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## References
Acknowledgements

The Department of Education would like to thank Western and Northern Canadian Protocol (WNCP) for Collaboration in Education, *The Common Curriculum Framework for K-9 Mathematics* - May 2006 and *The Common Curriculum Framework for Grades 10-12* - January 2008. Reproduced (and/or adapted) by permission. All rights reserved.

We would also like to thank the provincial Grade 5 Mathematics curriculum committee, the Alberta Department of Education, the New Brunswick Department of Education, and the following people for their contribution:

- Trudy Porter, Program Development Specialist – Mathematics, Division of Program Development, Department of Education
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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.

Early Childhood

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

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

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

Affective Domain

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

Curiosity about mathematics is fostered when children are actively engaged in their environment.
Goals For Students

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

The main goals of mathematics education are to prepare students to:
- use mathematics confidently to solve problems
- communicate and reason mathematically
- appreciate and value mathematics
- make connections between mathematics and its applications
- commit themselves to lifelong learning
- become mathematically literate adults, using mathematics to contribute to society.

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

CONCEPTUAL FRAMEWORK FOR K-9 MATHEMATICS

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

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

Students are expected to:

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

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

Communication [C]

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

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

Communication helps students make connections among concrete, pictorial, symbolic, oral, written and mental representations of mathematical ideas.
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 is a combination of cognitive strategies that enhance flexible thinking and number sense. It is calculating mentally without the use of external memory aids.

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

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

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

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

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

Estimation assists individuals in making mathematical judgements and in developing useful, efficient strategies for dealing with situations in daily life.
Learning through problem solving should be the focus of mathematics at all grade levels. When students encounter new situations and respond to questions of the type: How would you? or How could you?, the problem-solving approach is being modelled. Students develop their own problem-solving strategies by listening to, discussing and trying different strategies.

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

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

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

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

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

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

Calculators and computers can be used to:

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

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

Visualization [V]

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

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

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

Measurement visualization goes beyond the acquisition of specific measurement skills. Measurement sense includes the ability to determine when to measure, when to estimate and which estimation strategies to use (Shaw and Cliatt, 1989).
Mathematics is one way of trying to understand, interpret and describe our world. There are a number of components that define the nature of mathematics and these are woven throughout this program of studies. The components are change, constancy, number sense, patterns, relationships, spatial sense and uncertainty.

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

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

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

(Steen, 1990, p. 184).

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

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

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

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

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

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

Number sense develops when students connect numbers to their own real-life experiences and when students use benchmarks and referents. This results in students who are computationally fluent and flexible with numbers and who have intuition about numbers. The evolving number sense typically comes as a by product 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**

Spatial sense involves visualization, mental imagery and spatial reasoning. These skills are central to the understanding of mathematics. Spatial sense is developed through a variety of experiences and interactions within the environment. The development of spatial sense enables students to solve problems involving 3-D objects and 2-D shapes and to interpret and reflect on the physical environment and its 3-D or 2-D representations.

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

**Uncertainty**

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

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

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

Chance addresses the predictability of the occurrence of an outcome. As students develop their understanding of probability, the language of mathematics becomes more specific and describes the degree of uncertainty more accurately.
The learning outcomes in the program of studies are organized into four strands across the grades K–9. Some strands are subdivided into substrands. There is one general outcome per substrand across the grades K–9.

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

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

**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** 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** 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.

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 Focus 5 (Nelson). Schools and teachers have this as their primary resource offered by the Department of Education. Column four of the curriculum guide references Math Focus 5 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 5 is organized by units from Unit 1 to Unit 11. 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. The number of units need not equate with the number of formal assessments which are done. At times, assessment may incorporate more than one of the shorter units included in the course. In fact, if a teacher were to plan formal assessment for each individual unit it would have significant impact on their ability to complete the entire course.
GENERAL AND SPECIFIC OUTCOMES

GENERAL AND SPECIFIC OUTCOMES BY STRAND
(Pages 17–30)

This section presents the general and specific outcomes for each strand, for Grade 4, 5 and 6.

Refer to Appendix A for the general and specific outcomes with corresponding achievement indicators organized by strand for Grade 5.

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 4, 5 and 6)
## General and Specific Outcomes by Strand (Grades 1, 2 and 3)

### Number

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. Represent and describe whole numbers to 10 000, pictorially and symbolically. [C, CN, V] | 1. Represent and describe whole numbers to 1 000 000. [C, CN, V, T] | 1. Demonstrate an understanding of place value, including numbers that are:  
  • greater than one million  
  • less than one thousandth. [C, CN, R, T] |
| 2. Compare and order numbers to 10 000. [C, CN, V] | 2. Use estimation strategies, including:  
  • front-end rounding  
  • compensation  
  • compatible numbers in problem-solving contexts. [C, CN, ME, PS, R, V] | 2. Solve problems involving large whole numbers and decimal numbers. [ME, PS, T] |
| 3. Demonstrate an understanding of addition of numbers with answers to 10 000 and their corresponding subtractions (limited to 3- and 4-digit numerals) by:  
  • using personal strategies for adding and subtracting  
  • estimating sums and differences  
  • solving problems involving addition and subtraction. [C, CN, ME, PS, R] | 3. Apply mental mathematics strategies and number properties, such as:  
  • skip counting from a known fact  
  • using doubling or halving  
  • using patterns in the 9s facts  
  • using repeated doubling or halving to determine, with fluency, answers for basic multiplication facts to 81 and related division facts. [C, CN, ME, R, V] | 3. Demonstrate an understanding of factors and multiples by:  
  • determining multiples and factors of numbers less than 100  
  • identifying prime and composite numbers  
  • solving problems using multiples and factors. [CN, PS, R, V] |
### General and Specific Outcomes by Strand

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

### Number

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
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<td>General Outcome</td>
</tr>
<tr>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>4. Explain and apply the properties of 0 and 1 for multiplication and the property of 1 for division. [C, CN, R]</td>
<td>4. Apply mental mathematics strategies for multiplication, such as: • annexing then adding zero • halving and doubling • using the distributive property. [C, CN, ME, R, V]</td>
<td>5. Demonstrate an understanding of ratio, concretely, pictorially and symbolically. [C, CN, PS, R, V]</td>
</tr>
<tr>
<td>5. Describe and apply mental mathematics strategies, such as: • skip counting from a known fact • using doubling or halving • using doubling or halving and adding or subtracting one more group • using patterns in the 9s facts • using repeated doubling to determine basic multiplication facts to $9 \times 9$ and related division facts. [C, CN, ME, R]</td>
<td>5. Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems. [C, CN, PS, V]</td>
<td>6. Demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially and symbolically. [C, CN, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>6. Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit), and interpret remainders to solve problems. [C, CN, ME, PS, R, V]</td>
<td>7. Demonstrate an understanding of integers, concretely, pictorially and symbolically. [C, CN, R, V]</td>
</tr>
</tbody>
</table>
### Number

<table>
<thead>
<tr>
<th>Grade 4</th>
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<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
</tbody>
</table>
| 6. Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems by:  
  • using personal strategies for multiplication with and without concrete materials  
  • using arrays to represent multiplication  
  • connecting concrete representations to symbolic representations  
  • estimating products  
  • applying the distributive property.  
  [C, CN, ME, PS, R, V] | 7. Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to:  
  • create sets of equivalent fractions  
  • compare fractions with like and unlike denominators.  
  [C, CN, PS, R, V] | 8. Demonstrate an understanding of multiplication and division of decimals (1-digit whole number multipliers and 1 digit natural number divisors).  
  [C, CN, ME, PS, R, V] |
| 7. Demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by:  
  • using personal strategies for dividing with and without concrete materials  
  • estimating quotients  
  • relating division to multiplication.  
  [C, CN, R, V] | 9. Explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers).  
  [C, CN, ME, PS, T] |
| 8. Demonstrate an understanding of multiplication and division of decimals (1-digit whole number multipliers and 1 digit natural number divisors).  
  [CN, R, V] | 10. Demonstrate, with and without, concrete materials, an understanding of division (3-digit by 2-digit) and interpret remainders to solve problems.  
  [C, CN, PS] |
| 9. Explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers).  
  [C, CN, ME, PS, T] |
| 10. Demonstrate, with and without, concrete materials, an understanding of division (3-digit by 2-digit) and interpret remainders to solve problems.  
  [C, CN, PS] |
### Number

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</tr>
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<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>8. Demonstrate an understanding of fractions less than or equal to one by using concrete, pictorial and symbolic representations to:</td>
<td>11. Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths).</td>
<td></td>
</tr>
<tr>
<td>• name and record fractions for the parts of a whole or a set</td>
<td></td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td>• compare and order fractions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• model and explain that for different wholes, two identical fractions may not represent the same quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• provide examples of where fractions are used.</td>
<td></td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td>[C, CN, PS, R, V]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Represent and describe decimals (tenths and hundredths), concretely, pictorially and symbolically.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[C, CN, R, V]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Number

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
<td>Develop number sense.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>10. Relate decimals to fractions and fractions to decimals (to hundredths). [C, CN, R, V]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 11. Demonstrate an understanding of addition and subtraction of decimals (limited to hundredths) by:  
  - using compatible numbers  
  - estimating sums and differences  
  - using mental mathematics strategies to solve problems. [C, ME, PS, R, V] |                                              |                                              |

[C] Communication  [PS] Problem Solving  
[CN] Connections  [R] Reasoning  
[V] Visualization
Patterns and Relations (Patterns)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome</td>
<td>General Outcome</td>
<td>General Outcome</td>
</tr>
<tr>
<td><strong>Use patterns to describe the world and to solve problems.</strong></td>
<td><strong>Use patterns to describe the world and to solve problems.</strong></td>
<td><strong>Use patterns to describe the world and to solve problems.</strong></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. Identify and describe patterns found in tables and charts, including a multiplication chart. [C, CN, PS, V]</td>
<td>1. Determine the pattern rule to make predictions about subsequent elements. [C, CN, PS, R, V]</td>
<td>1. Demonstrate an understanding of the relationships within tables of values to solve problems. [C, CN, PS, R]</td>
</tr>
<tr>
<td>2. Translate among different representations of a pattern, such as a table, a chart or concrete materials. [C, CN, V]</td>
<td>2. Represent and describe patterns and relationships, using graphs and tables. [C, CN, ME, PS, R, V]</td>
<td>2. Represent and describe patterns and relationships, using graphs and tables. [C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>3. Represent, describe and extend patterns and relationships, using charts and tables, to solve problems. [C, CN, PS, R, V]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Identify and explain mathematical relationships, using charts and diagrams, to solve problems. [CN, PS, R, V]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Patterns and Relations  
(Variables and Equations)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>5. Express a given problem as an equation in which a symbol is used to represent an unknown number. [CN, PS, R]</td>
<td>2. Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions. [C, CN, PS, R]</td>
<td>3. Represent generalizations arising from number relationships, using equations with letter variables. [C, CN, PS, R, V]</td>
</tr>
<tr>
<td>6. Solve one-step equations involving a symbol to represent an unknown number. [C, CN, PS, R, V]</td>
<td></td>
<td>4. Demonstrate and explain the meaning of preservation of equality, concretely and pictorially. [C, CN, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Express a given problem as an equation in which a letter variable is used to represent an unknown number. [C, CN, PS, R]</td>
</tr>
</tbody>
</table>
### Shape and Space (Measurement)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Use direct or indirect measurement to solve problems.</td>
<td>Use direct or indirect measurement to solve problems.</td>
<td>Use direct or indirect measurement to solve problems.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
</tbody>
</table>
| 1. Read and record time, using digital and analog clocks, including 24-hour clocks. [C, CN, V] | 1. Design and construct different rectangles, given either perimeter or area, or both (whole numbers), and draw conclusions. [C, CN, PS, R, V] | 1. Demonstrate an understanding of angles by:  
* identifying examples of angles in the environment  
* classifying angles according to their measure  
* estimating the measure of angles, using 45°, 90° and 180° as reference angles  
* determining angle measures in degrees  
* drawing and labelling angles when the measure is specified. [C, CN, ME, V] |
| 2. Read and record calendar dates in a variety of formats. [C, V] | 2. Demonstrate an understanding of measuring length (mm and km) by:  
* selecting and justifying referents for the unit mm  
* modelling and describing the relationship between mm and cm units, and between mm and m units.  
* selecting and justifying referents for the unit km.  
* modelling and describing the relationship between m and km units. [C, CN, ME, PS, R, V] | 2. Demonstrate that the sum of interior angles is:  
* 180° in a triangle  
* 360° in a quadrilateral. [C, R] |
| 3. Demonstrate an understanding of area of regular and irregular 2-D shapes by:  
* recognizing that area is measured in square units  
* selecting and justifying referents for the units cm² or m²  
* estimating area, using referents for cm² or m²  
* determining and recording area (cm² or m²)  
* constructing different rectangles for a given area (cm² or m²) in order to demonstrate that many different rectangles may have the same area. [C, CN, ME, PS, R, V] | | |
# Shape and Space

(Measurement)

<table>
<thead>
<tr>
<th>General Outcome</th>
<th>Specific Outcomes</th>
</tr>
</thead>
</table>
| Use direct or indirect measurement to solve problems. | 3. Demonstrate an understanding of volume by:  
- selecting and justifying referents for cm³ or m³ units  
- estimating volume, using referents for cm³ or m³  
- measuring and recording volume (cm³ or m³)  
- constructing right rectangular prisms for a given volume.  
[C, CN, ME, PS, R, V]  

4. Demonstrate an understanding of capacity by:  
- describing the relationship between mL and L  
- selecting and justifying referents for mL or L units  
- estimating capacity, using referents for mL or L  
- measuring and recording capacity (mL or L).  
[C, CN, ME, PS, R, V] |

<table>
<thead>
<tr>
<th>General Outcome</th>
<th>Specific Outcomes</th>
</tr>
</thead>
</table>
| Use direct or indirect measurement to solve problems. | 3. Develop and apply a formula for determining the:  
- perimeter of polygons  
- area of rectangles  
- volume of right rectangular prisms.  
[C, CN, PS, R, V] |

<table>
<thead>
<tr>
<th>General Outcome</th>
<th>Specific Outcomes</th>
</tr>
</thead>
</table>
| Use direct or indirect measurement to solve problems. | 3. Demonstrate an understanding of volume by:  
- selecting and justifying referents for cm³ or m³ units  
- estimating volume, using referents for cm³ or m³  
- measuring and recording volume (cm³ or m³)  
- constructing right rectangular prisms for a given volume.  
[C, CN, ME, PS, R, V]  

4. Demonstrate an understanding of capacity by:  
- describing the relationship between mL and L  
- selecting and justifying referents for mL or L units  
- estimating capacity, using referents for mL or L  
- measuring and recording capacity (mL or L).  
[C, CN, ME, PS, R, V] |
Shape and Space
(3-D Objects and 2-D Shapes)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Outcome Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</td>
<td>General Outcome Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</td>
<td>General Outcome Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</td>
</tr>
<tr>
<td>Specific Outcomes 4. Describe and construct right rectangular and right triangular prisms. [C, CN, R, V]</td>
<td>Specific Outcomes 5. Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are: • parallel • intersecting • perpendicular • vertical • horizontal. [C, CN, R, T, V]</td>
<td>Specific Outcomes 4. Construct and compare triangles, including: • scalene • isosceles • equilateral • right • obtuse • acute in different orientations. [C, PS, R, V]</td>
</tr>
<tr>
<td></td>
<td>6. Identify and sort quadrilaterals, including: • rectangles • squares • trapezoids • parallelograms • rhombuses (or rhombi) according to their attributes. [C, R, V]</td>
<td>5. Describe and compare the sides and angles of regular and irregular polygons. [C, PS, R, V]</td>
</tr>
</tbody>
</table>
## Shape and Space
(Transformations)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
<td><strong>General Outcome</strong></td>
</tr>
<tr>
<td>Describe and analyze position and motion of objects and shapes.</td>
<td>Describe and analyze position and motion of objects and shapes.</td>
<td>Describe and analyze position and motion of objects and shapes.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>5. Demonstrate an understanding of line symmetry by:</td>
<td>6. Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw the image.</td>
<td>6. Perform a combination of translations, rotations and/or reflections on a single 2-D shape, with and without technology, and draw and describe the image.</td>
</tr>
<tr>
<td>• identifying symmetrical 2-D shapes</td>
<td>[C, CN, T, V]</td>
<td>[C, CN, PS, T, V]</td>
</tr>
<tr>
<td>• creating symmetrical 2-D shapes</td>
<td>7. Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes.</td>
<td>7. Perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations.</td>
</tr>
<tr>
<td>• drawing one or more lines of symmetry in a 2-D shape.</td>
<td>[C, T, V]</td>
<td>[C, CN, T, V]</td>
</tr>
<tr>
<td>6. Demonstrate an understanding of congruency, concretely and pictorially.</td>
<td></td>
<td>8. Identify and plot points in the first quadrant of a Cartesian plane, using whole number ordered pairs.</td>
</tr>
<tr>
<td>[CN, R, V]</td>
<td></td>
<td>[C, CN, V]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Perform and describe single transformations of a 2-D shape in the first quadrant of a Cartesian plane (limited to whole number vertices).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[C, CN, PS, T, V]</td>
</tr>
</tbody>
</table>
### Statistics and Probability
(Data Analysis)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong>&lt;br&gt;Collect, display and analyze data to solve problems.</td>
<td><strong>General Outcome</strong>&lt;br&gt;Collect, display and analyze data to solve problems.</td>
<td><strong>General Outcome</strong>&lt;br&gt;Collect, display and analyze data to solve problems.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong>&lt;br&gt;1. Demonstrate an understanding of many-to-one correspondence.&lt;br&gt; [C, R, T, V]</td>
<td><strong>Specific Outcomes</strong>&lt;br&gt;1. Differentiate between first hand and second-hand data.&lt;br&gt; [C, R, T, V]</td>
<td><strong>Specific Outcomes</strong>&lt;br&gt;1. Create, label and interpret line graphs to draw conclusions.&lt;br&gt; [C, CN, PS, R, V]</td>
</tr>
<tr>
<td>2. Construct and interpret pictographs and bar graphs involving many-to-one correspondence to draw conclusions.&lt;br&gt; [C, PS, R, V]</td>
<td>2. Construct and interpret double bar graphs to draw conclusions.&lt;br&gt; [C, PS, R, T, V]</td>
<td>2. Select, justify and use appropriate methods of collecting data, including:&lt;br&gt; • questionnaires&lt;br&gt; • experiments&lt;br&gt; • databases&lt;br&gt; • electronic media.&lt;br&gt; [C, CN, PS, R, T]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Graph collected data, and analyze the graph to solve problems.&lt;br&gt; [C, CN, PS, R, T]</td>
</tr>
</tbody>
</table>
## Statistics and Probability
(Chance and Uncertainty)

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Outcome</strong> Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.</td>
<td><strong>General Outcome</strong> Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.</td>
<td><strong>General Outcome</strong> Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Specific Outcomes</strong></td>
</tr>
<tr>
<td>3. Describe the likelihood of a single outcome occurring, using words such as: • impossible • possible • certain. [C, CN, PS, R]</td>
<td>4. Compare the likelihood of two possible outcomes occurring, using words such as: • less likely • equally likely • more likely. [C, CN, PS, R]</td>
<td>4. Demonstrate an understanding of probability by: • identifying all possible outcomes of a probability experiment • differentiating between experimental and theoretical probability • determining the theoretical probability of outcomes in a probability experiment • determining the experimental probability of outcomes in a probability experiment • comparing experimental results with the theoretical probability for an experiment. [C, ME, PS, T]</td>
</tr>
</tbody>
</table>
Numeration

Suggested Time:  $3 - 3\frac{1}{2}$ Weeks

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

Focus and Context

Students have already had significant place value experience in Grade 4. While there may be many students who have not mastered the topic completely, most should arrive at Grade 5 with a strong foundation to build upon; however, they have only worked with numbers to 10,000 in Grade 4 so there is a significant jump in place value from Grade 4 to Grade 5.

Students will explore key concepts of number including:

• Whole numbers to one million and decimals to thousandths.
• Classification of whole numbers and decimals, and characteristics of each through the use of base ten materials, grids and number lines.
• Whole and decimal number relationships’ representation of equivalent relationships.
• The place value system up to one million and to thousandths regarding decimals, focusing on patterns of the base ten system.
• Estimation of numbers will be explored by students through the use of number relations and benchmark numbers.

Math Connects

“Many of the ideas that contribute to computational fluency and flexibility with numbers are clear extensions of how numbers are related to ten and how numbers can be taken apart and recomposed in different ways” (Walle, Folk, 2008 p.121).

As students work with large whole numbers along with decimals to thousandths they are encouraged to develop new ideas. New knowledge will build on previous knowledge, further strengthening number sense. Through tools, such as, base ten materials, grids, and number lines students sift through existing ideas to find those that seem to be most useful in giving meaning to newly acquired concepts.

Working with larger numbers in this unit will give students a deeper understanding which will be necessary to extend to other mathematics strands such as Shape & Space (measurement) and Statistics & Probability. The understanding whole number concepts to millions will be beneficial in other subject areas, such as Geography where demographic information is presented using large whole numbers. The understanding of decimal concepts to thousandths will be useful in everyday life as students compare baseball batting averages and other sports statistics.
### Process Standards Key

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

### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>5N1 Represent and describe whole numbers to 1 000 000.</td>
<td>[C, CN, V, T]</td>
</tr>
<tr>
<td>Number</td>
<td>5N2 Use estimation strategies, including: front-end rounding compensation compatible numbers in problem-solving contexts.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N8 Describe and represent decimals (tenths, hundredths, thousandths) concretely, pictorially and symbolically.</td>
<td>[C, CN, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N9 Relate decimals to fractions and fractions to decimals (to thousandths).</td>
<td>[CN, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N10 Compare and order decimals (to thousandths) by using: benchmarks place value equivalent decimals.</td>
<td>[C, CN, R, V]</td>
</tr>
</tbody>
</table>
**NUMERATION**

**Strand: Number**

**Outcomes**

Students will be expected to

5N1 Represent and describe whole numbersto 1 000 000.

[C, CN, V, T]

**Elaborations—Strategies for Learning and Teaching**

Most of the work done by students will involve numbers in the tens and hundreds of thousands; however, they are now expected to develop meaning for “one million”. For example, one more than 999 999 is 1 000 000 or one thousand sets of 1 000 is one million. This can be modeled on a place value chart by showing 999 999 using counters. Then students are asked, “What number comes next if we add 1?” Students will need to regroup the counters and a new group of three digits will be started. Numbers written in standards form are organized and written into groups of three digits. Some authors call each of these groups a ‘period’. It is not important to highlight the term ‘period’ nor is it intended that students use the term. They can show they understand the concept without using the term ‘period’.

Have students create six digit numbers using two dice. Each roll of the dice provides two digits of the six digit number. Students then write the numbers on a chart and give the value of each digit.

**Achievement Indicators:**

5N1.1 Write a given numeral, using proper spacing without commas; e.g., 934 567.

5N1.2 Write a given numeral to 1 000 000 in words.

5N1.3 Describe the pattern of adjacent place positions moving from right to left.

To effectively read large numbers (i.e. number at and above tens of thousands) periods must be separated with a space. It is no longer the convention to separate periods with commas.

Having students write numbers in words requires them to consider the place value of each digit and solidifies the importance of periods. For example to write:

- 946 219 using words students must recognize that they start with the largest period, (in this case thousands), and continue with the successive periods.
- Students name each period once they say the total number in that period. In the example above, nine hundred forty-six MUST be followed with the period name “Thousand”.

It is important for students to realize that the word “and” is reserved for the decimal. Some students may want to write 946 as ‘nine hundred and forty-six’ instead of the proper wording ‘nine hundred forty-six.’

When discussing adjacent place positions and “hundreds of thousands” build on students’ prior knowledge with tens, hundreds, thousands and tens of thousands.

Using base ten materials have a discussion of “What Comes Next”. Begin with the unit cube as one, ten unit cubes make a rod, which represents ten. Then ask, "What comes next?". The response should be 10 rods which makes a flat, representing a hundred. Continue to a thousand.

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Paper and Pencil**
- Given a set of seven-digit numbers written in words have students write the numbers in standard form using correct spacing and no commas.
  \[(5N1.1)\]
- Given a set of numbers in standard form (up to seven digits) have students rewrite the numbers using words.
  \[(5N1.2)\]
- Ask students to scan newspapers and magazines for large numbers and have them rewrite the headlines/sentences with the numbers in words.
  \[(5N1.2)\]

**Performance**
- Ask students to brainstorm and create headlines that include seven-digit numbers using words. Have students create computer generated copies of their headlines with images.
  \[(5N1.2)\]
- Students roll dice (ten sided if possible) to create a 7-digit number and write in number.
  \[(5N1.2)\]
- Create a memory game matching standard form with its word form.
  \[(5N1.2)\]
- Given a set of seven number cards (0 - 9) students are asked to create and write 5 different seven-digit numbers with correct spacing and no commas.
  \[(5N1.1)\]

**Student-Teacher Dialogue**
- Orally present a series of numbers up to 1 000 000 and ask the student to write the given numbers on a piece of chart paper.
  \[(5N1.1)\]
- Give students a number in standard form and also in words. The word form should be incorrect and then ask students to correct and explain. E.g., 34 360 Thirty thousand four hundred sixty \[(5N1.2)\]
- Ask the student, “Why are the zeros important in the number 23 006?” “How would it affect the value of the number if the zeros were removed?” \[(5N1.3)\]

Resources/Notes

**Math Focus 5**
**Getting Started**
Teacher Resource (TR) pp. 9 - 12

Be selective with the Getting Started section – this is just an introduction to the unit.

**Lesson 1: Representing Numbers**
5N1 (1.1, 1.3, 1.4, 1.5)
TR pp. 12 - 16

This is not new for students.

To address this indicator students must write numbers in standard form as they go through any of the activities

Note: 5N1 (1.2) not covered in text
Strand: Number

Outcomes

Students will be expected to

5N1 Continued

Achievement Indicators:

5N1.6 Express a given numeral in expanded notation; e.g., 45,321 = (4 x 10,000) + (5 x 1,000) + (3 x 100) + (2 x 10) + (1 x 1) or 40,000 + 5,000 + 300 + 20 + 1.

This can then continue on, using thousands cubes to make a rod which represents ten thousand and so on up to the cubic metre which has one million unit cubes (Van de Walle Professional Series, Grades 3 - 5 Volume 2, pp. 48 – 49, 2006). Since typically not enough thousands cubes are available to complete the rod, the flat or the cube using the thousands cubes as building, students could be asked to visualize what each would look like based on what they are able to build.

Expanded form can be demonstrated in either of the following ways:

4,123 = 4,000 + 100 + 20 + 3

or

(4 x 1,000) + (1 x 100) + (2 x 10) + (3 x 1).

Students should be exposed to both forms. For true understanding of expanded form, students should be given numbers that include zeros, such as 50,302. Also, expanded form should be given in various orders such as 4 x 10,000 + 3 x 100,000 + 2 x 100.

Number cards, place value charts, dice, newspaper articles etc. can be used to create and/or find large numbers which can be represented in expanded form.

Literature Connections - The Guinness Book of World Records is a great resource for big numbers. Have students in groups choose several six-digit numbers to write in expanded and standard form to present to the class.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil

- Place two zeros anywhere in the number 2583 to form a new six digit number. Write the new number and explain how the value of each digit has changed.

  (5N1.3)

Performance

- Provide students with a place value chart and counters. Ask them to model a six digit number that has a 9 as two of its digits. Instruct the students to add one more “counter” to a place that has a 9 and write the new number with an explanation as to how they found that number.

  (5N1.3)

- Have students model 304 with base ten blocks and ask them to explain why 10 rods are not present in the model, but there is a digit (0) in the tens place of the number.

- Given a set of counters and a place value chart, have students model 5 different six-digit numbers. Write these numbers in expanded form. Make sure some of the place value positions are zero.

  E.g., 274 392

Math Focus 5
Lesson 1 (Continued):
Representing Numbers
5N1 (1.1, 1.3, 1.4, 1.5)
TR pp. 12 - 16

Lesson 2: Using Expanded Form
5N1 (1.1, 1.3, 1.4, 1.6, 1.7)
TR pp. 17 – 21

Resources/Notes

GRADE 5 MATHEMATICS CURRICULUM GUIDE - INTERIM
**Strand: Number**

<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>Write a large number in expanded form on the whiteboard. Have students write the number in standard form on individual whiteboards and hold up when completed. This is an excellent opportunity to assess students’ understanding.</td>
</tr>
<tr>
<td>5N1 Continued</td>
<td></td>
</tr>
<tr>
<td><strong>Achievement Indicators:</strong></td>
<td></td>
</tr>
<tr>
<td>5N1.7 Write the numeral represented by a given expanded notation.</td>
<td></td>
</tr>
<tr>
<td>5N1.4 Describe the meaning of each digit in a given numeral.</td>
<td>Given a set of numbers, each containing a common digit in a different place, ask students to give the values of that digit in each number. (E.g., 234 567, 108 300, 344 901)</td>
</tr>
<tr>
<td></td>
<td>Each student will roll a die six times to create a six-digit number. Students then record the numbers on a chart and give the value of each digit.</td>
</tr>
<tr>
<td></td>
<td>Some time may be required to review the concept of the “value” of a digit. The “value” of a digit is determined by where it falls in reference to the place value chart.</td>
</tr>
<tr>
<td></td>
<td>Have students give the value of an underlined digit.</td>
</tr>
<tr>
<td></td>
<td>e.g. 62 761 = value of 9 is 9 000</td>
</tr>
</tbody>
</table>
General Outcome: Develop Number Sense

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
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</thead>
<tbody>
<tr>
<td><strong>Journal</strong></td>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td>• Provide students with a statement such as: The digit 3 does not always have a value of 3. Have them explain in writing using examples. (5N1.4)</td>
<td>Lesson 2 (Continued): Using Expanded Form 5N1 (1.1, 1.3, 1.4, 1.6, 1.7) TR pp. 17 – 21</td>
</tr>
<tr>
<td><strong>Paper and Pencil</strong></td>
<td>Lesson 2 does not provide enough work in moving back and forth between standard and expanded form when zeros are concerned.</td>
</tr>
</tbody>
</table>
| • Given a set of numbers in expanded form, have students write them in standard form. Express in expanded notation  
  - 107 060  
  - 50 013 (5N1.6)  
• Given a set of numbers in standard form, have students write them in expanded form. Write the numeral for: 2 x 100 + 3 x 100 000 + 5 x 1 (5N1.7) |
| • Explain how the value of the “1” digit changed in each of the following numbers:  
  45 213  
  1 000 000  
  12 326  
  987 531  
  154 605 (5N1.4) |
| **Performance**               | **Curious Math:** |
| • Given a set of 5 number cards 0 – 9, ask students to show the following:  
  The greatest possible number.  
  The least possible number.  
  A third number with value between the greatest and least but closer in value to the greatest than to the least. (5N1.4)  
  | TR pp. 25 - 26  
  Keep on Doubling  
| **Curious Math:** | TR pp. 27 - 28  
  Lots of Money  
  Be selective, depending on time. |
Strand: Number

Outcomes

Students will be expected to

5N2 Use estimation strategies, including:
  - front-end rounding
  - compensation
  - compatible numbers
in problem-solving contexts.
[C, CN, ME, PS, R, V]

Elaborations—Strategies for Learning and Teaching

“To round a number simply means to substitute a “nice” number that is close so that some computation can be done more easily”. (Walle and Folk 2008, p. 260)

Create a number line on the whiteboard labeled similar to the one shown below. Have students, as a whole group, create the markings to divide the line and decide where to place a given number. Encourage discussion about the rounding of that number.

Achievement Indicator:

5N2.3 Determine the approximate solution to a given problem not requiring an exact answer.

Literature Connection - How Much is A Million? by David M. Schwartz

Share the story with students and extend the concept of how big a million is.

Have students create a collage of how they can group items to create a total group of 1 million. (Please note we are not expecting students to collect a million items.)

Provide newspapers/magazines/e-news/ etc. to highlight examples of large numbers used in headlines and stories. It is important that students view examples of large numbers used in the real world.

5N1 Represent and describe whole numbers to 1 000 000.
[C, CN, V, T]
# General Outcome: Develop Number Sense

## Suggested Assessment Strategies

**Pencil and Paper**

- Have students create a number line using cash register tape. Have them place a 4- or 5-digit number on the line. Ask: How did you decide where to place your number on your number line?  
  \[ (5N2.3) \]

**Performance**

- Joanne decided that she wanted to raise money for the Terry Fox Foundation. Her goal was to raise $10 000 with the support of her school. The total funds taken in was $7 692. A local company will round to the nearest 1 000 dollars. How much will the total donation be?  
  \[ (5N2.3) \]

- Have students scan newspapers/magazines/e-news/ etc. to find examples of large numbers in headlines and stories. Create a collage using numbers and phrases collected.  
  \[ (5N1.5) \]

**Journal**

- Provide students with a large number, up to one million, and ask them to describe a situation where they would see that number outside of school.  
  \[ (5N1.5) \]

- Explain why 79 321 is rounded to 80 000 and not 75 000.  
  \[ (5N2.3) \]

## Resources/Notes

- **Math Focus 5**
  - Lesson 4: Rounding Numbers  
    5N2 (2.3, 2.6)  
    TR pp. 29 - 32

While rounding is not one of the listed strategies, it is a prerequisite for the strategies of this grade level

- 5N2 (2.6) will be covered in Addition and Subtraction of decimals, Multiplication and Division units

- **Lesson 5: Exploring One Million**  
  5N1 (1.5)  
  TR pp. 33 - 35
## Strand: Number

### Outcomes

*Students will be expected to*

5N8 Describe and represent decimals (tenths, hundredths, thousandths) concretely, pictorially and symbolically.

[C, CN, R, V]

### Elaborations—Strategies for Learning and Teaching

According to Small (2009, p.62), students will learn important decimal principles, through the use of concrete materials, pictorial representations, and modeling. Using decimals extends the place value system to represent parts of a whole. The use of a decimal point must be taught as a symbol that separates the tenths from the ones, or in other words, the ‘part from the whole’.

1. Using decimals extends the place value system to represent parts of a whole.
2. The base ten place value system is built on symmetry around the ones place and the decimal.
3. Decimals can represent parts of a whole, as well as mixed numbers.
4. Decimals can be interpreted and read in more than one way.

Students should become familiar and comfortable renaming and reading decimals in several ways. E.g. 4.3 may be renamed 43 tenths.

5. Decimals can be renamed as other decimals or fractions.

E.g., \( \frac{600}{1000} \) or 0.600 can be renamed as \( \frac{60}{100} \) or 0.60. It can also be renamed as \( \frac{6}{10} \) or 0.6. (This can be shown pictorially on thousandths grid paper).

Focus on the need to continue the pattern in our base ten number system, so that the unit (or the whole) is divided into ten, a hundred or a thousand equal parts (or tenths, hundredths, thousandths).

Throughout the study of decimals, there are many concrete materials that will aid students in the understanding of decimal concepts including:

- grid paper (hundredths and thousandths)
- number lines (tenths and hundredths, and thousandths)
- gasoline prices, posted as tenth of a cent which is a thousandth of a dollar. 93.6¢ is $0.936
- metre stick (millimetres are thousandths of a metre)
- decimal squares

Students should read the decimal 3.2 as “3 and 2 tenths” not as “3 point 2”. Reading 7.23 as 7 and 23 hundredths reveals the important connection between fractions and decimals but the language “7 point 23” is fairly meaningless.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil
Write a fraction and a decimal to show the shaded part of each of the following diagrams:

![Fraction and Decimal Diagrams]

An ant walked 3829 mm across a patio table. Write the distance in metres.

Resources/Notes

Math Focus 5
Lesson 6: Decimal Place Value
5N8 (8.1, 8.2, 8.6)
TR pp. 39 - 43

Very important lesson
Strand: Number

Outcomes
Students will be expected to
5N8 Continued

Achievement Indicators:

5N8.1 Write the decimal for a given concrete or pictorial representation of part of a set, part of a region or part of a unit of measure.

Elaborations—Strategies for Learning and Teaching

Students should continue to use physical materials to represent or model decimals. In this way, they can better see the relationship between hundredths and thousandths.

To help model decimals use a thousands grid (found as part of decimal squares kit).

Alternatively, base-ten blocks might be used to illustrate the relationship. Within a given context, the thousands cube could represent 1, then the flat would represent 0.1, the rod 0.01 and the small cube 0.001. The model for 3.231 would be as shown.

Use metre sticks to represent decimals. Measuring to the nearest millimetre is one thousandths of a metre. Also, centimetres are hundredths of a metre and decimetres are tenths of a metre.

Using decimals extends the place value system to represent parts of a whole. This principle means that decimals are an extension of whole numbers. Writing the tenths digit after the decimal point is a convention that must be explicitly taught. If you follow the base ten relationship from left to right a pattern appears.

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- Present student with a base ten model of decimal numbers and ask the student to represent the model with a decimal number.

![Decimal model](image)

(5N8.1)

Pencil and Paper

- Have student write \(\frac{8}{100}\) as a decimal. (5N8.6)

Performance

Have students mark off tenths, hundredths and thousandths of a metre on a metre stick. Then students measure objects to the nearest tenth (dm), hundredth (cm) and thousandth (mm) of a metre. (5N8.1)

Have students model using a thousands grid the numbers 0.3, 0.30, 0.300. (5N8.1)

- Show the student cards on which decimals have been written (e.g., 0.4m, 0.75 m and 0.265 m). Ask the student to place the cards appropriately on a metre stick. (5N8.6)

- Have the student model 0.025 using a thousands grid. Then ask: How does this model differ from the model for 25 hundredths (done on a hundreds grid)? Ask the student to model 0.025 and 25 hundredths using base-ten blocks. (5N8.6)

Resources/Notes

Math Focus 5

Lesson 6 (Continued): Decimal Place Value

5N8 (8.1, 8.2, 8.6)

TR pp. 39 - 43
Strand: Number

Outcomes

Students will be expected to

5N8 Continued

Achievement Indicators:

5N8.6 Continued

Each time you move one place to the right of the decimal the value decreases by a factor of one tenth. So, it makes sense that the next place after one is one tenth of one or 0.1, and then the next place is one tenth of a tenth, which is one hundredth or 0.01, and then next place is one tenth of a hundredth, which is one thousandth or 0.001.

Using an overhead transparency of thousandths grid paper, shade a given value, such as 1.453. Discuss the value of each digit and how it is represented on the thousandths grid.

Using base ten blocks model a given decimal number such as: 3.709 and discuss the value of each digit.

5N8.2 Represent a given decimal, using concrete materials or a pictorial representation.

Base ten blocks are an effective tool for modeling decimal numbers. Model decimal numbers to the thousandths using large cubes as ones, flats as tenths, rods as hundredths and unit cubes as thousandths. For example using base ten blocks to model 3.146 as shown below.

Model decimal numbers to the thousandths using thousandth grid paper. For example using grid paper to model 3.146 as shown below.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Performance**
- Present students with the following decimal numbers:
  - 1.105
  - 0.403
  - 2.069
  - Ask students to model the decimals using base ten materials, grids, and number lines. Ask: How did you choose your materials to model the decimals. \(5N8.2\)

**Paper and Pencil**
- Have students work in pairs. One student prepares a list of 5 different decimal numbers. The other student must model these numbers using base ten materials and grids. Then the students alternate roles. \(5N8.2\)

**Student-Teacher Dialogue**
- Explain the meaning of each digit in $9.99. \(5N8.6\)
- Ask the student to identify a situation in which 0.750 represents a small amount and one in which it represents a very large amount. E.g., 0.750 of a million dollars is a big amount whereas 0.750 of a 10 dollars is a smaller amount. \(5N8.6\)
- Show the student several cards on which decimals have been written (e.g., 0.75 m and 0.265 m). Ask the student to place the cards appropriately on a metre stick. \(5N8.2\)

#### Resources/Notes

- **Math Focus 5**
  - Lesson 6 (Continued): Decimal Place Value
  - 5N8 (8.1, 8.2, 8.6)
  - TR pp. 39 - 43

- **Lesson 7: Renaming Decimals**
  - 5N8 (8.1, 8.2, 8.3, 8.4, 8.5, 8.6)
  - 5N9 (9.1, 9.2, 9.3)
  - TR pp. 44 – 48

*Very important lesson*
NUMERATION

Strand: Number

Outcomes

Students will be expected to

5N9 Relate decimals to fractions and fractions to decimals (to thousandths).

Achievement Indicators:

5N9.1 Write a given decimal in fractional form.

5N9.3 Express a given pictorial or concrete representation as a fraction or decimal; e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250 or \( \frac{250}{1000} \).

Elaborations—Strategies for Learning and Teaching

There are different, but, equivalent representations for a number. Relating fractions to decimals is an example of this concept.

Reinforce the connection between decimals and fractions by having the students write the fraction and the decimal for the shaded part. Conversely, provide the students with decimals or fractions and have them shade the appropriate amounts on the hundredth and/or thousandths grids. Encourage them to write the decimal and fraction for the unshaded part and compare the numbers they wrote for the shaded and unshaded parts. For example, if 0.425 is shaded then 0.575 is unshaded.

Decimals are introduced as tenths, hundredths or thousandths so students immediately recognize the relationship between decimals and fractions tenths, hundredths and thousandths. For example, \( \frac{2}{10} \) equals 0.2 and 0.34 is \( \frac{34}{100} \) and 2.405 is \( \frac{405}{100} \).

Students should also be aware of certain benchmarks.

E.g., 0.5 or 0.50 or 0.500 are all equal to \( \frac{1}{2} \)

0.25 or 0.250 both equal \( \frac{1}{4} \)

0.75 and 0.750 are equal to \( \frac{3}{4} \)

(Dr. Small Big Ideas, 2009, Grades 4 – 8, p 65)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

• Students play a concentration game where they use a deck of turned-over cards some with decimals and some with fractions. Their task is to make matches by turning over two cards. They keep the cards if the match. They turn them back over if they don’t match.

Card set should include:

And 0.1, 0.2, 0.25, 0.5, 0.75, 0.7, 0.01, 0.01, 0.02, 0.04, 0.6, 0.8, 0.9 Source: Small (2008), Making Math Meaningful. P.233 (5N9.1)

• Have students model three decimals numbers using base ten blocks, or grids. Then instruct students to: “Write the fraction equivalent for the decimal model you just created.”

Ask: “How do you know your fraction is correct?” (5N9.1)

Paper and pencil

• Write as many fractions and decimals as you can for the shaded area. (5N9.3)

• Mary and her brothers and sisters ate 0.75 of her birthday cake. Use a diagram to show what FRACTION of the cake remains. Express the amount eaten as a fraction, in as many forms as you can. (5N9.3)

Student-Teacher Dialogue

• Ask student to explain why 0.750 is equivalent to \( \frac{3}{4} \) using a number line. (5N9.3)

Resources/Notes

Math Focus 5
Lesson 7 (Continued): Renaming Decimals
5N8 (8.1, 8.2, 8.3, 8.4, 8.5, 8.6)
5N9 (9.1, 9.2, 9.3)
TR pp. 44 – 48
**Strand: Number**

**Outcomes**

Students will be expected to

5N8 Continued

**Achievement Indicators:**

- **5N8.3** Represent an equivalent tenth, hundredth or thousandth for a given decimal, using a grid.

- **5N8.4** Express a given tenth as an equivalent hundredth and thousandth.

- **5N8.5** Express a given hundredth as an equivalent thousandth.

**Elaborations—Strategies for Learning and Teaching**

In Grade 4, students used money (dimes and pennies) to explore the equivalence of tenth and hundredths. For example, 20 pennies (0.20) was equivalent to 2 dimes (0.2).

In Grade 5, equivalence will include tenths, hundredths and thousandths and therefore thousandths grid paper (or decimal squares) will be needed.

Have students fill 200 small squares on a thousandths grid. (0.200) which shows 0.20 (20 rows of ten small squares) and 0.2 (2 squares of 100 small squares)
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Pencil and Paper**
- Express the decimal represented by this grid in tenths, hundredths and thousandths.

![Grid](5N8.3)

**Student-Teacher Dialogue**
- What decimal is represented by the hundredths grid? Shade the tenths to show an equivalent amount? What decimal is represented by the tenths grid? Explain how you know decimals are equivalent.

![Grids](5N8.4)

What decimals are represented by the grids? Are they equivalent? Explain.

![Grids](5N8.5)

**Student-Teacher Dialogue**
- Display a series of decimals and ask the student to identify equivalent decimals.

<table>
<thead>
<tr>
<th>2.35</th>
<th>3.4</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.40</td>
<td>0.07</td>
<td>2.305</td>
</tr>
<tr>
<td>2.350</td>
<td>0.700</td>
<td>2.3</td>
</tr>
<tr>
<td>5.400</td>
<td>0.7</td>
<td>0.540</td>
</tr>
</tbody>
</table>

(5N8.4, 8.6)

#### Resources/Notes

**Math Focus 5**
- **Lesson 8: Communicating About Equivalent Decimals**
  - 5N8 (8.1, 8.2, 8.3, 8.4, 8.5, 8.6)
  - 5N9 (9.1, 9.2, 9.3)
  - TR pp. 49 – 52

More practice will be needed than the core text provides.

Have students play “Decimal Snap” math game in TR p. 57 (5N8.4)
Strand: Number

Outcomes

Students will be expected to

5N2 Use estimation strategies, including:
  • front-end rounding
  • compensation
  • compatible numbers

in problem-solving contexts.

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

Elaborations—Strategies for Learning and Teaching

Refer back to estimation strategies listed for N2. Students should be able to round decimals to simpler decimals such as 2.567 to 2.6 or 2.567 to 3. The conventions or rules for rounding are just like the ones for whole numbers.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Nearest Thousandth</th>
<th>Nearest Hundredth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9206</td>
<td>2.929</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Too often rounding numbers is taught as an algorithm without discussing why that algorithm makes sense. Students may think that rounding a number means changing it in some way when, really, rounding a number means that you substitute a ‘friendly’ number that is easier to use. For example, working with 6.5 is easier than working with 6.523.

You might round decimals when describing measurements with different units i.e., a wall that is 2.367 metres long can be estimated as 2.37 metres (2 metres and 37 centimetres) or 2.4 metres (2 metres and 4 decimetres) or as 2 metres.

Students should be able to determine which of two decimal numbers is greater by comparing the whole number parts first and then the amounts to the right of the decimals. It is important that students understand decimal numbers do not need the same number of places after the decimal to be compared. For example, one can quickly conclude that 0.8 > 0.423, without converting 0.8 to 0.800, because the former is much more than half and the latter is less than half. Students should also understand that a number having more places after the decimal than another does not mean it is smaller nor does it mean it is larger—these are common misconceptions. That is, some students think 0.101 is larger than 0.11 because 101 is larger than 11; others think it is smaller just because it has thousandths while the other number has only hundredths.

(These same students would also say 0.101 is smaller than 0.1 because it has thousandths while 0.1 has only tenths.) Such misconceptions are best dealt with by having students make base ten block representations of numbers that are being compared.
**General Outcome: Develop Number Sense**

### Suggested Assessment Strategies

#### Performance
- Close Nice Numbers - Write a four digit decimal on the board, e.g., \(-3.0917\), start with the whole numbers. “Is it closer to 3 or 4?” Then go to the tenths: “Is it closer to 3.0 or 3.1?” Repeat with hundredths and thousandths. At each answer challenge students to defend their choices. (Walle, Lovin, 2006)  
  (5N2.3)

- Give students the number cards 0.99, 0.987, 0.9 and 1.001, and ask them which decimal number they think is closest to 1. Have them explain how they made their decisions.  
  (5N10.1)

#### Paper and Pencil
- Jill had 4.673 m of velvet and 5.076 m of silk. She estimated the total at 9.8 m. Is Jill correct or incorrect? Explain your answer using numbers, pictures or diagrams.  
  (5N2.3)

#### Student-Teacher Dialogue
- Ask the student to explain why you cannot compare two decimals by simply counting the number of digits in each.  
  (5N2.3)

- Give students the number cards 9.023, 10.9, 9.05, 10.11 and 9.8, and ask them which decimal they think is closest to 10. Have them explain how they made their decisions.  
  (5N10.1)

### Resources/Notes

- **Math Focus 5**
  - Lesson 9: Rounding Decimals  
    5N2 (2.3)  
    5N8 (8.1, 8.2, 8.3, 8.4, 8.5)  
    5N9 (9.1, 9.2, 9.3)  
    TR pp. 53 - 56

- **Additional Reading:**
  - Small (2008), Making Math Meaningful. p. 233

- **Lesson 10: Comparing and Ordering Decimals**
  - 5N10 (10.1, 10.2, 10.3, 10.4, 10.6)  
  - TR pp. 59 - 62
Outcomes

Students will be expected to

5N10 Continued

Achievement Indicators:

5N10.2 Order a given set of decimals including only tenths, using place value.

5N10.3 Order a given set of decimals including only hundredths, using place value.

5N10.4 Order a given set of decimals including only thousandths, using place value.

5N10.5 Explain what is the same and what is different about 0.2, 0.20 and 0.200.

Elaborations—Strategies for Learning and Teaching

Create a number line on your classroom floor using masking tape. Have several decimal numbers, (less than 1) on flash cards. Show the numbers to the class ask: “What should our benchmarks be?”

Write the benchmarks on flash cards and have students place them correctly on the number line.

Giving students the flash cards, have a class discussion to determine where each decimal should be placed on the number line.

The above activity can be modified for tenths only, hundredths only, thousandths only, a mixture of decimals in tenths, hundredths and thousandths and even a mixture of decimals and fractions less than 1, even though this particular outcome is specific to decimals.

The decimal number 0.2, 0.20 and 0.200 represent the same amount, that \( \frac{2}{10} \) is equivalent to \( \frac{20}{100} \) which is also equivalent to \( \frac{200}{1000} \). They are different in their representation and in the number of digits used. Also, 0.2 mans 2 parts out of 10, while 0.20 means 20 parts out of 100 and 0.200 means 200 parts out of 1000. There is a difference in the precision of measurement implied. You cannot equate for example 3.2 m and 3.20 m since different levels of precision are implied by the use of more decimal places. The measurement 3.20 m indicates that the length could be anywhere between 3.195 m and 3.204 m. (The range of values that could be rounded to 3.20), whereas, 3.2 m could be anywhere between 3.15 m and 3.24 m (the range of values that could be rounded to 3.2), which makes 3.2 m less precise than 3.20 m. (Big Ideas from Dr. Small, 2009, p. 65)

This specific outcome can be met with the use of a T- diagram.

<table>
<thead>
<tr>
<th>Same</th>
<th>Different</th>
</tr>
</thead>
<tbody>
<tr>
<td>* have 0 and 2 as digits</td>
<td>* number of digits after the 0</td>
</tr>
<tr>
<td>* represent same amount</td>
<td>* degree of precision shown (3 places after the decimal suggests that the measurement was more precise - to thousandths)</td>
</tr>
<tr>
<td>* are all decimal #'s</td>
<td>* 0.2 represents 2 parts out of 10 where 0.20 represents 20 parts out of 100 and 0.200 represents 200 parts out of 1000</td>
</tr>
</tbody>
</table>
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Give students the following blank game board.

```
  >
  >
```

Roll a die. As the number is called each student fills in a blank on his/her board. Roll the die 18 times. The student who ends up with three true sentences wins that round. Then repeat the process. Circulate during the play asking questions and noting student's justification of position choice. Students could be asked to write any strategies they used on chart paper and a class discussion could follow. (5N10.2, 10.3, 10.4)

- Give students eight blank cards with a decimal number to the tenths on each. Have them challenge a partner to order the number cards. Repeat activity using decimal numbers to the hundredths and to the thousandths. (5N10.2, 10.3, 10.4)

- Demonstrate the equivalency of 0.5, 0.50 and 0.500 using base ten blocks, (i.e. 5 flats equals 50 rods equals 500 unit cubes) (5N10.5)

**Paper and Pencil**

- Provide examples of some of the best javelin throw distances that have occurred in past Olympics. E.g.,

```
1972: 90.48 m  1980: 91.20 m  1988: 84.28 m  1992: 89.66 m
```

Ask students to arrange the distances in order and determine whether records always improve. (5N10.3)

- How are 0.3, 0.30 and 0.300 the same? How are they different? Use pictures, words and numbers in your explanation. (5N10.5)

- How are 0.25 and 0.250 the same? How are they different? Use pictures, words and numbers in your explanation. (5N10.5)

**Resources/Notes**

*Math Focus 5*

Lesson 10 (Continued):
Comparing and Ordering Decimals

5N10 (10.1, 10.2, 10.3, 10.4, 10.6)

TR pp. 59 - 62

*This outcome is not directly addressed in the text, however, the concept of “equivalent decimals” has be developed in lessons 7 and 8.*
5N10 Continued

Achievement Indicator:

**N10.6** Order a given set of decimals including tenths, hundredths and thousandths, using equivalent decimals; e.g., 0.92, 0.7, 0.9, 0.876, 0.925 in order is: 0.700, 0.876, 0.900, 0.920, 0.925

Strategies for comparing decimals closely relate to strategies for comparing whole numbers. It is important to ensure that the same place values are being compared.

<table>
<thead>
<tr>
<th>Comparing Decimals Using Place Value Different Ways</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.78 &gt; 0.39 since 7 tenths &gt; 3 tenths</td>
</tr>
<tr>
<td>0.78 &gt; 0.39 since 78 hundredths &gt; 39 hundredths</td>
</tr>
</tbody>
</table>

Note that with whole numbers, you can rely on the number of digits to provide a sense of the relative size of numbers, that is, a 3 digit whole number is always greater than a 2 digit whole number. This is not the case with decimals. When comparing decimals, the number of digits is irrelevant; it is the place value of the digits that matters. Students can use either place value or benchmark numbers to help them compare. For example.

<table>
<thead>
<tr>
<th>Comparing using place value</th>
<th>Comparing using a benchmark number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02 &lt; 0.2 since 2 tenths</td>
<td>0.021 &lt; 0.1 since 0.2 &gt; 0.1</td>
</tr>
<tr>
<td>0.021 &gt; 0.01 since 2 hundredths &gt; 1 hundredths</td>
<td>0.021 &gt; 0.01 since 0.02 &gt; 0.01</td>
</tr>
</tbody>
</table>

Many students find it easier to compare (and calculate with) decimals when they have the same number of digits. This is always possible using equivalent decimals. For example,

<table>
<thead>
<tr>
<th>Comparing using equivalent decimals with same number of digits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.34 &gt; 0.3 since 34 hundredths &gt; 30 hundredths</td>
</tr>
<tr>
<td>8.302 &gt; 8.32 since 8.302 &gt; 8.320 (302 thousandths &gt; 320 thousandths)</td>
</tr>
</tbody>
</table>
### Suggested Assessment Strategies

#### Performance
- Divide students into groups of 2 or 3. Each student creates a 3-digit decimal number, less than 2. Next, they should build their number using base ten materials and sketch it in a journal. Place all numbers on a number line in relative position. Compare and check answers with classmates. Give students cards with various decimal numbers written on them and ask the students to place the numbers on a number line in appropriate places. (5N10.6)

#### Journal
- Michael says 1.40 is bigger than 1.406. Is he correct or not correct? Explain using base ten drawings. (5N10.6)

#### Pencil and Paper
- Tell the students the gasoline is priced at 56.9 cents per litre. Ask: What part of a dollar is this? (5N10.6)

---

### Resources/Notes

**Math Focus 5**

**Lesson 10 (Continued): Comparing and Ordering Decimals**

5N10 (10.1, 10.2, 10.3, 10.4, 10.6)

TR pp. 59 - 62

*End of chapter material and unit assessment - be selective.*
Adding and Subtracting Decimals

Suggested Time: 3 weeks

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

Focus and Context

Estimation is used in everyday situations because it is sometimes more practical and efficient than the time required to find an exact number. Using the estimation strategies of front-end rounding, compensation and compatible numbers, students will work in problem-solving contexts to add and subtract decimals. Students learn how these strategies can produce a reasonable answer - one that makes sense. In this unit students will use base ten materials and extend the place value system to include decimals.

Estimation is crucial in the addition and subtraction of decimals. In fact, “students should become adept at estimating decimal computations well before they learn to compute with pencil and paper” (Van de Walle and Lovin 2006, p. 124). Through estimation, the students use number sense to determine if the answer is reasonable. By building on students' understanding of addition and subtraction of whole numbers, the pattern of place value is extended to decimals and the importance of adding the same place values continues; i.e., adding tenths to tenth, hundredths to hundredths and so on. Van de Walle and Lovin (2006) state, “Addition and subtraction with decimals are based on the fundamental concept of adding and subtracting the numbers in like position values—a simple extension from whole numbers” (p. 107).

Math Connects

Conceptual understanding of decimals requires that the students connect decimal numbers to whole numbers and to fractions. Decimals are shown as an extension of the whole number system by introducing a new place value, the tenths place, to the right of the ones place, separated by the decimal point. The tenths place follows the pattern of the base ten number system by iterating one tenth ten times to make one whole or a unit (Wheatley and Abshire 2002, p. 152). Similarly, the hundredths place to the right of the tenths place iterates one hundredth ten times to make one hundredth. Following this pattern, the thousandths place to the right of the hundredths place iterates one thousandth ten times to make one thousandth. Van de Walle and Lovin (2006) suggest that the concepts of whole number place value be reviewed prior to considering decimal numerals with students and they state: “The base-ten place-value system extends infinitely in two directions: to tiny values as well as to large values. Between any two place values, the ten-to-one ratio remains the same. The decimal point is a convention that has been developed to indicate the units position. The position to the left of the decimal point is the unit that is being counted as singles or ones” (p. 107).
Process Standards

Key

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

Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>5N2 Use estimation strategies, including: front-end rounding compensation compatible numbers in problem-solving contexts.</td>
<td>[C, R, T, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N11 Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths).</td>
<td>[C, PS, R, T, V]</td>
</tr>
</tbody>
</table>
Adding and Subtracting Decimals

Strand: Number

Outcomes

Students will be expected to

5N2 Use estimation strategies, including:
• front-end rounding
• compensation
• compatible numbers

in problem-solving contexts.

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

Elaborations—Strategies for Learning and Teaching

Estimation is a mental “process of producing an answer that is sufficiently close to allow decisions to be made” (Reys 1986, p. 22). The focus for Grade Five is on computational estimation using: front-end rounding, compensation, and compatible numbers. As students estimate first and then calculate, they refine their estimation strategies. When estimating, it is important that students are encouraged to focus on the meaning of the numbers and the operations.

Consider the following when teaching computational estimation.

• Encourage the students to take risks as they explore various computational estimation strategies. They must develop a comfort level in finding approximate answers to computation.

• “Create a classroom environment that encourages student exploration, questioning, verification and sense making” (Reys 1992, p. 5).

• Have the students communicate their thinking as they estimate and then “share their reasoning with the class” (Reys 1992, p. 5).

• Capitalize on class sharing by highlighting the estimation strategies that result in close estimates; e.g., combining compensation with other strategies such as front-end or compatible numbers.

• Provide opportunities for the students to explore the multiple relationships among numbers and among operations.

• Provide regular reinforcement so that students always estimate before they calculate to determine the reasonableness of their calculated answers. Van de Walle and Lovin (2006) state, “A good place to begin computation is with estimation. Not only is it a highly practical skill, but it also helps [students] look at answers in ballpark terms and can form a check on calculator computation” (p. 125).

• Provide a variety of problem-solving contexts in which students decide that an estimated answer is adequate and efficient.

• Provide a variety of problem-solving contexts in which students have the opportunity to explore various types of computational estimation strategies and then choose the strategy that works best for them in a given situation.

When providing students with problems or questions, attempt to make the problems as relevant to the students as possible. Discuss situations where estimation is used in real life. As well, discuss with students why

Continued
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Paper and Pencil**
- Provide students with problem-solving contexts such as those listed below. Ask them to estimate the sums or differences first. Next encourage students to calculate the answer to the problem and then compare their calculated answer to the estimated answer.
  - Mount Everest is 8.850 km high. Mount Logan is 5.959 km high. What is their approximate height difference?
  - Jenny and her 11 friends go out to eat at a restaurant. Each meal costs $9.97 including GST and the tip. Will $100 cover the cost of the meals?
  - You have a piece of string and cut it off at 46.8 cm, leaving 138.6 cm. Estimate the length of string you had at the beginning.
  - Create a problem that requires only an estimated answer to solve it. Solve the problem you created by estimating the answer and explain your thinking.  

**Student-Teacher Dialogue**
- Ask the student to explain if a $10 bill would cover the cost of buying a milkshake for $3.98 and a sub for $6.59. Does this student use estimation in solving this problem? Have him/her explain why a $10 bill would not cover the cost of the two items.

### Resources/Notes

**Math Focus 5**

**Getting Started**
Teacher Resource (TR) pp. 8 - 12

*Be selective with the Getting Started section – this is just an introduction to the unit.*

**Lesson 1: Estimating Whole-Number Sums and Differences**
5N2 (2.3, 2.4, 2.5, 2.6, 2.7) TR pp. 13 - 17

*Note: Front-end rounding, compensation, and compatible numbers strategies are located in Math Background in TG p. 13.*

**Lesson 2: Communicating about estimating and calculating**
5N2 (2.3, 2.4, 2.5, 2.6, 2.7) TR pp. 18 - 21

*Treat these lessons together for instruction*
Strand: Number

Outcomes

Students will be expected to

5N2 Continued

Achievement Indicators:

5N2.3 Continued

5N2.4 Estimate a sum or product, using compatible numbers.

5N2.7 Apply front-end rounding to estimate:
- sums; e.g., 253 + 615 is more than 200 + 600 = 800
- differences; e.g., 974 – 250 is close to 900 – 200 = 700
- products; e.g., the product of 23 x 24 is greater than 20 x 20 (400) and less than 25 x 25 (625)
- quotients; e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200).

Elaborations—Strategies for Learning and Teaching

sometimes it is necessary to have an exact answer while other times an estimation is fine. One example to begin this lesson could be: A toy store has a sale. It will pay the tax if your purchase totals $25 or more. Jessica buys a computer game for $14.95 and some batteries for $4.99. About how much more would she need to spend in order to avoid paying the tax?

Compatible Numbers Strategy

The compatible numbers strategy is a method of estimating by using “friendly” or “nice” numbers, that can be easily calculated mentally. Compatible numbers can be used in estimating sums and differences.

E.g.,
(a) 543 – 257 is about 543 – 243 = 300.
(b) 46 + 78 + 54 = (46 + 54) + 78 = 100 + 78 = 178

Encourage students to explain, in their own words, why they used their estimation strategy.

Provide the students with a problem-solving context requiring the addition and subtraction of decimals. For example, to raise money at school, 24 students each sold 6 chocolate bars at $1.75 each. Estimate how much money the students collected.

Model estimating the sum using the compatible numbers strategy then encourage them to refine the estimate by using compensation if necessary.

Front-end Strategy

The front-end strategy is a method of estimating computations by keeping the first digit in each of the numbers and changing all the other digits to zeros. This strategy can be used to estimate sums and differences. Note that the front-end strategy always gives an underestimate for sums.

Example:
- 123 + 212 = 100 + 200 = 300.
- You have a piece of ribbon that is 46.5 cm long. You have to cut a piece that is 22.7 cm long. About how much do you have left?

Using front-end rounding strategy:

46.5 cm - 22.7 cm
40 cm - 20 cm = 20 cm

(Note that front-end estimation of products and quotients will be covered in other units.)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- Present the student with the following problem: Terry-Lynn had $257 to spend. She spent $173. Terry-Lynn estimates that she has less than $100 dollars left. Is her estimate reasonable? Explain. (5N2.4)

- Subtraction questions:
  \[ 685 - 217 = \quad 685 - 274 = \]
  Estimate (front-end strategy):
  \[ 600 - 200 = 400 \quad 600 - 200 = 400 \]
  Which estimate is closer to the actual difference? Explain your thinking without doing the actual calculation. (5N2.7)

Performance

- Place students in groups of 2 – 3. Provide each group with a weekly flyer. Have each group use estimation strategies to purchase items from the flyer by going as close as possible without going over a given amount. Have groups share their strategies with the class. (5N2.4)

- Complete the following:
  Ask students to estimate using compatible numbers.
  \[
  346 + 263 = \\
  952 + 324 + 147 = \\
  75 + 514 + 287 + 22 = \\
  \]
  Pick one of your answers and present to class. (5N2.4)

- Use estimation to determine which combination of animals above can safely cross the bridges with the given load limits?
  (a) Bridge A: 800 kg
  (b) Bridge B: 1 100 kg

Resources/Notes

Math Focus 5

Lesson 1 (continued): Estimating Whole-Number Sums and Differences
5N2 (2.3, 2.4, 2.5, 2.6, 2.7)
TR pp. 13 - 17

Lesson 2 (continued): Communicating about estimating and calculating
5N2 (2.3, 2.4, 2.5, 2.6, 2.7)
TR pp. 18 - 21

The text does not reference the estimation strategies of front-end rounding, compensation and compatible numbers in solving problems. Further development of these strategies should be used from the guide.
Strand: Number

Outcomes

Students will be expected to

5N2 Continued

Elaborations — Strategies for Learning and Teaching

Compensation Strategy

The compensation strategy is a method of adjusting a computational estimate to make it closer to the calculated answer. This strategy is used with the front-end rounding and compatible numbers strategies to provide better estimates.

Compensation strategy is used to adjust the estimate to make it closer to the actual sum.

E.g., You buy a hamburger for $4.79 and a drink for $1.26. Will a $5 bill cover the cost? (Solution: $4.79 + $1.26)

Front-end rounding: $4 + $1 = $5
Compensation: $0.79 and $0.26 = $1
$5 + $1 = $6

Answer: A $5 bill will not cover the cost because the cost is a little more than $6.

Write on the board: 136.2 + 26.2

140 + 30 = 170 (compatible numbers)

Explain that if you round one number up the other number should round down to improve accuracy.

Then write

So, 140 + 20 = 160

Ask students to think of alternative compensation strategies.
(e.g., 130 + 30, 135 + 25)

At this point, students should be given problems where they are expected to use reasoning skills to choose the estimating strategy which makes the most sense.

For example, according to the Guinness World Records 2005, the heaviest head of garlic had a mass of 1.191 kg. The heaviest potato had a mass of 3.487 kg. Estimate the combined mass of these vegetables by choosing the best estimation strategy.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil

- On a trip you travel 4250 km the first week, 3755 km the second week and 2115 km the third week. Estimate how many kilometres you travel during the three weeks. Explain your thinking. Do you think your estimate is more or less than the calculated answer? Explain your reasoning. (5N2.7)

- During one summer, Marcie travels 7185 km while Jimmy travels 4205 km. Estimate how much farther Marcie travelled than Jimmy during the summer. Explain your thinking. Do you think your estimate is more or less than the calculated answer? Explain your reasoning. (5N2.7)

- Phillip ran 26.5 km last week and 19.8 km this week. Using the compensation strategy to estimate his total running distance for the two week period. (5N2.5)

- Adam was given two Newfoundland puppies for his birthday named Ebony and Ireland. When they were born, Ebony had a mass of 0.775 kg and Ireland had a mass 0.836 kg. Estimate the total mass of Ebony and Ireland and explain your estimation strategy. (5N2.6)

Student-Teacher Dialogue

- Tony has 375 baseball cards and 823 hockey cards. He estimates his total collection of sports cards to be 1100. How could he have made his estimate closer to the actual total? (5N2.5)

Journal

- Jimmy is going to buy 3 packages of gum. Each package of gum costs $1.37. How can he estimate how much money he will need for his purchase? (5N2.6)

Performance

- Judy used the following estimation strategy to estimate the sum of 365 and 437. Judy's thinking: I used the front-end rounding strategy. 365 is about 300 and 437 is about 400
  
  300 + 400 = 700
  
  My estimate for the sum of 365 and 437 is about 700.
  
  How could you adjust Judy's estimate to make it closer to the calculated sum? Explain your thinking without doing the actual calculation. (5N2.6)

Resources/Notes

- Math Focus 5
- Lesson 1 (Continued): Estimating Whole-Number Sums and Differences
  5N2 (2.3, 2.4, 2.5, 2.6, 2.7)
  TR pp. 13 - 17

- Lesson 2 (Continued): Communicating about estimating and calculating
  5N2 (2.3, 2.4, 2.5, 2.6, 2.7)
  TR pp. 18 - 21
Strand: Number

Outcomes

*Students will be expected to*

5N11 Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths).

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

As students learn to add and subtract they should connect with what they learned about adding and subtracting whole numbers. It is also recommended that students revisit adding and subtracting to hundredths before moving forward to examples involving thousandths. Each principle and algorithm related to whole number operations continues to apply. There are virtually no changes to the explanations for the algorithms when dealing with addition and subtraction of decimals rather than whole numbers. What students learned about estimating whole numbers also applies to decimals.

In Grade four students have only been adding and subtracting tenths and hundredths and are now expected to work with thousandths.

Students should develop some computational fluency with decimal numbers. In the past, decimal computation was dominated by lining up the decimal places. While this is important, for accurate computation a firm understanding of place value is needed.

A good place to begin decimal computation is with estimation. The estimation strategies covered in indicators 5N2.4, 5N2.5 and 5N2.7 can be used for rough estimates helping students determine if their answer is reasonable. It also will aid with decimal placement.

Example: Jack rode his bike 8.5 km on Monday, and 7.3 km on Tuesday. How far did he ride in two days?

9 km + 7 km = 16 km (compensation)

Achievement Indicator:

5N11.4 Predict sums and differences of decimals, using estimation strategies.

On the board, place the following table:

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Mass (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>1.673</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>3.065</td>
</tr>
<tr>
<td>Lemon</td>
<td>5.265</td>
</tr>
<tr>
<td>Mango</td>
<td>1.94</td>
</tr>
<tr>
<td>Peach</td>
<td>0.725</td>
</tr>
<tr>
<td>Strawberry</td>
<td>0.231</td>
</tr>
</tbody>
</table>

Have students work in pairs. They take turns choosing two combinations of fruit and estimating their combined mass. Student A is to tell his partner an estimate. Student B guesses which two fruit were chosen. If Student B guesses incorrectly, Student A provides a closer estimate. Continue with different pairs of fruit and switching student roles.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

• Jane was running in her school’s track and field competition. Her first race time was 4.127 minutes. Her second race time was 4.091 minutes. Using estimation, explain about how long she was running in total. (Be sure to show how you estimated.) In which race did she have the better time? How much did she improve? (5N11.4)

Resources/Notes

Math Focus 5
Lesson 3: Estimating Decimal Sums and Differences
5N2 (2.1, 2.2)
5N11 (11.4, 11.5)
5PR2 (2.2)
TR pp. 22 - 25
### Strand: Number

**Outcomes**

Students will be expected to

5N2 Continued

**Achievement Indicators:**

- **5N2.1** Provide a context for when estimation is used to:
  - make predictions
  - check the reasonableness of an answer
  - determine approximate answers

- **5N2.2** Describe contexts in which overestimating is important.

5N11 Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths).

[C, CN, PS, R, V]

**Elaborations—Strategies for Learning and Teaching**

When estimating and predicting it is important that students check to make sure their answers are reasonable.

Brainstorm with students to create a list of real life situations in which overestimating would be required. For example; You are in a grocery store with only $20. You need to buy milk $3.98, bread $2.29, eggs $2.76 and a steak for $8.67. Will you have enough money at the cash register to buy your food items?

An example of the importance of overestimating could be planning a birthday party. We often overestimate the amount of food needed to make sure all guests have enough to eat.

As students learn to add and subtract decimals they should be using the strategies they learned about whole number addition and subtraction.

In Grade 4, students have represented decimals to the hundredths using base ten materials.

\[
\begin{align*}
\text{flat} &= \frac{1}{100} & \text{rod} &= \frac{1}{10} & \text{unit} &= \frac{1}{1000} \\
\text{or 0.1} & \quad \text{or 0.01} & \quad \text{or 0.001}
\end{align*}
\]

In Grade 5 the base ten materials have to extend to thousandths; therefore, the base ten materials will be represented as follows:

\[
\begin{align*}
\text{flat} &= \frac{1}{1000} & \text{rod} &= \frac{1}{100} & \text{unit} &= \frac{1}{10000} \\
\text{or 0.01} & \quad \text{or 0.001} & \quad \text{or 0.0001}
\end{align*}
\]

Time will be needed for students to practice this base ten representation. Rather than having students line up decimals vertically or add zeros, they should be focusing on place value of the digits.

Before students are introduced to regrouping in addition of decimals, they need to know how to add without regrouping. Smaller decimal numbers should be used as a starting point for introducing addition of decimal numbers.

Continued
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue
• Ask: We are going to put up a new bulletin board in the classroom. The border needed comes in lengths of 113 cm. The perimeter of (distance around) the board is 406 cm. Is it reasonable to use 6 lengths of border? Explain. (5N2.1)

Journal
• Describe a situation in which you would round $12.35 to $13 instead of down to $12. (5N2.2)

Paper and Pencil
• John wishes to buy a new computer game that costs a total of $109.95 (taxes included). He has $43.79 in his wallet and $59.98 in his piggy bank. He estimates his total to be over $110, so he can buy his game. Is his estimate reasonable? Explain. (5N2.1)

• Sophie and her sisters, Ruby and Rhonda, are going to the theatre. They each purchase a ticket which costs $7.85, and a snack pack that costs $8.99. Their parents give them $50. Using estimation, will Sophie, Ruby and Rhonda have to bring extra money with them to cover the cost? (5N2.2)

Pencil and Paper
• Maria’s math book has a mass of 0.573 kg, her social studies book is 0.45 kg, and her science book 0.108 kg. What is the total mass of Maria’s books? (5N11.5)

Performance
• Using base ten materials model, illustrate and solve the following number sentences.
  (a) 3.62 + 4.51 =
  (b) 3.21 + 1.41 =
  (c) 3.234 + 1.123 =
  (d) 1.562 + 1.238 =
      (5N11.5)

• Model 2.13 and 1.291 with thousandths grids. Ask students to use the materials to explain how to find the sum of the two numbers. (5N11.5)

Resources/Notes

Math Focus 5
Lesson 3 (Continued): Estimating Decimal Sums and Differences
5N2 (2.1, 2.2)
5N11 (11.4, 11.5)
5PR2 (2.2)
TR pp. 22 - 25

Lesson 4 is optional, as there is no direct mention of mental math in the outcomes; however it may be interesting and useful for some students.

Lesson 5: Adding Decimals by Regrouping
5N11 (11.2, 11.4)
TR pp. 30 - 34

Technology Connections:
http://nlvm.usu.edu
number operations (3-5)
base blocks decimals
**Strand: Number**

**Outcomes**

*Students will be expected to*

5N11 Continued

**Achievement Indicators:**

5N11.3 Explain why keeping track of place value positions is important when adding and subtracting decimals.

5N11.5 Continued

**Elaborations—Strategies for Learning and Teaching**

For example, 2.3 + 1.5 or 1.23 + 1.48

No Regrouping:

1.213 + 1.124 = 2.337

Regrouping:

The importance of keeping track of place value when adding decimals needs to be highlighted. The use of place value charts would be a helpful teaching tool. Provide examples of students adding numbers. One student has kept track of their place value position, another has not. For example;

Susan added 1.469 + 11.6 = 13.069
Ryan added the same numbers and said the answer was 1.585. Explain why the answers are different. Who is right? How do you know?

Point out to students that when adding decimals one must be sure that they are adding like place values. i.e. tenths to tenths, hundredth to hundredths, and so on. This is achieved by lining up decimals when adding vertically.

1-cm grid paper is a good tool to assist students in visualizing lining up place value.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- For each pair of students, provide base ten blocks (2 cubes, 7 flats, 12 rods, and 20 units), a deck of cards with different decimal numbers written on them such as 1.2, 2.05, 1.423, 12.3, 4.223, and recording paper.

Have students work with a partner. They each pick one number. Each student makes the number that they selected with base ten blocks and sketches the number on their recording sheet. Then the students will combine their two numbers to get the sum. The group members will compare and check each other’s sum and compare how they added the given numbers. Find the difference between the two numbers. Choose three cards and add them together. Choose two cards and create a word problem that uses the numbers on both cards. Exchange problems with another pair of students to solve them.

What strategies do students use to make their number? How do they decide what block will represent 1 whole?

How quickly and confidently do they know how to represent and add decimal numbers? Are they confident in trading/regrouping (particularly when zeros are involved)? How engaged are they in the discussion? What questions do they ask? (5N11.5)

Student-Teacher Dialogue

- Present the students with the following situation in which Jane made an error when she added. Ask the students what one might say to help Jane understand why the answer is incorrect.

\[ 5.23 + 4.232 = 4.755 \]  (5N11.3)

Pencil and Paper

- When adding 24.56 and 1.735 Ariana got a total of 4.191. How can you tell her answer is unreasonable? What was her error?  (5N11.3)
Strand: Number

Outcomes

Students will be expected to

5N11 Continued

Achievement Indicators:

5N11.1 Place the decimal point in a sum or difference, using front-end estimation; e.g., for 6.3 + 0.25 + 306.158, think 6 + 306, so the sum is greater than 312.

5N11.5 Solve a given problem that involves addition and subtraction of decimals, limited to thousandths.

Elaborations—Strategies for Learning and Teaching

Students have already been introduced to front-end rounding. The focus of this indicator is the understanding of decimal placement.

Have students use front-end rounding to solve the following equation:

\[ 6.3 + 0.25 + 306.158, \text{ think } 6 + 306, \text{ so the sum is greater than } 312. \]

Focus attention to the fact there are 9 wholes.

Then write on board: where does the decimal belong?

\[ 4.13 + 5.67 = 980 \]

decimal would come after 9 wholes: 9.80

Students have become familiar with estimation strategies as well computation of whole numbers and decimal numbers. These acquired skills will now be applied to make connections to solve various problems. Have students show their understanding of these strategies through communication of their solutions. Through Show, Share, and Compare, students will demonstrate their understanding. (Students show their work, verbally share how they arrived at the answer and compare with others students.)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Journal**
- Describe how to use front-end rounding for decimal placement to get the correct answer.  
  (5N11.1)

**Performance**
- Provide the students with a selection of addition and subtraction problems using decimals to thousandths and include the calculated answer without the decimal point. Have the students decide where the decimal point should be placed in each answer and explain how they know. Encourage the use of a variety of estimation strategies. Students can then share their answers with the whole class and correct any errors in the decimal point placements in the sums and differences.

Problem: Joanne bought 3.537 m of ribbon and used 0.48 m of it to wrap presents. How many metres of ribbon does Joanne have left?

Answer: Joanne has 3057 m of ribbon left. Place the decimal point in the number to answer the problem correctly. Explain your thinking.

Sample Solution: Using front-end estimation, the difference between the two numbers is 3 – 0 = 3. Therefore, the decimal point must be placed directly behind the 3 in 3057.

Correct answer to the problem: Joanne has 3.057 m of ribbon left.

- Have students working in groups of 2-3. Outline the solution to the following problem on chart paper to present to the class. Using words, numbers and pictures students are to represent their solutions in a variety of ways.

  Ask: Mr. Browne takes his three daughters to the playground. The three daughters decide that they want to play on the seesaw with Dad on one end. Dad has a mass of 70 kg, the same as the girls combined mass. If the oldest daughter is the heaviest and has a mass of 29.5 kg, what are the possible masses of the other two daughters if both of them have masses greater than 15 kg? Find two different possibilities for each of the two daughters.  
  (5N11.5)

- Ask: In pairs have students create a word problem involving decimals to thousandths. Allow students time to share problem with the class for classmates to solve.  
  (5N11.5)

Resources/Notes

**Math Focus 5**
Lesson 5 (Continued): Adding Decimals by Regrouping
5N11 (11.2, 11.4)
TR pp. 30 – 34

Lesson 6: Exploring Problems that Involve Decimals.
5N11 (11.5)
TR pp. 40 - 42

Curious Math:
TR pp. 43 - 44
Subtracting Decimals Using a Whole Number

Note: This activity involves addition and subtraction of decimals.
Strand: Number

Outcomes

Students will be expected to

5N11 Continued

Achievement Indicator:

5N11.5 Solve a given problem that involves addition and subtraction of decimals, limited to thousandths.

Elaborations—Strategies for Learning and Teaching

Some situations are ‘take away’ situations, by nature, while others are comparison situations. The problem below is a take-away situation in that some of the original amount is removed. This problem would naturally be solved using the take-away model. That is, model the first number using base ten materials and then remove the second amount to find the final result.

Problem #1 - Each summer Sarah and her family pick bakeapples and sell them. Sarah had picked 2.75 L and on the way back to the car tripped and spilled 0.342 L. How much does she now have in her container?
E.g.: 2.75 - 0.342

Equally valid is the use of the comparison model for subtraction of decimals using base ten materials.

Below is an example of a ‘comparison’ problem. That is, the focus is on finding the difference between the two numbers. In this case, we would model both numbers and compare. The difference between them is the solution.

Ask groups to model using their base ten materials, record their solution pictorially and solve the problems symbolically.

Problem #2 - Each summer Sarah and her family pick bakeapples and sell them. Sarah picked 2.75 L and her brother picked 1.345 L. How much more did Sarah pick than her brother?
E.g.: 2.75 - 1.346

When modeling with base 10 materials on the place value mat, model the 2.341 then subtract 1.225 (show borrowing).

When modeling on the board using pictures/diagrams, circle what is being borrowed and cross out what has been subtracted. Remember to move over what has been borrowed by redrawing in the new place value.

Continued
General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Performance**
- Model 2.12 and 1.140 with base ten blocks or thousandths grids. Ask the students to use the materials to explain how to find the difference between the two numbers.
  
  \[ \text{Model}\ 2.12\ \text{and}\ 1.140\ \text{with}\ \text{base}\ \text{ten}\ \text{blocks}\ \text{or}\ \text{thousandths}\ \text{grids.}\ \text{Ask}\ \text{the}\ \text{students}\ \text{to}\ \text{use}\ \text{the}\ \text{materials}\ \text{to}\ \text{explain}\ \text{how}\ \text{to}\ \text{find}\ \text{the}\ \text{difference}\ \text{between}\ \text{the}\ \text{two}\ \text{numbers.}}\ ]

- Using base-ten materials model and grid paper, illustrate and solve the following number sentences.
  
  (a). \[1.24 - 0.13 =\]
  (b). \[2.42 - 1.35 =\]
  (c). \[2.432 - 1.212 =\]
  (d). \[3.163 - 2.041 =\]
  (e). \[3.652 - 0.513 =\]
  (f). \[2.322 - 1.424 =\]

- Have students work in pairs. Each student measures off 10 of their own foot lengths in metres to the nearest millimetre. Then they find the sum and difference of the lengths. Share their results with other groups and switch comparisons.

### Resources/Notes

*Math Focus 5*

**Lesson 7: Subtracting Decimals by regrouping**

5N11 (11.1, 11.4, 11.5)

TR pp. 45 - 49

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**Pencil and Paper**

- Jacob has 2 sunflowers. One of the sunflowers is 80.254 cm tall and the other is 86.49 cm tall. What is the difference between the heights of the two sunflowers?

  \[ \text{Jacob}\ \text{has}\ 2\ \text{sunflowers.}\ \text{One}\ \text{of}\ \text{the}\ \text{sunflowers}\ \text{is}\ 80.254\ \text{cm}\ \text{tall}\ \text{and}\ \text{the}\ \text{other}\ \text{is}\ 86.49\ \text{cm}\ \text{tall}.}\ \text{What}\ \text{is}\ \text{the}\ \text{difference}\ \text{between}\ \text{the}\ \text{heights}\ \text{of}\ \text{the}\ \text{two}\ \text{sunflowers?}}\ ]

\[ \text{(5N11.5)} \]
Strand: Number

Outcomes

Students will be expected to

5N11 Continued

Achievement Indicator:

5N11.5 Continued

Elaborations—Strategies for Learning and Teaching

Students are expected to apply what they know about adding and subtracting whole numbers. Using the renaming method, introduced in Grade 4, may be more appropriate than the traditional algorithm.

Traditional Method:

\[
\begin{array}{c}
49 \\
\hline
287 \\
\hline
213
\end{array}
\]

Renaming Method:

\[
\begin{array}{c}
500 \text{(subtract 1)} \\
\hline
-287 \text{(subtract 1)} \\
\hline
213
\end{array}
\quad \begin{array}{c}
499 \\
\hline
-286 \\
\hline
213
\end{array}
\]

By using the renaming method you have created numbers which are much easier to work with because there is no need for regrouping.

Renaming method used for whole numbers can also be applied for decimal subtraction when the minuend is a whole number.

For example, 10 – 6.789.

\[
\begin{array}{c}
10.000 \text{(subtract 0.001)} \\
\hline
-6.789 \\
\hline
3.211 + 0.001 = 3.211
\end{array}
\]

OR:

\[
\begin{array}{c}
10.000 \text{ (subtract 0.001)} \\
\hline
-6.789 \text{ (subtract 0.001)} \\
\hline
3.211
\end{array}
\quad \begin{array}{c}
9.999 \\
\hline
6.788 \\
\hline
3.211
\end{array}
\]

Note: Students may need to review that 10 = 10.000 (E.g., equivalent decimals)

When subtracting from a number such as 10, the renaming method can be applied so that 10 changes to 9.999 to avoid trading and then adding the 0.001 to the answer once it is acquired. Another renaming method to consider for subtracting 10.000 – 6.789, simply drop both numbers by 0.001 to produce 9.999 – 6.788. This way the answer requires no adjustment. Sometimes students forget to add on the extra 0.001 using the first method. However, students might be interested in exploring why both methods work.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil

- Mary ran 3 km. Sally ran 2.432 km. Mary said she ran 0.567 m further. Is she correct? Explain. (5N11.5)

- Henry received $20 for his allowance. He bought a CD for $14.38. How much money does he have left? (5N11.5)

Student-Teacher Dialogue

- Explain how you would use the renaming method to calculate the following:
  1. 4 kg – 3.675 kg
  2. 25 km – 10.95 km (5N11.5)

Journal

- Subtracting decimals by “renaming” makes subtracting decimals a whole lot easier. Do you agree with this statement? Why or why not? (5N11.5)

Resources/Notes

Math Focus 5
Lesson 8: Subtracting Decimals by Renaming
5N11 (11.1, 11.4) TR pp. 50 - 54

Elementary and Middle School Mathematics – Teaching Developmentally. (Van De Walle & Folk, 2005)
Strand: Number

Outcomes

Students will be expected to

5N11 Continued

Achievement Indicator:

5N11.6 Create and solve problems that involve addition and subtractions of decimals, limited to thousandths.

Elaborations—Strategies for Learning and Teaching

Requiring students to create their own problems provides opportunities for them to explore operations in depth. It is a more complex skill requiring conceptual understanding and must be part of the student’s problem solving experiences.

There are many strategies to aid students in creating problems.

- Give a diagram or map and ask students to create story problems based on them
- Give a number sentence and ask that a story problem be created based on the given number sentence
- Give a story situation involving numbers and ask them to write questions which can be solved, based on the story

For example, have students write questions based on a story, such as ‘At the Mall’, that require math to answer them.

At the Mall!

Today we went to the mall to do some ‘back to school’ shopping. Mom said we could afford to spend $200 on back to school clothes. It seemed like a lot of money at first until I started looking at the prices. We went to the sports store first to buy running shoes. They ranged from about $49.88 to $199.95. I asked mom if the $200 included tax. She said, “No”. “Thank goodness!” I thought. I decided that it would be best to buy my running shoes at a discount store where they were less expensive.

At the mall, I found some nice t-shirts. They were $12.50 each or 3 for $25. Great deal! I bought two pairs of jeans that were originally $49 each but they were ½ price. I needed hoodies as well. I found some that I liked for $39 each and you get a second one for ½ price.

Mom said that I should remember to buy new underwear. I bought a 6 pack of underwear for $9.99. Great deal! Then I remembered socks. Luckily, I found a 6 pack of socks for $6.79.

As soon as we go to the discount store for my running shoes, I’ll be all set. Oh my! I’d better not forget the running shoes. I wonder if I can get two pairs!
**General Outcome: Develop Number Sense**

### Suggested Assessment Strategies

**Paper and pencil**
- Ask students to create a word problem, incorporating the numbers 1.3 and 3.7 (5N11.6)
- Have the students create a realistic word problem involving addition and subtraction for which the answer is 13.52 (5N11.6)

**Performance**
- Provide students with flyers and newspapers (sports page). Ask them to create a series of problems based on the information they find using decimal numbers limited to thousandths. Have them present their problems to the class. (5N11.6)

**Portfolio**
- Ask students to create money word problems that involve adding or subtracting decimals. (5N11.6)

### Resources/Notes

**Additional Lesson**
This lesson is not covered in the text.

Literature Connection
Math Curse
(Scieszka, Smith, 2006)

*End of chapter material and unit assessment - be selective.*
Data Relationships

Suggested Time: 2 Weeks

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

Focus and Context  Different situations (along with different purposes) will lend themselves to different data collection techniques. Prior to Grade 5, students have become familiar with collecting and organizing data.

Students will learn in data collection that they must create appropriate questions and think about how to best gather the data. A set of data can be collected, organized, and then displayed in a variety of ways, depending on the type of data and the purpose for its collection. Once a set of data is displayed, it can be analyzed to look for patterns, make comparisons, draw inferences, predict, and make decisions. This unit focuses students on data recording and problem solving using first and second hand data and double bar graphs. Students will formulate questions to collect first hand data on their own and to create questions from second hand data. Various samples of double-bar graphs will be provided to students to explore and interpret.

Math Connects  Graphing activities are great ways to connect a student’s world to number (Walle, Fold, 2008). Within all curriculum areas, data can be collected and graphed to allow students the opportunity to value the graphing process. This connection to real quantities in a student’s environment is an important aspect of graph development, comparisons of graphs will deepen their understanding and the knowledge will transcend other curriculum areas.
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### Curriculum Outcomes

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<td>5SP1 Differentiate between first-hand and second-hand data.</td>
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<tr>
<td>Statistics and Probability (Data Analysis)</td>
<td>5SP2 Construct and interpret double-bar graphs to draw conclusions.</td>
<td>[C, PS, R, T, V]</td>
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</table>
Strand: Statistics and Probability

Outcomes

Students will be expected to

5SP1 Differentiate between first-hand and second-hand data.

(C, R, T, V)

Elaborations—Strategies for Learning and Teaching

Students need to be given opportunities to activate their background knowledge of keeping a tally and creating bar graphs. Discuss and record various kinds of situations that warrant data collecting. Introduce the key terms of first-hand data and second-hand data.

First-hand data is collected by the researcher (in this case the students) and is best used when they are looking for answers to questions about people, places or objects found in their everyday lives. First-hand data is required when this information is not readily available from existing respectable sources. It is also used when data is limited or when students are just beginning to learn about data. It will be necessary to review first-hand data techniques such as: surveys, observations, interviews and experiments.

Second-hand data is data that has been collected by someone else. Second-hand data can be found in print and on the Internet. Some secondary sources include:

* World Almanac for Kids  
* Statistics Canada  
* Guinness World Records  
* The World Almanac and Book of Facts

Second-hand data sources can also consist of newspapers and resource books. Further explore curriculum areas such as Science and Social Studies in investigating second-hand data.

Provide students with examples of first-hand and second-hand data and ask them to identify the type of data i.e. a bar graph showing hockey statistics found in the newspaper represents a source of data for secondary analysis while asking the students to survey the class asking their preference in popcorn seasonings is an example of first-hand data. Encourage students to reflect on the meaning of first-hand and second-hand data and record this reflection in their math journals.

Have a class discussion on the two types of data. Guide your discussion according to the following information:

First Hand Data

- Data collected by the researcher (in school, this is the student)
- Observations, surveys, experiments
- Student primary source
- Questions created should help give more precise answers

Second Hand Data

- Data collected by others and used for secondary analysis
- Found in news, Internet, statistics
- Student not part of data collections or questioning
- Can create questions based on data

Achievement Indicator:

5SP.1 Explain the difference between first-hand and second-hand data.
General Outcome: Collect, display and analyze data to solve problems.

Suggested Assessment Strategies

Performance

- Have students create a collage showcasing various sources of second-hand data. Students can include clippings from newspapers, the Internet and or magazines. i.e. Sports section in newspaper. (5SP1.1)

Journal

- Ask students to explain the difference between first-hand and second-hand data and give examples. “The difference between first-hand and second-hand data is...” (5SP1.1)

Resources/Notes

Math Focus 5
Getting Started
Teacher Resource (TR) pp. 9 - 11

The ‘Getting Started’ is intended to activate prior knowledge.

Additional Reading:
Navigating through Data Analysis and Probability in Grades 3-5, p.11)

Lesson 1 (optional): Exploring types of Data
5SP1 (1.1)
TR pp. 13 - 15

(Suggested lesson serves as a beginning discussion on differentiating between first-hand and second-hand data. It is not necessary to explore all of the optical illusion examples on page 121 of text)

Have students plan “Matching Data” TR p. 25 (5SP1.1)
**Strand: Statistics and Probability**

**Outcomes**

*Students will be expected to*

### 5SP1 Continued

**Achievement Indicators:**

<table>
<thead>
<tr>
<th>5SP1.2 Formulate a question that can best be answered using first-hand data, and explain why.</th>
</tr>
</thead>
</table>

The process of data analysis begins with the formulation of questions concerning an issue or topic of interest. Students should be encouraged to formulate questions that address issues in their everyday lives at school, home or within their communities. All data investigations begin with questions, yet asking good questions is a skill that takes time to develop. (Navigating through Data Analysis and Probability in Grades 3-5, p.11)

Brainstorm questions that can be best answered by using first-hand data. Some examples are:

- What kind of ice-cream do you prefer?
- What is your favourite type of music?

Compile a list of student-generated questions to display on bulletin board. As students take part in the teacher-student dialogue, they should discuss how their question constitutes a good question. These questions will then be posted on the bulletin board.

Discuss with students the importance of posing specific questions that provide a clear answer i.e., ‘what is your favourite music?’ is not as specific as ‘what is your favourite type of music?’ Consider questions like: How many cars in the parking lot on an average day (observational)? Or, What number occurs most often when you roll two dice and add the numbers together (experimental)?

<table>
<thead>
<tr>
<th>5SP1.4 Find examples of second-hand data in print and electronic media, such as newspapers, magazines and the Internet.</th>
</tr>
</thead>
</table>

The Internet provides a wealth of data about sports, world records and Canadian statistics which can be used for secondary analysis.

<table>
<thead>
<tr>
<th>5SP1.3 Formulate a question that can best be answered using second-hand data, and explain why.</th>
</tr>
</thead>
</table>

Based on the data from other sources, students should pose questions that allow them to do secondary analysis of their data.

Provide students with examples of data from a variety of sources (print or electronic). Ask students to create questions based on the data and then share with their classmates.
General Outcome: Collect, display and analyze data to solve problems.

Suggested Assessment Strategies

**Performance**
- Guide students to create a bank of questions that can best be answered using first-hand data such as:
  - What is your favourite holiday?
  - Who is your favourite singer?
  - What is your favourite sport to watch on TV? (5SP1.2)
- Use Statistics Canada (www.statscan.ca) and other various sources to provide several examples of data. Remove related titles, information, questions. Have students work in pairs to generate and record a question that could be answered using this data. Gather all questions and sources of data. Have students choose which questions match the examples of data. (5SP1.3)

**Student-Teacher Dialogue**
- Give students data and ask them to generate questions. (5SP1.3)
- Ask students to provide a question based on the second-hand data provided by the teacher i.e. based on a local newspaper clipping, ask students to generate questions pertinent to that subject. (5SP1.4)

Resources/Notes

*Math Focus 5*
- Lesson 2: Using First-Hand Data
  - 5SP1 (1.2)
  - TR pp. 16 - 20

- Lesson 3: Using Second-Hand Data
  - 5SP1 (1.1, 1.3, 1.4)
  - TR pp. 21 - 24
Strand: Statistics and Probability

Outcomes

Students will be expected to

5SP2 Construct and interpret double bar graphs to draw conclusions.
(C, PS, R, TV)

Elaborations—Strategies for Learning and Teaching

“The value of having students actually construct their own graphs is not so much that they learn the techniques but that they are personally invested in the data and that they learn how a graph conveys information. Once a graph is constructed, the most important activity is discussing what it communicates to others who were not involved in making the graph. Discussions about real data that students have themselves been involved in gathering and graphing will help them interpret other graphs and charts that they see in newspapers and on TV. “(Van de Walle and Lovin 2006, p.329)

A double bar graph is best used to show how two sets of data are different or alike. An example is presented below. Five students in the class have been asked how many brothers and sisters they have.

<table>
<thead>
<tr>
<th>Student</th>
<th>Brothers</th>
<th>Sisters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Student 2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Student 3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Student 4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Student 5</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

The data can be displayed horizontally or vertically.

Discuss how this type of graph allows one not only to compare students in terms of how many brothers they have, or how many sisters they have, but also to compare the number of brothers versus the number of sisters.
General Outcome: Collect, display and analyze data to solve problems.

Suggested Assessment Strategies

**Performance**
- Have students create a double bar graph to compare two sets of data. Possible suggestions are:
  - The number of sisters that classmates have, compared with the number of brothers
  - Male and female Olympic track records.
  - The number of books read per month, according to grade level

Resources/Notes

- **Math Focus 5**
- **Lesson 3: Using Second-Hand Data**
- 5SP1 (1.1, 1.3, 1.4)
- TR pp. 21 - 24

- **Math Game:**
  - TR p. 25
    - Matching Data

*Good activity to reinforce outcome 5SP1.1 and data collection.*
Strand: Statistics and Probability

Outcomes

Students will be expected to

5SP2 Continued

Achievement Indicators:

5SP2.1 Determine the attributes (title, axes, intervals and legend) of double bar graphs by comparing a given set of double bar graphs.

5SP2.3 Draw conclusions from a given double bar to answer questions.

5SP2.4 Provide examples of double bar graphs used in a variety of print and electronic media, such as newspapers, magazines and the Internet.

Elaborations—Strategies for Learning and Teaching

Prior to Grade 5, students created and labelled graphs using appropriate scale and appropriate attributes.

Remind students that in a double bar graph:

- Each set of data must use the same scale
- All graphs must have a title, scale and legend.
- The order of colors must remain the same throughout.

Provide students with examples of various graphs displaying and/or describing the above attributes.

Invite students to discuss the following questions to draw a conclusion:

- What have I learned from this graph?
- What conclusions can you gather from this data?
- What message is conveyed in this double bar graph?
- Who did the collecting?
- Who was the data collected for?
- What message is the data telling us?

It is important to note to students that graphs can be:

- Factual, or
- An opportunity to make inferences that are not directly seen or observed.

Ask students to locate examples of double bar graphs found in newspapers, magazines, pamphlets, the Internet, posters or books. Discuss the different attributes found on these graphs.
General Outcome: Collect, display and analyze data to solve problems.

### Suggested Assessment Strategies

**Paper and pencil**
- Label a given double-bar graph appropriately using the terms title, axes, and legend.  
  (5SP2.1)

- Provide students with a double bar graph and have them draw conclusions to answer questions such as:
  - What information is being relayed?
  - What data was collected?
  - How many subjects were involved?
  - What conclusions can be drawn based on this data?  
  (5SP2.3)

**Presentation**
- Ask students to find an example of a graph from either newspapers, magazines or the Internet to present to their classmates. Pose questions to elicit information about the graph.  
  (5SP2.4)

**Performance**
- Ask students to write a brief report on a selected graph they found, telling about the different attributes found on the graph.  
  (5SP2.4)

### Resources/Notes

- **Math Focus 5**
  Lesson 4: Interpreting Double-Bar Graphs
  5SP2 (2.1, 2.3, 2.4)
  TR pp. 30 - 34

For additional graphs see:
- Grade 4 text - Math Focus 4, Chapter 4

Question #6 in text addresses 5SP2.4
Strand: Statistics and Probability

Outcomes

Students will be expected to

5SP2 Continued

Achievement Indicators:

5SP2.2 Represent a given set of data by creating a double bar graph, label the title and axes, and create a legend without the use of technology.

5SP2.5 Solve a given problem by constructing and interpreting a double bar graph

Elaborations—Strategies for Learning and Teaching

Model the construction of a double bar graph before students work independently to construct their own. Teachers can avail of chart paper grid pads in constructing the double bar graphs. At the beginning, students could use grid paper to construct bar graphs to ensure that the squares are all of equal size.

A double-bar graph shows how two different sets of data are alike or different. Using a legend helps the reader interpret a double-bar graph.

Through the use of sport statistics, a connection can be made between some students’ out of school interests and the area of mathematics. Hockey, soccer, baseball and football statistics lend themselves to the construction of a double bar graph.

Newspapers and informational text are good sources of statistical information.

Students should share their graphs with the class. Guide the students to discuss the following questions:

• How are your graphs different?
• What conclusions did you make?
• How might your conclusions have changed if you had surveyed twice as many boys as girls?

“Rather than directing a lesson, the teacher needs to provide time for students to grapple with problems, search for strategies and solutions on their own, and learn to evaluate their own results. Although the teacher needs to be very much present, the primary focus in the class needs to be on the students’ thinking processes.” (About Teaching Mathematics, Marilyn Burns, p. 29)

Brainstorm with students possible topics that leads to the construction of double bar graphs, for example, determine the intersection that has the most traffic, determine the most common lunch served in the cafeteria, or determine the most common fruit eaten during recess time.
General Outcome: Collect, display and analyze data to solve problems.

### Suggested Assessment Strategies

**Paper and Pencil**

- Ask the student to draw a double bar graph to show the results of a survey on the regular dinner times of classmates. They must label the title and axes and create a legend.  
  
- Ask students to compare results for students with moms who work outside the home versus moms who do not.

**Journal**

- Throughout the unit provide opportunities for students to self-assess their graphs. Here are some suggestions for students to complete:
  
  - I know I constructed a good double bar graph because ...
  - Some things that are similar between my double bar graph and my classmate's double bar graph are...
  - Today, I ...
  - Something surprising was...
  - I noticed that ...
  - Something challenging was...
  - Something my partner and I did well...
  - Next time I would....

**Performance**

- Students should construct a double bar graph to assist them in solving a given problem. Ask students to draw one conclusion based on their graph.

  Some suggestions are:
  - Which grade-level students seem to enjoy Mathematics the most? Grade 5 or Grade 6?
  - Which students watch NHL hockey the most - boys or girls?

### Resources/Notes

**Math Focus 5**

- Lesson 5: Constructing Double-Bar Graphs
  
- 5SP2 (2.2, 2.3)
  
- TR pp. 35 - 39

**Note:** Graph construction is often a slow process.

**Additional Reading**

- Van de Walle and Lovin 2006, p.329

**Lesson 6: Solving problems by Creating Diagrams**

- 5SP2 (2.5)
  
- TR pp. 40 - 43

**Curious Math:**

- TG pp. 44 - 45

  - Picture Graphs

*End of chapter material and unit assessment - be selective.*
Motion Geometry

Suggested Completion Time: 2 Weeks

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

Focus and Context
Symmetry was covered in Grade 4. Spend time activating background knowledge about symmetry in two-dimensional shapes. Transformational geometry is a new concept to the students. It is important to make use of the overhead projector, overhead pattern blocks and grid paper. The smartboard can also be used effectively for this topic.

The focus, for students in this unit is on being able to visualize three transformations: reflections (flips), translations (slides) and rotations (turns). The study of symmetry and congruence, which was a focus in Grade 4 is an important skill which will help students in this unit. In Grade 5, students will learn not only learn to identify the transformations but will also learn to communicate and describe them clearly.

Math Connects
Geometry is an important part of the mathematics curriculum because it helps students to represent, describe and appreciate geometry in the world in which we live. Being able to visualize the orientation and movement of shapes is important as we use it in everyday life when driving, moving furniture, etc. Developing a strong spatial sense is important and experiences in this unit, with everyday objects and physical materials help students develop more complex concepts and strategies. Transformations are applied in many career areas including design, drafting and engineering.
### Process Standards Key

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

### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape and Space (Transformations)</td>
<td>5SS7 Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw and describe the image.</td>
<td>[C, CN, T, V]</td>
</tr>
<tr>
<td>Shape and Space (Transformations)</td>
<td>5SS8 Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes.</td>
<td>[C, T, V]</td>
</tr>
</tbody>
</table>
Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

5SS7 Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw and describe the image.
[C, CN, T, V]

Achievement Indicators:

5SS7.1 Translate a given 2-D shape horizontally, vertically or diagonally, and describe the position and orientation of the image.

5SS7.4 Draw a 2-D shape, translate the shape, and record the translation by describing the direction and magnitude of the movement.

5SS8 Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes.
[C, CN, T, V]

Achievement Indicator:

5SS8.5 Describe a given translation by identifying the direction and magnitude of the movement.

Elaborations—Strategies for Learning and Teaching

In Grade 4, students have not been exposed to translations, reflections or rotations. To introduce this topic, draw a 2-D shape on overhead grid paper and use overhead pattern blocks to introduce translations.

Generate a discussion on key words such as horizontal, vertical, diagonal, etc. Discuss the orientation (In a translation the orientation does not change. It is facing the same direction of the shape.) Note that the terms up, down and across are equally acceptable.

General properties to identify translations:
- the 2-D shape and its image are congruent
- the 2-D shape and its image have the same orientation (that is, if we go around the object ABCD in a clockwise direction, we should be able to also go around its image A’B’C’D’ in a clockwise direction.)

Be sure to label the vertices of the shape (e.g. A, B, C, D) and the corresponding vertices of the reflected image (A’, B’, C’, D’). A’ is read as A prime.

Allot time for students to review the basics of using a ruler and as well as having sharpened pencils and holding the ruler properly.

Model drawing 2-D shapes such as squares, rectangles and triangles. Ask students to draw and translate simple 2-D shapes, as practiced.

Remind the students that the orientation of the translation is the same as before. The shape has simply moved to a new location. Students need to be exposed to numerous examples of each of the transformations to recognize when one has been performed. Students have been dealing with creating and performing translations. Model, using math language, how to describe given translations.
General Outcome: Describe and analyze position and motion of objects and shapes.

### Suggested Assessment Strategies

#### Performance
- Provide a 2-D shape (such as a rectangle) on grid paper and have students translate the shape according to specific instructions i.e. 3 units left and 2 units down. (5SS7.1)
- Provide students with grid paper and have them draw a square. Students must decide upon their own translation rule i.e. move the shape 2 units right and 3 units down. Students must record their translation rule. (5SS7.4)
- Provide students with various illustrations such as the following. Ask them to write the translation rule.

![Diagram](image)

(Answer: ABC is translated 6 units right and 4 units down)

#### Journal
- Have students write in their journal with the following starter:
  
  I know this is a translation because... (5SS8.5)

### Resources/Notes

- **Math Focus 5**
- **Getting Started**
  Teacher Resource (TR) pp. 9 - 11
- This is a good introduction to the unit.
- **Lesson 1: Performing Translations**
  5SS7 (7.1, 7.4, 7.7)
  5SS8 (8.1, 8.2)
  TR pp. 12 - 16

See p.46 in Teacher Resource for a good problem solving example.
**Strand: Shape and Space (Transformations)**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Students will be expected to</em></td>
<td>The term <em>Mira</em> can be interchanged with transparent mirror or Reflect View.</td>
</tr>
<tr>
<td><strong>5SS7</strong> Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw and describe the image.</td>
<td>Students need to make the connection between their prior knowledge of symmetry and the line of reflection. The line of reflection creates symmetry between object and image whereas a line of symmetry typically refers to symmetry within a given object.</td>
</tr>
<tr>
<td><strong>Achievement Indicator:</strong></td>
<td>Review mira use. Students should be very familiar with them.</td>
</tr>
<tr>
<td>5SS7.3 Reflect a given 2-D shape in a line of reflection, and describe the position and orientation of the image.</td>
<td>Have students make the connection that the image produced by a mira is considered a reflection.</td>
</tr>
<tr>
<td><strong>5SS7.6</strong> Draw a 2-D shape, reflect the shape, and identify the line of reflection and the distance of the image from the line of reflection.</td>
<td>- practice drawing/tracing a shape using a mira (note location of mirror line)</td>
</tr>
<tr>
<td>5SS8 Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes.</td>
<td>- using tracing paper, trace 2-D shape and new image fold over and note congruent images.</td>
</tr>
<tr>
<td><strong>Achievement Indicator:</strong></td>
<td><strong>A reflection can be identified if:</strong></td>
</tr>
<tr>
<td>5SS8.4 Describe a given reflection by identifying the line of reflection and the distance of the image from the line of reflection.</td>
<td>- a 2-D shape and its image are congruent</td>
</tr>
<tr>
<td></td>
<td>- a 2-D shape and its image are of opposite orientation (This is, if we go around the object ABCD in a clockwise direction, the image A'B'C'D' would require a counter-clockwise direction.)</td>
</tr>
<tr>
<td></td>
<td>Note: When labeling a 2-D shape and its reflected image, prime notation should be used.</td>
</tr>
<tr>
<td></td>
<td>As a whole class, perform a reflection on overhead projector or large flipchart grid paper indicating the mirror line (line of reflection).</td>
</tr>
<tr>
<td></td>
<td>» Focus students’ attention that it is equal distance from the mirror line to both the 2-D shape and reflected image.</td>
</tr>
<tr>
<td></td>
<td>For example, “the image has been reflected in an horizontal or vertical line of reflection.” Model using mathematical language how to describe a given reflection.</td>
</tr>
</tbody>
</table>
General Outcome: Describe and analyze position and motion of objects and shapes.

Suggested Assessment Strategies

Performance

• Using a mira and pattern blocks have students explore how moving the pattern block changes the reflected image. (5SS7.3)

• ‘Reflective Reflections’ - Place 3 geoboards in a row (See Figure below). On the middle geoboard construct a quadrilateral. Label the quadrilateral. Using the edges of the middle geoboard as mirror lines, construct the reflected images on the other two geoboards. Record your figure and the two images on the geopaper provided and label them. Be sure to label your figures and images. Ask: What are the similarities between the first shape you created and its reflected images? How are they different? Compare the reflections. What do you notice? (5SS7.3)

• Reflect ABC using the given line of reflection. Ask students to describe the position and orientation of the reflected image and justify why it is correct. (5SS7.6)

Pencil and Paper

• Triangle Reflection: Have students work in pairs to do the following:
  » Draw a triangle
  » Label the triangle ABC
  » Draw a line of reflection
  » Reflect the shape
  » Connect the corresponding vertices
  » Describe the distance of the image from the line of reflection.
  » Describe the orientation (5SS7.6)

Journal

• Provide a student with a given shape and a reflection line. Ask the student to draw and label the reflection image. (5SS7.6)

• Have students use the following story starter in a journal: I know this is a reflection because... (5SS8.4)

Resources/Notes

Math Focus 5
Lesson 2: Exploring Reflections using a Mirror
5SS7 (7.3, 7.6)
5SS8 (8.1, 8.2)
TR pp. 17 - 19

See p.46 in Teacher’s Guide for a good problem solving example.

This lesson simply focuses on using the mira and line of reflection. It is not intended to be a lengthy activity.

Lesson 3: Performing Reflections on a Grid
5SS7 (7.3, 7.6, 7.7)
5SS8 (8.2)
TR pp. 20 - 24

Allot time for modeling and carefully choose non-complicated questions.
Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

5SS7 Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw and describe the image.

[C, CN, T, V]

Achievement Indicator:

5SS7.2 Rotate a given 2-D shape about a vertex and describe the direction of rotation (clockwise or counterclockwise) and the fraction of the turn (limited to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or full turn).

Elaborations—Strategies for Learning and Teaching

Review the terms ‘clockwise’ and ‘counterclockwise’ with the students. When asking students to reflect 2-D shapes, model several shapes such as squares, rectangles and triangles, before students are expected to do this independently.

Students have no prior experiences with rotations. As well, students will only be expected to rotate the shape about a vertex at this grade level.

Rotations are the most commonly challenging of the transformations. Students need many first-hand experiences making rotations and examining the results before they will be able to identify such rotations given to them. At this grade level the emphasis should be on drawing rotation images and identifying a rotation image with centers on one of the vertices and angles that are $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ turns.

A rotation moves shapes in a circular motion.

-Using tracing paper, trace the image and label. Use a pencil tip to hold traced image on specified vertex, then rotate the traced image.

When students first begin working with turns, they identify them in terms of fractions of a circle: $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ turn. In adding to describing the amount of turn, students also need to identify the turn direction (clockwise or counterclockwise). Sometimes clockwise and counterclockwise are abbreviated as cw and ccw.

Continued
General Outcome: Describe and analyze position and motion of objects and shapes.

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Math Focus 5</em></td>
</tr>
<tr>
<td></td>
<td>Lesson 4: Performing Rotations</td>
</tr>
<tr>
<td>5SS7 (7.1, 7.5, 7.7)</td>
<td></td>
</tr>
<tr>
<td>5SS8 (8.1, 8.2, 8.3)</td>
<td></td>
</tr>
<tr>
<td>TR pp. 25 - 29</td>
<td></td>
</tr>
</tbody>
</table>

Additional Reading:
Marian Small – Making Math Meaningful
Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

5SS7 Continued

Achievement Indicators:

5SS7.2 Continued

Elaborations—Strategies for Learning and Teaching

Make a large plus on the floor using masking tape. Have one student stand at the center of the plus sign, holding rope. Have a second student stand along one of the arms of the plus sign, holding the other end of the rope so that it is taut. Tell the second student to walk clockwise (keeping the rope taut) and to stop when he or she gets to another arm of the plus sign. Ask: What rotation did the second student just make? Where was the center of the rotation? Continue by giving other instructions and having students discuss the subsequent rotations.

Using overhead projector, overhead pattern blocks and overhead grid demonstrate the various rotations possible i.e. \( \frac{3}{4} \) turn clockwise, \( \frac{1}{4} \) turn counterclockwise.

Demonstrate on the overhead how to rotate figure ABCD \( \frac{1}{4} \) clockwise around center C.

Use the same figure but rotate \( \frac{1}{2} \) turn or \( \frac{3}{4} \) turn.

Students should have had many opportunities to rotate various figures. Now, they will be required to draw a 2-D shape, rotate the 2-D shape, and describe the turn.
General Outcome: Describe and analyze position and motion of objects and shapes.

Suggested Assessment Strategies

Student-Teacher Dialogue

- Show the students the following diagram and ask them to describe it.

![Diagram of geometric shapes]

Pencil and Paper

- Have students complete a chart similar to the one below. Provide various rotations on individual cards. E.g.,

<table>
<thead>
<tr>
<th>Figure</th>
<th>Name of Transformation</th>
<th>Description of Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card 1</td>
<td>Rotation</td>
<td>180° counter-clockwise, about Q</td>
</tr>
<tr>
<td>Card 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Have students draw a 2-D shape on grid paper and get them to choose the vertex of rotation. Students must describe the direction of the turn, the fraction of the turn and the point of rotation. (5SS7.5)

Performance

- Students work in pairs. Ask students to provide their partner with a given shape and ask their partner to draw the rotation and explain his/her reasoning. (5SS7.5)

Resources/Notes

Math Focus 5
Lesson 4 (Continued): Performing Rotations
5SS7 (7.1, 7.5, 7.7)
5SS8 (8.1, 8.2, 8.3)
TR pp. 25 - 29
### Strand: Shape and Space (Transformations)

<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>Using the overhead projector, provide various examples of figures on a grid. Invite the students to predict the quadrant and position of the rotated image. Students must be able to verify the prediction.</td>
</tr>
</tbody>
</table>

#### 5SS7 Continued

**5SS7.7** Predict the result of a single transformation of a 2-D shape, and verify the prediction.

**5SS8.1** Provide an example of a translation, a rotation and a reflection.

**5SS8.2** Identify a given single transformation as a translation, rotation or reflection.

**5SS8.3** Describe a given rotation about a vertex by the direction of the turn (clockwise or counterclockwise).

**Achievement Indicators:**

Generate discussion around examples such as a player pivoting on a basketball court, sliding your bicycle out of the garage, etc.

Explain that these two triangles are reflections of one another. Have students use a ruler to find the mirror line. Check using a mira.

Repeat similar type problems for translations and rotations.

Students have explored a variety of rotations about a vertex of a 2-D shape.

Model, using math language, how to describe given rotations.
General Outcome: Describe and analyze position and motion of objects and shapes.

Suggested Assessment Strategies

Journal

- Have students answer the following questions:
  
  When do you see or use these transformations in your everyday lives? What transformation did you enjoy the most and the least? Why?
  
  (5SS7.7)

- Ask students what is the difference between the three transformations: translations, reflections, and rotations.
  
  (5SS8.2)

- Ask students to complete a Venn Diagram comparing any two transformations.
  
  (5SS8.2)

- I know this is a rotation because...
  
  (5SS8.3)

Performance

- Provide students with the opportunity to predict the quadrant and position of the rotated image.
  
  (5SS7.7)

- Motion Commotion - Provide students with a sheet of 8 1/2 by 14 inch paper to fold and cut according to the diagram below. Students must cut along the dotted edge so that the top half of the strip has flaps that can be folded over to cover the images. Place one figure in the first (lower left-hand) box of the strip. Students must perform a transformation and write on the flap a description of the movement performed. Students should continue performing these transformations until all blocks have been filled.
  
  (SS 8.1)

Source: Navigating through Geometry (Grades 3-5)

Paper and Pencil

- Provide students with examples of various transformations and ask them to identify the type and justify their reasoning.
  
  (5SS8.2)

Student Teacher Dialogue

- Provide students with a variety of completed transformations. Have students identify the type of transformation and explain how they know.
  
  (5SS8.2)

Resources/Notes

Math Focus 5

Lesson 4 (Continued):
Performing Rotations
5SS7 (7.1, 7.5, 7.7)
5SS8 (8.1, 8.2, 8.3)
TR pp. 25 - 29

Lesson 5: Communicating about Transformations
5SS7 (7.1, 7.2, 7.3, 7.7)
5SS8 (8.2, 8.3)
TR pp. 30 - 33

Math Game:

TG pp. 34 - 35
Cover Up

Curious Math:

TG pp. 36 - 37
Fun with Transformations

End of chapter material and unit assessment - be selective.
Multiplication

Suggested Time: 3 - 4 Weeks

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

Focus and Context

The focus of this unit is to enable students to apply what they have learned about multiplication to larger numbers and to choose the most efficient method or strategy for multiplying numbers. Mental computation and estimation should be integrated throughout the unit as students routinely determine the reasonableness of their computations. Immediate recall of basic multiplication facts (within 3 seconds) is a necessary prerequisite not only for paper-and-pencil algorithmic procedures, but also for estimation and mental computation. When students demonstrate inefficient strategies with respect to their facts, this should be worked on while still progressing through the unit. As students develop methods to estimate and solve problems which require multiplication, they should be encouraged to record and share their methods so they can learn from each other and try one another's methods. When students are provided opportunities to model multiplication problems with pictures, diagrams, or concrete materials, they develop an understanding of what the factors and their product represent in various real life contexts.

Math Connects

Multiplication is an essential part of the mathematics curriculum and of everyday life. Whether mentally or on paper, multiplication is an important skill that most people use daily in planning, purchasing, etc. When students can see the connection between multiplication and repeated addition it enables them to better understand multiplication. It is important to start with a word problem and then have students use materials to determine the product. Students should use a variety of models such as base ten blocks, money and a place value chart to investigate multiplication problems to help develop an understanding of the connection between the model and the symbols.

Estimation is also a process that is used constantly by adults and can be mastered by children. It involved an intelligent prediction of the outcome of a computation. It is important that students know if an estimate is reasonable and this is best determined through strong estimation skills. It is equally important that students realize there are also situations in which an approximate answer is as good as an exact one.
## Process Standards Key

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>5N2 Use estimation strategies, including: • front-end rounding • compensation • compatible numbers in problem-solving contexts.</td>
<td>[C, CN, ME, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N3 Apply mental mathematics strategies and number properties, such as: • skip counting from a known fact • using doubling or halving • using patterns in the 9s facts • using repeated doubling or halving to determine, with fluency, answers for basic multiplication facts to 81 and related division facts.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N4 Apply mental mathematics strategies for multiplication, such as: • annexing then adding zero • halving and doubling • using the distributive property.</td>
<td>[C, CN, ME, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N5 Demonstrate, with and without concrete materials, an understanding of multiplication (2 digit by 2-digit) to solve problems.</td>
<td>[C, CN, PS, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Variables and Equations)</td>
<td>5PR2 Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions</td>
<td>[C, CN, PS, R]</td>
</tr>
</tbody>
</table>
Strand: Number

Outcomes

Students will be expected to

5N3 Apply mental mathematics strategies and number properties, such as:

• skip counting from a known fact
• using double and halving
• using patterns in the 9s facts
• using repeated doubling and halving to determine, with fluency, answers for basic multiplication facts to 81 and related division facts.

[C, CN, ME, R, V]

Elaborations—Strategies for Learning and Teaching

Students who have developed number sense see the benefit of using mental math and estimation strategies. When using algorithms or processes they can take into account the situation and the numbers involved. They show flexibility when working with numbers and operations. They move toward use of an efficient strategy that does not require more steps or greater complexity than needed.

Most mental math algorithms require students to compose and decompose numbers. E.g. 99 + 36 is the same as 100 + 35, or 111 – 89 may be thought of as 100 – 90 + 10 + 1. Students who do mental calculations further develop their number sense.

Students need to be able to determine whether a particular computation should be done mentally, on paper, with a calculator, or if an estimate will suffice.

Mental math and estimation are key elements when using algorithms. They support the application of algorithms as students apply their number sense throughout the process.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Students work in pairs and decide that one student represents odd numbers while the other represents even numbers. Students prepare a T-chart to record their scores.

| Even | Odd |

Both students put both hands behind their backs and one of the players says “go”. Both students bring their hands to the front with any number of fingers, of their choice, held up. The students take turn multiplying the numbers and if the product is even the student representing “even” scores a point. If the product is “odd” the student representing “odd” scores a point. The first to score ten points wins the game.

Assessment observations: How are the students multiplying the 2 numbers? For example, are they applying strategies (efficient or inefficient) to find various products. Are they able to look at 5 add 7 and immediately say 35? Is there an automatic response for some and not for others?

8 \times 6 = 48

Resources/Notes

Math Focus 5
Getting Started
Making Dream Catchers
Teacher Resource (TR) pp. 9-11

Be selective with the Getting Started section – this is just an introduction to the unit.

Lesson 1: Multiplication Strategies
5N3 (3.1, 3.2)
TR pp. 12 - 15
Strand: Number

Outcomes

Students will be expected to

5N3 Continued

Achievement Indicator:

5N3.1 Describe the mental mathematics strategy used to determine a given basic fact, such as:

- skip count up by one or two groups from a known fact; e.g., if $5 \times 7 = 35$, then $6 \times 7$ is equal to $35 + 7$ and $7 \times 7$ is equal to $35 + 7 + 7$

- skip count down by one or two groups from a known fact; e.g., if $8 \times 8 = 64$, then $7 \times 8$ is equal to $64 - 8$ and $6 \times 8$ is equal to $64 - 8 - 8$

- doubling; e.g., for $8 \times 3$ think $4 \times 3 = 12$, and $8 \times 3 = 12 + 12$

- patterns when multiplying by 9; The sum of the two digits in the product is always 9. E.g. for $7 \times 9$, think: 1 less than 7 is 6, 6 and 3 make 9, so the answer is 63.

- repeated doubling; e.g., if $2 \times 6$ is equal to 12, then $4 \times 6$ is equal to 24 and $8 \times 6$ is equal to 48

- repeated halving; e.g., for $60 \div 4$, think $60 \div 2 = 30$ and $30 \div 2 = 15$

Elaborations—Strategies for Learning and Teaching

Each of the strategies indicated can be taught individually using the given examples in problem solving contexts:

- James is placing cookies on a cooling sheet. He has 6 rows of 8 cookies and he can fit 2 more rows on the sheet. How many cookies can James place on the sheet in all?
- This year Mr. White planted his carrots in rows. He has 9 rows of 9 plants. Last year he had 1 row less. How many carrots did he have last year?
- Siobhan saved 7 dollars each week for 4 weeks. How much money did she save in 2 weeks? How much money did she save in 4 weeks? How much will she save in 8 weeks?
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Student-Teacher Dialogue**

- Given the fact that $7 \times 8 = 56$, explain how you could use this to determine $8 \times 8$ and $9 \times 8$. Use words, diagrams and numbers to explain.
- Bill says that because $7 \times 7 = 49$, he knows that $6 \times 7 = 42$. Explain his thinking.
- Amy knows that $4 \times 9 = 36$. How can she use this fact to help her determine $8 \times 9$? Explain.
- Jack states that $9 \times 7 = 64$. How can Jill see right away that Jack’s answer is incorrect because $6 + 4 = 10$. What pattern was Jill using?
- Explain how you would use the repeated doubling strategy to determine any of the 8 times facts. (5N3.1)

**Portfolio**

- After reading and discussing Gregory Tang’s, “The Best of Times”, have students create their own illustrated booklet on given multiplication facts strategies. (5N3.1)

#### Resources/Notes

* Math Focus 5
  Lesson 1 (Continued):
  Multiplication Strategies
  5N3 (3.1, 3.2)
  TR pp. 12 - 15

* (Repeated halving will be addressed in Chapter 9, Division, Lesson 2)

**Literature Connection**

The Best of Times, by Gregory Tang
Strand: Number

Outcomes

Students will be expected to

5N3 Continued

Achievement Indicator:

5N3.2 Explain why multiplying by zero produces a product of zero.

5N3.4 Determine, with confidence, answers to multiplication facts to 81 and related division facts.

Elaborations—Strategies for Learning and Teaching

To show 5 sets of 0 you might use 5 empty baskets and ask, "How many muffins are there in all?" Since there is nothing in any of the baskets, the answer is 0, because 5 groups of 0 is 0. It will not matter how many empty baskets there are, any number of baskets with 0 muffins in them, result in 0 muffins altogether.

\[ 5 \times 0 = 0 \]

Strategies for Basic Multiplication Facts - The basic number facts are among the tools that students need to be successful in their mathematics program. In the past, students memorized the facts once they had been introduced to multiplication as a faster method of addition.

It is now recommended that students learn patterns and strategies for as many facts as possible so that they strengthen their understanding of the relationships between numbers and the patterns in mathematics. Then they begin to memorize.

It is important that students recognize that multiplication and division are inverse operations. For each multiplication, or division fact, there is a related fact family.

E.g. \( 7 \times 8 = 56 \) therefore, the 3 related facts are: \( 8 \times 7 = 56 \); \( 56 \div 7 = 8 \) and \( 56 \div 8 = 7 \).
General Outcome: Develop Number Sense

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
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<tbody>
<tr>
<td><strong>Portfolio</strong></td>
<td>Math Focus 5</td>
</tr>
<tr>
<td>• Have students write a poem, or create a poster with the theme, “I May be Zero, but I am NOT nothing”. (5N3.2)</td>
<td>Lesson 2: Special Products</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>5N3 (3.4)</td>
</tr>
<tr>
<td>• Game: Race to 1000. Two Players. One student rolls a pair of dice and uses the numbers rolled as factors for a product. The student determines the product and the other student verifies the answer using a calculator or a multiplication facts table. When a student gives a correct fact they keep a running tally until one student reaches 1000. Students can use manipulatives, place value charts or numbers to keep their tally. (5N3.4)</td>
<td>TR pp. 16 - 19</td>
</tr>
<tr>
<td>• Exit Card Activity: Near the end of a mathematics lesson (10 minutes) give each student a 4” x 6” index card. Students must recap strategies learned to complete any set of multiplication facts (e.g. 9s facts). Be sure they put their name on the card. Students then exchange cards with their peers. Have two or three students share their strategies with the class. Lead discussion to include ways to enhance and clarify the strategies. (5N3.4)</td>
<td>Related division facts are not addressed in student text but must be addressed as part of the outcome.</td>
</tr>
<tr>
<td><strong>Pencil and Paper</strong></td>
<td>Lesson 3: Relating Multiplication Facts (Optional)</td>
</tr>
<tr>
<td>• Have student fill-in a blank times table chart to determine facts that need to be worked on with appropriate strategies. The chart can be created with the number in sequence or with the numbers placed randomly such as:</td>
<td>TR pp. 20 -22</td>
</tr>
</tbody>
</table>

![Blank times table chart](image)
Strand: Number

Outcomes

Students will be expected to

5N4 Apply mental mathematics strategies for multiplication, such as:
• Annexing then adding zero
• Halving and doubling
• Using the distributive property.
[C, CN, ME, R, V]

Elaborations—Strategies for Learning and Teaching

Why is mental math a valuable skill?
• It can be done quickly using tools which are always readily available.
• It adds efficiency to our computation, problem solving work, and to our ability to do algebra later. Without mental math, students have to make too many side-trips in more complex tasks which take them away from the main problem and increases the likelihood of error.

Achievement Indicator:

5N4.1 Determine the products when one factor is a multiple of 10, 100 or 1000 by annexing zero or adding zeros; e.g., for 3 × 200 think 3 × 2 and then add two zeros.

Estimation and calculations of multi-digit products are based on knowledge of the multiplication facts and how to multiply with multiples of 10, 100, and 1000. The following models can be used to teach and explain these concepts.

Model 6 × 20 as 6 groups of 20

6 × 20 = 6 × 2 tens
= 12 tens

Regroup 12 tens by trading 10 tens for 1 hundred

6 × 2 tens = 12 tens
= 1 hundred, 2 tens
= 120

(Big Ideas from Dr. Small, 2009, pp. 32)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

• Facto - Create facto cards [4 x 5] containing 2 factors [one of which is a multiple of 10]. Each pair of students is given one grid and a set of product cards with the answers to the problems on the grid. Turn the product cards face down. Students take turns turning over product cards and placing them on the appropriate problem on the Facto card. The first student to achieve a straight line wins the game.

<table>
<thead>
<tr>
<th>F</th>
<th>A</th>
<th>C</th>
<th>T</th>
<th>O</th>
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<tbody>
<tr>
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<td>4 x 100</td>
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<td>14 x 1000</td>
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<td>66 x 100</td>
<td>40 x 20</td>
<td>25 x 10</td>
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</tr>
<tr>
<td>8 x 70</td>
<td>600 x 30</td>
<td>70 x 5</td>
<td>62 x 10</td>
<td>60 x 50</td>
</tr>
<tr>
<td>20 x 800</td>
<td>30 x 25</td>
<td>12 x 40</td>
<td>13 x 20</td>
<td>6 x 90</td>
</tr>
</tbody>
</table>

(5N4.1)

Pencil and Paper

• What basic fact is used to find the product 4 x 8 000? What is the product? (5N4.1)

Complete each pattern. Explain the pattern you see.

3 x 7 = ___  4 x 5 = ___
3 x 70 = ___  4 x 50 = ___
3 x 700 = ___  4 x 500 = ___
3 x 7000 = ___  4 x 5000 = ___
3 x 70 000 = ___  4 x 50 000 = ___ (5N4.1)

• Choose two factors from the list for each estimated product. You may use each number more than once.

LIST

309  193  4  3  759  7

\(\Delta \times \Delta = 2100\)  \(\Delta \times \Delta = 900\)

\(\Delta \times \Delta = 1200\)  \(\Delta \times \Delta = 800\)

\(\Delta \times \Delta = 2400\)  \(\Delta \times \Delta = 5600\) (5N4.1)

Resources/Notes

Math Focus 5
Lesson 4: Multiplying by Tens, Hundreds, and Thousands
5N4 (4.1)
5PR2 (2.2)
TR pp. 23 – 26

Questions 9 and 13 in lesson 4, page 187 SB address this indicator.
Strand: Number

Outcomes

Students will be expected to

5N4 Continued

Achievement Indicators:

5N4.2 Apply halving and doubling when determining a given product; e.g., 32 × 5 is the same as 16 × 10.

Elaborations—Strategies for Learning and Teaching

The double-half strategy is a specific example of the multiplication principle which states: to multiply two numbers you can divided one factor and multiply the other by the same number without changing the product.

Consider 8 groups of 3 (8 x 3). If you pair up groups of three, you will have 6 in each group, (twice as many in each group), but only 4 groups (half as many groups), while the total number of circles remains the same. (8 x 3 = 4 x 6)

8 groups of 3

4 groups of 6

8 x 3 = 4 x 6 (double and half)

(Big Ideas from Dr. Small, 2009, p 28)

The halving and doubling strategy works best when on or more of the factors is even, since having an odd number results in a fraction. This strategy is particularly useful for factors such as 5, 15, 25, etc.

E.g.,    12 × 15  ->  6 × 30  ->  180
        25 × 18  ->  50 × 9  ->  450

5N4.3 Apply the distributive property to determine a given product involving multiplying factors that are close to multiples of 10; e.g., 98 × 7 = (100 × 7) – (2 × 7).

The ability to break numbers apart in flexible ways is even more important in multiplication than in addition or subtraction. The distributive property is another important concept in multiplication.

E.g. 43 × 5 = (40 × 5) + (3 × 5).

The example given in the indicator combines distributive property with compensation. It could also be approached as:

98 × 7 = (90 × 7) + (8 × 7)

A discussion could occur around which strategy, or combination of strategies, students find most useful.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- For which of the following computations would you use halving and doubling strategy. Explain.
  
  | 9 x 7  | 8 x 13  |
  | 50 x 8 | 51 x 9  |
  | 25 x 16 | 35 x 4 |

- Give the student the following equation: $57 \times 7 = (60 \times 7) _{\_} (3 \times 7)$. Ask the student which operation should go in the _, “+” or “–” and explain why.

Journal

- Explain how the halving doubling strategy would be used to solve $5 \times 34$.

Performance

- Have students model the following using base ten blocks.

  ![](image)

  

Paper and Pencil

- Ask students to solve the following using the distributive property.
  
  $68 \times 7$ and have them explain their method.
Strand: Number

Outcomes

Students will be expected to

5N2 Use estimation strategies, including:
- Front-end rounding
- Compensation
- Compatible numbers in problem-solving contexts.

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

Elaborations—Strategies for Learning and Teaching

Why is estimation a valuable skill?

- Estimation enables us to judge the reasonableness of an answer acquired using pencil and paper or calculators.
- It can be done quickly using tools which are always readily available.
- An estimation is often all that is required to make an important decision.

Provide the students with problem-solving contexts requiring the multiplication of two 2-digit whole numbers. Model estimating the product using the front-end strategy. Then encourage the students to refine the estimate by using compensation. An example is provided below.

Problem:
To raise money at school, 24 students each sold 36 chocolate bars. Estimate how many chocolate bars the students sold.

Solution:
Through discussion, have the students decide the operation used in this problem: multiplication.

Write “front-end strategy” on the board and state that this strategy will be used to estimate the product.

Explain that the front-end strategy uses only the first digit in each number and replaces the other digits with zeros; therefore, 24 becomes 20 and 36 becomes 30. Review multiplying by 10s and also rewriting each number as a product of 10.

Write “24 × 36” on the board.

Then rewrite it using the front-end strategy: 20 × 30.

If necessary, rewrite “20 × 30” as “2 × 3 × 10 × 10 = ?”

Finally, write “20 × 30 = 600.”

This completes the estimation using the front-end strategy, but encourage the students to refine the estimate by using compensation. Explain that the compensation strategy is used to adjust the estimate to make it closer to the actual product. Ask the students whether 600 is more or less than the actual product and why they think so. A sample explanation might be “Since the digits in the ones place were replaced (Continued)
**General Outcome: Develop Number Sense**

**Suggested Assessment Strategies**

**Journal**

- Judy's class sold Belgian chocolate as a fund raiser for her school. Her class sold 46 boxes of chocolate at $18.00 a box. Judy estimated that her class raised $920.00. Explain her strategy and tell whether you think it is reasonable or not. (5N2.1)

**Student-Teacher Dialogue**

- Present students with the following scenario: Jane has to purchase hoodies for her team of 30 gymnasts. Each hoodie costs $63.00 and Jane estimates the total by using $60.00 x 30 to get a cost of $1800.00. Is her estimate too high or too low? In this case, why is a low estimate a problem. Students will then discuss the fact that in rounding $63 to $60 Jane won't have enough money to cover the cost of the hoodies. In this scenario, over-estimating will ensure sufficient money for the hoodies. (5N2.2)

**Paper and Pencil**

- You have 4 pieces of chocolate that each weigh 253 g. Estimate whether the total weight of these 4 pieces of chocolate is more or less than 1000 g or 1 kg. Explain your thinking. (5N2.1)

- In each box, circle all factors whose estimated product is in the center. Explain your choice for any two sets of factors.

```
<table>
<thead>
<tr>
<th>2 x 599</th>
<th>6 x 212</th>
<th>3 x 395</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x 304</td>
<td>1 200</td>
<td>2 x 673</td>
</tr>
<tr>
<td>3 x 444</td>
<td>4 x 256</td>
<td>6 x 184</td>
</tr>
<tr>
<td>6 x 524</td>
<td>4 x 888</td>
<td>9 x 444</td>
</tr>
<tr>
<td>4 x 973</td>
<td>3 600</td>
<td>6 x 555</td>
</tr>
<tr>
<td>9 x 381</td>
<td>6 x 631</td>
<td>4 x 918</td>
</tr>
</tbody>
</table>
```

(5N2.4, 2.7)

**Resources/Notes**

`Math Focus 5`

Lesson 7: Estimating Products

5N2 (2.1, 2.2, 2.3, 2.4, 2.6, 2.7)

TR pp. 38 – 41
Outcomes

Students will be expected to

5N2 Continued

Achievement Indicators:

5N2.4 Estimate a sum or product, using compatible numbers.

5N2.6 Select and use an estimation strategy for a given problem.

5N2.7 Apply front-end rounding to estimate:
- sums; e.g., 253 + 615 is more than 200 + 600 = 800
- differences; e.g., 974 – 250 is close to 900 – 200 = 700
- products; e.g., the product of 23 × 24 is greater than 20 × 20 (400) and less than 25 × 25 (625)
- quotients; e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200).

Elaborations—Strategies for Learning and Teaching

by zeros, then 24 x 36 is greater than 600.” Through discussion, have the students generalize that the front-end strategy for finding the product of two numbers is always an underestimate; therefore, compensation is needed to refine the estimate.

Write “24 × 36 is greater than 600” on the board. Underline the 4 in 24 and the 6 in 36 to focus attention on the digits that were dropped using the front-end strategy.

Have the students decide what number must be added to 600 to make the estimate more accurate. Sample response: “4 was dropped from 24, and 6 groups of 30 is 120. 6 was dropped from 36, and 6 groups of 20 is 120. 120 + 120 = 240, so using compensation, the adjusted estimate is 600 + 240 = 840.”

Answer to the problem: The students sold about 840 chocolate bars.

Encourage the students to calculate the answer to the problem using a personal strategy and then compare their calculated answer to the estimated answer.

Maren and her friends each read a different story by Hans Christian Andersen. Maren said she had read the most because her story had the most pages. Nicholas pointed out that his story had more lines on a page so he actually read the most. Finally, Brooklyn and Jaxon decided they should all estimate the number of lines in their stories to settle the argument.

1. Select and use strategies to estimate the number of lines in each story to find out who read the most. Show all your thinking below.

Explain which person read the most.

2. Explain why you used the estimation strategy or strategies that you chose. (Source: www.LearnAlberta.ca Grade 5, Number (SO 2) 2008 Alberta Education Page 28 of 36)
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Find two different ways to use compatible numbers to estimate each product and explain each method you used.

\[
23 \times 8 \quad 94 \times 5 \quad 43 \times 54 \quad (5N2.4)
\]

Student-Teacher Dialogue

- Present the following problem to the student and have him or her read it orally. You have 18 pieces of string and each piece is 32 cm in length. Estimate the total length of string. Use the following prompts to guide the student’s thinking, if necessary:
  - State the problem in your own words.
  - What do each of the numbers in the problem represent?
  - What is the unknown in the problem?
  - What number sentence could you write to show the meaning of the problem?
  - What operation will you use to solve the problem? Explain.
  - Use an estimation strategy that makes sense to you to find the answer to the problem. Explain your thinking as you write the numbers. (Hint: provide guidance in using the front-end or compatible numbers strategies, if necessary.)
  - Explain how you know your estimate is quite close to the calculated answer. (Hint: have the student use compensation, if appropriate, to refine the estimate.)
  - Calculate the answer to the problem using paper and pencil to record your personal strategy.
  - Compare your calculated answer with your estimated answer.

- Use the same procedure as outlined in Question 2 with the following problem: There are 52 candies in each of 23 bags. Estimate how many candies there are in all the bags.

- Have the students create a problem that requires only an estimated answer to solve it. Solve the problem you created by estimating the answer and explaining your thinking.

(5N2.3, 2.6)

Resources/Notes

Math Focus 5
Lesson 7 (Continued): Estimating Products
5N2 (2.1, 2.2, 2.3, 2.4, .2.6, 2.7)
TR pp. 38 – 41
Strand: Number

Outcomes

Students will be expected to

5N5 Demonstrate, with and without concrete materials, an understanding of multiplication (2 digit by 2-digit) to solve problems.
[C, CN, PS, V]

Achievement Indicators:

5N5.1 Illustrate partial products in expanded notation for both factors; e.g., for 36 × 42, determine the partial products for (30 + 6) × (40 + 2).

5N5.2 Represent both 2-digit factors in expanded notation to illustrate the distributive property; e.g., to determine the partial products of 36 × 42, (30 + 6) × (40 + 2) = 30 × 40 + 30 × 2 + 6 × 40 + 6 × 2 = 1200 + 60 + 240 + 12 = 1512.

5N5.3 Model the steps for multiplying 2-digit factors, using an array and base ten blocks, and record the process symbolically.

Elaborations—Strategies for Learning and Teaching

There are many good reasons for students to be exposed to various algorithms for multiplication and for them to invent their own strategies and algorithms, including:

- One algorithm may be more meaningful to a student than another
- One algorithm may work better for a particular set of numbers.
- Some algorithms lend themselves to mental computations.
- At home, parents may use a different algorithm than one taught at school, so students should be open to many strategies.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance
- Ask students to use a model to show the amount of money collected for photographs if 43 students each bring in $23.00. (5N5.5)

Student-Teacher Dialogue
- On chart paper prepare a series of 2-digit by 2-digit products and have students fill-in missing numbers and provide justification for their choices.
  e.g.
  45 x 36
  = (40 + 5) x (__ + 6)
  = 40 x 30 + 40 x __ + 5 x __ + 5 x 6
  = 1200 + ___ + 150 + 30 = ____ (5N5.1, 5.2)

Pencil and paper
- Noah planted 15 rows of tulips with 24 tulips in each row. When determining how many tulips he planted he wrote the following. His answer is incorrect? Explain Noah’s error.

  15
  x24
  20
  40
  10
  200
  270 (5N5.1, 5.2)

Resources/Notes

Math Focus 5
Lesson 8: Multiplying Two-Digit Numbers (Optional)
5N5 (5.5)
TR pp. 42 – 45

Lessons 9: Multiplying with Base Ten Blocks
5N5 (5.1,5.2, 5.3, 5.5)
TR pp. 46 -49

Lesson 10: Multiplying with Arrays
5N5 (5.3, 5.4, 5.5)
TR pp. 50 - 53
Strand: Number

Outcomes

Students will be expected to

5N5 Continued

Achievement Indicators:

5N5.4 Describe a solution procedure for determining the product of two given 2-digit factors, using a pictorial representation such as an area model.

5N5.5 Solve a given multiplication problem in context, using personal strategies, and record the process.

Elaborations—Strategies for Learning and Teaching

Remember that students should be able to explain any algorithm they choose to use. It is also important that students explain their reasoning clearly using correct mathematical language. When describing algorithms terms might include:

- Regroup
- Trade or exchange
- Product
- Place Value terms like hundreds, tens and ones.

Effective communication of mathematical thinking should be done using words, pictures and numbers. These should be logically outlined and clearly presented in students’ responses.

An alternative procedure for 2 digit by 2 digit multiplication is as follows:

To multiply 24 x 68, make a Tilted square as shown

Drop diagonals vertically as shown to divide each block into two triangles. This divides each block into tens and ones.

When multiplying 4 x 8 the answer 32 is recorded as shown.

This continues until all triangles are filled.

Add the digits from each column to get the final answer.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Have students model $31 \times 24$ using base ten blocks and represent the model on grid paper, indicating clearly the final product.

\[
\begin{array}{c}
31 \\
\times 24 \\
\hline
4 \\
120 \\
20 \\
+ 600 \\
\hline
744
\end{array}
\]

(Pencil and Paper)

- The fish processing plant finished packaging 25 crates of halibut. There were 72 kg of halibut in each crate. How many kilograms of halibut were packaged altogether? Use words, numbers and pictures to solve the problem. (5N5.5)

- Find the products, using base ten blocks if required. Record the process using numbers, words and/or pictures.

\[
\begin{align*}
25 \times 36 & \quad 14 \times 23 \\
22 \times 32 & \quad 21 \times 17
\end{align*}
\]

(Pencil and Paper)

- Use the tilted square shown to multiply $23 \times 45$.

Answer:

- Make your own tilted square and use it to multiply $26 \times 43$.

Resources/Notes

**Math Focus 5**

- Lessons 9 (Continued):
  - Multiplying with Base Ten Blocks
  - 5N5 (5.1, 5.2, 5.3, 5.5)
  - TR pp. 46 - 49

- Lesson 10 (Continued):
  - Multiplying with Arrays
  - 5N5 (5.3, 5.4, 5.5)
  - TR pp. 50 - 53

**Curious Math:**

- TG p. 58
  - Lattice Multiplication
Strand: Number

Outcomes

Students will be expected to

5N5 Continued

Achievement Indicators:

5N5.6 Refine personal strategies to increase their efficiency.

5N5.7 Create and solve a multiplication problem, and record the process.

Elaborations—Strategies for Learning and Teaching

It is important to monitor the types of strategies that students are using. While invented strategies should be accepted, when those strategies become inefficient students should make a transition to more efficient strategies. These more efficient strategies will serve them better as they move to more complex mathematical situations. For example, a student may use repeated addition to solve $6 \times 24$, $(24 + 24 + 24 + 24 + 24 + 24)$. Although it is an effective strategy, it is not efficient.

“Using problem writing as an assessment can reveal student understanding and misunderstanding in a manner in which traditional assessment cannot.” (Teaching Children Mathematics, NCTM September, 2008) It is possible to see gaps in student understanding that can be used to tailor instruction to individual needs. It also allows opportunity for students to demonstrate mathematical reasoning through the discussion of their problem.

When students are given a set of numbers and asked to generate and solve their own multiplication problems, they must demonstrate an understanding of real-world, everyday problems that require multiplication and then effectively apply strategies to solve those problems. Students should be encouraged to record their answers, and report about their solutions to their problems.

Their opportunities for class discussions of the various strategies used in solving the multiplication problems will be a valuable source of learning and ongoing assessment.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- Have students explain at least 2 different strategies they would use to solve a given problem. Ask the student which of the strategies they would prefer and why. (Record observation about the efficiency of strategy chosen. This would be an opportunity to discuss the appropriate use of a given strategy with the student.) (5N5.6)

Pencil and Paper

- Britney is having her 10th birthday party at a movie theatre. The cost is $9.39 per child. She is inviting 12 of her friends and her mother is estimating the cost. What cost should she use in her estimation. Explain. (5N5.6)

- Using ten number cards 0-9 students select 4 cards to create two 2-digit numbers. These are used as factors in a multiplication problem. Have students use the two numbers to create and solve two words problems. One problem has a solution that must be calculated and the other requires only an estimation. Have students explain their choices. (5N5.7)

Resources/Notes

Math Focus 5
Lesson 11: Communicating about Multiplication Methods
5N5 (5.6, 5.7)
TR pp. 54 – 57

Math Game:
TG p. 59
Rolling Products

End of chapter material and unit assessment - be selective.
Patterns in Mathematics

Suggested Time: 3 Weeks

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

Focus and Context

Recognizing patterns and making generalizations are necessary skills in mathematics. Patterns are used repeatedly as a means of developing concepts and as a tool for solving problems. In Grade 5 students will represent patterns numerically, pictorially, and symbolically. Through the use of concrete materials, tables, charts and symbols, students will describe pattern rules, use relationships in patterns to make predictions of missing elements and solve problems. Students’ ability to determine pattern rules enables students to write equations to help solve problems.

In Grade 5, students will be more formally introduced to an algebraic approach in which they first describe the problem using an unknown or variable in an equation and then solve the equation. It will be important to connect the concrete, pictorial and symbolic representations as students develop an understanding of equations and continue to build on their understanding of equality as a relationship and not an operation.

Math Connects

Algebra is a symbolic language used to express mathematical relationships. Algebra provides the language through which students communicate patterns they find in numbers, shapes and expressions. Students are given opportunities to analyze, extend and create patterns and to use problem-based thinking to understand and represent mathematical and real world situations.
Process Standards Key

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

Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns and Relations (Patterns)</td>
<td>5PR1 Determine the pattern rule to make predictions about subsequent elements.</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td>Patterns and Relations (Variables and Equations)</td>
<td>5PR2 Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions.</td>
<td>[C, CN, PS, R]</td>
</tr>
</tbody>
</table>
PATTERNS IN MATHEMATICS

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

5PR1 Determine the pattern rule to make predictions about subsequent elements.

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Grade 5 students will continue to work with patterns however the focus will be on making and verifying predictions of missing elements in various patterns. The students will use concrete materials and tables to determine pattern rules which will enable them to predict missing elements in a pattern.

Given a number, geometric, pictorial, or situational pattern, students should be able to explain the pattern in spoken and written language. Very often, students will need to extend the pattern to fully understand it.

Achievement Indicator:

5PR1.1 Extend a given pattern with and without concrete materials, and explain how each element differs from the preceding one.

Skip counting is one way to introduce patterns. Provide students with a hundred chart to help them practice the strategy of skip counting to find patterns i.e. counting by 6’s.

The hundreds chart is a tool for exploring number relationships which is the focus of pattern work.

Provide students with number patterns such as the following:

85, 80, 75 …
77, 65, 53……
6, 12, 24……
8, 15, 22……

Have students continue the pattern for the next three numbers and then tell how the elements are changing as they extend the pattern.
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

**Paper and Pencil**
- Extend the following patterns and describe the pattern rule.
  - 3, 6, 9, 12, ____ , ____ , ____
  - 8, 17, 26, 35, ____ , ____ , ____
  - 97, 86, 75, 64, ____ , ____ , ____
  - 49, 42, 35, 28, ____ , ____ , ____
- Explain how each element is different from the preceding element. (5PR1.1)

**Performance**
- Working with a partner, have students build a staircase using either connecting cubes or rods from base ten materials.

![Step 1, Step 2, Step 3]

- Copy and extend the pattern above to show the next three steps.
  - Describe what you notice about the pattern.
  - Record the pattern on the chart provided.
  - Have students predict how many blocks might be in the tenth step.
  - Explain your prediction. (5PR1.1, 1.2, 1.6)

Resources/Notes

**Math Focus 5**

**Getting Started**

**Collecting Pennies**

Teacher Resource (TR) pp. 9-11

In Getting Started the focus is on patterns in a hundreds chart. This material has been addressed in Grades 2, 3, and 4 therefore it is recommended that you be very selective with regard to this material as it does not reflect patterns at the grade 5 level. Select only 1 or 2 practice exercises or it may be omitted.

**Lesson 1: Modelling Patterns**

5PR1 (1.1, 1.2, 1.6, 1.8)

TR pp. 12 - 15
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

5PR1 Continued

Achievement Indicators:

5PR1.6 Predict subsequent elements in a given pattern.

Elaborations—Strategies for Learning and Teaching

A table or “T-chart” can be constructed to represent a pattern. Once a table is used for the pattern, students may realize that they can extend and predict the pattern without using concrete materials. For those students who find it beneficial to use manipulatives, they should be readily available for their use.

The challenge is to predict subsequent elements in a given pattern without actually completing all the entries of the table. When students recognize the pattern, they will be able to determine the 5th, 10th or even the 20th element without recording all the elements in between.

The diagram below shows a series of triangles built using toothpicks.

Continue the pattern above for the next three triangles.

Complete the chart to show how many toothpicks will be used to create each picture.

<table>
<thead>
<tr>
<th>Picture Number</th>
<th>Number of Toothpicks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Describe either orally or in writing, how the pattern grows.

Predict the number of toothpicks needed to construct picture 10.

Explain your prediction.

This is an opportunity for students to use concrete materials. Students should be able to record the pattern in a given table. When using geometric patterns, students might be asked to describe how to build the next model or other models in the series. This helps to connect the pattern with the model.

Students should be asked to represent a pattern using a picture or a number of concrete materials such as pattern blocks or square tiles when appropriate.

Enabling students to verify their predictions of elements further in the pattern often requires visual representations.

Students should be asked to explain their predictions.

Create a pattern block train by alternating one red trapezoid with one yellow hexagon. Predict which block will be in the 15th place? Complete your train to verify your prediction.

5PR1.8 Represent a given pattern visually to verify predictions
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and Pencil

- Have students complete the following table to predict the number of students who will attend the school in 2015-2016 if the population of students continue to decline.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-2007</td>
<td>355</td>
</tr>
<tr>
<td>2007-2008</td>
<td>344</td>
</tr>
<tr>
<td>2008-2009</td>
<td>332</td>
</tr>
<tr>
<td>2009-2010</td>
<td></td>
</tr>
<tr>
<td>2010-2011</td>
<td></td>
</tr>
<tr>
<td>2015-2016</td>
<td></td>
</tr>
</tbody>
</table>

- Have students predict the seventh element in the following patterns:
  10, 20, 40, 80…..,  (5PR1.6)

- If you keep dividing the square as shown below, how many sections will there be in the fifth picture?

  Explain how the pattern changes using mathematical language.  (5PR 1.6)

Performance

- House #1 has two shapes, House #2 has 4 shapes, and House # 3 has 6 shapes. How many shapes does House #4 have? House #8?
  Draw a picture of each of the eight houses to verify your answer.  (5PR1.8, 5PR1.7)

Resources/Notes

Math Focus 5
Lesson 1 (Continued): Modelling Patterns
5PR1 (1.1, 1.2, 1.6, 1.8)
TR pp. 12 - 15

Curious Math:
TR pp. 16 - 17
Adding Squares
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

5PR1 Continued

Elaborations—Strategies for Learning and Teaching

Through teacher questioning, students should have ample opportunity to explain orally prior to writing descriptions of how elements in various patterns change as the patterns are extended. Have students use manipulatives to copy and extend patterns. Ask them to describe how the concrete representation illustrates the pattern.

Provide students with number patterns such as the following:

85, 80, 75 …
37, 26, 17…..
8, 15, 22……
6, 12, 24……

Have students continue the pattern for the next three numbers and then describe the pattern rule.

When describing a pattern, students should be encouraged to state at what number the pattern started and how the number changed. For example in the first pattern above, a student may say The pattern starts at number 85 and subtract 5 each time.

If you keep building the T shape using square tiles, how many tiles will there be in the sixth picture.

What pattern rule will you use to determine the number of tiles needed?
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

- Have students use cubes or square tiles to copy and extend these shapes to the fifth shape in the pattern. Ask students to explain in words how the pattern grows. (5 PR1.1, 1.8, 1.2)

![Pattern Example]

- Have students fold a piece of paper to have 2 sections. When the students fold the same piece of paper twice, the result is 4 sections. Ask students to investigate the number of sections one would get with 3 folds and with 4 folds and have them predict the number of sections with 5 folds. Have students check their predictions and explain how one would predict the number of sections for 8 folds, if it were possible to do it. (5PR1.6)

- Have students create either an increasing or decreasing pattern with 4 elements using multi links, pattern blocks or other concrete materials and then ask a partner to add two more elements to their pattern. Record the pattern that was created. Explain, either orally or in writing, how the pattern was extended. (5PR 1.1, 1.2)

Performance

- Provide students with the first two elements in a pattern and have them extend the pattern. Have students work with a partner and see how many different patterns they can create. Write the pattern rule for each of the patterns.

Some possible beginnings are:

4, 8.....
100, 94, .......

- Sue filled bags with marbles. She placed 2 marbles in the first bag, 4 marbles in the second bag, 6 marbles in the third bag, and 8 marbles in the fourth bag and 12 in the fifth bag.

Her friend Lisa noticed an error in the pattern. Can you identify and describe the error? (5PR1.5, , 5PR1.2, 5PR1.7)

Student-Teacher Dialogue

- Ask students to explain whether 127 would occur in the following patterns:

4, 8, 12, 16........
1, 3, 5, 7........
300, 295, 290, 285........ (5PR1.1, 5PR1.5)
Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

5PR1 Continued

Achievement Indicator:

5PR1.5 Determine and explain why a given number is or is not the next element in a pattern.

Elaborations—Strategies for Learning and Teaching

The challenge with patterning or sequencing of numbers is not only to find and extend the pattern but for students to be able to determine if an element is or is not the next one in the pattern.

It is important for students to identify errors in patterns to prevent students from continuing to extend a pattern incorrectly.

It is helpful for students to think of a pattern rule and apply it when analyzing tables or charts for errors.

Present the class with the following problem.

Jim was conducting a science experiment on plant growth. The growth occurred based on a pattern. After each week, he recorded the height of his plant in the following chart:

<table>
<thead>
<tr>
<th>Week(s)</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>120</td>
</tr>
</tbody>
</table>

Ask students to explain if there is an error in Jim’s chart and to support their answer.

Patterns are used repeatedly as a means of developing concepts and as a tool for solving problems.

Many problems solved through the use of patterns are appropriate for Grade 5 students.

Examples include:

Use the following pattern to figure out what $9 \times 999$ would be.

2 × 999

3 × 999

4 × 999

Possible enrichment task: How far can this pattern be extended before it comes to an end?

Use the following pattern to determine what the product of $11 \times 13$.

$11 \times 19 = 209$

$11 \times 18 = 198$

$11 \times 17 = 187$
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Paper and pencil

• Sharon delivers pizza. Each day, she earns $20. How much will she earn at the end of one day? How much will she earn at the end of two days? How much will she earn at the end of one week? How many days will it take Sharon to earn $240? Ask students to explain how they solved the problems.

(5PR1.1, 5PR1.6, 5PR1.7)

Performance

• A book in a Scholastic Flyer costs $25. How much does it cost to buy two books? Three books? Four books? Complete the following table to find the cost.

<table>
<thead>
<tr>
<th>Number of Books</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$25</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Describe the pattern rule.

How much would it cost to buy 9 books? How do you know?

(5PR1.1, 5PR1.2, 5PR1.6 5PR1)

Resources/Notes

Math Focus 5
Lesson 4: Describing Number Patterns in Games (optional)
5PR1 (1.2, 1.5, 1.6)
TR pp. 27 - 29
While lesson 4 matched the outcome, the first lessons were also addressing the same outcome. In the interest of time, this lesson should be considered, only if time is not an issue.

Lesson 5: Solving Problems Using Patterns
5PR1 (1.6, 1.7)
TR pp. 30 - 33
Question number 4 may be challenging for students therefore they may need some guidance.
**Strand: Patterns and Relations (Patterns)**

**Outcomes**

*Students will be expected to*

**5PR1 Continued**

**Achievement Indicator:**

\[ 5PR1.3 \text{ Write a mathematical expression to represent a given pattern, such as } r + 1, r - 1, r + 5. \]

**Elaborations—Strategies for Learning and Teaching**

In Grade Four students used symbols in expressions such as \( 4 + \Delta \) whereas in Grade 5 lower case letters will be used for the variable. It will be necessary for students to see how \( 4 + \Delta \Delta = 7 \) means the same as \( 4 + n = 7 \). The symbol \( \Delta \Delta \) has now been replaced by \( n \).

This will be students’ first formal exposure to the use of variables to represent a number. A variable is a letter or symbol used to represent an ‘unknown’. Patterns using symbols and variables provide a means of describing change mathematically, for example, 2 more than or 6 less than.

When writing the variable expression for a pattern, it is best to limit the study to those patterns where the difference in terms is 1 such as 6, 7, 8… or 17, 16, 15….. If \( n \) represents the term number in a pattern then \( n + 5 \) can be used to describe the pattern 6, 7, 8….That is, term 1 is \( 1 + 5 = 6 \), term 2 is \( 2 + 5 = 7 \) and term 3 is \( 3 + 5 = 8 \). To predict the 10th number in the pattern, we can simply write \( 10 + 5 = 15 \). That is the 10th number in the pattern 6, 7, 8….is 15.

A number sentence is called an equation. A number sentence with a variable is an algebraic equation. The major difference between an equation and an expression is that an equation is a complete sentence and therefore contains a verb. For example, \( p = 3 \) reads ‘\( p \) is equal to 3,’ whereas \( p + 3 \) reads ‘\( p \) plus three.’ \( p + 3 \) contains no verb and is therefore considered an expression.

In Mathematics, variables are, typically, quantities that change. Students might relate variables to things which change over time that are part of their own experiences, such as their height or hair length.

In the early stages of variable usage it may be wise to avoid the use of “\( x \)” as a variable, since students often get “\( x \)” mixed up with the multiplication symbol. It is important, when reading aloud to students, to read expressions such as \( m + 3 \) as “a number \( m \) added to 3,” or “3 more than \( m \).”

**Tables** are often used to enable students to determine the pattern rule. Tables are used to record the numeric components of patterns such as the number of blocks used for each step. By using a table, students can see the relationship between the terms as well as between the position of the term and its value.
General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance
- Have students match each situation with the corresponding expression.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature increases 6°</td>
<td>t + 6</td>
</tr>
<tr>
<td>Mary walked down 4 steps</td>
<td>t - 12</td>
</tr>
<tr>
<td>John ran up 9 steps</td>
<td>l + 2</td>
</tr>
<tr>
<td>Susan is 2 years older than Leon</td>
<td>m + 5</td>
</tr>
<tr>
<td>Adele walks 5 km than Maria</td>
<td>j + 9</td>
</tr>
<tr>
<td>Temperature drops 12°</td>
<td>m - 4</td>
</tr>
</tbody>
</table>

(5PR 1.3)

- Ask students to match the pattern to its variable expression
  a) 4 + n  i) 4, 5, 6…….
  b) n + 3  ii) 5, 6, 7…….
  c) 17 - n iii) 14, 13, 12…….
  d) 15 - n iv) 16, 15, 14 ……

(5PR1.3)

Performance
- The table shows the relationship between the number of students on a field trip and the cost of providing boxed lunches.

<table>
<thead>
<tr>
<th>Customers</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost in dollars</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

Ask students to explain how the cost of lunches is related to the number of students.

Have students explain the pattern they observe for the number of students to show the relationship between the number of students and the cost of lunches.

Use the pattern to help determine the number of students on the bus if the lunches cost 90 dollars in total?

(5PR1.4)

Resources/Notes

Math Focus 5
Lesson 6: Describing Relationships using Expressions
5PR1 (1.3, 1.4)
TR pp. 38 - 42

Please omit question numbers 7 and 8 since they go in further depth than is necessary in Grade 5.
Strand: Patterns and Relations (Variables and Equations)

Outcomes

Students will be expected to

5PR2 Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions.
[C, CN, PS, R]

Achievement Indicators:

5PR2.1 Express a given problem as an equation where the unknown is represented by a letter variable.

5PR2.2 Solve a given single-variable equation with the unknown in any of the terms; e.g., \( n + 2 = 5 \), \( 4 + a = 7 \), \( 6 = r - 2 \), \( 10 = 2c \).

5PR2.3 Identify the unknown in a problem; represent the problem with an equation; and solve the problem concretely, pictorially or symbolically

Elaborations—Strategies for Learning and Teaching

It is important to note the difference between an expression and an equation which was explained in 5PR1.3.

The focus here should be on equations using smaller numbers which can be more easily modeled or solved using concrete materials such as counters, pan balance or pictures. This will enable students to build on their conceptual knowledge of one step equations.

Students will come to realize that there is more than one possible strategy that can be used to solve equations.

To provide reinforcement, demonstrate a simple 2-pan balance scale with a numeric expression in each pan. E.g., \( m + 5 = 14 \)

Here is how a student may solve the equation mathematically outlining the steps that they did as they solved the equation using a pan balance.

\[
\begin{align*}
    m + 5 &= 14 \\
    m &= 14 - 5 \\
    m &= 9
\end{align*}
\]

Remind the students that since the scale is balanced, an equation can be written to represent the situation illustrated. Have the students replicate the situation using blocks (centicubes) and a balance scale. Then have them write the equation and the solution.

Provide students with a problem such as the following: Sam has 12 stickers and Meg gave him some more stickers. Sam now has 16 stickers. How many stickers did Meg give Sam?

12 + p = 16

Here are the steps that may be followed to solve the problem.

\[
\begin{align*}
    p &= 16 - 12 \\
    p &= 4
\end{align*}
\]
## General Outcome: Represent Algebraic Expressions in Multiple Ways

### Suggested Assessment Strategies

**Performance**

- Draw a diagram to represent and solve the following equations.

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

- Fran is 3 years older than Hannah. Hannah is 21 years old. How old is Fran? Write an equation to solve the problem and then solve the equation. Is it possible to write a different equation for the same problem? Explain.

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

**Student-Teacher Dialogue**

- Solve the following equation and explain your thinking.

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

- Max said that \( r \) in the following equation equals 6. Is Max correct? Why or why not?

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

**Journal**

- Explain how you would solve this equation.

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

**Paper and Pencil**

- Ask students to write an equation for the following problem:

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

- Have students use concrete materials such as blocks or counters and the balance scales to find the value of \( p \) in the following equations. If necessary, model the use of guess and test as one strategy. By observing patterns in their results, students become more systematic in the guesses they make.

\[
\begin{align*}
\text{Performance} & : n + 12 = 19 \quad k = 14 - 3 \quad 9 + d = 16 \\
\end{align*}
\]

---

### Resources/Notes

**Math Focus 5**

**Lesson 7: Using equations to solve Problems**

5PR2 (2.1, 2.2, 2.3, 2.4)

TR 43 - 47

**Virtual Manipulatives**


Pan Balance - Numbers

This is an activity where students can explore balanced equations.
Strand: Patterns and Relations (Variables and Equations)

<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>Encourage students to create problems using a variety of operations: + - x ÷. It may be necessary to review the different types of equations such as the ones presented in PR 2.2.</td>
</tr>
<tr>
<td>5PR2 Continued</td>
<td>You may need to model for students how to create a problem for a given equation.</td>
</tr>
<tr>
<td>Achievement Indicator:</td>
<td>As a whole class activity, use the following equation to create a problem.</td>
</tr>
<tr>
<td>5PR2.4 Create a problem for a given equation.</td>
<td>46 + 12 = h</td>
</tr>
<tr>
<td></td>
<td>A possible problem could be:</td>
</tr>
<tr>
<td></td>
<td>Bob has 46 hockey cards; Harry has 12 more hockey cards than Bob. How many cards does Harry have?</td>
</tr>
<tr>
<td></td>
<td>15 = n - 9</td>
</tr>
<tr>
<td></td>
<td>Another possible problem could be:</td>
</tr>
<tr>
<td></td>
<td>There are now 15 students in the classroom. 9 students went to choir. How many students are usually in the classroom?</td>
</tr>
</tbody>
</table>
General Outcome: Represent Algebraic Expressions in Multiple Ways

Suggested Assessment Strategies

Paper and Pencil
Have students create a problem for the given equations and then solve the equations.

\[
\begin{align*}
12 + p &= 16 \\
m - 3 &= 21 \\
c + 7 &= 19 \\
p &= 24 - 14
\end{align*}
\]

\(5PR2.2, 5PR2.3, 5PR2.4\)

Student-Teacher Dialogue

- Pat walked 14 metres less than Joan. Joan walked 24 metres. How far did Pat walk?
  
  Amy wrote the equation \(14 + 24 = p\) and said that Pat walked 38 metres.
  
  Was she correct? Explain. \(5PR2.1, 5PR2.2, 5PR2.3\)

- Given a diagram such as the one shown below.

  ![Diagram](image)

  - Using the information presented in the diagram above, have students create two problems. Write equations to solve the problems. Solve the problems to find the missing values.

  - Use a map to create a similar problem. Trade your problem with a partner and have them solve your problem. Check your partner’s solution.

\(PR2.2, 2.4\)

Resources/Notes

Math Focus 5

Lesson 8: Creating Problems

5PR2 (2.2, 2.4)

TR pp. 48 - 50

Math Game:

5PR2

TR pp. 51 - 52

Matching Equations with Solutions

Good center activity

End of chapter material and unit assessment - be selective.
Fractions

Suggested Time:  3 Weeks

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

Focus and Context

In previous grades, students focus greatly on pictures and manipulatives to show various parts of a whole or parts of a set. At this grade level, students will further their understanding of fractions using concrete, pictorial and symbolic representation to create and compare equivalent fractions. Students will still be using concrete and pictorial representations to generate rules and to extend their understanding of equivalent fractions. While the goal is to develop symbolic methods, students work from personal strategies to more efficient ones. Fractions, and their connection to decimals in this unit, is based on fractions with denominators of 10, 100 and 1000. These denominators are then easily linked to the tenth, hundredth and thousandths. Through thousandths grids and base ten materials students will express a given pictorial or concrete representation as a fraction or a decimal. They will also write a fraction from a given decimal and vice versa.

When working with fraction and decimals students should start to understand that decimals are simply another form for a fraction. Using number lines, benchmarks and place value students will compare and order decimals to thousandths. Focus is also on recognizing equivalent decimals to help compare and order given sets of decimals.

Math Connects

Fraction concepts are connected to other mathematical concepts. Equivalency, ratio, proportion, decimal and percents require a solid understanding of fractions. Early exposure was limited to representing fractions as parts of the whole and should be expanded at this grade level to make deeper connections.

Students understanding should include the connection that fractional parts are equal-sized portions of a whole. Fractions have a special name that explains the number of equal parts. For example, thirds have three equal parts. Also, the more fractional parts the smaller each individual part. This is a new concept for this grade level. Equivalent fractions are two fractions which represent the same quantity but are expressed with different denominators.

Fractions and decimals are connected and therefore should be taught in conjunction. This connection of two numerations systems should be based on understanding rather than from a set of rules.

Real world understanding of fraction permits students to gain an understanding and connections between fractions and decimals. This connection is integral in a student’s ability to easily move between each form.

Fractions and decimals are linked and the focus is on fraction decimal association using only the tenths, hundredths, and thousandths in this unit. This understanding is the foundation to connecting other fractional forms and their associated decimal. For example $\frac{3}{4}$ is equivalent to 0.75.
### Process Standards Key

| [C]  | Communication                      | [PS] Problem Solving |
| [CN] | Connections                        | [R] Reasoning        |
| [V]  |                                   | [V] Visualization    |

### Curriculum Outcomes

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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</thead>
<tbody>
<tr>
<td>Number</td>
<td>5N7 Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to: • create sets of equivalent fractions • compare fractions with like and unlike denominators.</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N9 Relate decimals to fractions and fractions to decimals (to thousandths).</td>
<td>[CN, R, V]</td>
</tr>
<tr>
<td>Number</td>
<td>5N10 Compare and order decimals (to thousandths) by using: • benchmarks • place value • equivalent decimals.</td>
<td>[C, CN, R, V]</td>
</tr>
</tbody>
</table>
Strand: Number

Outcomes

Students will be expected to

5N7 Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to:

• Create sets of equivalent fractions
• Compare fractions with like and unlike denominators.

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Most of the work done by students will involve dealing with fractions concretely (using manipulatives), pictorially (creating and identifying) and symbolically.

In Grade 4, students created fractions focusing on parts of a whole and parts of a set.

Now, in Grade 5, they are expected to find equivalent fractions of those given or created.

Literature Connection:

“Fraction Action” by Loreen Leedy is a short chapter picture book that deals with fractions. The first two chapters discuss the basic fraction of whole, \( \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8} \). The focus of these two chapters is on parts of a whole and also parts of a set. It is a nice way to start the unit of fractions to refresh students' memories.

Students should be given many opportunities to work with various manipulatives such as:

• Pattern blocks
• Parts of sets of objects such as buttons or counters
• Fraction pieces (fraction strips)

(Continued)
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Performance**
- Using various manipulatives to create the following equivalent fraction $\frac{2}{3} = \frac{4}{6}$.  
  \(5N7.1\)

**Pencil and Paper**
- On an index card, have students explain the meaning of equivalent fractions using words, numbers and pictures.  
  \(5N7.1\)

### Resources/Notes

- **Math Focus 5**
- **Getting Started**
- Teacher Resource (TR) pp. 10 - 11

- **Lesson 1: Recognizing and Creating Equivalent Fractions**
- 5N7 (7.1, 7.2, 7.3, 7.5)
- TR pp. 12 - 16
Students will be expected to

5N7 Continued

Achievement Indicator:

5N7.1 Continued

Parts of sets

Fraction pieces

A suggestion for this concept would be to create centers allowing students to explore the above manipulatives.
General Outcome: Develop Number Sense

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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*Math Focus 5*

Lesson 1 (Continued):
Recognizing and Creating Equivalent Fractions

5N7 (7.1, 7.2, 7.3, 7.5)

TR pp. 12 - 16
Strand: Number

Outcomes

Students will be expected to

5N7 Continued

Achievement Indicators:

5N7.2 Model and explain that equivalent fractions represent the same quantity.

5N7.3 Determine if two given fractions are equivalent using concrete materials or pictorial representations.

Elaborations—Strategies for Learning and Teaching

Model equivalent fractions by folding a square piece of paper in half, unfolding to show how one whole piece of paper is equivalent to 2 halves. Continue folding paper to show fourths, and eighths to help students visualize for example $\frac{2}{4}$ equals $\frac{1}{2}$. (This can be modelled for the thirds and sixths as well)

One way to model equivalent fractions is to use the following modified Frayer for equivalent fractions. Work with students to create a whole class Frayer Model guided by the following diagram.

Time has been spent having students concretely creating fractions that are equivalent. Now students will be expected to show if two given fractions are equivalent. This can be done using the manipulatives they have previously worked with.

Focus students attention to the concept that the whole figures or whole sets have to be the same size in order to compare them.

For example when drawing $\frac{2}{6}$ and $\frac{1}{3}$ in bars the bars have to be the same size.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Pencil and Paper
John ate \( \frac{4}{8} \) of a pizza. Joanne ate \( \frac{1}{2} \) of a pizza. Who ate more pizza or did they eat the same? (5N7.2)

Journal
Explain why \( \frac{2}{4} \) is equivalent to \( \frac{1}{2} \). Use words, pictures and numbers. (5N7.2)

Performance
Working in pairs, each student has a set of two number cubes as shown below:

```
Number Cube 1       Number Cube 2
1
2 3 5 4
6
```

(You can use blank dice and add the numbers to them)

Each person will roll their dice making a proper fraction. They will then write 2 equivalent fractions from the fraction they rolled. The pair should verify each others suggestions. (5N7.2)

Resources/Notes

Math Focus 5
Lesson 1 (Continued): Recognizing and Creating Equivalent Fractions
5N7 (7.1, 7.2, 7.3, 7.5)
TR pp. 12 - 16

Lesson 2: Using Fractions to Describe Area
5N7 (7.3, 7.5)
TR pp. 17 - 20

Curious Math:
TR pp. 21 - 22
Fraction Riddles

Math Game:
TR pp. 32 - 33
Winner Takes All
As students become more familiar with the creation of equivalent fractions they should now be given the opportunity to generate equivalent fractions from ones that is given. For example:

Students are given \( \frac{1}{4} \) and then asked to create equivalent fractions using the same diagram.

Literature Connections – “Apple Fractions” by Jerry Pallotta is a simple book that demonstrates fractions. As you read each page have the students observe the created fraction. Then ask each student to draw the image and find an equivalent fraction. When they are finished continue through the book. Students’ work with this type of representations solidifies the understanding of equivalency.

Often in real life connections students will have to extend the size of equivalent fractions beyond what is reasonable to draw. Therefore, they will have to identify a rule for developing equivalent fractions.

Students should continue to draw diagrams to further help them in developing more symbolic methods.

The symbolic methods that are developed in Grade 5 for finding like denominators is the foundation for adding and subtracting fractions that will be a focus in Grade 7.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Paper and Pencil**

- You eat $\frac{2}{3}$ of the 6 chocolates in the box. How many chocolates did you eat? (Using of a diagram would be helpful.) (5N7.5)

**Performance**

- Students can create Equivalent Fraction Counting Books. Using the fractions: whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, students create a page for each. Each page can be divided into two sections one with the original fraction and the other side containing the equivalent fraction. Each page should include pictures, words and numbers. (5N7.5)

**Journal**

- Sally is given the following set of equivalent fractions $\frac{1}{3}$, $\frac{2}{6}$, $\frac{4}{12}$, $\frac{8}{24}$, $\frac{16}{48}$. Help Sally find a pattern to describe this set of equivalent fractions. (5N7.4)

**Paper and Pencil**

- Using a list of fractions below determine which are equivalent.

  $\frac{2}{3}$, $\frac{4}{12}$, $\frac{6}{20}$, $\frac{3}{15}$ (5N7.4)

**Performance**

- Using egg cartons / ice cube trays have students use colored counters to show equivalent fractions. Then have them show the operation (multiplication / division) that they used. (5N7.4)

Resources/Notes

- Math Focus 5
- Lesson 2 (Continued): Using Fractions to Describe Area
  5N7 (7.3, 7.5)
  TR pp. 17 - 20

- Lesson 3: Creating Equivalent Fractions
  5N7 (7.1, 7.2, 7.3, 7.4, 7.5)
  TR pp. 23 - 27
Strand: Number

Outcomes

Students will be expected to

5N7 Continued

Achievement Indicators:

5N7.4 Continued

Elaborations—Strategies for Learning and Teaching

Have students examine the following two fractions that are equivalent:

\[ \frac{3}{6} = \frac{6}{12} \]

Have students discuss what they notice about the two fractions. Students should notice that: \(3 \times 2 = 6\) and that \(6 \times 2 = 12\). The numerator and the denominator were multiplied by the same number.

Multiplication is used to increase the numerator and denominator to write a fraction written in lower terms as a larger equivalent fraction.

Division is used to reduce both the numerator and denominator simplify a fraction written in larger terms to a smaller equivalent fraction.

In Grade 4, students have worked with placing fractions with like denominators on a number line. This concept is expanded in Grade 5 to include ordering fractions with like and unlike denominators on the number line.

Using an “Empty Number Line” allows students the opportunity to develop a deeper sense of number. An empty number line is a strip of paper that has no numbers. Students will need to decide on the beginning and end points. This process requires a deeper thinking process and a teacher is able to observe the students. Observation often gives a clear picture of those students with and without number sense. Begin with fractions of like denominators and work your way to unlike denominators. Some students may require a starting point for their number lines, while others can create their own.

Continued
General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Pencil and Paper**

- Lilly put a set of fractions on a number line. She placed one of the fractions incorrectly. Which fraction is incorrect and explain her thinking.

![Number line with fractions](image)

(5N7.7)

**Journal**

- You need to explain to your friend the steps in placing $\frac{2}{3}$, $\frac{1}{5}$ and $\frac{1}{2}$ on an empty number line. Explain using pictures, words and numbers the steps you followed.

(5N7.7)

### Resources/Notes

**Math Focus 5**

**Lesson 3 (Continued): Creating Equivalent Fractions**

5N7 (7.1, 7.2, 7.3, 7.4, 7.5)

TR pp. 23 - 27

**Lesson 4: Fractions on a Number Line**

5N7 (7.7)

TR pp. 28 - 31
Outcomes

Students will be expected to

5N7 Continued

Achievement Indicators:

5N7.7 Continued

As a whole class, work with the following fractions and place them on an “Empty Number Line” (this can be a strip of cash register tape) \( \frac{2}{3}, \frac{1}{5}, \frac{2}{6}, \) and \( \frac{2}{4} \).

Students should support the placement of the fractions using their mathematical knowledge. For example \( \frac{2}{4} \) is in the middle of the line because it is equivalent to \( \frac{1}{2} \). \( \frac{2}{6} \) would be close to \( \frac{2}{4} \) as \( \frac{2}{6} \) is only \( \frac{1}{6} \) away from \( \frac{3}{6} \) which is \( \frac{1}{2} \).

Dominoes are a great way to have students work with fractions, as the domino already is a fraction, with a number on top and bottom separated by a line. (For this indicator, make sure students place the lower number on the top of the domino)

Note: there are different sets of dominos i.e. double-nine dominos, double-twelve dominos.

Distribute to students, in a group, a set of dominos to order. In this set, you can add the domino that has a zero on top or a blank. (This will help determine the students number sense of zero)

When comparing fractions, students should use strategies that suit the question. If given \( \frac{2}{3} \) and \( \frac{1}{3} \) then drawing the diagram would be a better strategy.

A diagram easily shows that \( \frac{2}{3} \) is larger (note the whole has to be same size). If asked to compare \( \frac{2}{5} \) and \( \frac{1}{4} \) than finding like denominators to get equivalent fractions would be a better strategy.

\[
\frac{2}{5} \times \frac{4}{4} = \frac{8}{20} \quad \frac{1}{4} \times \frac{5}{5} = \frac{5}{20}
\]

So, \( \frac{8}{20} > \frac{5}{20} \)

therefore, \( \frac{2}{5} \) is larger

Dominoes can also be used with this indicator having students draw from a bag two dominos to compare.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Paper and Pencil**
- Ellen has two birthday cakes that are the same size. One is chocolate and one is vanilla. The boys ate $\frac{2}{3}$ of the chocolate cake. The girls ate $\frac{3}{4}$ of the vanilla cake. Who ate more cake? (5N7.6)

**Journal**
- You are given 10 m of string to make a kite. Would you prefer to use $\frac{4}{10}$ of the string or $\frac{3}{5}$ of the string to make your kite? Explain your choice. (5N7.6)

**Student – Teacher Dialogue**
- Have student pick two dominos from a bag. Ask: How can you use equivalent fractions to tell which fraction is larger. (5N7.6)

**Performance**
- Fraction Squares Game - Object of this game is to form equivalent fractions using game pieces.

Game pieces are placed face down and each player randomly selects 10 game pieces. Players look at selected pieces and form two equivalent fractions. Using fraction pieces players can check their fraction by placing the fraction pieces on top of each other to see if they are the same size. Students will receive a point for each pair of equivalent fractions they form. When they have found all possible pairs of equivalent fractions round one is over. Students will play four rounds. Each new round student’s players select ten new pieces. Player with most points after four round wins. When students are comfortable with game you can add trade rule where students can trade a game piece to create a pair of equivalent fractions. (5N7.6)
FRACTIONS

Strand: Number

Outcomes

Students will be expected to

5N9 Relate decimals to fractions (to thousandths)

[CN, R, V]

Elaborations—Strategies for Learning and Teaching

Decimals and fractions to hundredths were a focus in Grade 4. The exposure was in relation to money. In Grade 5, students will extend the place value system to thousandths; however, time should be spent on reviewing decimals in tenths and hundredths.

A review of tenths should include everyday situations such as toes, fingers, and pencils. When reviewing hundredths the use of money is a real life situation that helps students make connections.

Some questions to review decimals to fractions are:

A package of 10 colored pencils contained 4 red, 3 blue, 2 yellow, and 1 green. Write the fraction and decimal represented by each color.

Nick has written 1.3 and said it was 1 and 3 tenths, Justin said it is 1 and 3 hundredths. Who is correct?

Using a hundreds grid represent 0.03 and 0.3. How are they different?

Achievement Indicator:

5N9.1 Write a given decimal in fractional form.

Using the thousandths grid students can see the connection between the tenth, hundredth and the thousandth covering an area or fraction of the whole grid.

Each column is one tenth, or \( \frac{1}{10} \), or 0.1
Each square is one hundredth, or \( \frac{1}{100} \), or 0.01
Each rectangle is one thousandth, or \( \frac{1}{1000} \), or 0.001

Another approach to writing decimals as a fraction is to connect a fraction to how we say decimals in words. Example 0.385 is spoken as three hundred eighty five thousandths. Meaning 385 thousands of a whole thousand or \( \frac{385}{1000} \).
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Pencil and Paper**

- Why is $\frac{3}{4}$ easier to visualize than $\frac{750}{1000}$ or 0.750? (5N9.1)

- Lois recorded the runners finish times for a local cross country race

<table>
<thead>
<tr>
<th>Runner</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally</td>
<td>9.1</td>
</tr>
<tr>
<td>Tan</td>
<td>8.5</td>
</tr>
<tr>
<td>Abdul</td>
<td>8.556</td>
</tr>
<tr>
<td>Jake</td>
<td>9.279</td>
</tr>
<tr>
<td>Teisha</td>
<td>9.26</td>
</tr>
</tbody>
</table>

- Change the times to fractions then place them on a number line to order the times from least to greatest. (5N9.1)

**Performance**

- Using a Guinness World Record book. Ask students to locate 5 different decimals. Once they have the five decimals have the students change the decimals to fractions. (5N9.1)

Resources/Notes

- *Math Focus 5*
- Lesson 6: Using Decimals and Fractions
  - 5N7 (7.5)
  - 5N9 (9.1, 9.2, 9.3)
  - 5N10 (10.5)
- TR pp. 43 - 46
- *Note: 5N9 and 5N10 are addressed in this lesson*
Strand: Number

Outcomes

Students will be expected to

5N9 Continued

Achievement Indicators:

5N9.2 Write a given fraction with a denominator of 10, 100, or 1000 as a decimal.

5N9.3 Express a given pictorial or concrete representation as a fraction or a decimal; e.g., 250 shaded squares on a thousandths grid can be expressed as 0.250 or 250/1000

Elaborations—Strategies for Learning and Teaching

At this grade level, students will be relating fractions and decimals for denominators of 10, 100 or 1000.

In the place value chart, the decimal place columns are tenths, hundredths, and thousandths. So, if a fraction is written as a tenth, hundredth, or thousandths (i.e. 650/1000 is 650 thousandths). Using a place value chart you can then write a fraction into the place value chart.

Students should be exposed to moving between concrete and pictorial representations. Working from one representation and changing into other representation shows the students’ level of number sense in this area.

For example, give them \( \frac{36}{1000} \) and model this could also be represented as 0.036 or 36 shaded squares on a thousandths grid.

This concept can also be shown at a lower level using a ten frame and placing counters, representing tenths, onto the frame.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**

- Give the student a set of number cards. Show them the fraction \( \frac{65}{1000} \). Ask them to place the number cards as a decimal on a place value mat.  

- A bingo game can be used to work with various representations of fractions. Bingo cards can be created using pictures, decimals, or fractions.

  ![Bingo Card](image)

  The caller (teacher or student) will have a set of fraction call out cards.

  **Samples**

  - Four Fifths
  - One Half
  - Five Sixths

  The caller will select a fraction call out card and players will cover the matching representation on their boards.

- Using individual whiteboards have students draw a picture that matches a decimal given. This can also be reversed.

**Journal**

- James is having a party and he is ordering a pizza to share among 5 friends and himself. Draw a picture showing how you would cut the pizza, and how much of the pizza each person will get in decimals.

Resources/Notes

- **Math Focus 5**
  - Lesson 6 (Continued): Using Decimals and Fractions
  - 5N7 (7.5)
  - 5N9 (9.1, 9.2, 9.3)
  - 5N10 (10.5)
  - TR pp. 43 - 46

  *Note: 5N9 and 5N10 are addressed in this lesson*
Strand: Number

Outcomes

Students will be expected to

5N10 Compare and order decimals (to thousandths) by using:
- Benchmark
- Place value
- Equivalent decimals

[CN, R, V]

Elaborations—Strategies for Learning and Teaching

To compare and order decimals, students should be exposed to various ways to display their comparisons. Using:
- Number lines
- Base Ten
- Diagrams/ Pictures
- Money (only deals with hundredths)
- Grids (hundredths and thousandths)

A review of the base ten connections is important as students need to have an understanding that the larger cube is the whole, flat is tenths, rod in hundredths and the unit thousandths.

In Grade 5, the base ten materials relation changes so that the large cube becomes the whole, flat is tenths, rod is hundredths, and unit cube is thousandths.

![Diagram showing base ten connections]

Achievement Indicator:

5N10.5 Explain what the same is and what is different about 0.2, 0.20, and 0.200.

When students are explaining what is the same and different the following could be included in their explanations:

- That the three numbers 0.2, 0.20, 0.200 are equivalent.
- If shaded on a thousandths grid, the same amount would be shaded.
- Each number has a different number of digits.
- 2 falls in the tenths place in each number
- That zeros that fall after the non-zero digit can show an equivalent decimal.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Journal**
- Ask the students to explain the difference and similarities between 0.5, 0.50, 0.500. (5N10.5)

#### Resources/Notes

**Math Focus 5**
**Lesson 6 (Continued): Using Decimals and Fractions**
- 5N7 (7.5)
- 5N9 (9.1, 9.2, 9.3)
- 5N10 (10.5)
- TR pp. 43 - 46

*Note: 5N9 and 5N10 are addressed in this lesson*

**Math Game:**
- TR pp. 47 - 48
  - Matching Parts
## Strand: Number

### Outcomes

Stated will be expected to

5N10 Continued

**Achievement Indicator:**

5N10.6 Order a given set of decimals including tenths, hundredths, and thousandths using equivalent decimals; e.g., 0.92, 0.7, 0.9, 0.876, 0.925 in order: 0.700, 0.876, 0.900, 0.927, 0.925.

### Elaborations—Strategies for Learning and Teaching

When ordering decimals students need time to explore the addition of zeros to assist in comparing. The connection of fraction and decimal is an important concept that will require time and continued practice. Students should have an understanding of why adding zeros makes an equivalent decimal.

Modelling using base ten materials can help students visualize this concept.

\[
0.2 = \square \square
\]

\[
0.20 = 20 \times \square
\]

\[
0.200 = 200 \times \square
\]

Problem solving and using problem solving strategies help students connect to real life situations.

Using logical reasoning, when solving problems dealing with fractions and decimals, is a way for students to show their understanding of what makes sense and what does not make sense. When students are presented with a problem, logical reasoning gives them a starting point.

Logical reasoning is a strategy that will eliminate unreasonable answers and allow students the time to devise a plausible plan.

### 5N9 Continued

**Achievement Indicators:**

5N9.1 Write a given decimal in fractional form.

5N9.2 Write a given fraction with a denominator of 10, 100, or 1000 as a decimal.

5N7.6 Compare two given fractions with unlike denominators by creating equivalent fractions.

5N7.5 Identify equivalent fractions for a given fraction.
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

<table>
<thead>
<tr>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Keisha was given the decimal 0.609. She said that it was closer to ( \frac{1}{2} ) than ( \frac{3}{4} ). Do you agree with her choice? Using words, pictures and numbers to explain your thinking.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pencil and Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What is my Decimal Riddle</td>
</tr>
<tr>
<td>Clue 1- My tenths digit is twice my hundredths</td>
</tr>
<tr>
<td>Clue 2- My hundredths is three more than my thousandths</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td>Lesson 7: Using Equivalent Decimals</td>
</tr>
<tr>
<td>5N7 (7.6)</td>
</tr>
<tr>
<td>5N9 (9.1, 9.2, 9.3)</td>
</tr>
<tr>
<td>5N10 (10.6)</td>
</tr>
<tr>
<td>TR pp. 49 - 52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student – Teacher Dialogue</th>
</tr>
</thead>
<tbody>
<tr>
<td>• There are two possible answers to the decimal riddle above. Explain how you arrived at your answer, and how the other answer is possible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Lesson 8: Solving Problems Using Logical Reasoning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5N7 (7.5, 7.6)</td>
</tr>
<tr>
<td>5N9 (9.1, 9.2)</td>
</tr>
<tr>
<td>TR pp. 53 - 56</td>
</tr>
</tbody>
</table>

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*End of chapter material and unit assessment - be selective.*
This is the first explicit focus on measurement, but as with other outcomes, it is ongoing throughout the year.
Unit Overview

Focus and Context

The focus of this unit is to demonstrate an understanding of metric linear units, volume, capacity and the construction of rectangles based on a given area or perimeter. While perimeter has been covered in Grade 3, students may require a review of this topic.

Students will:

• explore mm, cm, m and km and examples of when to use these units of measurement.
• explore mL and L and examples of when to use these units of measurement.
• use benchmarks to guide their estimates of the volume and capacity of objects.
• construct rectangles given a specific area or perimeter.
• estimate, measure and construct rectangular prisms based on a given volume.

Math Connects

Measurement involves a comparison of an item that is being measured with a unit that has the same attribute (area, length, volume, etc). To measure anything meaningfully, the attribute to be measured must be understood. Students must be actively involved in constructing their understanding of measurement by measuring items that are familiar to them such as the length and width of a math book, glue stick, pencil case, width of a door.

Measurement is an essential link between mathematics and science, art, social studies and other disciplines, and it is pervasive in daily activities. Providing students with rich examples of when measurement is used in their daily lives will help them understand the importance and relevance of this concept. For example, how much water is in a bottle? How much water does your family consume per day? How much gas does your family car use in a week?
## Process Standards Key

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

## Curriculum Outcomes

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<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape and Space</strong></td>
<td><strong>5SS1</strong> Design and construct different rectangles, given either perimeter or area, or both (whole numbers), and draw conclusions.</td>
<td>[C, CN, PS, R, V]</td>
</tr>
<tr>
<td><strong>(Measurement)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **5SS2** Demonstrate an understanding of measuring length (mm and km) by:  
  • selecting and justifying referents for the unit mm  
  • modelling and describing the relationship between mm and cm units, and between mm and m units.  
  • selecting and justifying referents for the unit km.  
  • modelling and describing the relationship between m and km units. | [C, CN, ME, PS, R, V] |
| **Shape and Space**        | **5SS3** Demonstrate an understanding of volume by:  
  • selecting and justifying referents for cm³ or m³ units  
  • estimating volume, using referents for cm³ or m³  
  • measuring and recording volume (cm³ or m³)  
  • constructing right rectangular prisms for a given volume. | [C, CN, ME, PS, R, V] |
| **(Measurement)**          |                                                                                                                                                                                                        |                   |
| **5SS4** Demonstrate an understanding of capacity by:  
  • describing the relationship between mL and L  
  • selecting and justifying referents for mL or L units  
  • estimating capacity, using referents for mL or L  
  • measuring and recording capacity (mL or L). | [C, CN, ME, PS, R, V] |
| **Shape and Space**        | **(Measurement)**                                                                                                                                                                                    |                   |
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

5SS2 Demonstrate an understanding of measuring length (mm and km) by:

- selecting and justifying referents for the unit mm
- modelling and describing the relationship between mm and cm units, and between mm and m units.
- selecting and justifying referents for the unit km.
- modelling and describing the relationship between m and km units.

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

Achievement Indicators:

5SS2.5 Show that 10 mm is equivalent to 1 cm using concrete materials; e.g., a ruler.

5SS2.6 Show that 1000 mm is equivalent to 1 m using concrete materials; e.g., a metre stick

5SS 2.8 Provide examples of when mm are used as the unit of measure

Elaborations—Strategies for Learning and Teaching

The introduction to millimetres should take place after students have had experience using centimetres. A good way to introduce millimetres is to look at objects that are between centimetres. For example, something that is 25 mm is between 2 and 3 cm.

When discussing centimetres use an overhead ruler which has only centimetres marked (if possible). Once students work with centimetres, introduce the ruler that includes the markings for centimetres and millimetres.

![Ruler with millimetres](image)

It can easily be shown on a centimetre ruler that 1 cm = 10 mm or that 30 mm = 3 cm for example.

Students will require many experiences converting from one unit of measurement to another. Have students make some curved paths on the floor with masking tape. Use a rope to measure the path, then stretch out the rope and measure it in mm. Ask the students to decide what the measure will be in a different unit such as mm or cm.

Possible shapes:

![Shapes](image)

A metre stick is divided into centimetres, so have children view the metre stick to see that 100 cm = 1 metre.

Then a ruler should be used to determine that 1 cm = 10 mm; therefore, 100 cm (1 m) = 100 x 10 mm = 1000 mm.

Using the metre stick children can mark off sets of 10 mm (1 cm) again realizing that 10 mm x 100 = 1000 mm.

In discussing a millimetre, students realize that a millimetre is a very tiny linear measurement. Have students draw 1 mm on paper using a ruler. Ask students to brainstorm objects that would be that tiny. Examples include, thickness of a fingernail, width of an eyelash, head of a straight pin, a fraction of a mosquito leg etc.

It would be useful here to include referents of objects that are measured in millimetres as a method of comparison for how small a millimetre is. E.g., 5 mm-width of a child’s pinkie nail.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

### Suggested Assessment Strategies

**Pencil and Paper**
- Have students use metric units to fill in the blanks.
  
  - $30 \text{ cm} = \underline{\phantom{000}} \text{ mm}$
  - $2 \text{ mm} = \underline{\phantom{000}} \text{ cm}$

**Performance**
- Have students measure the length of their desks in cm. Then ask them to measure in mm. Ask: which way was most appropriate? What markings on their rulers did they use? Note any troubles students may have with the actual measuring.

**Journal**
- In our world what would we measure with the millimetre unit and why is this unit useful?

### Resources/Notes

**Math Focus 5**
- Getting Started: Planning a Park
  - Teacher Resource (TR) pp. 9 - 11 (optional)

**Lesson 1: Measuring length in millimetres**
- 5SS2 (2.5,2.6,2.8)
- TR pp. 12 - 15

**Additional Resources:**
- Making Math Meaningful.
  - Marian Small

- Crooked Paths (Elem. And Middle school Mathematics by Van de Walle and Folk)

- Elementary and Middle School Mathematics.
  - Van de Walle and Folk, Canadian Edition.
Outcomes

*Students will be expected to*

**5S2 Continued**

**Achievement Indicators:**

- **5SS2.4** Provide a referent for one kilometre, and explain the choice.
- **5SS2.7** Know that 1000 metres is equivalent to 1 kilometre.
- **5SS2.9** Provide examples of when kilometre (km) are used as the unit of measure.
- **5SS2.10** Relate millimetres, centimetres, metres and kilometres.

**Elaborations—Strategies for Learning and Teaching**

Ask students: What is the distance from the school to various points in the community such as the post office, bank, or their home? Some will already be familiar with the kilometre from their life experiences. Others may refer to these distances in metres. Though conversation, point out that the metre is too small a unit for measurement of longer distances. The unit for measurement of longer distances is the kilometre (km).

As a benchmark students might relate to the fact that it takes about 15 minutes to walk a kilometre. Consider going on a kilometre walk to give students a feel for how long a kilometre is. Exposure to the kilometre as a unit of measure is important to be able to read map scales. While map scales are often written as 100 000:1 which is a ratio, they are also written as 1 cm represents 10 km. The latter is more likely to have meaning for grade 5 students.

Make a class chart as follows and ask students to put their name under one of the three headings.

<table>
<thead>
<tr>
<th>Distance from home to school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 km</td>
</tr>
</tbody>
</table>

Ask students to discuss in pairs how many times they would have to walk around the perimeter of the school yard to walk one kilometre. Ask what strategy they used to find their answer. Ask them to write about their strategy.

Students should also relate the metre with the kilometre. They should come to realize that if 1000 metre sticks were lined up end-to-end it would make 1 kilometre.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance
• Work in pairs to decide how many children laying down head to toe it would take to stretch 1 kilometre. Ask the students to use a map to find distances and make a chart of communities in Newfoundland and their distance from the child’s home town.

<table>
<thead>
<tr>
<th>Town</th>
<th>Distance from</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Which of these would you measure using kilometres?
- the distance from your school to the ocean
- the distance from your school to a corner store
- the distance from your school building to the play ground
- the distance from your desk to the whiteboard
- the distance from your nose to your toes
- the distance from your school to a hospital

For the ones above that your selected, estimate the distance in kilometres. (5SS2.4, 2.7, 2.9, 2.10)

• Match one of these distances to each of the examples given: 10 cm, 10 km, 10 m, 10 mm
  a) the length of a transport truck
  b) the distance you drove in a car
  c) the distance a snail travel in 5 seconds
  d) the length of your hand. (5SS2.7, 2.10)

• Suppose there are two stores where you can go to buy treats. One is 500 m away and the other is 5 km away. To which one would you choose to walk? Explain your choice. (5SS2.10)

Resources/Notes

Extra Lesson: Measuring Length in Kilometres.
5SS2 (2.4, 2.7, 2.9, 2.10)

This extra lesson is not covered in the resource materials.
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

5S2 Continued

Achievement Indicators:

5SS 2.10 Relate mm, cm, metres and kilometres.

Providing benchmarks for 1 mm and 1 cm will help students with their measurement estimation.

It is important for students to understand that the unit chosen for measurement affects the numerical value of the measurement. The larger the unit the smaller the numerical value: For example: \( 1 \text{ m} = 100 \text{ cm} \), the larger unit which is metres has the numerical value of 1 but the distance measured in a smaller unit such as centimetres yields the larger numerical value of 100.

Working in pairs (girl/girl, boy/boy), have one student trace their partner’s body on large sheets of paper. Measure the length of their paper body parts i.e. legs, arms, fingers and total length of body. Students will need to decide which measuring tool would be most appropriate for each measurement i.e. to measure fingers, they would use a cm ruler, to measure the length of body, they would use a metre stick. Ask students to record all measurements in mm, cm and m. Ask why the millimetre measurements have a larger numerical value than the metre measurements.

5SS2.1 Provide a referent for 1 mm and explain the choice

Referents are everyday objects of particular lengths that students can use as benchmarks to help them estimate (example: a millimetre is about the thickness of a fingernail, centimetre is about the width of a fingernail, a metre is about the length from the doorknob to the floor). The use of referents makes the learning more meaningful for students and helps them come up with reasonable estimates.

When discussing referents for 1 mm, examples should be given of objects that would be measured in mm like the thickness of a button, a ladybug, thickness of a gold chain, the width of a diamond

5SS 2.2 Provide a referent for 1 cm and explain the choice

The metre stick provides an excellent referent for 1 metre and is a familiar object for students. After tracing or marking out a metre with tape, students could brainstorm ideas for objects that are about a metre or more than one metre. Ex: The long edge of a newspaper, width of a whiteboard/smartboard, teacher’s desk.

5SS 2.3 Provide a referent for 1 metre
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

• Have students measure the sides of a rectangle and give the results in mm, cm, and m.

  (5SS2.10)

Paper and Pencil

• Have the student use metric units to fill in the blanks in as many ways as possible:

  1000_____ = 1 ____ .

  (5SS2.10)

Journal

• If you change metres to centimetres, will the numerical value become greater or less? Why?

  (5SS2.10)

• Have students look around the classroom and choose one object and estimate their measurement. Ask what referent they used to determine their measurements.

  (5SS2.1, 2.2, 2.3)

Resources/Notes

Math Focus 5
Lesson 2: Estimating Length
5SS2 (2.1, 2.2, 2.3, 2.8)
TR pp. 16 - 19
Outcomes

Students will be expected to

5SS1 Design and Construct
different rectangles given either perimeter or area or both (whole numbers) and draw conclusions

[C, CN, PS, R, V]

Elaborations—Strategies for Learning and Teaching

Chart sized grid pads are available and are a useful tool for teaching area and perimeter. In grade 4, students have worked extensively with area including finding the area and constructing different rectangles for a given area. Perimeter was addressed in grade 3. Measuring perimeter is an application of linear distance. While investigating the distance around various rectangles students should, in their own words, explain any generalizations noticed.

E.g., \[2l + 2w\]

These all give perimeter measurement of a rectangle. Use of formulas for perimeter is not essential. The important thing is that students know that perimeter means distance around. This year the focus will be on working with area and perimeter when constructing rectangles. Students will be required to make conclusions regarding rectangular shapes that create the greatest and least areas. As they investigate they should see the relationship: Area of a rectangle = length x width. This investigation should be done using a problem solving approach.

Problem Solving Approach: Problem solving means “engaging in a task for which the solution method is not known in advance. In order to find a solution, students must draw on their knowledge, and through this process, they will often develop new mathematical understandings. Solving problems is not only a goal of learning mathematics but also a major means of doing so. Students should have frequent opportunities to formulate, grapple with and solve complex problems that might require a significant amount of effort and should then be encouraged to reflect on their thinking”.

It is essential that the concepts of area and perimeter be applied to real-life situations. Realizing that to lay hardwood on a floor or to paint a wall takes knowledge of the area of the floor or wall lets students see the life applications of these math concepts.

Geoboards or grid paper can be used to create various rectangles all with the same perimeter (for example: a rectangle with a perimeter of 20 units can have sides that are 8 cm, 8 cm, 2 cm, 2 cm or 6 cm, 6 cm, 4 cm, 4 cm. They are working towards the realization of the fact that rectangles of different dimensions can have the same perimeter.
**General Outcome: Use Direct or Indirect Measurement to Solve Problems**

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance</strong></td>
<td>Students will have had exposure to perimeter in grade 3 but not in grade 4. They may require a review of finding the perimeter before they begin constructing given a specific perimeter.</td>
</tr>
<tr>
<td>• Instruct students to create different size rectangles on grid paper. They will find the perimeter and area of each and describe the relationship between area and perimeter. (5SS1.1)</td>
<td></td>
</tr>
<tr>
<td>• James is painting a rectangle room that has 4 walls. The dimensions of the room are 3 metres by 5 metres. A can of paint will cover 35 square metres. How many cans of paint will be needed? (5SS1.1)</td>
<td></td>
</tr>
<tr>
<td>• On a geoboard create two rectangles with a perimeter of 20 cm. Explain how you decided the dimensions of the rectangles. (5SS1.1)</td>
<td>Math Focus 5</td>
</tr>
<tr>
<td><img src="geoboard.png" alt="Geoboard Diagram" /></td>
<td>Lesson 3: Exploring Perimeter</td>
</tr>
<tr>
<td></td>
<td>5SS1 (1.1)</td>
</tr>
<tr>
<td></td>
<td>TR pp. 20 - 22</td>
</tr>
<tr>
<td><strong>Student/Teacher Dialogue</strong></td>
<td>Additional Reading:</td>
</tr>
<tr>
<td>• How many base-ten flats can fit in a square metre? (5SS1.1)</td>
<td>Principles and Standards for School Mathematics 2000</td>
</tr>
<tr>
<td><strong>Portfolio</strong></td>
<td></td>
</tr>
<tr>
<td>• Tell the student that the area of a rectangle classroom is 600 m² and its perimeter is 100 m. Ask: What are the dimensions of the classroom? (5SS1.1)</td>
<td></td>
</tr>
</tbody>
</table>
### Strand: Shape and Space (Measurement)

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<tr>
<td>Students will be expected to</td>
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</tbody>
</table>

#### 5SS1 Continued

**Achievement Indicators:**

1. **5SS1.2 - Construct or draw 2 or more rectangles for a given area in a problem solving context**

Take students through the following activity:

Divide your class into groups of 2 or 3. Give each group 30 colour tiles and ask them to create all possible rectangles and give perimeter for each. Ask students to find a method to keep track of side lengths and width, also have them sketch the rectangles on grid paper. Word problems could be solved and created based on the area and/or perimeter of these rectangles. Ask: Which rectangles has the greatest/least perimeter?

2. **5SS 1.3 – Illustrate that for any given perimeter the square or shape closest to a square will result in the greatest area**

The playground can be a good place for students to investigate perimeter. First, ask students which unit of measurement they should use to measure the playground (mm, cm or m). Then, have students estimate the perimeter by estimating the number of steps they would take if they walked around the perimeter. Record the estimates of each child. Using a trundle wheel, find the actual measurement of the perimeter.

Creating problems based on pieces of children’s literature allows a spring board for thinking creatively about concepts like area and perimeter.

After reading “Pigs” by Robert Munsch, pose the following problem: A new pen is being built to corral the pigs after their adventures. The pen will be a rectangle and there is 100 m of fence to be used. Create 3 possible pens for the pig and model them on grid paper. Give the perimeter and area for each pen. Create a pen that would have a shape that would be a square. Why might you choose this shape for the pen? After students have had experience working with perimeter, use a rectangular mat from the Physical Education department and ask students to estimate how many people can fill in the perimeter of the mat. Then have students use a standard unit of measurement (m) to determine the actual perimeter.

Next, ask the students to estimate the number of students needed to cover the mat. Record the number of students needed to cover the area. Using the students knowledge in area, find the area using the formula length x width.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

**Suggested Assessment Strategies**

**Paper and Pencil**
- Jane has to make a rectangular cabbage patch with an area of 24 m².
  a) Using grid paper, sketch all the possible rectangles.
  b) Find and record the side lengths of each rectangle.
  c) Why might Jane want to make the patch with the greatest perimeter? *(5SS1.2)*

**Journal**
- A farmer has 100 m of fencing to make a pen for his pigs. He decides a rectangle would be the best shape. What are some possible sizes of pens he could make? How do the areas of the pens compare and what size they would recommend and why? What pen has the greatest area? What is special about this rectangle? *(5SS 1.3)*

**Performance**
- Provide students with grid paper. Have them draw a square that has sides of two units. Find its perimeter and its area. Share results. Repeat with squares that have other side measurements. Do you see a relationship between side length and perimeter? Between side length and area? *(5SS 1.5)*

**Resources/Notes**

* Math Focus 5
  Lesson 4: Perimeters and Areas of Rectangles
  5SS1 (1.2, 1.3, 1.4, 1.5)
  TR pp. 23 - 26

* Curious Math:
  TR pp. 27 - 28
  Same Area, Greater Perimeter

* Additional Reading:
### Strand: Shape and Space (Measurement)

#### Outcomes

Students will be expected to

5SS 3 Demonstrate an understanding of volume by
- Selecting and justifying referents for cm³ or m³ units
- Estimating volume using referents for cm³ or m³
- Measuring and recording volume (cm³ and m³)
- Constructing right rectangular prisms for a given volume

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

#### Elaborations—Strategies for Learning and Teaching

Volume is the amount of space occupied by a 3-dimensional object. Students explore the idea that one object has more volume than another if it is bigger or takes up more space. The objects used for all of these explorations will be rectangular prisms. Volume and capacity are both terms for measures of the 'size' of three-dimensional regions.

Standard units of volume, frequently regarded in terms of their linear measure, are expressed in cubic centimetres, cubic metres, etc. Students have not had previous experience with volume or capacity.

In order for students to identify the cube as the most efficient unit for measuring volume they have to be exposed to measuring volume using other objects like marbles, or styrofoam peanuts.

A suggestion would be to have groups of 2-3 students determine the volume of a given box by first filling it with marbles and record this number. Then have them fill the box with cubes and record the number and compare and explain the differences.

Involving students in a hands-on activity to explore the volume of a given box will aid in their understanding of this concept.

Have students stand in a large appliance box (these should be readily available from any local department store). Ask students to estimate how many students can fit inside the box. Record the results. Have students fill the box and record the number of students required. Discuss with students how filling the box with students is different than lying flat on the rectangular mat.

After this experience, students should estimate volume using a variety of sized boxes. Using cubes to fill the boxes will help students understand why the volume is recorded in cubic units.
General Outcome: Use Direct or Indirect Measurement to Solve Problems

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<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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<tbody>
<tr>
<td><strong>Journal</strong></td>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td>• I noticed that...</td>
<td>Lesson 5: Measuring and Comparing Volumes</td>
</tr>
<tr>
<td>• I learned that ...</td>
<td>5SS3 (3.1, 3.6, 3.7, 3.8)</td>
</tr>
<tr>
<td></td>
<td>TR pp. 33 - 36</td>
</tr>
<tr>
<td>• How could you figure out the number of cubes that would fit in a box, without filling it?</td>
<td>(5SS 3.6)</td>
</tr>
<tr>
<td>• How is area different from volume?</td>
<td>(5SS3.6)</td>
</tr>
<tr>
<td>• What would be the dimensions linked with height, of a box that could be built from a 10 unit by 10 unit rectangle by cutting one square from each corner of the paper (length 8 unit, width 8 units and height 1 unit)?</td>
<td>(5SS 3.6)</td>
</tr>
</tbody>
</table>
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

5SS3 Continued

Achievement Indicators:

5SS 3.7 Construct a right rectangular prism for a given volume.

5SS 3.8 Explain that many right rectangular prisms are possible for a given volume by constructing more than one right rectangular prism for the same given volume.

Elaborations—Strategies for Learning and Teaching

Build A Box - Organization:

Put students in pairs. Give each pair 5 sheets of 2 cm grid paper. Students will need scissors and pencils. Have students trim each grid sheet to 9 squares x 11 squares (18 cm x 22 cm)

Caution students not to cut into squares when trimming. When sheets are all trimmed have a quick discussion on the dimensions of the grids and ask how many squares each sheet has; work towards realization that the flat paper has no volume because it has no height. Steps:

1. Take grid sheet and cut one square off of each corner
2. Fold up out side row on each side and tape corner to make box (Fill the box using 2 cm cubes (multi link may be used if necessary) and record the total used.
3. Have groups report on findings and discuss strategies in order to lead them to discuss what the length and width were and their relationship to total.
4. The remaining boxes will be made one by one using the same steps except for step 1 which changes each time as follows:
   - box 2: cut a 2 by 2 square from each corner
   - box 3 cut a 3 by 3 square from each corner
   - box 4 cut a 4 by 4 square from each corner

Before continuing with box construction, check to see if students have discovered any generalizations about volume that will lead them to the understanding that volume is # columns (length) x # of rows (width) x # of layers (height).

After students have the understanding that one cm cube has a volume of 1 cm they should build various rectangular prisms and find the volume. If each cube has a volume
General Outcome: Use Direct or Indirect Measurement to Solve Problems

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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<tr>
<td><strong>Math Focus 5</strong></td>
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<tr>
<td>Lesson 5: Measuring and</td>
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<tr>
<td>Comparing Volumes</td>
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<tr>
<td>5SS3 (3.1, 3.6, 3.7, 3.8)</td>
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<tr>
<td>TR pp. 33 - 36</td>
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<tr>
<td><strong>Math Game:</strong></td>
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<td>TR pp. 37 - 38</td>
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<tr>
<td>Building Boxes</td>
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## Strand: Shape and Space (Measurement)

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<tr>
<td>5SS3 Continued</td>
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<tr>
<td>Achievement Indicators:</td>
<td></td>
</tr>
<tr>
<td>5SS 3.2 Provide a referent for a cubic centimetre and explain the choice</td>
<td></td>
</tr>
<tr>
<td>A square centimetre is 1cm x 1cm x 1cm and a good referent for this is the base 10 unit cube. After some investigation with finding volume using non-standard units a centimetre cube will be introduced. Students should develop personal referents for units. The use of personal referents helps students establish the relationships between the units (e.g., the small cube in the base-ten blocks is 1 cm³ and would hold 1 mL).</td>
<td></td>
</tr>
<tr>
<td>5SS 3.3 Provide a referent for a cubic meter and explain the choice</td>
<td></td>
</tr>
<tr>
<td>A good way to model a cubic metre as a personal referent is to take 12 newspaper rolls (1 metre long each) and tape together to form a cube. If the cube were solid it would have a volume of 1 m³. Students will be able to see that the newspaper cube has a height, length and width of one meter each.</td>
<td></td>
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<tr>
<td>5SS 3.4 Determine which standard cubic unit is represented by a given referent</td>
<td></td>
</tr>
<tr>
<td>Using a series of different 3-D objects ask students if they would be better measured in cubic centimetres or metres and justify their reasoning. Use a cracker box to guide discussion.</td>
<td></td>
</tr>
<tr>
<td>5SS 3.5 Estimate the volume of a given 3-D object using personal referents</td>
<td></td>
</tr>
<tr>
<td>3-D objects should be in the shape of rectangular prisms.</td>
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</tbody>
</table>
General Outcome: Use Direct or Indirect Measurement to Solve Problems

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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<tbody>
<tr>
<td><strong>Journal</strong></td>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td>• Name a 3-D object that could be measured in cubic centimetres and a 3-D object that would be measured in cubic metres and explain why?</td>
<td><strong>Lesson 6: Measuring Volume in Cubic Centimetres</strong></td>
</tr>
<tr>
<td></td>
<td>5SS3 (3.2, 3.3, 3.5, 3.7)</td>
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<tr>
<td></td>
<td>TR pp. 39 - 43</td>
</tr>
<tr>
<td></td>
<td><strong>Lesson 7: Measuring Volume in Cubic Meters</strong></td>
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<tr>
<td></td>
<td>5SS3 (3.3, 3.4, 3.5)</td>
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<td>TR p. 44 - 47</td>
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</table>
Strand: Shape and Space (Measurement)

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<tr>
<td>Students will be expected to</td>
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<tr>
<td>5SS4 Demonstrate an understanding of capacity by:</td>
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</tr>
<tr>
<td>• Describing the relationship between ml and L</td>
<td></td>
</tr>
<tr>
<td>• Selecting and justifying referents for ml or L units</td>
<td></td>
</tr>
<tr>
<td>• Estimating capacity using referents for ml and L</td>
<td></td>
</tr>
<tr>
<td>• Measuring and recording capacity (ml or L)</td>
<td></td>
</tr>
<tr>
<td>[C, CN, ME, PS, R, V]</td>
<td></td>
</tr>
</tbody>
</table>

Capacity units are generally used for measuring liquids or the containers that hold those liquids (ml, L etc). Students have not had previous experience with volume or capacity. Investigation of capacity should begin with non-standard units.

Give students containers of different sizes and shapes. Have them order these from largest capacity/volume to smallest capacity volume. Have them provide examples from real life contexts that represent these quantities (e.g., 250 ml contains a bit less than the average pop can; the smallest base ten block (unit block) has a volume of 1 cm³).

The investigation should next move to use of standard measures. Begin with litres because they are a familiar part of everyday life (milk, ice-cream etc). Using a variety of litre containers can help children see that one litre container shapes can vary but the capacity remains the same.

Achievement Indicators:

5SS 4.1 – Demonstrate that 1000 ml is equivalent to 1 L by filling a 1 L container using a combination of smaller containers

Take a series of graduated cylinders with varying capacities of less than 1 L and one 1 L container. Use the smaller containers to fill the one litre container, charting the amounts added until the 1 L container is filled. When students add the amounts they should realize it takes 1000 ml to equal 1 L. This activity can also be done in reverse, starting with a filled litre container.

5SS 4.7 – Determine the capacity of a given container using materials that take the shape of the inside of the container. e.g.: liquid, rice, sand, beads, and explain the strategy

Discuss with students their strategies and decisions involving which containers to use that will result in ‘rich’ learning. Be engaged with the students, prompting discussion of strategy and justification for choosing a labelled container to estimate the capacity of an unlabeled container. Ask: Why did you choose this container to determine that the bowl contains 750 ml? A student might reply “I chose the 250 ml container to determine that the bowl contains 750 ml because I could fit 3 scoops of sand (250 mls each) in the bowl, so its capacity is 750 mls.”
General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

• Students may be given a variety of containers (scoops, cups, and spoons) and asked to estimate how many of one container it would take to fill another. To determine if their estimation was correct, students would fill the large container from the smaller to check. (5SS4.1)

Pencil and Paper

• Use Frayer model to determine students' understanding of capacity. (5SS4.7)

Possible Answers:

<table>
<thead>
<tr>
<th>Definition</th>
<th>Real-life Problem and Visual Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity is the amount that a container will hold.</td>
<td>Sarah is filling a 1 L clear plastic bottle with layers of various colors of sand as a decoration for her room. Which of the following containers filled with sand could she use to completely fill her bottle?</td>
</tr>
<tr>
<td>Characteristics</td>
<td></td>
</tr>
<tr>
<td>* The amount of liquid, sand, or rice contains the same when placed in different shaped containers.</td>
<td>Container A: 355 mL.</td>
</tr>
<tr>
<td>* Capacity can be measured in non-standard or standard units for capacity.</td>
<td>Container B: 225 mL.</td>
</tr>
<tr>
<td>* The smaller the unit of measure, the greater the number of units needed to measure the capacity of a given container.</td>
<td>Container C: 125 mL.</td>
</tr>
<tr>
<td>* When comparing capacities, the same units must be used.</td>
<td>Container D: 420 mL.</td>
</tr>
<tr>
<td>* Standard units for capacity include ml and L.</td>
<td>Container E: 160 mL.</td>
</tr>
</tbody>
</table>

Examples

Capacity is used in the following:

* sand in a sandbox
* water in a swimming pool
* juice in a pitcher
* grain in an elevator
* milk in a glass

Capacity is not used in the following:

* fencing around a garden
* lace around a tablecloth
* painting walls
* tiles floors
* covering countertops

Resources/Notes

Math Focus 5
Lesson 8: Exploring millilitres and litres.
TR pp. 48 - 50
5SS4 (4.1, 4.2, 4.7)
Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

5SS4 Continued

Achievement Indicators:

5SS 4.2 Relating ml and L in problem solving situations

Rote conversion of ml to L or L to ml will not be as meaningful to students as solving problems rooted in real life situations.

Tell students that Jim has to make a recipe in which he has to use 2 L of orange juice and he only has a 500 ml container to measure the juice. How could he use the 500 ml container to measure 2 L of orange juice? Explain using numbers, pictures and words.

Ask students to draw 3 smaller containers whose capacity when added would equal 1 L. Ask them to explain their choices.

Students will be asked to choose from a series of containers (5 ml, 75 ml, 200 ml, etc), a combination that will create a total capacity of 1 litre.

5SS 4.3 Provide a referent for a L and explain the choice

Aside from familiar referents such as 1 L milk carton and water bottles, students should realize that a large base ten cube hollowed out would have the capacity to hold 1 L.

5SS 4.4 Provide a referent for a ml and explain the choice.

A useful referent for a millilitre would be a unit base ten cube. Since the millilitre is so small, students should use referents that represent millilitre units like 5 ml = 1 tsp or 15 ml = 1 tbsp. Use a medicine dropper that shows a 1 ml marking. Talk about how small babies often receive medicine in this unit. Also, eye and ear drops are often given in quantities even less than a millilitre.

Using a series of different containers, ask students if they would be better measured in ml or L and justify their reasoning. For example, a glass of milk, a container of laundry detergent, etc. Then, they would estimate the capacity in the chosen unit and, using a litre container, check their estimates.

5SS 4.5 Determine which capacity unit is represented by a given referent

Review the referents for the cm [pinkie nail] and a metre (base of door to the doorknob) and ask students to suggest a suitable referent for 1 ml and explain why it would be suitable. Have the students use their referent to determine the capacity of a small container.

5SS 4.6 Estimate the capacity of a given container using personal referents
<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
<th>Resources/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance</strong></td>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td>• Have students order various containers and provide a referent for each of the different</td>
<td>Lesson 9: Estimating and Measuring Capacity</td>
</tr>
<tr>
<td>containers. (e.g., 250 ml contains less than the average pop can. In their journals,</td>
<td>5SS4 (4.1, 4.2, 4.3)</td>
</tr>
<tr>
<td>students can illustrate and explain how they know their ordering is correct.</td>
<td>TR pp. 52 - 55</td>
</tr>
<tr>
<td></td>
<td>Lesson 8 and Lesson 9 (focus on estimation)</td>
</tr>
<tr>
<td></td>
<td>*End of chapter material and unit assessment - be</td>
</tr>
<tr>
<td></td>
<td>selective.*</td>
</tr>
</tbody>
</table>
Division

Suggested Time: 3 Weeks

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

Focus and Context

In this unit, students will explore the meanings of division and develop a strong conceptual understanding of this operation. Development of computational fluency should flow from a sound understanding of what division means. Equal sharing (15 ÷ 5 = 3 the number of treats each of 5 people will get if there are 15 treats) and equal grouping (15 ÷ 5 = 3, the number of equal groups of 5 in 15) are two meanings of division that should be presented to students in real world contexts. In this way division does not become a rote procedure but one that is rooted in a problem situation requiring division.

When dividing whole numbers, there are often remainders. Students should discuss the meanings of these remainders. At times remainders may require that a quotient be adjusted, rounded up or ignored.

Finally, estimation is an essential tool for determining the reasonableness of a solution in division. Indeed, estimation should be employed to determine an approximate solution before computation using an algorithm or modeling strategy.

It is important to develop a strong conceptual framework of division before computational fluency is achieved.

It is important for students to explore the inverse relationship between multiplication and division. To help students make the connection between multiplication and division we could use the following:

\[
\begin{array}{c}
\text{Quotient} \\
\text{Divisor} \quad \text{Dividend} \\
\text{Factor} \quad \text{Product}
\end{array}
\] or

In problem solving contexts, the meaning of these operations will be evident. The use of concrete materials like base ten blocks, counters and number lines to model division and relating these models to any computational algorithm, solidifies a strong, conceptual grasp of division.

Multiplication and division should be applied to real world problems so that students see the need for proficiency in these operations in their lives. For example, determining the amount of money needed to be saved each month to reach a monetary goal for a basketball camp or splitting a class of students into teams require division.

Mathematical concepts in general are far more meaningful when connected with and built on students’ existing knowledge and experience.

It is also important to make the connection between division and repeated subtraction. That is, division is a short cut for repeated subtractions.

Math Connects
### Process Standards Key

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

<table>
<thead>
<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
</tr>
</thead>
</table>
| Number | 5N2 Use estimation strategies, including:  
• front-end rounding  
• compensation  
• compatible numbers in problem-solving contexts. | [C, CN, ME, PS, R, V] |
| Number | 5N3 Apply mental mathematics strategies and number properties, such as:  
• skip counting from a known fact  
• using doubling or halving  
• using patterns in the 9s facts  
• using repeated doubling or halving to determine, with fluency, answers for basic multiplication facts to 81 and related division facts. | [C, CN, ME, R, V] |
| Number | 5N6 Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit), and interpret remainders to solve problems. | [C, CN, ME, PS, R, V] |
Strand: Number

Outcomes

Students will be expected to

5N3  Apply mental math strategies and number properties by:

- skip counting from a known fact
- using doubling or halving
- using patterns in 9s facts
- using repeated doubling or halving

to determine answers for basic multiplication facts to 81 and related division facts.

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

Achievement Indicator:

5N3.1 Describe the mental mathematics strategy used to determine a given basic fact, such as:

- skip count up by one or two groups from a known fact; e.g., if 5 x 7 = 35, then 6 x 7 is equal to 35 + 7 and 7 x 7 is equal to 35 + 7 + 7
- skip count down by one or two groups from a known fact; e.g., if 8 x 8 = 64, then 7 x 8 is equal to 64 – 8 and 6 x 8 is equal to 64 – 8 – 8
- doubling; e.g., for 8 x 3 think 4 x 3 = 12, and 8 x 3 = 12 + 12
- patterns when multiplying by 9: The sum of the two digits in the product is always 9. E.g., for 7 x 9, think: 1 less than 7 is 6, 6 and 3 make 9, so the answer is 63.
- repeated doubling; e.g., if 2 x 6 is equal to 12, then 4 x 6 is equal to 24 and 8 x 6 is equal to 48
- repeated halving; e.g., for 60 ÷ 4, think 60 ÷ 2 = 30 and 30 ÷ 2 = 15.

Elaborations—Strategies for Learning and Teaching

Arrays and sets are important in helping students establish the relationship between multiplication and division and in the development of computational procedures for multiplication and division. Coloured tiles are effective when exploring arrays for this purpose.

Using coloured tiles on an overhead, have a class discussion to create as many rectangles as possible that have 20 square units. Relate each of the rectangles to multiplication facts, (1 x 20, 2 x 10 and 4 x 5). Next, split each rectangle into equal groups of coloured tiles to develop the corresponding division facts. (20 ÷ 1 = 20; 20 ÷ 20 = 1; 20 ÷ 2 = 10; 20 ÷ 10 = 2; 20 ÷ 4 = 5; 20 ÷ 5 = 4)

Skip counting from a known fact can be used as a tool for division. For example, if the known fact is 40 ÷ 8 = 5, then use this fact to determine 56 ÷ 8 by skip counting up 2 more 8s to get from 40 → 48 → 56 which shows 56 ÷ 8 = 5.

Skip counting from a known fact can also work by skipping back. For example, if the known fact is 80 ÷ 8 = 10, then use this fact to determine 72 ÷ 8 by skip counting down 1 more 8 to get from 80 → 72.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

**Performance**
- Judy is stitching together a quilt for her grade 5 class. The students have prepared 30 squares of linen, 30 cm x 30 cm, with their own drawings showing Friendship. Using 30 colored tiles, model Judy’s quilt design to determine all possible layouts. Show all multiplication and related division facts. Which layout would be the most reasonable for the quilt? Why?  
  \( (5N3.1) \)

- Use the repeated halving strategy to find \( 48 \div 4 \). Use repeated halving to divide.  
  \( (5N3.1) \)

**Student-Teacher Dialogue**
- Judy solved the problem \( 32 \div 8 \) by thinking: \( 32 \div 2 = 16 \), then \( 16 \div 2 = 8 \) and finally \( 8 \div 2 = 4 \). Explain the strategy Judy used.  
  \( (5N3.1) \)

**Paper and Pencil**
- Use the known fact \( 56 \div 8 = 7 \), to find \( 64 \div 8; 72 \div 8; 80 \div 8 \).  
  \( (5N3.1) \)

- Use the know fact \( 49 \div 7 = 7 \) to find \( 42 \div 7, 35 \div 7 \) and \( 28 \div 7 \).  
  \( (5N3.1) \)

**Student-Teacher Dialogue**
- How would you use 24 colored tiles to show that \( 24 \div 6 = 4 \)? What other division sentences could you show using the 24 colored tiles?  
  \( (5N3.1) \)

**Resources/Notes**

* Math Focus 5
  Getting Started: Opening Ceremony
  Teacher Resource (TR) pp. 9 – 11

* Lesson 1: Division Fact Strategies
  5N3 (3.1, 3.3, 3.4)
  TR pp. 13 - 16
Strand: Number

Outcomes

Students will be expected to

5N3 Continued

Elaborations—Strategies for Learning and Teaching

“You cannot divide 0,” is a Principle of Division and may be difficult to explain. The repeated subtraction model may be a useful tool. For example, $20 \div 5 = 4$ because $20 - 5 - 5 - 5 - 5 = 0$. However $5 \div 0$ is undefined because no matter how many times 0 is subtracted from 5, you will never reach 0,

E.g., $5 - 0 - 0 - 0 - \ldots = 5$, not 0.

To activate prior knowledge and connect multiplication and division facts, have students give the related division facts from flash cards showing different multiplication facts.

To illustrate the repeated halving method, provide the students with the problem $32 \div 4 = 8$. Place 32 counters in an array on the overhead. When the student is unable to divide by 4, they can instead, divide by 2 and do this twice for the same result. That is, $32 \div 2 = 16$ and $16 \div 2 = 8$. 

5N3.1 Continued

5N3.3 Explain why division by 0 is not possible or undefined, e.g. $8 \div 0$.

5N3.4 Determine, with confidence, answers to multiplication facts to 81 and related division facts.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Performance**

- Aaron states that division by zero is not possible. Is he correct? Use an example to explain. (5N3.3)

- State all multiplication and related division facts for each:
  
  (i) 48  (ii) 36  (iii) 18  (iv) 56  (5N3.4)

#### Resources/Notes

*Math Focus 5*

Lesson 1 (Continued): Division Fact Strategies

5N3 (3.1, 3.3, 3.4)

TR pp. 13 - 16

Lesson 2: Dividing by Halving

TR pp. 17 - 20
Strand: Number

**Outcomes**

*Students will be expected to*

5N6 Demonstrate, with and without concrete materials, an understanding of division (3 digit by 1-digit) and interpret remainders to solve problems.

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

**Achievement Indicators:**

5N6.1 *Model the division process as equal sharing, using base ten blocks, and record it symbolically.*

5N6.3 *Solve a given division problem in context, using personal strategies, and record the process.*

**Elaborations—Strategies for Learning and Teaching**

Have students work in groups of 2. Give each group 3 flats and 2 rods to represent 320. Have the students estimate 320 ÷ 8. Next, divide the base ten blocks into 8 equal groups. Have students record their groupings on grid paper, or with base ten sketches. Students should start with the flats when trading because this follows the same pattern as the algorithm, (i.e. starting on the left of the dividend).

When dividing a 3-digit number which is multiple of ten, it is often effective to rename the dividend as a multiple of tens or hundreds. For example, 320 would be 32 sets of ten, or 600 would be 6 sets of one hundred.

320 ÷ 8 = 32 tens ÷ 8 which is 4 tens, so 320 ÷ 8 = 40, since 32 ÷ 8 = 4.

600 ÷ 3 = 6 hundreds ÷ 3 which is 2 hundreds, so, 600 ÷ 3 = 200, since 6 ÷ 3 = 2.

Use base tens materials to show that 120 ÷ 4, would be 12 rods shared equally into 4 groups with 3 rods in each group. Since each rod represents 10, the answer is 30.

Then 1200 ÷ 4 would be 12 flats shared equally into 4 groups to get 3 flats in each group. Since each flat represents 100, then answer is 300.

From this and other similar examples discuss the pattern of dividing multiples of 10 and 100. For example, 12 ÷ 4 = 3, so 120 ÷ 4 = 30 and 1200 ÷ 4 = 300.
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

**Performance**
- Use base ten blocks to model 253 shared equally among 7 groups. Represent your answer using diagrams and a number sentence.

- Anna solved the following problem: There were 367 fans going to a hockey game. Each SUV can carry 7 fans. How many SUV are needed?
  - Her answer was $367 \div 7 = 52 \text{ R}3$.
  - What does the remainder 3 represent?
  - Anna’s final answer was 53. Explain.

**Performance**
- Use base ten materials to solve $320 \div 8$. How could you then use the answer to solve $3200 \div 8$?

**Paper and Pencil**
- Use basic facts to calculate each of the following:
  - $2400 \div 8 = \text{___}$
  - $560 \div 7 = \text{___}$
  - $4800 \div 6 = \text{___}$

**Student-Teacher Dialogue**
- What basic fact would help you solve $3600 \div 9$? What is $3600 \div 9$?
- Explain how the fact that $45 \div 5 = 9$ would help with $4500 \div 9$.

### Resources/Notes

- **Math Focus 5**
  - Lesson 3: Dividing Tens and Hundreds
  - 5N6 (6.1, 6.3)
  - TR pp. 21 - 24

- **Math Game: Choose Four**
  - TR pp. 25 - 26
Strand: Number

Outcomes

Students will be expected to

5N2 Use estimation strategies, including:
- Front-end rounding
- Compensation
- Compatible numbers in problem-solving contexts.

Elaborations—Strategies for Learning and Teaching

To estimate products and quotients students should know multiplication and division facts as well as how to multiply and divide with multiples of 10, 100, 1000…

Why is estimation a valuable skill?

- Estimation enables us to judge the reasonableness of an answer acquired using pencil and paper or calculators.
- It can be done quickly using tools which are always readily available.
- An estimation is often all that is required to make an important decision.

It is accepted that there is not any one strategy or any one right answer in estimating.

Some strategies for estimating division include:
- Round one or both numbers to the nearest multiple of 10, 100 or 1000. e.g. 829 ÷ 42 = 800 ÷ 40 = 20
- Round numbers so that familiar facts can be used. 643 ÷ 8 = 640 ÷ 8 = 80
- Round both numbers up or down. e.g. 372 ÷ 9 = 400 ÷ 10 = 4

Focus on this by helping student see what happens when

- 437 ÷ 9 → 450 ÷ 9 [about 50]
- 437 ÷ 9 → 500 ÷ 10 [about 50]
- 437 ÷ 9 → 400 ÷ 8 [about 50]

Discuss why each change in the dividend and divisor makes sense.

Students should be encouraged to estimate before completing quotients to check the reasonableness of their answer.

Present the following scenario. Brianna has 823 beads and she wants to make 8 friendship bracelets. She determines that she can put 13 beads on each bracelet. Is her answer reasonable? Why or why not?

To determine the reasonableness of the answer, students should be encouraged to estimate 823 to 800 and then think, “800 ÷ 8 = 100” so an answer of only 13 beads per bracelet would not be reasonable.
General Outcome: Develop Number Sense

Suggested Assessment Strategies

Pencil and Paper
- Give students 375 ÷ 4 and ask them to estimate the quotient two different ways and explain their choices. (5N2.6)

Student-Teacher Dialogue
- Angela and her 3 friends went shopping during the weekend. They spent a total of $103.00. If each person spent the same amount, about how much did each person spend? Explain your estimation strategy. (5N2.6)

Performance
- Present the class with the following problem: Bert’s class raised $234.00 as a class project. They are going to share that money equally among 3 different charities. About how much will each charity receive? Have students record their estimation on paper, or individual white boards, and hold them up on cue. Have several students share their strategies with the class. (5N2.6)

Resources/Notes

Math Focus 5
Lesson 4: Estimating Quotients
5N2 (2.1, 2.2, 2.3, 2.6, 2.7)
TR pp. 27 - 30
### Outcomes

*Students will be expected to*

5N2 Continued

### Achievement Indicators:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5N2.2</td>
<td>Describe contexts in which overestimating is important.</td>
</tr>
<tr>
<td>5N2.3</td>
<td>Determine the approximate solution to a given problem not requiring an exact answer.</td>
</tr>
</tbody>
</table>
| 5N2.7     | Apply front-end rounding to estimate:  
  - **Sums:** e.g., 253 + 615 is more than 200 + 600 = 800  
  - **Differences:** e.g., 974 – 250 is close to 900 – 200 = 700  
  - **Products:** e.g., the product of 23 × 24 is greater than 20 × 20 (400) and less than 25 × 25 (625)  
  - **Quotients:** e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200). |

### Elaborations—Strategies for Learning and Teaching

Sometimes when estimating, it is important to overestimate. For example, there are 23 people and 5 per car. How many cars are needed? 23 ÷ 5 = 4 R 3 (It doesn't make sense to leave 3 people behind, so 6 cars will be needed.)

The purpose of estimating is to change numbers in a problem to ones which are easier to do mentally. Also, students must recognize when estimating is an appropriate strategy for a given problem.

In applying front-end rounding in division only the first digit of the dividend is considered and the rest of the digits become zero. The estimate is then indicated as being less than or greater than the actual answer.

For example, 476 ÷ 5 would be 400 ÷ 5 = 80.

Note: With front-end estimation the estimate will always be less than the actual answer. This strategy should be used along with an adjustment. Ex. 589 ÷ 5 using front-end would be 500 ÷ 5 which is 100. An adjustment should be made for the remaining 89 ÷ 5 which is close to 100 ÷ 5 = 20 for a final estimate of 120.
### General Outcome: Develop Number Sense

#### Suggested Assessment Strategies

**Student-Teacher Dialogue**

- There are 336 students traveling to a hockey tournament on buses. There are 6 busses. How many students will be on each bus? Did you overestimate or underestimate? Explain.  
  \(5N2.2\)

- James estimated \(834 \div 4\) to be 200. Will the actual answer be less than or greater than this estimate? Explain.  
  \(5N2.7\)

**Paper and Pencil**

- At the annual Spring Fair there were 947 prizes won at the Duck Pond. If the fair lasted 3 hours, use front-end estimation to determine about how many prizes were won each hour?  
  \(5N2.7\)

- Create and solve (using front-end estimation) a problem.  
  \(579 \div 3\).  
  \(5N2.7\)

#### Resources/Notes

- **Math Focus 5**
- **Lesson 4 (Continued): Estimating Quotients**
  
  \(5N2 (2.1, 2.2, 2.3, 2.6, 2.7)\)
  
  TR pp. 27 - 30

*Front-end estimation is not directly dealt with in the text. Focus is on rounding the dividend to the nearest multiple of 10.*
### Division

#### Strand: Number

**Outcomes**

Students will be expected to

5N6 Demonstrate, with and without concrete materials, an understanding of division (3 digit by 1-digit) and interpret remainders to solve problems.

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

**Achievement Indicators:**

5N6.3 Solve a given division problem in context, using personal strategies, and record the process.

5N6.1 Model the division process as equal sharing, using base ten blocks, and record it symbolically.

**Elaborations—Strategies for Learning and Teaching**

Multiplication has been identified as repeated addition. Likewise, division is repeated subtraction.

While a number line is a possible and plausible visual to demonstrate division as repeated subtraction, students also may find the following context just as meaningful.

For example, Erin has 251 hockey cards in her collection. She decides she doesn’t want to collect hockey cards anymore so she decides to share them equally among her 8 friends. So she writes the following:

```
8 \[\underline{251}\] 10 cards
- 80
- 171
- 80
- 91
- 80
- 11
- 8
---
3R
```

Base ten blocks are useful tools for developing the understanding of the traditional algorithm for division. Students divide three digit numbers using base ten blocks recording their calculations symbolically. Through discussion, the connection between the base ten models and the traditional algorithm is forged. Remind students to estimate before they divide.

The traditional long-division algorithm, whether modelled with base ten blocks or not, is best described using “sharing words.” For example, in the algorithm for 432 \( ÷ 3 \), it is important that students realize the “4” represents 4 hundreds and if three share, each will get 1 (hundred). One hundred is left and when put with the 32 gives 132 to share among 3, etc.

Students should understand why the number of units leftover after the sharing must be less than the divisor. Models help to clarify this idea.

Present the following activity. Place students in groups of three or four. Give each group a random set of base tens materials totalling some unknown number. The task is for the students to share the materials equally (divide) and then complete a math sentence. Ex. a group has 2 blocks or large cubes, 5 flats and 7 rods, representing 257. They then share equally into 3 groups to get a quotient of 85 with 2 remaining. They then write the sentence; \( 257 ÷ 3 = 85, R 2 \) and \( 85 \times 3 + 2 = 257 \).

*Continued*
## General Outcome: Develop Number Sense

### Suggested Assessment Strategies

#### Journal
- Fred was asked to divide 42 by 7. He started at 42 and skip counted backwards by 7. How many groups did he get? Is this a good strategy for solving division problems? Why or why not?  
  *(5N6.3)*

#### Paper and Pencil
- Create and solve a problem involving division with a divisor of 6 and a dividend of 252.  
  *(5N6.3)*
- John has to read 266 pages of his novel in seven days. How many pages should he read each day? Explain!  
  *(5N6.3)*
- Each trailer can carry 4 horses. If there are 308 horses to be moved, how many trailers would be needed.  
  *(5N6.1)*
- Purity Factories produce Cream Crackers. They prepare gift packs with three boxes of Cream Crackers in each pack. If they have 725 boxes of crackers, how many gift packs can they produce?  
  *(5N6.1)*

#### Performance
- Ask the student to use base ten materials to model 489 divided by 7. Have students record their solution using the traditional algorithm.  
  *(5N6.1)*

#### Student-Teacher Dialogue
- Ask the student to tell what division is being modelled below and to provide a word problem that would apply to the model.  
  \[ 100 \div 3 = 33 \text{ R}1 \]

### Resources/Notes

- **Math Focus 5**
  - Lesson 5: Exploring Division with Greater Numbers  
    *(5N6.3)*  
    TR pp. 31 - 34
  - Curious Math: Stubborn Remainders  
    TR pp. 43-44
  - Lesson 7: Divide by Sharing  
    *(5N2.1, 2.6)*  
    *(5N6.1, 6.3)*  
    TR pp. 45 - 49
Outcomes

Students will be expected to

5N6 Continued

Achievement Indicators:

5N6.1 Continued

5N6.2 Explain that the interpretation of a remainder depends on the context:
- ignore the remainder; e.g., making teams of 4 from 22 people.
- Round up the quotient; e.g., the number of 5 passenger cars required to transport 13 people.
- Express remainders as fractions; e.g., 5 apples shared by 2.

Elaborations—Strategies for Learning and Teaching

Present the following problem on the board and model the solution using base ten blocks making the connection with the traditional algorithm.

Six friends decide to share a jar of 325 marbles equally. How many marbles will each friend get?

When dividing whole numbers there are often remainders. Students must understand what these remainders mean as well as how to express them symbolically. There are many ways to interpret remainders and they can be expressed as:

- decimals, $19.00 shared equally among 4 people is $19 \div 4 = 4 \text{ R}3$ which is $4.75$
- whole numbers where it is ignored, 27 marbles shared among 4 children, $27 \div 4 = 6 \text{ R}3$, because there are 3 marbles left over so each child gets 6 marbles;
- round up the quotient, 26 children with 7 children per van. How many children in each van. $26 \div 7 = 3 \text{ R}5$, there are 4 vans needed.
- fractions, 17 hours shared among 3 workers is $17 \div 3 = 5 \text{ R}2$ which is $5 \frac{2}{3}$ hours each.

There should be some discussion on the fact that the contexts in which you ignore the remainder involve items that cannot be expressed other than as a whole, e.g. marbles, cards, etc.

Contexts in which the remainder is expressed as a fraction involve items that can be expressed as less than a whole. Ex. metres, pizzas, cakes, etc.
**General Outcome: Develop Number Sense**

### Suggested Assessment Strategies

**Performance**
- Using play money, have students model the following:
  
  Jacob won $83.00. He wanted to share equally among himself and his three friends. How much will each person receive? (5N6.2)

- Meredith cut a 42 m bolt of cloth into 5 equal lengths. How long is each piece? Give your answer as a decimal number of meters. (5N6.2)

**Paper and Pencil**
- In the following situations would you
  
  a. ignore the remainder
  b. round up the quotient
  c. express as a fraction.

  Explain.

  (i) William has 185 hockey cards that he wants to share equally among his three friends. How many cards will each person receive?

  (ii) Mrs. Peabody has 9 bars of Swiss chocolate to share equally among her 4 nephews. How much chocolate will each nephew receive?

  (iii) Ian can transport 3 people in his canoe. How many trips would take him to transport 35 people across a river? (5N6.2)

**Student - Teacher Dialogue**
- Ask the student to create a problem where their interpretation of a remainder is…
  
  (i) to ignore the remainder.

  (ii) the express the remainder as a fraction.

  (iii) to round up the quotient (5N6.2)

### Resources/Notes

- **Math Focus 5**
  - Lesson 8: Describing Remainders as Decimals
    - 5N2 (2.6)
    - 5N6 (6.2, 6.3)
    - TR pp. 50 - 52
  
  *The text takes the conceptual understanding approach using mainly money as a model.*

- **Lesson 9: Interpreting Remainders**
  - 5N6 (6.2, 6.3)
  - TR pp. 53 - 56

- **Math Game:**
  - TR pp. 57-58
  - Two Hundred Plus
Strand: Number

Outcomes

Students will be expected to

5N6 Continued

Achievement Indicator:

5N6.3 Solve a given division problem in context, using personal strategies, and record the process.

Elaborations—Strategies for Learning and Teaching

Trial-and-error, or guess-and-check, is another suitable strategy for solving division problems. Being able to estimate is helpful with this strategy by determining a starting point. For example, consider the problem “The boys in Ms. Watkins’ class raised $875.35 at their school fundraising project. There are 9 boys in her class. How much money was raised per boy?” Estimating may be as follows: 900 ÷ 10 = 90, therefore a good starting point to “guess and check” would be 90. Then, the student may try 9 x 90 = 810, which is too low. They may then adjust their estimate to 95, so 9 x 95 = 855. Then they would be able to state the amount per student is a little more than 95 dollars.
General Outcome: Develop Number Sense

**Suggested Assessment Strategies**

*Paper and Pencil*

- Jill is a chicken farmer. She has 816 m of fencing material to build a chicken coop. Jill fences off an area with all sides lengths the same. How many sides are there in all? Give three possibilities. (5N6.3)

*Student - Teacher Dialogue*

- Stephen shared $24.00 evenly among his friends. Each received the same amount in dollars. How many friends did Stephen have? Give four possibilities. (5N6.3)

*Journal*

- A Marine biologist discovered a school of translucent sea creatures floating in the Coral Reef. The total number of tentacles was 96. If each creature had the same number of tentacles, how many creatures were there and how many tentacles were on each. Give three different possibilities. Explain ONE of your answers. Use words and pictures in your explanation. (5N6.3)

**Resources/Notes**

*Math Focus 5*

*Lesson 10: Solving Problems by Guessing and Testing*

5N6 (6.3)

*TR pp. 59 - 61*

*End of chapter material and unit assessment - be selective.*
Probability

Suggested Time: \(3 - 3 \frac{1}{2}\) Weeks
Unit Overview

Focus and Context

Probability is the study of chance. When discussing the likelihood of an event occurring we are discussing the ‘probability’ that an event will occur.

In this unit, students will be able to identify that the likelihood of a single outcome is possible, impossible or certain.

Students will also compare the likelihood of a single outcome as less likely, equally likely or more likely to occur. This is the students’ first exposure to probability.

Math Connects

Students need to understand probability so that they can interpret weather forecast, avoid unfair games of chance, and make informed decisions about medical treatments whose success rate is provided in terms of percentage. Students must be able to assess a situation and determine whether it is possible, impossible or certain. This concept can certainly be applied in everyday living i.e. what is the chance or likelihood that students will go outside for second lunch duty during the month of April? What is the likelihood that students will read over the summer holiday? In addition to real life and everyday living, students can assess various situations that are curriculum related such as in Social Studies: What is the likelihood that the Vikings landed on the Northern Peninsula in L’anse aux Meadows, etc. In addition to assessing if a situation is possible, impossible or certain, students need to determine if the likelihood of completing a task is less likely, equally likely or more likely to occur. For example, is it more likely that the grade 6 students will participate in the DARE program each year?
### Process Standards Key

| [C] Communication                  | [PS] Problem Solving |
| [CN] Connections                  | [R] Reasoning        |
| and Estimation                    | [V] Visualization    |

### 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>5SP3 Describe the likelihood of a single outcome occurring, using words such as:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• impossible</td>
<td>[C, CN, PS, R]</td>
</tr>
<tr>
<td></td>
<td>• possible</td>
<td></td>
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<td></td>
<td>• certain</td>
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<td></td>
<td>5SP4 Compare the likelihood of two possible outcomes occurring, using words such as:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• less likely</td>
<td>[C, CN, PS, R]</td>
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<tr>
<td></td>
<td>• equally likely</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• more likely</td>
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</tr>
</tbody>
</table>
Strand: Statistics and Probability (Chance and Uncertainty)

Outcomes

Students will be expected to

5SP3 Describe the likelihood of a single outcome occurring, using words such as:

• impossible
• possible
• certain.

[C, CN, PS, R]

Achievement Indicator:

5SP3.1 Provide examples of events from personal contexts that are impossible, possible or certain.

Elaborations—Strategies for Learning and Teaching

This will be students first exposure to probability. In order for students to understand the concept of probability they will require many hands-on experiences with everyday common materials.

Literature Link:

Read Cloudy with a Chance of Meatballs, Barrett 1978)

Position the three reference points ‘impossible’, ‘possible’ and ‘certain’ on a clothesline. Provide examples of events that would be impossible, possible or certain such as: I will walk to the moon next week in my pyjamas, my 8 month old baby sister will drive me to school, I will go for a walk after supper, the ice cream in my cone will melt. Have students place these events on the clothesline (probability line) in the appropriate places.

Students could also create their own probability events and have other classmates place them on the probability line.
**General Outcome:** Use Experimental or Theoretical Probabilities to Represent and Solve Problems Involving Uncertainty.

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<thead>
<tr>
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<tbody>
<tr>
<td><strong>Journal</strong></td>
<td><strong>Math Focus 5</strong></td>
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<tr>
<td>• Write a journal outlining events that are impossible, possible and certain in your everyday lives.</td>
<td>Getting Started: Predicting the Results of an Experiment</td>
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<td></td>
<td>Teacher Resource (TR) pp. 8 - 11</td>
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<tr>
<td></td>
<td><em>This can serve as an introduction to the unit.</em></td>
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<tr>
<td></td>
<td>Lesson 1: Probability Lines</td>
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<tr>
<td></td>
<td>5SP3 (3.1)</td>
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<tr>
<td></td>
<td>TR pp. 12 - 15</td>
</tr>
</tbody>
</table>
Strand: Statistics and Probability (Chance and Uncertainty)

Outcomes

Students will be expected to

5SP3 Continued

Achievement Indicators:

5SP3.2 Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible or certain.

5SP3.3 Design and conduct a probability experiment in which the likelihood of a single outcome occurring is impossible, possible or certain.

5SP3.4 Conduct a given probability experiment a number of times, record the outcomes, and explain the results.

Elaborations—Strategies for Learning and Teaching

Experimental probability is the probability reached by actually performing an experiment. For example, in theory if you flip a coin 2 times you should get one head and one tail. However after flipping the coin twice you may get 2 heads. The more you flip the coin, the greater the chance of having equal heads and equal tails.

Using spinners, dice or colored cubes have students predict whether the outcome will be impossible, possible or certain. Examples include the following:

- In a bag with 8 red cubes and 4 yellow cubes, a red cube is more possible to be drawn than a yellow cube.
- Using the spinner below, it is impossible to spin a 5 and possible to spin a 1, 2, 3, or 4.
- When rolling a die, it is certain that they will roll a 1,2,3,4,5 or 6 but impossible to roll a 7.

Have students create a spinner that is divided into 10 equal sections, labelled 0,1,2,...9 (or a 10-faced die is used). The student spins the spinner 5 times and totals the numbers spun. Ask the student to repeat this process several times, then report the probability that the sum is greater than 25. Have the students compare their findings.

Have students place colored cubes in a bag to create a situation/outcome where choosing a red cube is:
(i) certain (all cubes red)
(ii) possible (at least one cube is red)
(iii) impossible (no red cubes)

Have students invent a game that is related to sums and products using dice, spinners or cards i.e. you get a point if the sum of the cards you pick is highest. Then students will try to decide if the games are fair.

Perform the following experiment and turn on a classroom radio. Note whether the first voice you hear is a female or male voice. Change to a different station and record the gender of the voice. Repeat five times. Describe the probability of hearing a male voice.

Have students predict which letter a spinner is most likely to land on. Hold a paper clip in place with a pencil and spin. Record the letter on which the paperclip lands. Repeat the experiment ten times. Record the result. Try another twenty spins. Discuss results.
General Outcome: Use Experimental or Theoretical Probabilities to Represent and Solve Problems Involving Uncertainty.

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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<tbody>
<tr>
<td><strong>Performance</strong></td>
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<tr>
<td>• Using a bag which contains 20 green cubes and 5 red cubes. Ask a student to remove, without looking, one cube from the bag, record the color, and return it to the bag. Repeat the experiment 20 times. Have the students indicate the probability that a green cube was chosen. (5SP3.3)</td>
<td><strong>Math Focus 5</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Lesson 2: Conducting Spinner Experiments</strong></td>
</tr>
<tr>
<td></td>
<td>5SP3 (3.2, 3.3, 3.4)</td>
</tr>
<tr>
<td></td>
<td>TR pp. 16 - 20</td>
</tr>
<tr>
<td>• Give student a paper bag containing 10 colored tiles; 5 red, 3 blue, 2 yellow. Conduct an experiment to determine the probability of choosing a red tile. Explain. (5SP3.3)</td>
<td><strong>Lesson 3: Conducting Experiments with a Die</strong></td>
</tr>
<tr>
<td></td>
<td>5SP3 (3.2, 3.3, 3.4)</td>
</tr>
<tr>
<td></td>
<td>TR pp. 21 - 24</td>
</tr>
<tr>
<td>• Have students toss a coin to see if they will get heads or tails. Have students toss a coin at least twenty times and record their results in a chart. Discuss their findings. Try flipping the coin another twenty times and discuss the results again. (5SP3.4)</td>
<td><strong>Math Game:</strong></td>
</tr>
<tr>
<td></td>
<td>TR pp. 25 - 26</td>
</tr>
<tr>
<td><strong>Journal</strong></td>
<td><strong>Choose your Spinner</strong></td>
</tr>
<tr>
<td>• Ask the student why the probability that the sum of the numbers on a pair of dice is 3 is not the same as the probability that the sum is 7. (5SP3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Student - Teacher Dialogue</strong></td>
<td></td>
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<tr>
<td>• Ask the student the following: If Jesse rolls a dice 10 times, how many times do you expect her to roll an even number? Explain. (5SP3.4)</td>
<td></td>
</tr>
</tbody>
</table>
### Outcomes

*Students will be expected to*

5SP4 Compare the likelihood of two possible outcomes occurring, using words such as:
- less likely
- equally likely
- more likely.

[C, CN, PS, R]

### Elaborations—Strategies for Learning and Teaching

**Achievement Indicators:**

1. **5SP4.1 Identify outcomes from a given probability experiment that are less likely, equally likely or more likely to occur than other outcomes.**

2. **5SP4.2 Design and conduct a probability experiment in which one outcome is less likely to occur than the other outcome.**

3. **5SP4.3 Design and conduct a probability experiment in which one outcome is equally likely to occur as the other outcome.**

4. **5SP4.4 Design and conduct a probability experiment in which one outcome is more likely to occur than the other outcome.**

Provide the following using overhead spinners.

As a class discussion, ask students:

*Which spinner is most likely to spin a 2?*

*Which spinner is less likely to spin a 2?*

*Which spinner is equally likely to spin a 2 or 3?*

Using a variety of coloured multilink cubes, ask students to identify the number of coloured cubes needed to produce an outcome that is less likely to occur. For example, they may place 15 red, 10 blue and 5 green in a bag. They would then state which colour is less likely to be drawn?

Provide students with blank spinners and have them design an experiment with an event that is less likely to occur. For example, they may design a spinner that is \( \frac{1}{2} \) yellow, \( \frac{1}{4} \) red and \( \frac{1}{8} \) blue and \( \frac{1}{8} \) green. Possible events would be the spinner is less likely to land on blue than red, or green than yellow, etc.

Using a variety of coloured multilink cubes, ask students to identify the number of coloured cubes needed to produce an outcome that is equally likely to occur. For example, place 10 red, 10 blue and 10 green in a bag. Ask the students which colour is likely to be drawn and explain their thinking?

Using a variety of coloured multilink cubes, ask students to identify the number of coloured cubes needed to produce an outcome that is less likely to occur. For example, place 15 red, 10 blue and 5 green in a bag. Ask the students which colour is most likely to be drawn?
General Outcome: Use Experimental or Theoretical Probabilities to Represent and Solve Problems Involving Uncertainty.

<table>
<thead>
<tr>
<th>Suggested Assessment Strategies</th>
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</thead>
<tbody>
<tr>
<td><strong>Paper and Pencil</strong></td>
<td></td>
</tr>
</tbody>
</table>
| • Given a paper bag containing 10 colored tiles; 5 red, 2 blue, 1 yellow, 2 green, students are asked to describe and explain an event that is:  
  (i) more likely to occur  
  (ii) equally likely to occur  
  (iii) less likely to occur | **Math Focus 5**  
Lesson 4: Comparing Probabilities  
5SP3 (3.2, 3.3, 3.4)  
5SP4 (4.1, 4.2, 4.3, 4.4)  
TR pp. 30 - 34 |
| **Journal**                     |                 |
| • In a bag with 10 red cubes, 5 green and 4 yellow, why is it less likely that a yellow cube is to be drawn? | **Lesson 5: Solving Problems by Conducting Experiments**  
5SP3 (3.3, 3.4)  
5SP4 (4.2, 4.3, 4.4)  
TR pp. 35 - 38 |
| **Student - Teacher Dialogue**  |                 |
| • Ask the student to design an experiment in which one outcome is less likely to occur than the other outcome. |                 |
| • Ask student to describe an experiment where one outcome is equally likely to occur as another outcome. |                 |
| • Ask student to describe an experiment where one outcome is more likely to occur than another outcome. |                 |

*End of chapter material and unit assessment - be selective.*
2-D and 3-D Geometry

Suggested Time: 2 Weeks
Unit Overview

Focus and Context
Spatial sense is the understanding of shapes and solids and the relationships among them. Developing spatial sense gives students a feeling for the geometric aspects of their surroundings and the shapes of objects in their environment. Appreciation of form in art, nature and architecture is fostered by strong spatial sense. It is developed through rich experiences with shape and spatial relationships, provided consistently over time.

In earlier grades the focus was on classification of 2-D and 3-D shapes according to visible properties. In this unit the focus is on properties of shapes that involve the relationships associated with sides and faces. These properties are used to classify shapes according to attributes to further develop spatial awareness.

Students study horizontal, vertical, parallel, intersecting and perpendicular lines and apply these attributes to both 2-D and 3-D objects. Also, students engage in a study of the properties of 2-D shapes (quadrilaterals) and a variety of 3-D solids. Through this study, students will develop the tools necessary to refine their own spatial awareness.

Math Connects
Spatial sense is developed through a variety of experiences and interactions within the environment. Spatial sense involves visualization and spatial reasoning, and is important to the conceptual understanding of many mathematical ideas. It allows students to interpret and differentiate between 2-D and 3-D images.

Development of spatial sense should be tied to everyday living and connections made to other areas. Students develop their conceptual understanding objects from those in their environment. Local architecture provides a rich source of examples demonstrating how the various geometric shapes and solids are used in real life situations. Developing spatial sense helps students recognize attributes that can be measured, identify units used to measure them, and provide a description of the attributes. Some problem solving situations involve attaching numbers and units to dimensions of objects. Spatial sense enables students to visualize objects and the effects of changes made to any of the dimensions of a figure.

For example:
- changing the length of a side of a polygon increases the area by a given factor.
- volumes of solids can be determined given the dimensions of a solid.
### Process Standards Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>Communication</td>
</tr>
<tr>
<td>CN</td>
<td>Connections</td>
</tr>
<tr>
<td>ME</td>
<td>Mental Mathematics and Estimation</td>
</tr>
<tr>
<td>R</td>
<td>Reasoning</td>
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<tr>
<td>T</td>
<td>Technology</td>
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<tr>
<td>V</td>
<td>Visualization</td>
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</table>

### Curriculum Outcomes

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<tr>
<th>STRAND</th>
<th>OUTCOME</th>
<th>PROCESS STANDARDS</th>
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<tbody>
<tr>
<td>Shape and Space (3-D Objects and 2-D Shapes)</td>
<td>SS5 Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are: parallel, intersecting, perpendicular, vertical, horizontal</td>
<td>(C, CN, R, T, V)</td>
</tr>
<tr>
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<tr>
<td>Shape and Space (3-D Objects and 2-D Shapes)</td>
<td>SS6 Identify and sort quadrilaterals, including: Rectangles, Squares, Trapezoids, Parallelograms, Rhombuses according to their attributes.</td>
<td>(C, R, V)</td>
</tr>
</tbody>
</table>
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

5SS5 Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are:

- parallel
- intersecting
- perpendicular
- vertical
- horizontal

(C,CN, R, T, V)

Achievement Indicator:

5SS5.3 Identify parallel, intersecting, perpendicular, vertical and horizontal sides on 2-D shapes.

Elaborations—Strategies for Learning and Teaching

Students should recognize the connections between different shapes, the effects of changing dimension of shapes and the distinguishing and similar characteristics of different shapes. These understandings lay a strong foundation for learning a variety of mathematical concepts.

These indicators overlap and one activity may cover several indicators. This indicator can be introduced by discussing the definitions and identifying examples in the classroom.

Notes: Lines in the same plane can be parallel or they can intersect. Parallel lines never meet since they remain a constant distance apart. Whenever two lines intersect, they meet at a single point. Perpendicular lines are intersecting lines that meet or cross at a right angle (a square corner or 90 degrees).

To develop the concepts of vertical and horizontal, have students identify examples in and outside the classroom. To get started, they could consider the horizon. Which way is the horizon? Up and down or left to right?

Students may need guided exploration to learn about these different lines.

Using pattern blocks, ask students to categorize sets of lines as parallel, intersecting, perpendicular, vertical or horizontal.
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><strong>Performance</strong></td>
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</tr>
<tr>
<td>• Have students search through newspapers, magazines, etc. to find examples of vertical and horizontal lines. (5SS5.3)</td>
<td><em>Math Focus 5</em></td>
</tr>
<tr>
<td>• Place the students in groups of four to six. Have them form a shape based on your given properties (e.g., four sides equal and all angles are right angles). The first group to correctly form and identify the shape are the winners. (5SS5.3)</td>
<td>Getting started: Matching Nets with 3-D objects</td>
</tr>
<tr>
<td><strong>Student-Teacher Dialogue</strong></td>
<td></td>
</tr>
<tr>
<td>• Have 2-D shapes and 3-D shapes prepared on flash cards. Show the student a flash card and ask the student to identify horizontal and vertical lines. (5SS5.3, 5SS5.1)</td>
<td>Lessons 1: Vertical and Horizontal Lines and Faces</td>
</tr>
<tr>
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<td>TR pp. 13 - 17</td>
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<td></td>
<td>Lesson 2: Parallel, Intersecting, and Perpendicular Lines and Faces</td>
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<tr>
<td></td>
<td>TR pp. 18 - 21</td>
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</tbody>
</table>
2-D AND 3-D GEOMETRY

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

Outcomes

Students will be expected to

5SS5 Continued

Achievement Indicator:

5SS5.1 Identify parallel, intersecting, perpendicular, vertical and horizontal edges and faces on 3-D objects.

Elaborations—Strategies for Learning and Teaching

Students have been introduced to the concept of edges and faces in the primary grades.

Note: Faces are the flat surfaces of a 3-D object. Edges are where two faces meet or intersect. Adjacent faces of a cube are perpendicular and opposite faces are parallel.

Have students, working in small groups, stack pattern blocks to build prisms like the sample below which used triangle and trapezoid pattern blocks. Pattern blocks will form triangular prisms, rectangular prisms, trapezoidal prisms, rhombus prism, and an hexagonal prism.

Prepare questions such as:
- Which solid has the most parallel faces?
- Which solid has the least number of edges?
- Which solid has only two parallel faces?
- Which solids have eight intersecting edges?
- Which solid has four sets of parallel faces?
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**
- Using a variety of geometric solids, have students identify parallel, intersecting, and perpendicular edges. (5SS5.1)

**Performance**
- While students are performing the stacking activity described on the previous page, circulate and look for evidence that they are able to correctly perform the task. (5SS5.1)

- Have students construct 3-D shapes using popsicle sticks and glue and have them paint them different colors according to any given properties. (5SS5.1)

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Resources/Notes

**Math Focus 5**

Lessons 1 (Continued): Vertical and Horizontal Lines and Faces.
5SS5 (5.9)
TR pp. 13 - 17

Lesson 2 (Continued): Parallel, Intersecting, and Perpendicular Lines and Faces
5SS5 (5.9)
TR pp. 18 - 21
Strand: Shape and Space (3-D Objects and 2-D Shapes)

**Outcomes**

Students will be expected to

5SS5 Continued

**Elaborations—Strategies for Learning and Teaching**

This indicator can be addressed in conjunction with SS5.3 by asking students to explain their reasoning in the activity in SS5.3.

Have students pair up to play a shape-describing game. Partner A draws a 2-D shape that Partner B cannot see and describes it to Partner B using appropriate vocabulary (parallel, intersecting, perpendicular, vertical or horizontal lines). Partner B responds by drawing a shape with these criteria, and may ask questions as he or she attempts to draw. When Partner B is finished, Partner B will verify the shape with Partner A. Partners switch roles. (BC Math K to 7…)

As students play the shape-describing game, notice whether or not a student is able to use the vocabulary to describe a shape's attributes.

Have students conduct self-assessment in pairs. Partners reflect on how they did on the task, with reference to questions such as the following:

- How well did you work together as a team?
- How did you deal with disagreements?
- What did you enjoy about this collaborative activity?
- What were the challenges faced? (BC Math K to 7…)

Students may need to be reminded to always use a ruler when drawing straight lines.

To draw a 2-D shape with parallel lines students can use their rulers to measure equal distances between lines. For perpendicular lines, remind students they are drawing a square corner, (i.e. a 90 degree angle). A simple index card can be used to draw perpendicular lines, (right angles), to compare side lengths and to draw straight lines.

This can be modelled on the overhead or whiteboard.

Achievement Indicators:

5SS5.6 Draw 2-D shapes that have sides that are parallel, intersecting, perpendicular, vertical or horizontal.

5SS5.9 Describe the sides of a given 2-D shape, using terms such as parallel, intersecting, perpendicular, vertical or horizontal.
## Suggested Assessment Strategies

**Paper and Pencil**

- Provide student with a variety of 2-D shapes.
  
  1. Have them identify the following lines using color;  
     
     For example, color parallel lines red, intersecting line blue,  
     perpendicular lines green, etc.  
     
     2. Explain why their choices.  

- Draw separate 2-D figures for each of the following:
  
  a. one set of parallel sides,  
  b. two sets of parallel sides,  
  c. no parallel sides  
  d. adjacent sides perpendicular  
  e. adjacent sides perpendicular  
  f. vertical and horizontal lines  

**Journal**

- Have students create a “Who Am I” math journal entry. The  
  students describes a 2-D by its attributes and challenges other  
  students to identify the shape being described.  
  
  Note: When reviewing student journal entries notice the extent to  
  which students used the vocabulary to explain the task  

### Resources/Notes

**Math Focus 5**

- Lessons 1 (Continued): Vertical and Horizontal Lines and Faces  
  5SS5 (5.9)  
  TR pp. 13 - 17  

- Lesson 2 (Continued): Parallel, Intersecting, and Perpendicular  
  Lines and Faces  
  5SS5 (5.9)  
  TR pp. 18 - 21
Strand: Shape and Space (3-D Objects and 2-D Shapes)

### Outcomes

Students will be expected to

5SS5 Continued

### Elaborations—Strategies for Learning and Teaching

Hold up a cereal box (rectangular prism). Have students identify the faces and edges. Lead discussion that will have students describe edges and faces in terms of parallel, intersecting, perpendicular, vertical and horizontal. Record student responses on a chart for future reference.

Have students work in pairs. One student chooses a geometric solid and describes it according to its attributes. The second student then tries to identify the solid. Once the solid is identified, students switch roles.

Activities related to 3-D may focus on but are not limited to rectangular and triangular prisms which were explored in grade four. Teachers may include pyramids to let students see that not all solids have parallel sides. This activity can include other prisms, for example, hexagonal or octagonal.

Prisms, by definition, have two congruent parallel faces made of polygons called bases with lines joining corresponding points on the two bases. These lines are always parallel and are called edges.

Drawing 3-D shapes:

This activity will be new to students and may need to be addressed as a separate “mini” lesson.

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Draw two congruent polygons (triangles or rectangles) slightly staggered vertically.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Join corresponding vertices with parallel lines</td>
</tr>
<tr>
<td>Step 3</td>
<td>Erase “unseen” lines and replace with dotted lines</td>
</tr>
</tbody>
</table>

---

5SS5.8 Describe the faces and edges of a given 3-D object, using terms such as parallel, intersecting, perpendicular, vertical or horizontal.

5SS5.7 Draw 3-D objects that have edges and faces that are parallel, intersecting, perpendicular, vertical or horizontal.
### General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

### Suggested Assessment Strategies

#### Paper and Pencil

- Have a variety of 3-D objects for students to use and drawing templates to record their findings. In a set of prisms have students shade in:
  - **a.** set of parallel faces
  - **b.** set of perpendicular faces
  - **c.** set of intersecting faces

In a set of prisms have students color:

  - **a.** horizontal lines red
  - **b.** vertical lines blue
  - **c.** set of parallel lines yellow
  - **d.** set of interesting lines green
  - **e.** set of perpendicular lines orange

Ask them to explain their reasoning, orally or in writing.

(5SS5.1, 5SS5.8)

- Using a display of geometric solids as a guide, have students draw a 3-D object such as a rectangular and triangular prisms. (5SS5.7)

#### Performance

- Have students create a glossary (in comic strip/dictionary) to define these words: parallel, intersecting, perpendicular, vertical, and horizontal. (Using 2-D and 3-D objects).

Work with students to establish criteria for a good glossary, such as clear definition using mathematical language, examples from the real world and accurate illustrations.

#### Journal

- Have students work in pairs. One student selects a geometric solid. The other student tries to identify the solid by asking “yes” or “no” questions. Once the solid is identified, they switch roles.

Have students use their math journals to record their reflections by answering the following guiding questions:

  - How well did you and your partner work together?
  - What did you enjoy about this activity?
  - What were the difficulties?
  - How does working with partners help learning?
  - Were you usually successful in identifying the solid? Why or why not?

(Students will need more practice drawing than text references)

### Resources/Notes

- **Math Focus 5**
  - Lessons 1 (Continued): Vertical and Horizontal Lines and Faces.
  - 5SS5 (5.9)
  - TR pp. 13 - 17

- **Lesson 2 (Continued): Parallel, Intersecting, and Perpendicular Lines and Faces**
  - 5SS5 (5.9)
  - TR pp. 18 - 21
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

5SS5 Continued

Achievement Indicators:

5SS5.4 Provide examples from the environment that show parallel, intersecting, perpendicular, vertical and horizontal line segments.

5SS5.5 Find examples of edges, faces and sides that are parallel, intersecting, perpendicular, vertical and horizontal in print and electronic media such as newspapers, magazines and the Internet.

5SS5.2 Identify that perpendicular lines meet to form 90 degree angles.

Elaborations—Strategies for Learning and Teaching

To provide examples from the environment that show parallel, intersecting, perpendicular, vertical and horizontal line segments, consider going on a walk to explore the different shapes and lines around your community. It is important that students record their observations.

Provide students with magazines, newspapers, photographs and pre-selected internet sites and have them find parallel, intersecting, perpendicular, and vertical and horizontal lines. Using a chart with each of the concepts as a heading may simplify the activity.

This indicator will be addressed as part of the study of perpendicular lines in SS1.3. Students have not being formally introduced to angles in previous grades. Measuring angles with a protractor will be addressed in grade six.
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

- Ask students to share examples of each type of line that they may see in their environment. (5SS5.4)

- Ask: Given sets of pairs of lines have students indicate which of the lines below intersect at 90 degrees? (5SS5.2)

Performance

- You could integrate technology here by having students prepare a Power Point slideshow using photographs of shapes and lines observed around their community. (5SS5.4)

- Students can create a collage of 3-D and 2-D objects with parallel, intersecting, perpendicular, vertical and horizontal edges, faces and sides. (5SS5.5)

- Again, students could use Power Point to present a slideshow of items found on the internet to display each of the examples listed in the indicator. (5SS5.5)

Journal

- Use the following writing prompt for a journal entry: “Shapes and Lines in my World”. (5SS5.4)

Resources/Notes

Math Focus 5
Lesson 3: Finding Lines and Faces in the Media
5SS5 (5.4, 5.5)
TR pp. 22 - 24

No reference in the text to this indicator (5SS5.2)

Math Game:
TR pp. 25 - 26
Shape Eliminator
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

5SS6 Identify and sort quadrilaterals, including:
- rectangles
- squares
- trapezoids
- parallelograms
- rhombuses

according to their attributes.

(C, R, V)

Achievement Indicators:

5SS6.1 Identify and describe the characteristics of a pre-sorted set of quadrilaterals.

Elaborations—Strategies for Learning and Teaching

Quadrilaterals are four-sided polygons. Although rectangles are the most common quadrilaterals that you see in everyday life, students will soon discover that there are many classes of quadrilaterals. The quadrilateral family includes squares, rectangles, rhombuses, parallelograms, kites, and trapezoids, along with other four sided regular and non-regular shapes.

- All quadrilaterals are polygons with four straight sides and four vertices (four angles).
- Every quadrilateral has two diagonals.
- Because a diagonal divides a quadrilateral into two triangles, the sum of the angles in a quadrilateral is always 180 + 180 or 360.

<table>
<thead>
<tr>
<th>Quadrilateral</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallelogram</td>
<td>A quadrilateral with two pairs of parallel sides</td>
</tr>
<tr>
<td>Rectangle</td>
<td>A parallelogram with all sides equal in length</td>
</tr>
<tr>
<td>Rhombus</td>
<td>A parallelogram with four right angles</td>
</tr>
<tr>
<td>Trapezoid</td>
<td>A rectangle with all sides equal in length</td>
</tr>
<tr>
<td>Kite</td>
<td>A quadrilateral with one pair of parallel sides. If two sides are equal, it is an isosceles trapezoid.</td>
</tr>
<tr>
<td></td>
<td>A quadrilateral with two pairs of equal adjacent sides.</td>
</tr>
</tbody>
</table>

Some quadrilaterals do not fit into any of the above listed classifications. E.g.,
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**

- Draw various quadrilaterals, one on each sticky label. Place one label on the back of a student, with the student facing you. Present the following problem to the student.

  **Problem:** Identify the shape on your back by asking the teacher four attribute questions about the shape.

  The questions must have a “yes” or “no” answer.

  There are four possible answers to a question:

  - yes
  - no
  - I don't understand. Please ask it another way.
  - I don't know how to answer that.

  Teachers would determine the number of questions needed to verify the students understanding. (5SS6.1, 5SS6.3, 5SS6.4)

**Performance**

- The above activity could be conducted as a class activity with groups of students. Each student has a shape on his back and asks several students a question to determine the shape. (5SS6.1, 5SS6.3, 5SS6.4)

**Additional Resources:**

- **Math Focus 5**
  - **Lesson 4: Sorting Quadrilaterals**
  - 5SS5 (5.3, 5.6, 5.9)
  - 5SS6 (6.1, 6.2, 6.3, 6.4)
  - TR pp. 31 - 35

- Teaching Student-Centered Mathematics
  - Grades 3 - 5
  - John A Van De Walle; Louanne H. Lovin
Students will be expected to

SS6 Continued

Achievement Indicators:

5SS6.1 Continued

The Mystery Definition Approach (Van de Walle).

Use the overhead or chalkboard to conduct the following activity.

Students are presented with the following diagram:

Students are asked to identify a property that is characteristic of all members of the first set, but not characteristic of any members of the second set. Once they have identified the property (i.e. all sides are equal) they must select shapes from the third set that have that characteristic. Rather than verbalize the choice of shapes in the third set, students should write an explanation for their choice.

Variations of the Mystery Definition activity may include any of the following:

All of these have something in common

(All four sides equal)
(All angles perpendicular)
(Opposite sides equal)
(One pair of opposite sides parallel)
(Adjacent sides equal)
(Four right angles, opposite sides equal) etc.

None of these have it.

Various non-examples

Which of these have it?

Various examples

Continued
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

Paper and Pencil

- Provide the students with a template for the Frayer Model and have them fill in the sections individually to demonstrate their understanding of a geometric concept such as a rhombus. (5SS6.1)

See the sample below:

![Frayer Model Example](image)

Math Focus 5

Lesson 4 (Continued): Sorting Quadrilaterals

5SS5 (5.3, 5.6, 5.9)

5SS6 (6.1, 6.2, 6.3, 6.4)

TR pp. 31 - 35

Math Game:

TR pp. 25 - 26

Shape Eliminator

Additional Resources:

Teaching Student –Centered Mathematics

Grades 3 - 5

John A Van De Walle; Louanne H. Lovin
Strand: Shape and Space (3-D Objects and 2-D Shapes)

Outcomes

Students will be expected to

SS6 Continued

Achievement Indicators:

5SS6.1 Continued

5SS6.2 Sort a given set of quadrilaterals, and explain the sorting rule

5SS6.3 Sort a given set of quadrilaterals according to the lengths of the sides.

5SS6.4 Sort a given set of quadrilaterals according to whether or not opposite sides are parallel.

Elaborations—Strategies for Learning and Teaching

The value of the Mystery Definition Approach is that students develop their own definitions based on their own experiences. The official or formal definition can be presented after students have developed a conceptual understanding of the quadrilateral property(s) being explored.

Provide students with a set of quadrilaterals. Sort them into groups and describe their sorting rule. Have them sort the shapes a different way and describe their sorting rule.

Provide students with an assortment of quadrilaterals, have them sort them according to different categories of properties such as:

- Opposite sides equal;
- All sides equal;
- No sides equal;

Label each group according to the common attributes.

Provide students with an assortment of quadrilaterals, have them sort them according to:

- two pairs of opposite sides parallel
- one pair of opposite sides parallel
- no sides parallel.
- label each group according to the common attributes.
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
- Prepare a number of “Flash Cards” listing quadrilateral properties. Have students identify the quadrilateral given the properties. Cards could include such things as:
  - A 2-D shape with four straight sides of equal length and four right-angles.
  - A 2-D shape with four straight sides and four right-angles. One pair of sides is longer than the other.
  - A 2-D shape with four straight sides. One pair of sides is parallel with one side longer than the other.
  
  …and so on (5SS6.1)

Paper and Pencil
- What rule did Ray use to sort the shapes above into two groups?
  Use the sets below to answer the question. (5SS6.1)

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Student Teacher dialogue
- Have a set of quadrilaterals for students to manipulate. Ask them to sort them and to explain the sorting rule they used. Perform the task again using a different sorting rule. (5SS6.2)

Resources/Notes

Math Focus 5
Lesson 4 (Continued): Sorting Quadrilaterals
5SS5 (5.3, 5.6, 5.9)
5SS6 (6.1, 6.2, 6.3, 6.4)
TR pp. 31 - 35
## Strand: Shape and Space (3-D Objects and 2-D Shapes)

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Elaborations—Strategies for Learning and Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be expected to</td>
<td></td>
</tr>
<tr>
<td>SS6 Continued</td>
<td></td>
</tr>
</tbody>
</table>

**Achievement Indicators:**

- 5SS 6.2 Continued
- 5SS 6.3 Continued
- 5SS 6.4 Continued
General Outcome: Describe the Characteristic of 3-D Objects and 2-D Shapes and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Given the students the following sets of quadrilaterals:

![Group A](Note: rule \(\rightarrow\) opposite sides are equal)

![Group B](Note: rule \(\rightarrow\) all sides equal)

Ask: Write a sorting rule based on the lengths of the sides. (i.e. all sides equal, opposite sides equal, adjacent sides equal or no sides equal, etc.). (5SS6.3)

- Given the students the following sets of quadrilaterals:

![Group A](Rule: Opposite Sides Parallel)

![Group B](Rule: Opposite side NOT parallel)

Ask: Write a sorting rule based whether or not opposite sides are parallel. (5SS6.4)

Resources/Notes

Math Focus 5
Lesson 4 (Continued): Sorting Quadrilaterals
5SS5 (5.3, 5.6, 5.9)
5SS6 (6.1, 6.2, 6.3, 6.4)
TR pp. 31 - 35

Lesson 5: Solving Problems by Drawing Diagrams
5SS6 (6.2, 6.3, 6.4)
TR pp. 36 - 37
Students will apply the skills and concepts learned in the previous units to solve problems involving quadrilaterals. Students are encouraged to draw diagrams to solve the problems.

End of chapter material and unit assessment - be selective.
Appendix A
Outcomes by Strand
(with page references)
<table>
<thead>
<tr>
<th>Strand: Number</th>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Outcomes</td>
<td>Achievement Indicators</td>
</tr>
</tbody>
</table>
| *It is expected that students will:* | *The following set of indicators help determine whether students have met the corresponding specific outcome:*

### 5N1 Represent and describe whole numbers to 1,000,000.
**[C, CN, V, T]**
* p. 34, 40

- **5N1.1** Write a given numeral, using proper spacing without commas; e.g., 934,567.
- **5N1.2** Write a given numeral to 1,000,000 in words.
- **5N1.3** Describe the pattern of adjacent place positions moving from right to left.
- **5N1.4** Describe the meaning of each digit in a given numeral.
- **5N1.5** Provide examples of large numbers used in print or electronic media.
- **5N1.6** Express a given numeral in expanded notation; e.g., 45,321 = (4 × 10,000) + (5 × 1,000) + (3 × 100) + (2 × 10) + (1 × 1) or 40,000 + 5,000 + 300 + 20 + 1.
- **5N1.7** Write the numeral represented by a given expanded notation.

### 5N2 Use estimation strategies, including:
- **front-end rounding**
- **compensation**
- **compatible numbers**
in problem-solving contexts.
**[C, CN, ME, PS, R, V]**
* pp. 40, 52, 62, 70, 124, 210

- **5N2.1** Provide a context for when estimation is used to:
  - make predictions
  - check the reasonableness of an answer
  - determine approximate answers.
- **5N2.2** Describe contexts in which overestimating is important.
- **5N2.3** Determine the approximate solution to a given problem not requiring an exact answer.
- **5N2.4** Estimate a sum or product, using compatible numbers.
- **5N2.5** Estimate the solution to a given problem, using compensation, and explain the reason for compensation.
- **5N2.6** Select and use an estimation strategy for a given problem.
- **5N2.7** Apply front-end rounding to estimate:
  - sums; e.g., 253 + 615 is more than 200 + 600 = 800
  - differences; e.g., 974 – 250 is close to 900 – 200 = 700
  - products; e.g., the product of 23 × 24 is greater than 20 × 20 (400) and less than 25 × 25 (625)
  - quotients; e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200).
## Strand: Number

### General Outcome: Develop number sense

**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:

#### 5N3 Apply mental mathematics strategies and number properties, such as:

- skip counting from a known fact
- using doubling or halving
- using patterns in the 9s facts
- using repeated doubling or halving

**To determine, with fluency, answers for basic multiplication facts to 81 and related division facts.**

- \[ C, CN, ME, R, V \]
- *p. 114, 204*

**Achievement Indicators**

5N3.1 Describe the mental mathematics strategy used to determine a given basic fact, such as:

- skip count up by one or two groups from a known fact; e.g., if \( 5 \times 7 = 35 \), then \( 6 \times 7 = 35 + 7 \) and \( 7 \times 7 = 35 + 7 + 7 \)
- skip count down by one or two groups from a known fact; e.g., if \( 8 \times 8 = 64 \), then \( 7 \times 8 = 64 – 8 \) and \( 6 \times 8 = 64 – 8 – 8 \)
- doubling; e.g., for \( 8 \times 3 \) think \( 4 \times 3 = 12 \), and \( 8 \times 3 = 12 + 12 \)
- patterns when multiplying by 9; The sum of the two digits in the product is always 9. E.g. for \( 7 \times 9 \), think: 1 less than 7 is 6, 6 and 3 make 9, so the answer is 63.
- repeated doubling; e.g., if \( 2 \times 6 \) is equal to 12, then \( 4 \times 6 \) is equal to 24 and \( 8 \times 6 \) is equal to 48
- repeated halving; e.g., for \( 60 \div 4 \), think \( 60 \div 2 = 30 \) and \( 30 \div 2 = 15 \).

5N3.2 Explain why multiplying by zero produces a product of zero.

5N3.3 Explain why division by zero is not possible or is undefined; e.g., \( 8 \div 0 \).

5N3.4 Determine, with confidence, answers to multiplication facts to 81 and related division facts.

#### 5N4 Apply mental mathematics strategies for multiplication, such as:

- annexing then adding zero
- halving and doubling
- using the distributive property.

**To determine, with fluency, answers for basic multiplication facts to 81 and related division facts.**

- \[ C, ME, R \]
- *p. 120*

**Achievement Indicators**

5N4.1 Determine the products when one factor is a multiple of 10, 100 or 1000 by annexing zero or adding zeros; e.g., for \( 3 \times 200 \) think \( 3 \times 2 \) and then add two zeros.

5N4.2 Apply halving and doubling when determining a given product; e.g., \( 32 \times 5 \) is the same as \( 16 \times 10 \).

5N4.3 Apply the distributive property to determine a given product involving multiplying factors that are close to multiples of 10; e.g., \( 98 \times 7 = (100 \times 7) – (2 \times 7) \).

#### 5N5 Demonstrate, with and without concrete materials, an understanding of multiplication (2 digit by 2-digit) to solve problems.

**To determine, with fluency, answers for basic multiplication facts to 81 and related division facts.**

- \[ C, CN, PS, V \]
- *p. 128*

**Achievement Indicators**

5N5.1 Illustrate partial products in expanded notation for both factors; e.g., for \( 36 \times 42 \), determine the partial products for \( (30 + 6) \times (40 + 2) \).

5N5.2 Represent both 2-digit factors in expanded notation to illustrate the distributive property; e.g., to determine the partial products of \( 36 \times 42 \),

\[
(30 + 6) \times (40 + 2) = 30 \times 40 + 30 \times 2 + 6 \times 40 + 6 \times 2 = 1200 + 60 + 240 + 12 = 1512.
\]

5N5.3 Model the steps for multiplying 2-digit factors, using an array and base ten blocks, and record the process symbolically.

5N5.4 Describe a solution procedure for determining the product of two given 2-digit factors, using a pictorial representation such as an area model.

5N5.5 Solve a given multiplication problem in context, using personal strategies, and record the process.

5N5.6 Refine personal strategies to increase their efficiency.

5N5.7 Create and solve a multiplication problem, and record the process.
<table>
<thead>
<tr>
<th>Strand: Number</th>
<th>General Outcome: Develop number sense</th>
</tr>
</thead>
<tbody>
<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>5N6 Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit), and interpret remainders to solve problems. [C, CN, ME, PS, R, V] pp. 208, 214</td>
<td>5N6.1 Model the division process as equal sharing, using base ten blocks, and record it symbolically.</td>
</tr>
<tr>
<td></td>
<td>5N6.2 Explain that the interpretation of a remainder depends on the context:</td>
</tr>
<tr>
<td></td>
<td>• ignore the remainder; e.g., making teams of 4 from 22 people</td>
</tr>
<tr>
<td></td>
<td>• round up the quotient; e.g., the number of five passenger cars required to transport 13 people</td>
</tr>
<tr>
<td></td>
<td>• express remainders as fractions; e.g., five apples shared by two people</td>
</tr>
<tr>
<td></td>
<td>• express remainders as decimals; e.g., measurement and money.</td>
</tr>
<tr>
<td></td>
<td>5N6.3 Solve a given division problem in context, using personal strategies, and record the process.</td>
</tr>
<tr>
<td></td>
<td>5N6.4 Refine personal strategies to increase their efficiency.</td>
</tr>
<tr>
<td></td>
<td>5N6.5 Create and solve a division problem, and record the process.</td>
</tr>
<tr>
<td>5N7 Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to: • create sets of equivalent fractions • compare fractions with like and unlike denominators. [C, CN, PS, R, V] p. 156</td>
<td>5N7.1 Create a set of equivalent fractions; and explain, using concrete materials, why there are many equivalent fractions for any given fraction.</td>
</tr>
<tr>
<td></td>
<td>5N7.2 Model and explain that equivalent fractions represent the same quantity.</td>
</tr>
<tr>
<td></td>
<td>5N7.3 Determine if two given fractions are equivalent, using concrete materials or pictorial representations.</td>
</tr>
<tr>
<td></td>
<td>5N7.4 Formulate and verify a rule for developing a set of equivalent fractions.</td>
</tr>
<tr>
<td></td>
<td>5N7.5 Identify equivalent fractions for a given fraction.</td>
</tr>
<tr>
<td></td>
<td>5N7.6 Compare two given fractions with unlike denominators by creating equivalent fractions.</td>
</tr>
<tr>
<td></td>
<td>5N7.7 Position a given set of fractions with like and unlike denominators on a number line (horizontal or vertical), and explain strategies used to determine the order.</td>
</tr>
<tr>
<td>5N8 Describe and represent decimals (tenths, hundredths, thousandths) concretely, pictorially and symbolically. [C, CN, R, V] pp. 42, 50</td>
<td>5N8.1 Write the decimal for a given concrete or pictorial representation of part of a set, part of a region or part of a unit of measure.</td>
</tr>
<tr>
<td></td>
<td>5N8.2 Represent a given decimal, using concrete materials or a pictorial representation.</td>
</tr>
<tr>
<td></td>
<td>5N8.3 Represent an equivalent tenth, hundredth or thousandth for a given decimal, using a grid.</td>
</tr>
<tr>
<td></td>
<td>5N8.4 Express a given tenth as an equivalent hundredth and thousandth.</td>
</tr>
<tr>
<td></td>
<td>5N8.5 Express a given hundredth as an equivalent thousandth.</td>
</tr>
<tr>
<td></td>
<td>5N8.6 Describe the value of each digit in a given decimal.</td>
</tr>
<tr>
<td>Strand: Number</td>
<td>General Outcome: Develop number sense</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Achievement Indicators</strong></td>
</tr>
<tr>
<td><em>It is expected that students will:</em></td>
<td><em>The following set of indicators help determine whether students have met the corresponding specific outcome:</em></td>
</tr>
</tbody>
</table>
5N9.2 Write a given fraction with a denominator of 10, 100 or 1000 as a decimal.  
5N9.3 Express a given pictorial or concrete representation as a fraction or decimal; e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250 or \( \frac{250}{1000} \). |
| 5N10 Compare and order decimals (to thousandths) by using: * benchmarks  
* place value  
* equivalent decimals. [ CN, R, V] pp. 52, 172 | 5N10.1 Order a given set of decimals by placing them on a number line (vertical or horizontal) that contains the benchmarks 0.0, 0.5 and 1.0.  
5N10.2 Order a given set of decimals including only tenths, using place value.  
5N10.3 Order a given set of decimals including only hundredths, using place value.  
5N10.4 Order a given set of decimals including only thousandths, using place value.  
5N10.5 Explain what is the same and what is different about 0.2, 0.20 and 0.200.  
5N10.6 Order a given set of decimals including tenths, hundredths and thousandths, using equivalent decimals; e.g., 0.92, 0.7, 0.9, 0.876, 0.925 in order is: 0.700, 0.876, 0.900, 0.920, 0.925 |
| 5N11 Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths). [C, CN, PS, R, V] pp. 68, 70 | 5N11.1 Place the decimal point in a sum or difference, using front-end estimation; e.g., for 6.3 + 0.25 + 306.158, think 6 + 306, so the sum is greater than 312.  
5N11.2 Correct errors of decimal point placements in sums and differences without using paper and pencil.  
5N11.3 Explain why keeping track of place value positions is important when adding and subtracting decimals.  
5N11.4 Predict sums and differences of decimals, using estimation strategies.  
5N11.5 Create and solve problems that involve addition and subtraction of decimals, limited to thousandths. |
<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>Achievement Indicators</th>
</tr>
</thead>
</table>
| **5PR1** Determine the pattern rule to make predictions about subsequent elements. [C, CN, PS, R, V] *p. 138* | **5PR1.1** Extend a given pattern with and without concrete materials, and explain how each element differs from the preceding one.  
**5PR1.2** Describe, orally or in writing, a given pattern, using mathematical language, such as one more, one less, five more.  
**5PR1.3** Write a mathematical expression to represent a given pattern, such as: \( r + 1, r - 1, r + 5 \).  
**5PR1.4** Describe the relationship in a given table or chart, using a mathematical expression.  
**5PR1.5** Determine and explain why a given number is or is not the next element in a pattern.  
**5PR1.6** Predict subsequent elements in a given pattern.  
**5PR1.7** Solve a given problem by using a pattern rule to determine subsequent elements.  
**5PR1.8** Represent a given pattern visually to verify predictions. |
### Strand: Patterns and Relations
(Variables and Equations)

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Represent algebraic expressions in multiple ways.</th>
<th>Achievement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5PR2</strong></td>
<td>Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions.</td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome:</td>
</tr>
<tr>
<td></td>
<td>It is expected that students will:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>5PR2.1</strong> Express a given problem as an equation where the unknown is represented by a letter variable.</td>
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<tr>
<td></td>
<td><strong>5PR2.2</strong> Solve a given single-variable equation with the unknown in any of the terms; e.g., ( n + 2 = 5 ), ( 4 + a = 7 ), ( 6 = r - 2 ), ( 10 = 2c ).</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>5PR2.3</strong> Identify the unknown in a problem; represent the problem with an equation; and solve the problem concretely, pictorially or symbolically.</td>
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<tr>
<td></td>
<td><strong>5PR2.4</strong> Create a problem for a given equation.</td>
<td></td>
</tr>
</tbody>
</table>

[C, CN, PS, R] p. 148
### Strand: Shape and Space (Measurement)

**General Outcome:** Use direct or indirect measurement to solve problems.

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>Achievement Indicators</th>
</tr>
</thead>
</table>
| **5SS1** Design and construct different rectangles, given either perimeter or area, or both (whole numbers), and draw conclusions. [C, CN, PS, R, V] *p. 186* | 5SS1.1 Construct or draw two or more rectangles for a given perimeter in a problem-solving context.  
5SS1.2 Construct or draw two or more rectangles for a given area in a problem-solving context.  
5SS1.3 Illustrate that for any given perimeter, the square or shape closest to a square will result in the greatest area.  
5SS1.4 Illustrate that for any given perimeter, the rectangle with the smallest possible width will result in the least area.  
5SS1.5 Provide a real-life context for when it is important to consider the relationship between area and perimeter. |
| **5SS2** Demonstrate an understanding of measuring length (mm and km) by:  
- selecting and justifying referents for the unit mm  
- modelling and describing the relationship between mm and cm units, and between mm and m units.  
- selecting and justifying referents for the unit km.  
- modelling and describing the relationship between m and km units. [C, CN, ME, PS, R, V] *p. 180* | 5SS2.1 Provide a referent for one millimetre, and explain the choice.  
5SS2.2 Provide a referent for one centimetre, and explain the choice.  
5SS2.3 Provide a referent for one metre, and explain the choice.  
5SS2.4 Provide a referent for one kilometre, and explain the choice.  
5SS2.5 Show that 10 millimetres is equivalent to 1 centimetre, using concrete materials; e.g., a ruler.  
5SS2.6 Show that 1000 millimetres is equivalent to 1 metre, using concrete materials; e.g., a metre stick.  
5SS2.7 Know that 1000 metres is equivalent to 1 kilometre.  
5SS2.8 Provide examples of when millimetres are used as the unit of measure.  
5SS2.9 Provide examples of when kilometres are used as the unit of measure.  
5SS2.10 Relate millimetres, centimetres, metres and kilometres. |
| **5SS3** Demonstrate an understanding of volume by:  
- selecting and justifying referents for cm$^3$ or m$^3$ units  
- estimating volume, using referents for cm$^3$ or m$^3$  
- measuring and recording volume (cm$^3$ or m$^3$)  
- constructing right rectangular prisms for a given volume. [C, CN, ME, PS, R, V] *p. 190* | 5SS3.1 Identify the cube as the most efficient unit for measuring volume, and explain why.  
5SS3.2 Provide a referent for a cubic centimetre, and explain the choice.  
5SS3.3 Provide a referent for a cubic metre, and explain the choice.  
5SS3.4 Determine which standard cubic unit is represented by a given referent.  
5SS3.5 Estimate the volume of a given 3-D object, using personal referents.  
5SS3.6 Determine the volume of a given 3-D object, using manipulatives, and explain the strategy.  
5SS3.7 Construct a right rectangular prism for a given volume.  
5SS3.8 Explain that many rectangular prisms are possible for a given volume by constructing more than one right rectangular prism for the same given volume. |
### Strand: Shape and Space (Measurement)

**General Outcome:** Use direct or indirect measurement to solve problems.

**Specific Outcomes**

*It is expected that students will:*

5SS4 Demonstrate an understanding of capacity by:
- describing the relationship between mL and L
- selecting and justifying referents for mL or L units
- estimating capacity, using referents for mL or L
- measuring and recording capacity (mL or L).

[C, CN, ME, PS, R, V] p. 196

**Achievement Indicators**

- 5SS4.1 Demonstrate that 1000 millilitres is equivalent to 1 litre by filling a 1 litre container using a combination of smaller containers.
- 5SS4.2 Relate mL and L in problem solving situations.
- 5SS4.3 Provide a referent for a litre, and explain the choice.
- 5SS4.4 Provide a referent for a millilitre, and explain the choice.
- 5SS4.5 Determine which capacity unit is represented by a given referent.
- 5SS4.6 Estimate the capacity of a given container, using personal referents.
- 5SS4.7 Determine the capacity of a given container, using materials that take the shape of the inside of the container (e.g., a liquid, rice, sand, beads), and explain the strategy.
**Strand:** Shape and Space  
(3-D Objects and 2-D Shapes)

<table>
<thead>
<tr>
<th>General Outcome:</th>
<th>Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Outcomes:</td>
<td>It is expected that students will:</td>
</tr>
<tr>
<td>Achievement Indicators:</td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome:</td>
</tr>
</tbody>
</table>

**5SS5** Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are:  
- parallel  
- intersecting  
- perpendicular  
- vertical  
- horizontal.  

[C, CN, R, T, V]  
p. 234

5SS5.1 Identify parallel, intersecting, perpendicular, vertical and horizontal edges and faces on 3-D objects.  
5SS5.2 Identify that perpendicular lines meet to form 90 degree angles.  
5SS5.3 Identify parallel, intersecting, perpendicular, vertical and horizontal sides on 2-D shapes.  
5SS5.4 Provide examples from the environment that show parallel, intersecting, perpendicular, vertical and horizontal line segments.  
5SS5.5 Find examples of edges, faces and sides that are parallel, intersecting, perpendicular, vertical and horizontal in print and electronic media, such as newspapers, magazines and the Internet.  
5SS5.6 Draw 2-D shapes that have sides that are parallel, intersecting, perpendicular, vertical or horizontal.  
5SS5.7 Draw 3-D objects that have edges and faces that are parallel, intersecting, perpendicular, vertical or horizontal.  
5SS5.8 Describe the faces and edges of a given 3-D object, using terms such as parallel, intersecting, perpendicular, vertical or horizontal.  
5SS5.9 Describe the sides of a given 2-D shape, using terms such as parallel, intersecting, perpendicular, vertical or horizontal.

**5SS6** Identify and sort quadrilaterals, including:  
- rectangles  
- squares  
- trapezoids  
- parallelograms  
- rhombuses (or rhombi) according to their attributes.  

[C, R, V]  
p. 244

5SS6.1 Identify and describe the characteristics of a pre-sorted set of quadrilaterals.  
5SS6.2 Sort a given set of quadrilaterals, and explain the sorting rule.  
5SS6.3 Sort a given set of quadrilaterals according to the lengths of the sides.  
5SS6.4 Sort a given set of quadrilaterals according to whether or not opposite sides are parallel.
**Strand:** Shape and Space  
(Translations)  

<table>
<thead>
<tr>
<th>Specific Outcomes</th>
<th>General Outcome: Describe and analyze position and motion of objects and shapes.</th>
<th>Achievement Indicators</th>
</tr>
</thead>
</table>
| **5SS7** Perform a single transformation (translation, rotation or reflection) of a 2-D shape, and draw and describe the image.  
[C, CN, T, V]  
*pp. 100, 102, 104* | It is expected that students will:  
| | The following set of indicators help determine whether students have met the corresponding specific outcome:  
| | 5SS7.1 Translate a given 2-D shape horizontally, vertically or diagonally, and draw and describe the position and orientation of the image.  
| | 5SS7.2 Rotate a given 2-D shape about a vertex, and describe the direction of rotation (clockwise or counter clockwise) and the fraction of the turn (limited to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or full turn).  
| | 5SS7.3 Reflect a given 2-D shape in a line of reflection, and describe the position and orientation of the image.  
| | 5SS7.4 Draw a 2-D shape, translate the shape, and record the translation by describing the direction and magnitude of the movement.  
| | 5SS7.5 Draw a 2-D shape, rotate the shape about a vertex, and describe the direction of the turn (clockwise or counter clockwise), the fraction of the turn (limited to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or full turn) and point of rotation.  
| | 5SS7.6 Draw a 2-D shape, reflect the shape, and identify the line of reflection and the distance of the image from the line of reflection.  
| | 5SS7.7 Predict the result of a single transformation of a 2-D shape, and verify the prediction.  
| **5SS8** Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes.  
[C, T, V]  
*pp. 100, 102, 108* | 5SS8.1 Provide an example of a translation about a vertex, a rotation and a reflection.  
| | 5SS8.2 Identify a given single transformation as a translation, rotation or reflection.  
| | 5SS8.3 Describe a given rotation about a vertex by the direction of the turn (clockwise or counter clockwise).  
| | 5SS8.4 Describe a given reflection by identifying the line of reflection and the distance of the image from the line of reflection.  
| | 5SS8.5 Describe a given translation by identifying the direction and magnitude of the movement.  

<table>
<thead>
<tr>
<th><strong>Strand:</strong> Statistics and Probability (Data Analysis)</th>
<th><strong>General Outcome:</strong> Collect, display and analyze data to solve problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Outcomes</strong></td>
<td><strong>Achievement Indicators</strong></td>
</tr>
<tr>
<td><em>It is expected that students will:</em></td>
<td>The following set of indicators help determine whether students have met the corresponding specific outcome:</td>
</tr>
<tr>
<td>5SP1 Differentiate between first-hand and second-hand data.</td>
<td>5SP1.1 Explain the difference between first-hand and second-hand data.</td>
</tr>
<tr>
<td>[C, R, T, V] p. 86</td>
<td>5SP1.2 Formulate a question that can best be answered using first-hand data, and explain why.</td>
</tr>
<tr>
<td></td>
<td>5SP1.3 Formulate a question that can best be answered using second-hand data, and explain why.</td>
</tr>
<tr>
<td></td>
<td>5SP1.4 Find examples of second-hand data in print and electronic media, such as newspapers, magazines and the Internet.</td>
</tr>
<tr>
<td>5SP2 Construct and interpret double bar graphs to draw conclusions.</td>
<td>5SP2.1 Determine the attributes (title, axes, intervals and legend) of double bar graphs by comparing a given set of double bar graphs.</td>
</tr>
<tr>
<td>[C, PS, R, T, V] p. 90</td>
<td>5SP2.2 Represent a given set of data by creating a double bar graph, label the title and axes, and create a legend without the use of technology.</td>
</tr>
<tr>
<td></td>
<td>5SP2.3 Draw conclusions from a given double bar graph to answer questions.</td>
</tr>
<tr>
<td></td>
<td>5SP2.4 Provide examples of double bar graphs used in a variety of print and electronic media, such as newspapers, magazines and the Internet.</td>
</tr>
<tr>
<td></td>
<td>5SP2.5 Solve a given problem by constructing and interpreting a double bar graph.</td>
</tr>
<tr>
<td>5SP3 Describe the likelihood of a single outcome occurring, using words such as:</td>
<td>5SP3.1 Provide examples of events, from personal contexts, that are impossible, possible or certain.</td>
</tr>
<tr>
<td>• impossible</td>
<td>5SP3.2 Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible or certain.</td>
</tr>
<tr>
<td>• possible</td>
<td>5SP3.3 Design and conduct a probability experiment in which the likelihood of a single outcome occurring is impossible, possible or certain.</td>
</tr>
<tr>
<td>• certain.</td>
<td>5SP3.4 Conduct a given probability experiment a number of times, record the outcomes, and explain the results.</td>
</tr>
<tr>
<td>[C, CN, PS, R] p. 224</td>
<td></td>
</tr>
<tr>
<td>5SP4 Compare the likelihood of two possible outcomes occurring, using words such as:</td>
<td>5SP4.1 Identify outcomes from a given probability experiment that are less likely, equally likely or more likely to occur than other outcomes.</td>
</tr>
<tr>
<td>• less likely</td>
<td>5SP4.2 Design and conduct a probability experiment in which one outcome is less likely to occur than the other outcome.</td>
</tr>
<tr>
<td>• equally likely</td>
<td>5SP4.3 Design and conduct a probability experiment in which one outcome is equally likely to occur as the other outcome.</td>
</tr>
<tr>
<td>• more likely</td>
<td>5SP4.4 Design and conduct a probability experiment in which one outcome is more likely to occur than the other outcome.</td>
</tr>
<tr>
<td>[C, CN, PS, R] p. 228</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES
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