>
<td>2PR1.1 Identify the core of a given repeating pattern.</td>
</tr>
<tr>
<td>• describing</td>
<td>2PR1.2 Describe and extend a given double attribute pattern.</td>
</tr>
<tr>
<td>• extending</td>
<td>2PR1.3 Explain the rule used to create a given repeating non-numerical pattern.</td>
</tr>
<tr>
<td>• comparing</td>
<td>2PR1.4 Predict an element in a given repeating pattern, using a variety of strategies.</td>
</tr>
<tr>
<td>• creating</td>
<td>2PR1.5 Predict an element of a given repeating pattern, and extend the pattern to verify the prediction.</td>
</tr>
<tr>
<td>patterns using manipulatives, diagrams, sounds and actions.</td>
<td>2PR1.6 Compare two given repeating patterns, and describe how they are alike/different.</td>
</tr>
<tr>
<td>[C, CN, PS, R, V]</td>
<td>2PR1.7 Create a repeating pattern where the core has three to five elements.</td>
</tr>
<tr>
<td>p. 34</td>
<td></td>
</tr>
</tbody>
</table>

<p>| <strong>2PR2</strong> Demonstrate an understanding of increasing patterns by: | 2PR2.1 Identify and describe increasing patterns in a variety of given contexts; e.g., hundred chart, number line, addition tables, calendar, tiling pattern or drawings. |
| • describing | 2PR2.2 Represent a given increasing pattern, concretely and pictorially. |
| • reproducing | 2PR2.3 Identify errors in a given increasing pattern. |
| • extending | 2PR2.4 Explain the rule used to create a given increasing pattern. |
| • creating | 2PR2.5 Create an increasing pattern, and explain the pattern rule. |
| patterns using manipulatives, diagrams, sounds and actions (numbers to 100). | 2PR2.6 Represent a given increasing pattern, using another mode; e.g., colour to shape. |
| [C, CN, PS, R, V] | 2PR2.7 Solve a given problem, using increasing patterns. |
| pp. 46, 62, 66, 158 | 2PR2.8 Identify and describe increasing patterns in the environment; e.g., house/room numbers, book pages, calendar, pine cones, leap years. |
| | 2PR2.9 Determine missing elements in a given concrete, pictorial or symbolic increasing pattern, and explain the reasoning. |</p>
<table>
<thead>
<tr>
<th>Strand: Patterns and Relations (Patterns)</th>
<th>General Outcome: Use patterns to describe the world and to solve problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Outcomes</td>
<td>Achievement Indicators The following set of indicators help determine whether students have met the corresponding specific outcome:</td>
</tr>
<tr>
<td>It is expected that students will:</td>
<td></td>
</tr>
<tr>
<td>2PR3 Demonstrate and explain the meaning of equality and inequality by using manipulatives and diagrams (0-100). [C, CN, R, V] pp. 84, 200</td>
<td>2PR3.1 Determine whether two given quantities of the same object (same shape and mass) are equal by using a balance scale. 2PR3.2 Construct and draw two unequal sets, using the same object (same shape and mass), and explain the reasoning. 2PR3.3 Demonstrate how to change two given sets, equal in number, to create inequality. 2PR3.4 Choose from three or more given sets the one that does not have a quantity equal to the others, and explain why.</td>
</tr>
<tr>
<td>2PR4 Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V] pp. 118, 200</td>
<td>2PR4.1 Determine whether two sides of a given number sentence are equal (=) or not equal (#). Write the appropriate symbol and justify the answer. 2PR4.2 Model equalities, using a variety of concrete representations, and record the equality symbolically. 2PR4.3 Model inequalities, using a variety of concrete representations, and record the inequality symbolically.</td>
</tr>
</tbody>
</table>
### Strand: Shape and Space (Measurement)

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Use direct or indirect measurement to solve problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>It is expected that students will:</strong></td>
<td><strong>Achievement Indicators</strong> <em>The following set of indicators help determine whether students have met the corresponding specific outcome:</em></td>
</tr>
</tbody>
</table>

#### 2SS1 Relate the number of days to a week and the number of months to a year in a problem-solving context. [C, CN, PS, R]  
*p. 152*

- 2SS1.1 Read a date on a calendar.  
- 2SS1.2 Name and order the days of the week.  
- 2SS1.3 Identify the day of the week and the month of the year for an identified calendar date.  
- 2SS1.4 Communicate that there are seven days in a week and twelve months in a year.  
- 2SS1.5 Determine whether a given set of days is more or less than a week.  
- 2SS1.6 Identify yesterday’s/tomorrow’s date.  
- 2SS1.7 Identify the month that comes before and the month that comes after a given month.  
- 2SS1.8 Name and order the months of the year.  
- 2SS1.9 Solve a given problem involving time that is limited to the number of days in a week and the number of months in a year.

#### 2SS2 Relate the size of a unit of measure to the number of units (limited to non-standard units) used to measure length and mass. [C, CN, ME, R, V]  
*pp. 164, 176*

- 2SS2.1 Explain why one of two given non-standard units may be a better choice for measuring the length of an object.  
- 2SS2.2 Explain why one of two given non-standard units may be a better choice for measuring the mass of an object.  
- 2SS2.3 Select a non-standard unit for measuring the length or mass of an object, and explain why it was chosen.  
- 2SS2.4 Estimate the number of non-standard units needed for a given measurement task.  
- 2SS2.5 Explain why the number of units of a measurement will vary depending upon the unit of measure used.

#### 2SS3 Compare and order objects by length, height, distance around and mass, using non-standard units, and make statements of comparison. [C, CN, ME, R, V]  
*pp. 160, 172, 178*

- 2SS3.1 Estimate, measure and record the length, height, distance around or mass of a given object, using non-standard units.  
- 2SS3.2 Compare and order the measure of two or more objects in ascending or descending order, and explain the method of ordering.
Strand: Shape and Space  
(Measurement)  

<table>
<thead>
<tr>
<th>General Outcome: Use direct or indirect measurement to solve problems.</th>
</tr>
</thead>
</table>
| **Specific Outcomes**  
*It is expected that students will:*  

| Achievement Indicators  
The following set of indicators help determine whether students have met the corresponding specific outcome:  

| 2SS4 Measure length to the nearest non-standard unit by:  
• using multiple copies of a unit  
• using a single copy of a unit (iteration process).  
[C, ME, R, V]  
*pp. 162, 168*  
| 2SS4.1 Explain why overlapping or leaving gaps does not result in accurate measures.  
2SS4.2 Count the number of non-standard units required to measure the length of a given object, using a single copy or multiple copies of a unit.  
2SS4.3 Estimate and measure a given object, using multiple copies of a non-standard unit and using a single copy of the same unit many times, and explain the results.  
2SS4.4 Estimate and measure, using non-standard units, a given length that is not a straight line.  
| 2SS5 Demonstrate that changing the orientation of an object does not alter the measurements of its attributes.  
[C, R, V]  
*pp. 172, 176*  
| 2SS5.1 Measure a given object, change the orientation, re-measure, and explain the results.  

```
<table>
<thead>
<tr>
<th>Strand: Shape and Space (3-D Objects and 2-D Shapes)</th>
<th>General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Achievement Indicators</strong></td>
</tr>
<tr>
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<td><em>The following set of indicators help determine whether students have met the corresponding specific outcome:</em></td>
</tr>
<tr>
<td>2SS6 Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule. [C, CN, R, V] pp. 212, 224</td>
<td>2SS6.1 Determine the differences between two given pre-sorted sets, and explain the sorting rule. 2SS6.2 Identify and name two common attributes of items within a given sorted group. 2SS6.3 Sort a given set of 2-D shapes (regular and irregular), according to two attributes, and explain the sorting rule. 2SS6.4 Sort a given set of 3-D objects, according to two attributes, and explain the sorting rule.</td>
</tr>
<tr>
<td>2SS7 Describe, compare and construct 3-D objects, including: • cubes • spheres • cones • cylinders • pyramids. [C, CN, R, V] p. 218</td>
<td>2SS7.1 Sort a given set of 3-D objects, and explain the sorting rule. 2SS7.2 Identify common attributes of cubes, spheres, cones, cylinders and pyramids from given sets of the same 3-D objects. 2SS7.3 Identify and describe given 3-D objects with different dimensions. 2SS7.4 Identify and describe given 3-D objects with different orientations. 2SS7.5 Create and describe a representation of a given 3-D object, using materials such as modelling clay. 2SS7.6 Identify examples of cubes, spheres, cones, cylinders and pyramids found in the environment.</td>
</tr>
<tr>
<td>2SS8 Describe, compare and construct 2-D shapes, including: • triangles • squares • rectangles • circles. [C, CN, R, V] pp. 206, 216</td>
<td>2SS8.1 Sort a given set of 2-D shapes, and explain the sorting rule. 2SS8.2 Identify common attributes of triangles, squares, rectangles and circles from given sets of the same 2-D shapes. 2SS8.3 Identify given 2-D shapes with different dimensions. 2SS8.4 Identify given 2-D shapes with different orientations. 2SS8.5 Create a model to represent a given 2-D shape. 2SS8.6 Create a pictorial representation of a given 2-D shape.</td>
</tr>
<tr>
<td>2SS9 Identify 2-D shapes as parts of 3-D objects in the environment. [C, CN, R, V] p 226</td>
<td>2SS9.1 Compare and match a given 2-D shape, such as a triangle, square, rectangle or circle, to the faces of 3-D objects in the environment. 2SS9.2 Name the 2-D faces of a given 3-D object.</td>
</tr>
</tbody>
</table>
### Strand: Statistics and Probability (Data Analysis)

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Collect, display and analyze data to solve problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is expected that students will:</td>
<td>Achievement Indicators The following set of indicators help determine whether students have met the corresponding specific outcome:</td>
</tr>
</tbody>
</table>

#### 2SP1 Gather and record data about self and others to answer questions.

[C, CN, PS, V]  
pp. 92, 102

- 2SP1.1 Formulate a question that can be answered by gathering information about self and others.
- 2SP1.2 Organize data as it is collected, using concrete objects, tallies, check marks, charts or lists.
- 2SP1.3 Answer questions, using collected data.

#### 2SP2 Construct and interpret concrete graphs and pictographs to solve problems.

[C, CN, PS, R, V]  
p. 94

- 2SP2.1 Determine the common attributes of concrete graphs by comparing a given set of concrete graphs.
- 2SP2.2 Determine the common attributes of pictographs by comparing a given set of pictographs.
- 2SP2.3 Answer questions pertaining to a given concrete graph or pictograph.
- 2SP2.4 Create a concrete graph to display a given set of data, and draw conclusions.
- 2SP2.5 Create a pictograph to represent a given set of data, using one-to-one correspondence.
- 2SP2.6 Solve a given problem by constructing and interpreting a concrete graph or pictograph.
REFERENCES
REFERENCES


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


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


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