Mathematics
Kindergarten

Curriculum Guide 2016

Education and Early Childhood Development

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INTRODUCTION

Background

The curriculum guide communicates high expectations for students.

The Mathematics curriculum guides for Newfoundland and Labrador have been derived from *The Common Curriculum Framework for K-9 Mathematics: Western and Northern Canadian Protocol*, 2006. These guides incorporate the conceptual framework for 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

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

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

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

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

PROGRAM DESIGN AND COMPONENTS

Affective Domain

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

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

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

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

Goals For Students

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

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

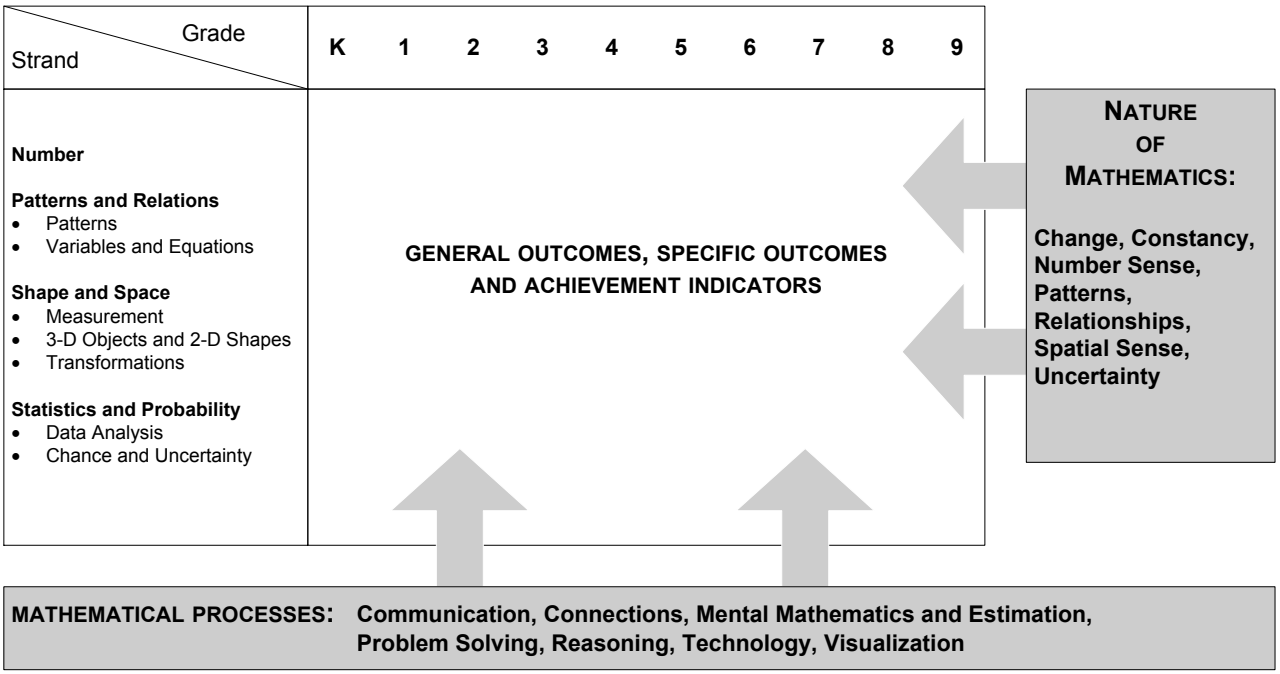
- use mathematics confidently to solve problems
- communicate and reason mathematically
- appreciate and value mathematics
- make connections between mathematics and its applications
- commit themselves to lifelong learning
- become mathematically literate adults, using mathematics to contribute to society.

Students who have met these goals will:

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

CONCEPTUAL FRAMEWORK FOR K - 9 MATHEMATICS

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



Mathematical Processes

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

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

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

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

Communication [C]

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

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

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

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

Connections [CN]

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

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

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

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

Mental Mathematics and Estimation [ME]

Mental mathematics and estimation are fundamental components of number sense.

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

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

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

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

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

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

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

Problem Solving [PS]

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

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

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

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

Reasoning [R]

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

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

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

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

Technology [T]

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

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Technology can be used to:

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

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

Visualization [V]

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

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

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

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

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

Nature of Mathematics

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

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

Change

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

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

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

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

(Steen, 1990, p. 184).

Constancy

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

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

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

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

Number Sense

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

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

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

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

Patterns

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

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

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

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

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

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

Relationships

Mathematics is used to describe and explain relationships.

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

Spatial Sense

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

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

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

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

Uncertainty

Uncertainty is an inherent part of making predictions.

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

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

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

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

Essential Graduation Learnings

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

Aesthetic Expression

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

Citizenship

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

Communication

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

Personal Development

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

Problem Solving

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

Technological Competence

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

Spiritual and Moral Development

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

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

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

Program Organization

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

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

Number

Number

- Develop number sense.

Patterns and Relations

Patterns

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

Variables and Equations

- Represent algebraic expressions in multiple ways.

Shape and Space

Measurement

- Use direct and indirect measurement to solve problems.

3-D Objects and 2-D Shapes

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

Transformations

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

Statistics and Probability

Data Analysis

- Collect, display and analyze data to solve problems.

Chance and Uncertainty

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

Outcomes and Achievement Indicators

The curriculum is stated in terms of general outcomes, specific outcomes and achievement indicators (pp. 19 - 138)

General Outcomes

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

Specific Outcomes

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

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

Achievement Indicators

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

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

Summary

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

ASSESSMENT AND EVALUATION

Purposes of Assessment

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

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

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

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

Assessment has three interrelated purposes:

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

Assessment *for* Learning

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

Assessment *for* learning:

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

Assessment *as* Learning

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

Assessment *as* learning:

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

Assessment *of* Learning

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

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

Assessment *of* learning:

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

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

Assessment Strategies

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

Observation (formal or informal)

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

Performance

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

Paper and Pencil

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

Journal

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

Interview

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

Presentation

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

Portfolio

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

INSTRUCTIONAL FOCUS

Planning for Instruction

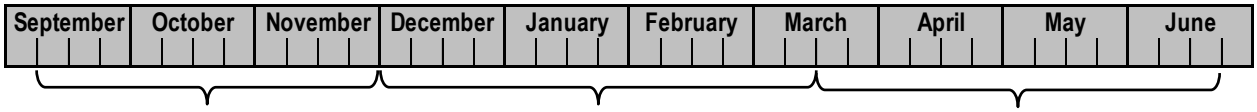
Consider the following when planning for instruction:

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

Teaching Sequence

The curriculum guide for Kindergarten is organized in a sequence that suggests the outcomes from three strands be taught concurrently within each term.

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



Exploring Number: 1 to 5
Lessons 1 - 9

Exploring Patterns: Sorting and Classifying
Lessons 1 and 2

Exploring Geometry (Describing/Sorting) and Measurement (Length/Height)
Lessons 1, 2, 5 and 6

Exploring Numbers to 10
Lessons 1 - 10

Exploring Patterns: Two Elements
Lessons 3, 4, and 5

Exploring Geometry (Building 3-D Objects) and Measurement (Mass)
Lessons 3, 4, and 8

Exploring Numbers to 10: Ten-Frame/Counting
Lessons 11 and 12

Exploring Patterns: Three Elements
Lessons 3, 4, and 5

Exploring Geometry and Measurement (Capacity)
Lesson 7

Instructional Time per Unit

The suggested percentage of time for instruction per unit is listed in the guide at the beginning of each unit with the Number strand receiving the most attention.

Resources

The authorized resource for Newfoundland and Labrador students and teachers is *Math Makes Sense K* (Pearson). Column Four of the curriculum guide references *Math Makes Sense K* for this reason.

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

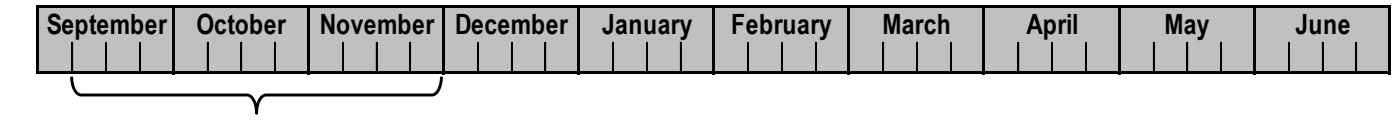
General and Specific Outcomes

GENERAL AND SPECIFIC OUTCOMES WITH ACHIEVEMENT INDICATORS (pp. 19 - 138)

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.

Exploring Number: 1 to 5

Suggested Percentage of Time in Term One: 70%



Exploring Number: 1 to 5
Lessons 1 - 9

Exploring Patterns: Sorting and Classifying
Lessons 1 and 2

Exploring Geometry (Describing/Sorting) and Measurement (Length/Height)
Lessons 1, 2, 5 and 6

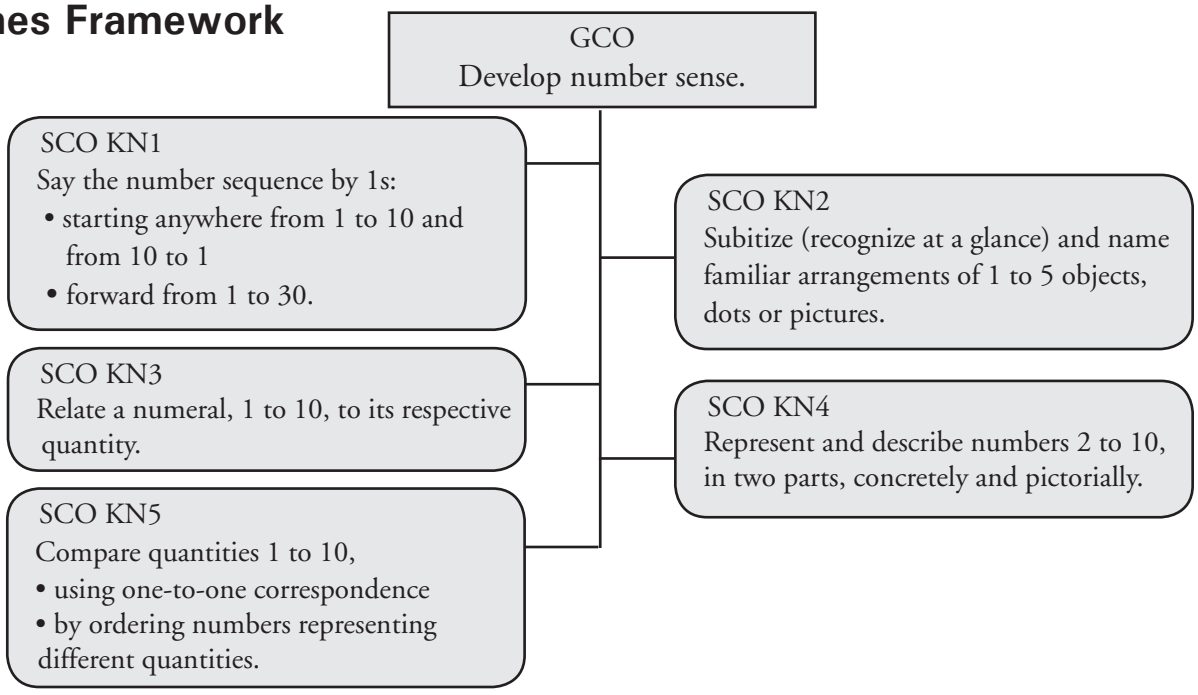
Unit Overview

Focus and Context

An understanding of the number combinations to ten is critical in building a strong math foundation. If students are to develop number concepts and number sense, considerable instructional time must be devoted to number and numeration. In Kindergarten, number concepts will be explored using numbers one to ten. It is important that students experience activities using a variety of manipulatives such as counters, snap cubes, and five and ten-frames.

In Term One, students will work with numbers to five. Focus will be given to counting activities, where students will learn the word names for numbers and will be able to use them in the correct order. Students will be provided meaningful daily experiences to refine their understanding of counting. They will begin to develop counting strategies, learning to assign each object with one number (one to one correspondence). Students will recognize that when counting, the last number named represents the total number of objects in a set. Students will begin to recognize small groups of objects without having to count (subitizing). The five-frame will be introduced and there will be a focus on building a relationship with five as an anchor for the other numbers. Learning the relationship between numbers is a complex process and should begin with the smaller numbers. Students will begin to develop the part-part-whole relationship of numbers. This is an important foundation for developing number sense and an understanding of mathematical operations taught in Grade One. Students will need many opportunities experiencing repetition of activities for each number before introducing the next number in the sequence.

Outcomes Framework



SCO Continuum

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

Mathematical Processes

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

Daily Routine Opportunity

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

Strand: Number

Outcomes

Students will be expected to

KN1 Say the number sequence by 1s:

- **starting anywhere from 1 to 10 and from 10 to 1**
- **forward from 1 to 30.**

[C, CN, V]

Achievement Indicators:

KN1.1 Say the number that comes after a given number from 0 to 9.

KN1.2 Say the number that comes before a given number from 2 to 10.

KN1.3 Count on from a given number to a stated number, forward 1 to 10 and backward 10 to 1.

KN1.4 Rote count from 1 to 30.

Elaborations—Strategies for Learning and Teaching

Students arrive at school having had varied experiences with counting. Further opportunities for students to develop an understanding of number sequence through play and daily interactions must be provided. It should not be assumed that students understand the concepts "before" and "after" when used within the context of counting. Direct teaching may be required to enhance understanding of these concepts. An activity involving the selection of three students to line up at the classroom door prior to inviting the other students to join in may be included in daily classroom routines which require the class to form a line. The teacher points to the middle student and asks, "Who is **after** this student?," "Who is **before** this student?" This activity will provide reinforcement of these concepts. Eventually, the number of students in the line may be increased and the activity may include the use of numeral cards. The students may order themselves sequentially in the line according to the numeral on their card. Instead of naming students, ask questions such as, "What number comes after two?" "What number comes before two?"

Use of the calendar during daily routines provides an opportune time to count and it is an effective visual aid to use while counting. Daily calendar routines provide opportunities for students to hear and speak mathematical vocabulary in a natural setting. Effective questioning techniques during calendar activities provide occasions for students to learn the number that comes 'before' and the number that comes 'after' a specific date. For example, "Yesterday, we placed the number three on the calendar. Can you tell me which number comes after three?" Calendar activities also provide opportunities for students to count to and from larger numbers each day as the month progresses. A countdown to special days is a meaningful opportunity to rote count.

When opportunities to count arise in the natural environment, pose questions which encourage students to count for authentic purposes.

Possible questions may include:

- How many people wore mittens today?
- How many pencils are needed at this table?
- In this story, how many different animals did you see?
- How many letters are in your name?

General Outcome: Develop Number Sense

Suggested Assessment Strategies

For the purpose of assessment, numerals up to five are assessed during the first term. The following assessment activities may be re-visited throughout the year using numerals six to ten as they are introduced.

Performance

- Individually or in small groups, say a numeral from one to five and ask the student(s) to say the numeral that comes before. Repeat this activity and say a numeral from one to five and ask the student(s) to say the numeral that comes after. Record the accuracy of student responses on a checklist.

  (KN1.1, KN1.2)

- Form a human number line. At the beginning of the year, use numbers to five. Later in the year, extend the number line to ten. Give each student a number card and ask them to arrange themselves in order starting with one. Then, remove a number card or two and ask them to arrange themselves again. Encourage them to leave spaces for missing numbers. Observe student conversations as they form the number line and note how students determine their positions on the line.

  (KN1.1, KN1.2)

- In small or large groups, invite students to create simple number riddles to ask classmates. Observe students as they interact with one another when responding to the riddles. This can be done anytime throughout the day. Sample riddles that may be modelled prior to this activity may include:

  I am 6. What comes after me?
  I am 4. What comes before me?
  I am 2. What is one more?

  (KN1.1, KN1.2)

- Invite students to form a circle and begin counting by starting with the number one. The student to the right will continue counting until the tenth individual reaches the number ten (e.g., 1, 2, 3 . . .). Repeat this activity in reverse order and ask the students to continue counting backwards to 0 (e.g., 10, 9, 8, 7, 6, 5 . . . etc). The number used to begin counting should vary and not always be one. Also, consider counting to ten while omitting some of the numbers in the sequence and asking students to say the missing numbers when they reach them in the sequential order (e.g., 1, 2, 3, …, 5, 6, …, …, 9, 10. Observe student responses as they take their turn counting forwards and/or backwards. (KN1.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 9, pp. 46-49

Line Masters 4-7: pp. 63-66

Line Master 9: p. 68

Activity Bank

- *Spin and Count,* p. 49
- *What Comes After?,* p. 49
- *Before and After,* p. 49
- *Apple Picking,* p. 49

Big Math Book: p. 24

Suggested Resource

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- counting games and activities
- interactive five-frame

Strand: Number

Outcomes

Students will be expected to

KN1 Continued

Achievement Indicators:

KN1.1 (Continued) Say the number that comes after a given number from 0 to 9.

KN1.2 (Continued) Say the number that comes before a given number from 2 to 10.

KN1.3 (Continued) Count on from a given number to a stated number, forward 1 to 10 and backward 10 to 1.

KN1.4 (Continued) Rote count from 1 to 30.

Elaborations—Strategies for Learning and Teaching

Teaching activities may include:

- counting while performing finger plays, chants or exercises
- counting while skipping, hopping, bouncing a ball, or taking part in other physical activities
- counting the number of students in various groups during morning routines

Provide frequent opportunities to read children's literature, chant, sing songs and perform action rhymes that involve counting numbers. Use the audio CDs to sing counting songs and include actions with the lyrics. *Johnny Taps with One Hammer* is one of the selections which can be sung along with the audio CD as students use one of their hands to make a fist while using the other hand to tap fingers on their fist. Students will tap the same number of fingers as Johnny taps hammers. *Alice the Camel* may be sung while holding up fingers to show the number of humps on Alice as the lyrics are sung.

Use snap cubes to construct towers. Students add one cube each day, for ten days. On the tenth day, the students count backward as the cubes are removed, one at a time. Students may also construct towers by adding a snap cube each day as the calendar month progresses. For this activity, it is important to assess only the *rote counting* to 30.

Although the numeral zero is not included in the outcome, counting backward from ten to one provides a natural opportunity to expose students to the concept of zero. "Blast Off" is an activity that reinforces counting forward and backward in a fun way. Students squat and place their hands on the floor. This position is a point of reference for zero. As the students count forward, their bodies and hands slowly rise upward to waist level. The benchmark of five should be emphasized at this point by saying, "five is in the middle!" Encourage students to stay in the middle for a short period to emphasize this benchmark. As the students count forward to ten, their bodies and hands slowly rise upward as they reach for the sky. This position is a point of reference for ten. Stay in this position for a short period. Begin to count backward until five is reached, again emphasizing this benchmark at waist level. Students continue to count backward and jump up in the air shouting, "BLAST OFF!" when they arrive back to zero.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Seat five students on a row of chairs and assign each student a numeral from one to five in a sequential order. Ask the whole class to begin counting from one to five. As students hear their assigned numeral, they will stand up one at a time. When five of the students are standing, begin counting backward. As individual numerals are heard, students will sit in their assigned seat, one at a time. Observe students as they engage in this activity to see if they recognize their assigned numeral in sequence forward and backward.

  (KN1.3)

- Use the visuals that are found throughout the various titles of the little books to provide authentic opportunities for students to count. Assess whether the student can say the numeral which comes before and after a specified numeral and if they can count forward and backward from the number.

  (KN1.1, KN1.2, KN1.3)

Interview

- Meet individually with students to determine their level of competency when saying the number sequence. Questions may include:

  "Can you say the numbers for me starting at one?" If the student is unable to say the number sequence, provide a hint to get him/her started, e.g., " one, two. . .," to see if the student is able to continue. A visual may also be used.

  "Can you start at five and count backward to zero?" Ask this question when the student can count forward to five. A hint or a visual may be necessary.

  "Can you name the number that comes before five? Before three?"

  "Can you start at two and say the numbers to five?" Ask this question when the student demonstrates correct number sequence from zero to five.

  "Can you start at five and say the number sequence backward to one?" Ask this question when the student is comfortable saying the number sequence backward from five to zero.

  (KN1.1, KN1.2, KN1.3)

- Individually, ask students to start counting from one and to count as high as they can. Record the highest number that a student counts and note the date.

  (KN1.4)

Resources/Notes

Authorized Resource

Math Makes Sense K Audio CD 1:

Selections 18 and 19

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 2-21

Suggested Resource

Other curriculum resources

- Appendix (ELA Kindergarten)

Strand: Number

Outcomes

Students will be expected to

KN3 Relate a numeral, 1 to 10, to its respective quantity.

[CN, R, V]

Achievement Indicator:

KN3.1 Identify the number of objects in a set.

Elaborations—Strategies for Learning and Teaching

Upon completion of the previous outcome, students will have exposure to counting items in a set for the number sequence one to five. Assumptions cannot be made that a student who is able to rote count will necessarily understand a quantity represented by the number. For example, a student who is able to rote count to five and show five fingers may not be able to represent the quantity of five using other objects. Planning activities that help students understand spatial characteristics, arrangements of objects and the sequential order of counting objects in a set are necessary. They include important skills in the development of number sense when counting forward, counting backward and counting on.

It is important for students to engage in activities using manipulatives in order to relate a numeral to its respective quantity. In Kindergarten, emphasis should be placed on counting concrete objects in a play-based environment rather than counting images on reproducible worksheets. Students require a variety of materials available, such as Link-Its™, counters, pattern blocks, snap cubes, beans, popsicle sticks, etc. Containers of small toys, cubes, cars, and pasta, can be arranged on plates, cookie sheets, trays, or hula hoops to present sets of a given quantity. Students pass through many stages when learning to visually count a set of objects. Students may scan the set, touch the objects to keep track, move objects as they count, group the objects, or they may recognize a known quantity at a glance from the visual arrangement. As students develop the "counting on" strategy, some or all of these behaviors may be exhibited by some of the students.

The use of manipulatives allows students to move objects and say the numbers as they count. Even though conservation of number is included in indicator KN3.6, it is important for teachers to note that this may be an appropriate time to emphasize that the starting point and order of counting does not affect the quantity and the arrangement or types of objects does not affect the count.

Kindergarten students need authentic opportunities to count. This can be easily incorporated into daily routines. For example, ask students to count the number of students ordering recess, the number of students in a centre, chairs at a table, pencils in a tub, etc. Opportunities throughout the day which allow for authentic counting will reinforce this concept in a meaningful way ensuring that students can count using one-to-one correspondence rather than simply counting by rote.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

It is necessary to assess each student to determine their understanding of number, not only in the oral expression of numbers, but also in counting abilities and sense of number.

Performance

- Present a set of one to five manipulatives to individual students and ask them to count the objects in the set. A circle may be formed with a shoelace to define the space for the objects being counted. Ask, "How many are in the set?" Observe and note how students count the set.

  (KN3.1)

- Using the visuals depicting sets from one to five in the *Addison Wesley Mathematics Little Books,* ask students to count and identify the number of items in sets with up to five objects.

  (KN3.1)

- Use numeral plates or cards with representations for numerals one to five and ask students to count the number of dots on the plates or cards as they are turned over. Record student responses on a checklist.

  (KN3.1)

- Display a set of 5 objects. Ask the student, "How many are in your set?" Observe whether the student is able to say the numbers in the correct order, if he/she must move the objects to avoid confusion, if he/she can easily determine the quantity by looking at the set, and if he/she realizes that the last number said is the number in the set. Repeat varying the number of objects.

  (KN3.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 3, pp. 22-25

Lesson 4, pp. 26-29

Lesson 5, pp. 30-33

Line Masters 9-13: pp. 68-72

Activity Bank

- *I Spy, Taking 3 and Finding 3s,* p. 25
- *Simon Says, Match Them and Secret Handshake,* p. 29
- *Dot Card Collection, How Many? Number Creatures and Five Little Monkeys,* p. 33

Unit Centres

- *Arts and Crafts:* p. 10
- *Construction:* p. 10

Big Math Book: pp. 15-17

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 2-21

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicators:

KN3.2 *Recognize and name numerals 1 to 10.*

KN3.3 *Construct a set of objects corresponding to a given numeral.*

Elaborations—Strategies for Learning and Teaching

Chants and songs provide excellent oral language experiences for young students and they motivate them while acquiring literacy and numeracy skills. Chant the poem, *Three Jellyfish* or the rhyme, *Four Little Fishes Swimming Out to Sea* and invite students to join in and add actions as the lyrics are played on the audio CD. Sing counting songs such as *Let's Do the Numbers Rumba, Five People in My Family and Boogie Down and Cruise*. Encourage students to dramatize the songs to represent the numerals up to five.

During the daily routine ask students to show the appropriate number of fingers for a given numeral. Students may be given snap cubes to place on the tips of their fingers, on one or two hands. Show a number card or call out a numeral and ask students to hold up the corresponding number of fingers. Discuss the different ways that the numeral was shown by different students.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Interview

- Present numeral cards one to five in random order to a student. Ask the student to name the numeral on the card one at a time.

(KN3.2)

Performance

- Present numeral cards one at a time to students with numerals one to five. Ask the student to place the correct number of snap cubes on the card with the corresponding numeral.

(KN3.3)

- Distribute numeral cards to each student and invite one student to roll a foam number cube. The student who rolls the cube must find a student in the group with the same numeral on their card. The student holding the card is the next person to roll the cube.

(KN3.2)

- Provide students with a tray and some manipulatives. Hold up a numeral card from a stack of numeral cards with numerals one to five. Ask students to construct a set corresponding to the numeral on the card. This activity can be varied by using a set of plates depicting numerals one to five. Ask students to select a plate and construct a set on each plate with the corresponding number of manipulatives. For example, a student who selects a plate displaying the number four will place four plastic fish, bears or counters on the plate.

(KN3.3)

- Tell a story involving numbers up to five that may be represented using counters or cubes. For example, a story about playful kittens using kitten counters or cubes to represent the number of kittens in the story may begin by saying: *One day a little girl looked out her window and she saw five kittens playing in her sandbox. Two kittens jumped out and ran away.* After the story is told, invite the students to represent the correct number of kittens in the sandbox by placing counters on the lid of a shoe box. Afterwards, ask the students to show you what was seen in the sandbox after two kittens jumped out and ran away. Use other oral stories and observe the students' understanding of counting as they represent the number of objects in the story.

(KN3.3)

- Invite students to play hopscotch using a bean bag. Ask students to name the number that the bean bag lands on.

(KN3.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Audio CD 1:

Selections 12-16

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicators:

KN3.3 *(Continued) Construct a set of objects corresponding to a given numeral.*

KN3.4 *Print numerals from 1 to 10 to represent the number of objects in a given set.*

KN3.5 Match numerals with pictorial representations.

Elaborations—Strategies for Learning and Teaching

The printing of numerals is an expectation for the Mathematics curriculum in Kindergarten. As each numeral is introduced, it should be practised through meaningful activities such as journal entries, recording charts in counting centres, forming numerals in sand, rice or sugar, on whiteboards and painting easels and creating numerals using beautiful stuff such as pine cones. Emergent writers should be given opportunities to use multiple representations to practise number writing and they should not be limited to pencil and paper activities. Representations may include the use of materials such as plasticine, play-dough, sand and paint. Use of these materials encourages students to take risks since objects can be re-created until the formation is suitable for the student. Opportunities for students to experiment freely on unlined paper using markers, crayons, and pencils should also be included. The power of the blank page should not be underestimated.

Using beautiful stuff and a defined space such as a piece of construction paper or a tray, encourage students to experiment with materials such as feathers, buttons, corks, marker tops, etc. to form numerals. Since materials are not pasted onto the surface, a digital photograph may be taken and displayed in the math centre as a number display board.

Ask the physical education teacher to include numeral formation in movement activities in the gymnasium. For example, ask four students to use their bodies kinesthetically to form the numeral four.

Many opportunities exist to match numerals with pictorial representations and can be used in sorting and matching activities, memory games, construction of sets, and activities that require the counting of objects in a set.

When introducing a new number or the number of the day, show the number to the students and ask them to gather a matching number of small objects such as Link-Its™, buttons, etc. Afterwards, students display the sets on blank paper or cookie sheets. Representations may be illustrated in journals and matching numerals recorded. Upon completion of entries, students may independently affix the corresponding number of stickers to their work.

The creation of student-generated counting books should be encouraged throughout the year. Seasonal themes easily lend themselves to creating counting books. Teachers may provide stickers, bingo blotters, foam cut-outs, stampers, etc. for use when creating pictures for matching numerals.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Place sets of objects for numerals one to five under plastic tubs. Ask students to look under the tubs and count the objects. Students may record the numeral on a piece of paper/notepad and place it by the tub. Afterwards, students may select one tub and represent its contents in a journal and record the corresponding numeral. (KN3.4)
- Ask students to select a card from a set of numeral cards one to five. In a journal, students will draw a set to represent the number selected and record the numeral by the set. (KN3.4)

Performance

- In the block centre, ask students to construct sets using a specific number of blocks or cubes and match the quantity to the correct numeral on a numeral card. (KN3.3)
- Display a set of objects up to five. Ask students to print the corresponding numeral on individual whiteboards or clipboards. Observe student responses and record student learning on a checklist. (KN3.4)
- Invite students to take part in a scavenger hunt. Distribute numeral cards to identify the number of items to collect. Ask students to bring back sets of objects in quantities that correspond to the numeral on the card. This activity can be adapted in a daily routine by showing a numeral card on the morning message asking all students to bring a specific number of items to the large group. (KN3.3)
- Select students to lead daily movement activities. Roll a number cube and select a student to identify the number. The number rolled will indicate the number of actions for the student to lead. For example, a student may roll four and ask classmates to do four jumping jacks. (KN3.3)

Observation

- Observe students playing a concentration/memory game with pairs of cards that show numerals and matching pictorial representations. When a match is found, ask the student to explain how they know the numeral matches a particular set. It is important to ask this question about pairs that are matched both correctly and incorrectly to determine the students' reasoning. Student observations should be recorded. (KN3.5)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Unit Centres

- *Literacy: Number Books*, p. 11

Supplementary Resource

Kindergarten Math Manipulative Kit

- links (200)
- two-colour counters (200)
- overhead two-colour counters (50)
- soft dot dice (100)

Note:
The recording of numerals is not addressed in *Math Makes Sense K.*

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicator:

KN3.6 Recognize that the original count of a set is maintained when objects are spatially re-arranged (conservation of number).

Elaborations—Strategies for Learning and Teaching

Conservation of number is the understanding that the number of objects will remain the same when they are spatially rearranged. Students who do not demonstrate conservation of number believe that the number of objects in a set change when they are spatially rearranged. They may recount the objects in a set even though nothing was added or taken from the set. Varied and authentic counting experiences are required throughout the year to develop this skill.

Select five students to stand and form a line at the front of the classroom. Ask the students who remain seated to count the number of students standing. Direct students to change their positions. Ask a volunteer to count the number of students in the second formation. Ask, "How many now?" Repeat this activity by directing students to stand further apart, closer together, pointing in different directions, dispersed throughout the room and bunched together. These formations should be created without adding or removing a student. Repeatedly ask, "How many now?, How do you know?, Did anyone join/leave the line?" An extension of this activity may be reinforced in the gymnasium to allow for more movement.

Using chairs, invite one to five students to sit on an imaginary train. To introduce this concept, all seats on the train should be filled. After the "choo choo" sound, students will rearrange themselves on the seats of the train. Ask students to count the number of passengers on the train. Following their response, ask: "Do the number of passengers change when passengers switch places?" and "Why did the number stay the same?" After students become familiar with this activity, you may want to leave empty seats on the train or change the spatial arrangement of the seating.

In the daily routine, include an activity for conservation of number using the classroom whiteboard and magnets. Invite a student to arrange one to five magnets and count the arrangement aloud with the whole class. Invite another student to change the spatial arrangement using the same number of magnets and ask "How many now?, How do you know?, Were other magnets placed on or removed from the board?"

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Interview

- Meet with individual students and place one to five cubes in a row and ask the student to count the cubes. Ensure that the student watches as the cubes are moved into different arrangements which are spread out or bunched together. Ask, "How many now?, How do you know?" Note whether or not the student recounts the cubes and his/her mathematical reasoning. A student who recounts the cubes does not have an understanding of number conservation. A student who gives the answer without counting should be asked to explain their thinking. Appropriate responses may include:
  - *I watched you move them.*
  - *You did not put any more there or take any away.*

(KN3.6)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 3, pp. 22-23

Teaching Tip: p. 23

Big Math Book: p. 15

Note:
Conservation of number is embedded throughout many of the lessons within the authorized resource but it is not treated explicitly in any specific lesson. However, there are many opportunities to develop this concept within the suggested activities of the lessons.

Strand: Number

Outcomes

Students will be expected to

KN2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects, dots or pictures.

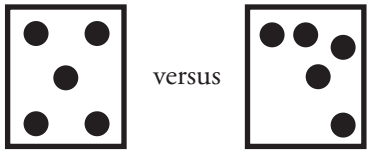
[C, CN, ME, V]

Achievement Indicator:

KN2.1 At a glance, identify the number of a given arrangement of 1 to 5 objects or dots, without counting.

Elaborations—Strategies for Learning and Teaching

Subitizing is the ability to instantly recognize, without counting, arrangements of dots or objects in sets. Students should recognize that there are many ways to arrange a set of objects and that some arrangements are easier to identify more quickly than others, as seen below.



Recognition of small arrangements of objects in sets helps students to count on, combine, separate numbers into parts and represent numbers in many ways. Initially, students may count each one of the dots or objects until they begin to recognize the arrangements without counting. It is important to vary the orientation of the objects, dots or pictures to avoid the misconception that there is only one way to arrange a specific quantity.

Identification of numbers displayed on a dot cube is a strategy for students to begin learning the arrangement of dots up to five. The configuration of five, for example, may be recognized as the formation of the letter X and a three may be recognized as a diagonal line. It should be noted that students need exposure to other arrangements of dots on items such as dot plates. The number five on a dot plate may be configured as a horizontal line and three may be configured as a triangle. To introduce different combinations, use stickers and bingo dabbers to make dot plates with various arrangements to five. Refer to the dot cards on Line Masters 4-7 for dot arrangements which can be used to create class sets of dot plates. These plates can be used to play a flash game during morning routines. Show each plate for a short period of time and ask, "What do you see?"and "How do you know?"

Using metal pie plates and magnetic counters, encourage students to make different arrangements for numbers up to five. The number of magnets will determine the number to be displayed. Students may share their arrangements with each other and identify the number displayed on the other plates. Emphasis should be placed on the different ways that a number can be represented.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Use of flashcards or dot plates may be included in the daily routine for assessment purposes. A simple dot plate flash game may be played using dot plates or dot cards to flash various arrangements for each number to the entire class. Ask students to identify the number that they see by recording their responses on individual white boards. Formation of numerals is not the focus of this assessment. Therefore, students who are unable to form numerals should be assessed verbally in a smaller group. The orientation of the dot plates or cards should be changed to ensure recognition regardless of the position of the dots on the plates or cards.

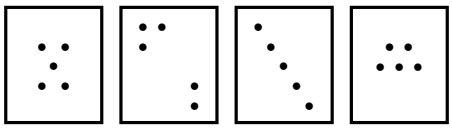
  (KN2.1)

- Use the visuals in the little book title, *How Many in All?*. Select a visual and ask the student how many objects they see in each particular set. Student responses may be recorded on the assessment master.

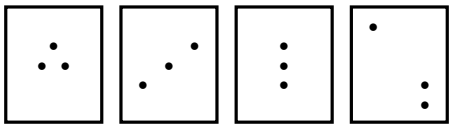
  (KN2.1)

- Provide a set of eight dot cards to a pair of students . The cards will illustrate different dot arrangements for two numbers. Students sort the dot cards according to number. After the dot cards have been sorted, ask: "Which cards were the easiest to sort? Why?" "Which cards were the most difficult to sort? Why?"

  Cards for the number 5:

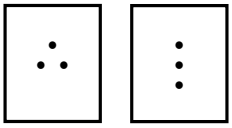
  

  Cards for the number 3:

  (KN2.1)

- Play "Go-Fish." Using Line Masters 4-7, create a deck of matching dot cards from one to five which have different arrangements for each number. Pairs will not have identical arrangements in this game. Instead, students will recognize that the dots can be rearranged differently and still represent the same number. Please note that it is not recommended to use all twenty-four cards on Line Masters 4-7. The visual below shows a possible match for the number three.

  (KN2.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 8: pp. 42-44

Line Masters 4-7: pp. 63-66

Activity Bank

- *In a Cup,* p. 45
- *Total Recall,* p. 45
- *Dots and Numerals,* p. 45
- *Fancy Dot Cards,* p. 45

Big Math Book: pp. 22-23

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 82-89

Strand: Number

Outcomes

Students will be expected to

KN2 Continued

Achievement Indicator:

KN2.2 Identify the number represented by an arrangement on a five-frame.

Elaborations—Strategies for Learning and Teaching

A five-frame is a rectangle of five squares with each square large enough to hold a counter. Five-frames focus on the relationship to five as an anchor for numbers. This five-frame represents 5:

Introduce the following rules for showing numbers on a five-frame:

- only one counter is permitted in each box of the five-frame.
- always start filling the five-frame from left to right. It mimics left-right directionality for reading and writing. Placing a visual cue such as a sticker, above the first square on the left will assist students in beginning to fill the frame correctly.

There are different views on the placement of counters on the five-frame. However, it is important to consider why five-frames, and later ten-frames in Grade One, are used. The main purpose of using the frames is to visualize numbers in relation to five and ten, or relate numbers to five and ten as benchmarks. Following theses rules for showing numbers on a five-frame may avoid possible confusion at a later time. Model the correct way to fill a five-frame by displaying a five-frame representing numbers from one to five on the overhead projector or interactive whiteboard. Ask students to duplicate what they see using their own five-frame and counters. When students are first introduced to the five-frame they may empty all of the counters from the frame before starting to represent a different number. Later, it is important to model different numbers by simply adding or taking away counters from an existing number on the five-frame.

During daily routines, show students prepared flash cards of five-frames for numbers one to five. Hold up each five-frame card in random order and ask students to identify the number represented on the card. Ask, “What do you see?” and “How do you know?”

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide each student with a five-frame and five counters. Say a number from one to five and ask students to represent the number by placing counters on the five-frame. Note student performance using a checklist.

(KN2.2)

Interview

- Randomly flash five-frames representing each of the numbers one to five to the student. The student names the number represented. Note student performance using a checklist or anecdotal note.

(KN2.2)

- Place different numbers of counters on a five-frame. After each arrangement is shown to the student, ask:
  - How many counters do you see on the five-frame?
  - How many more will make five?

  Record the numbers that students recognize without counting and those that he/she must count.

(KN2.2)

Journal

- Using Line Master 16, provide each student with five five-frames. Students will fill in the five-frames to represent numbers one to five and paste them in a journal. After each frame is pasted, students will print clozed sentences beneath each frame and write the numerals in the space. Sentences may include:

  I see 5.

  I see 4.

  I see 3.

  I see 2.

  I see 1.

(KN2.2)

Observation

- Show students a prepared dot plate and ask them to show you the given arrangement using a five-frame. Observe to see if the correct number is represented and if the five-frame is filled from the left to the right cell. (KN2.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 7, pp. 38-40

Line Master 16: p. 75

Activity Bank:

- *All Aboard,* p. 41
- *Colourful 5s,* p. 41
- *Paper Cup Five-Frames,* p. 41

Unit Centres

- *Exploration: Filling Five,* p. 10

Big Math Book: pp. 20-23

Note:

Ignore the Teaching Tip on page 39 in Unit 2 of the resource stating "…children should fill squares in a variety of ways without feeling they need to go from left to right."

Strand: Number

Outcomes

Students will be expected to

KN4 Represent and describe numbers 2 to 10, in two parts, concretely and pictorially.

[C, CN, ME, R, V]

Achievement Indicator:

KN4.1 Show a given number as two parts, using fingers, counters or other objects, and name the number of objects in each part.

Elaborations—Strategies for Learning and Teaching

Conceptualizing a number in two or more parts is an important relationship about number that Kindergarten students must develop. It is unlikely that a Kindergarten student will count a set of objects and focus on the fact that the set could be made of two parts. However, understanding the relationship among the parts of a number and the relationship between the parts and the whole is essential in developing an understanding of number sense and mathematical operations. Opportunities to partition numbers into two or more smaller sets will reinforce this skill and help students recognize that the action of partitioning a set of objects does not affect the count. A student who makes these connections will be able to determine a larger quantity without counting each object.

Part-part-whole relationships are constructed during counting activities and they may be included during daily routines. Ways to represent numbers may include using two dot plates, two dot cards, counters or two hands. The number four can be represented on two hands, for example, by raising three fingers on one hand and one finger on the other hand, or by raising four fingers on one hand and none on the other, and again by raising two fingers on each hand. Including different combinations during activities in daily routines allows students opportunities to begin understanding that the number four can be represented in many ways. However, it is common for students to use their fingers and show the numeral only on one hand. Therefore, different combinations of fingers on two hands should be modeled for numbers up to five so that students will recognize that there are different ways to use combinations of fingers when representing numbers. It is important to use a variety of representations to avoid the misconception that partitioning can only be represented using fingers.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Assessment in Term One is through the guided process of small and whole group discussions and activities. It is through this process that the students will develop the skills and confidence to demonstrate their understanding of the outcome.

Performance

- Provide students with numbers from one to five and access to containers of snap cubes in two different colours. Ask them to make three different trains using snap cubes of the same two colours. For example, a student with the number five may select three blue and two red, one blue and four red and two blue and three red to represent the three trains made from five snap cubes. Listen to student conversations as number cubes are selected for trains and observe how students determine how to build their three trains to look differently. Ask students to tell you about the three trains and the number of cubes used altogether and the numbers represented by each colour on the train.

  (KN4.1)

- Using part-part-whole mats and counters, show a set of five counters. Ask a student to count how many are in the set. After the set is counted, partition the counters into two parts. Ask the student: "How many objects are there? How do you know?" Show a different partition and observe whether the student must recount all of the objects or if he/she knows that partitioning the objects has not changed the quantity by repeating the same questions.

  (KN4.1)

- Seat students in a circle and ask them to use one of their hands to give a "high five" to their shoulder partner on the right. Discuss ways that it would be possible to give someone a high five using fingers on both hands. Invite students to give a high five to a shoulder partner on their left using fingers on both of their hands. Throughout the day, repeat the activity calling "two-handed high five" as a signal for students to give each other "high fives" using two hands. Observe students as they interact with one another and engage in conversation about their two-handed high-five.

  (KN4.1)

Journal

- Use a handful of transparent counters to shake and spill less than five counters in two different colours on the overhead. Ask students to identify the number of counters that they see altogether and the number of each colour that they see. Complete a journal entry using pictures or numerals to represent the number of counters that they see altogether and the number of counters that they see in each colour. (KN4.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 6, pp. 34-37

Line Masters 14-15: pp. 73-74

Unit Centres

- *Literacy: Number Books*, p. 11

Big Math Book: pp. 18-19

Strand: Number

Outcomes

Students will be expected to

KN4 Continued

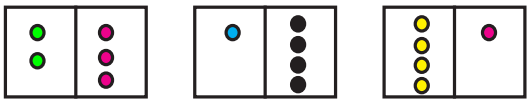
Achievement Indicator:

KN4.2 Show a given number as two parts, using pictures, and name the number of objects in each part.

Elaborations—Strategies for Learning and Teaching

Students need encouragement to create their own representations of mathematical ideas. Provide opportunities for students to create journal entries by representing numbers in two parts using pictures, stamps, stickers, bingo blotters, etc. When students represent mathematical ideas, they are making sense by constructing and refining their thinking. Representations may involve dramatizing, drawing, painting, or using concrete materials. Some students may be able to begin using numerals and words in their representations. Opportunities for students to generate multiple representations of the same idea are critical components when developing a deeper understanding of mathematical concepts.

Provide opportunities for students to represent numbers using two-part mats. Draw five two-part mats on a large sheet of paper. Using two bingo dabbers in different colours, ask students to create five different combinations of five on the mat.



Introduce the lyrics of the song, *Five Bananas.* Select three students to dramatize the song using five bananas. One of the students will hold the bananas in a basket. The other two students will select the number of bananas required to represent the quantity of bananas in two parts from five to zero. As students become familiar with the lyrics of the song, they may change the lyrics to create two different parts which represent the number of bananas on the tree.

Five Bananas

Five bananas on banana tree, three for you and two for me.

Five bananas on banana tree ... Oh, I love those bananas.

Four bananas on banana tree, two for you and two for me.

Four bananas on banana tree ... Oh, I love those bananas.

Three bananas on banana tree, two for you and one for me.

Three bananas on banana tree ... Oh, I love those bananas.

Two bananas on banana tree, one for you and one for me.

Two bananas on banana tree ... Oh, I love those bananas.

One banana on banana tree, half for you and half for me.

One banana on banana tree ... Oh, I love those bananas.

No bananas on banana tree, none for you and none for me.

No bananas on banana tree ... Oh, I love those bananas.

General Outcome: Develop Number Sense

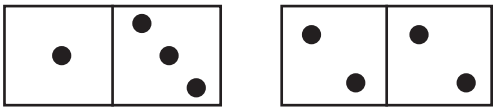
Suggested Assessment Strategies

Performance

- Ask students to select two dot plates with numerals up to four represented on each plate. The dots on each plate should be two different colours. For example, three blue dots on one plate and two yellow dots on the other plate represent five. Ask students to name the number and the number of objects in each part. Observe students as they identify the number of objects in each part.

(KN4.2)

- Provide students with dominos that represent numbers up to four. Ask students to name the total number of dots on the domino, and the number of dots on each part.



(KN4.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Audio CD 1:

Selection 17

Supplementary Resource

Kindergarten Math Manipulative Kit

- jumbo foam dominoes
- two-colour counters (200)
- overhead two-colour counters (50)

Strand: Number

Outcomes

Students will be expected to

KN5 Compare quantities 1 to 10:

- **using one-to-one correspondence**
- **by ordering numbers representing different quantities.**

[C, CN, V]

Achievement Indicator:

KN5.1 Compare and describe two given sets using words such as more, fewer, as many as or the same number.

Elaborations—Strategies for Learning and Teaching

Kindergarten students are beginning to develop an understanding of comparing quantities through interactions which occur naturally during play and daily routines. For example, some students may recognize the student who has the most blocks during their play or the student who receives fewer counters during an activity.

Once students are able to determine whether one set is more than another, they are ready to match items using one-to-one correspondence to determine if there are any objects remaining in one of the sets. Concrete objects should be used when comparing sets and exploring one-to-one correspondence. Unlike paper-pencil activities, concrete materials provide students with opportunities to manipulate and experiment with objects using a trial-and-error strategy. Conversations and shared thinking are enhanced as students explore concrete materials while working in pairs or small and large groups.

In Kindergarten, the term **fewer** is used instead of the term *less than* because the focus is on comparing **sets** of concrete objects, not the comparison of **numbers**. When numbers are compared, in later grades, the term *less than* will be used. Although it is not the intent right now that students order numbers, it will happen later in the year. When talking about sets that have the same number of objects, the terms *the same number* and *as many as* should be used. Though the concept of *fewer* is logically equivalent to the concept of *more,* the term *fewer* proves to be more difficult for Kindergarten students than the term *more*. To help students with the concept of *fewer*, frequently pair it with the term *more* and make a conscious effort to ask questions, " Which group has fewer?" and "Which group has more?" This increased exposure to the terms within contexts will increase familiarity with mathematical language. Terms should be displayed on word walls as they are introduced.

When comparing quantities, students may use strategies for sight recognition which allow them to recognize the number of objects without counting. Obviously, this strategy becomes more challenging as the quantity of objects increases. The student compares the sets according to size. This strategy may cause confusion for young students. The size and spatial arrangement can give the impression that there are more objects in one set than in the other, even when there is the same number of objects in both sets or even fewer objects in the first set.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Observation

- Listen to student responses and discussions as they interact with one another to determine their sense of number and the prior knowledge that they bring to this outcome. Record observations through anecdotal notes, checklists, or rating scales.

(KN5.1)

- Observe two students playing a game which may be referred to as "Shake and Spill." Students are provided with a cup and up to ten double-sided counters. Each student takes a turn shaking and spilling the counters to compare the colours using the words *more, fewer, as many as, or the same as.* Using the *Assessment Master 3.1* on the resource CD, you may customize a checklist to note the mathematical language used by each student.

(KN5.1)

Interview

- Conference with individual students and present two sets of objects of differing quantities (e.g., four objects in one set and five objects in the other set) and ask students:
  Can you compare the two sets and tell me about them?

(KN5.1)

- Listen for student use of mathematical language such as *fewer*, *more, as many as,* and *the same number.* Open-ended questioning may be difficult for some students and specific closed-ended questioning techniques may be required to assess student learning. Include questions such as:

  Which set has fewer/more/as many as or *the same number as?*

(KN5.1)

Journal

- Ask students to select two towers of varying heights made from snap cubes. The towers may be previously constructed by the teacher and stored in a container or bag. Once the two towers are selected the student then represents the towers in a journal and labels them using the terms *more, fewer, as many as, or the same number*. Visuals may be provided to assist the students with labelling. Copies of digital photographs of the towers may also be used in journals.

(KN5.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Launch, p. 13

Lesson 1: pp. 14-17

Line Master 3: p. 62

Big Math Book: pp. 12-13

Teacher Guide on CD with Microsoft Word™ files: *Assessment Masters*

- Assessment Master 2: *Diagnostic Conference,* p. 53
- Assessment Master 3.1: *Ongoing Observations Checklist: Exploring Number (Lessons 1 and 2),* p. 54

Suggested Resource

Other curriculum resources

- *Ten Little Fingers and Ten Little Toes* by Mem Fox (ELA Kindergarten)
- *One* by Kathryn Otoshi (ELA Kindergarten)

Strand: Number

Outcomes

Students will be expected to

KN5 Continued

Achievement Indicator:

KN5.1 (Continued) Compare and describe two given sets using words such as more, fewer, as many as or the same number.

Elaborations—Strategies for Learning and Teaching

Since the terms *fewer* and *more* are developmentally appropriate for Kindergarten rather than *greater than* and *less than,* the lyrics of the song, *Alligator Greater Than/Less Than* need to reflect the appropriate mathematical language for Kindergarten students. Once students become familiar with the tune of the song it may be sung or chanted using the appropriate mathematical language suggested below. Please note that the audio CD does not reflect this change in mathematical language. An alligator puppet may be used while singing or chanting. Invite students to sing the song and ask the alligator, "How many pizzas do you like to chomp?" Invite students to hold up their fingers to show the number of pizzas that are included throughout the lyrics of the song.

Alligator MORE Than FEWER Than

Alligator, Alligator sitting in the swamp

How many pizzas do you like to chomp?

One or three?

I'm a very very hungry alliga-tor

so I'll eat whichever one is more

One is fewer than three

Three is more than one

I'll eat three.

Yum!

Alligator, Alligator sitting in the swamp

How many pizzas do you like to chomp?

Four or two?

Well..

I'm a very very hungry alliga-tor

so I'll eat whichever one is more

Four is more than two and

two is fewer than four so I'll eat four.

Yum!

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Interview

- After the *Alligator More Than Fewer Than* song/chant is introduced, use counters or paper plate pizzas to represent the number of pizzas. Show two sets of pizza plates with numbers up to and including five in each set. Ask students to name the set which has more, fewer or the same number. Observe how students determine their answers and record anecdotal notes.

  (KN5.1)

- Using two different sets of manipulatives, such as bears and fish or coloured counters, invite students to pair the items. As students are matching the items, observe and record evidence of :
  - one-to-one correspondence
  - use of mathematical language
  - knowledge of mathematical concepts *(fewer, more, and the same)*

  (KN5.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Audio CD 1:

Selection 11

Suggested Resource

Other curriculum resources

- Alphabet Puppets: The letter "Aa" puppet (ELA Kindergarten)

Strand: Number

Outcomes

Students will be expected to

KN5 Continued

Achievement Indicator:

KN5.1 (Continued) Compare and describe two given sets using words such as more, fewer, as many as or the same number.

Elaborations—Strategies for Learning and Teaching

In the dramatic play area, place dishes, glasses, cutlery, napkins and a tablecloth in a storage container. The contents should include one item for each of the four settings. Encourage students to set a table for four. Students may place all of the props to determine if there are fewer, more or the same number as the places at the table. When the students become familiar with this activity, you may take away or add particular items. Ask them to store the extra items or retrieve them from the storage areas when there are purposely too many or too few items.

Create a nuts and bolts activity in the math centre for three students. Store nuts and bolts in three separate containers such as small toolboxes or plastic bags. Students should sort, count and record the number of nuts and bolts. Individual recording sheets will be required for use in the centre. Students will then determine whether there are as many nuts as bolts, more nuts than bolts, or fewer nuts than bolts by screwing them together. Students will also record their results on individual recording sheets by ticking one of the columns reading: as many nuts as bolts, more nuts than bolts, or fewer nuts than bolts. Visuals may accompany the text to assist students when recording their results.

Create a sandbox centre in the classroom. If space is limited, a small dish pan filled with sand or rice may be used. Hide small plastic objects for a pair of students to retrieve. Seasonal items such as pumpkins, ghosts, snowmen and snowflakes may be used to vary this activity throughout the year. Students sift through the sand or rice and find objects to place on their individual trays. After all of the objects are retrieved from the sand, the pair of students will group similar objects into sets on their individual trays. Afterwards, the partners will compare the quantities of similar objects on the two trays. Students should be encouraged to use the language of comparison. This activity should be modelled to the whole group prior to working independently in centres. For example, responses might include:

- *I have fewer pumpkins than you have.*
- *I have more ghosts than pumpkins in my sets.*
- *I have five red gems and you have two so I have more.*
- *We both have the same. I have two cars and you have two.*

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Informal Observation

- Observe and document student interactions during play using anecdotal notes or checklists. A recording device may be placed in a play area to capture authentic conversations to gain insight in student learning during play.

(KN5.1)

Portfolio

- Collect the recording sheet from the nuts and bolts centre to include in student portfolios. Observations of student work should be noted.

(KN5.1)

Performance

- Ask students to sort themselves in two lines based on gender. Students pair up one boy and one girl to form one-to-one correspondence. This will help them to determine which line has more boys, fewer boys, or the same number of boys as girls.

(KN5.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Activity Bank

- *Nuts and Bolts*, p. 17

Unit Centre

- *Imaginative Play: Zookeeper,* p. 10

Strand: Number

Outcomes

Students will be expected to

KN5 Continued

Achievement Indicators:

KN5.1 (Continued) Compare and describe two given sets using words such as more, fewer, as many as or the same number.

KN5.2 Using a given set, construct another set to show more than, fewer than or as many as.

KN5.3 Order quantities of objects in given sets in a sequential order from fewer to most.

Elaborations—Strategies for Learning and Teaching

One-to-one correspondence is required for students to build a foundation for understanding number relationships, problem solving, and in later years, the construction and analysis of graphs. In Kindergarten, most students use one-to-one correspondence when comparing sets of concrete objects and making direct comparisons. Initially, the objects should be identical and placed in a parallel position. Then, the concept can be developed to related objects such as heads and hats or students and chairs. After students compare sets of related objects, they may progress to one-to-one correspondence with unrelated objects arranged randomly.

Using the little book, *How Many in All?* invite students to look at the pictures throughout the text. For example, after looking at the rings on pages four and five, discuss and invite students to share their observations. Ask questions such as:

- *Are there more/fewer rings in the thick group than the thin group? How do you know?*

Before asking students to create their own sets, place five chairs at the front of the classroom to represent trucks. Invite a specific number of drivers (one to six) to sit in the trucks. For example, select four drivers to show fewer drivers than trucks, six drivers to show more drivers than trucks or five drivers to show the same number of drivers as trucks, etc. Once they compare and describe given sets, they should begin constructing their own sets to show more than, fewer than or as many as a given set.

In a large group, invite students to participate in the construction of sets by using two hula hoops. Select a student to construct a set and invite another student to create a second set with more, fewer or the same number of objects as the first set.

Distribute five pre-made five-frames, dot plates or dot cards representing numerals one to five. Ask the students to arrange themselves from one to five. Once students become familiar with this activity, you may play music and ask students to order themselves once the music stops. To vary this activity, groups may use different materials such as Link-Its™ or cube towers.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Constructing sets is very closely related to comparing sets. For an indication of students' understanding of comparing quantities, use a blank plate, tray or a mirror and five counters such as glass gems. Create a set and ask the student to make another set on their plate, tray or mirror with *more, fewer* and the *same as.* (KN5.2)

- Provide the student with one dot cube and ten counters. The student rolls the cube and builds a set showing *more, fewer* or the *same as* the number of dots rolled on the cube. (KN5.2)

- During the daily routine or in small groups, the teacher draws a set of objects on the whiteboard and asks students to draw a set showing *more, fewer* or *the same as* on their individual whiteboards. For example, you may say, "I have 4 dots, show me fewer dots on your whiteboard." Ask students to show their boards. Observe to see if individual students are understanding this concept as they flash their boards. Magnets and cookie sheets also work well for this activity. (KN5.2)

- Using counters and one of the number books from the *Addison Wesley Mathematics Little Books*, show a visual representation of a set and ask the student to create a set that is *more, fewer, or the same as the* quantity represented in the visual. (KN5.2)

- Using Link-Its™, the teacher may model members of his/her family by creating a chain with links representing each person. Invite students to do the same and compare their chains amongst each other to determine who has more, fewer or the same number of people in their families. (KN5.2)

- Give each student a spinner from the template, "5-part Spinner, Blocks." Pair students to spin an arrangement of blocks at the same time. Students determine who has more, fewer or as many as. (KN5.2)

- Use a string to create a line in the classroom to display dot cards. Attach the cards randomly on the line with clothes pins. Ask a student to arrange the cards on the line by ordering the quantities represented on the cards from fewer to most. (KN5.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 2:

Lesson 2: pp.18-21

Line Masters 4-8: pp. 63-67

Line Master 16: p. 75

Big Math Book: p. 14

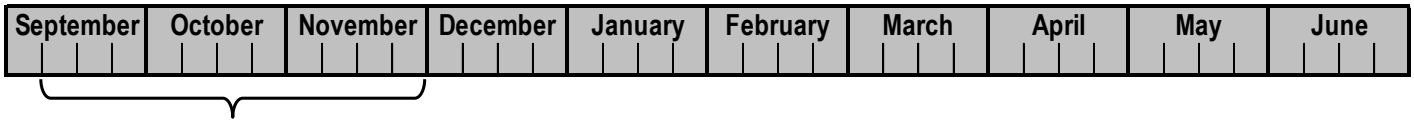
Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 2-21 and pp. 82-85

Kindergarten Math Manipulative Kit

- links (200)
- two colour counters (200)
- overhead two colour counters (50)
- soft dot dice (100)

Exploring Patterns: Sorting and Classifying

Suggested Percentage of Time in Term One: 15%



Exploring Number: 1 to 5
Lessons 1 - 9

Exploring Patterns: Sorting and Classifying
Lessons 1 and 2

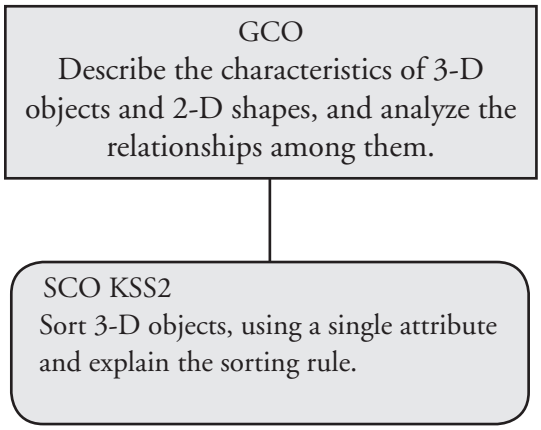
Exploring Geometry (Describing/Sorting) and Measurement (Length/Height)
Lessons 1, 2, 5 and 6

Unit Overview

Focus and Context

This unit provides students with experiences in sorting, comparing and describing familiar 3-D objects. The focus of the teaching and learning is on sorting and comparing 3-D objects using one attribute, rather than on naming shapes and objects. Before students engage in patterning activities they need to come to the understanding, through hands on exploration, that objects can be sorted and classified according to their various attributes.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Shape and Space (3-D Objects and 2-D Shapes)	
Specific Outcomes	**Specific Outcomes**
KSS2. Sort 3-D objects, using a single attribute and explain the sorting rule. [C, CN, PS, R, V]	1SS2. Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule. [C, CN, R, V] 1SS3. Replicate composite 2-D shapes and 3-D objects. [CN, PS, V] 1SS4. Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]

Mathematical Processes

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

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

Outcomes

Students will be expected to

KSS2 Sort 3-D objects using a single attribute and explain the sorting rule.

[C, CN, PS, R, V]

Achievement Indicators:

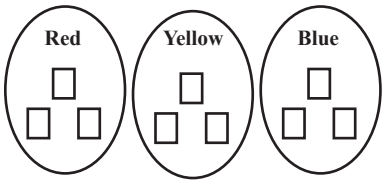
KSS2.1 Identify a common attribute in a given set of 3-D objects.

KSS2.2 Sort a set of objects including familiar 3-D objects, using a single attribute such as size or shape, and explain the sorting rule.

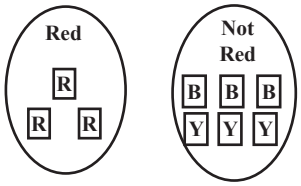
Elaborations—Strategies for Learning and Teaching

The concept of patterning is closely related to sorting. Sorting is the physical process of grouping objects according to shared characteristics. Geometric solids such as cubes, cylinders, pyramids, etc., may be sorted but the focus should be on familiar 3-D objects. Students need frequent practice sorting familiar 3-D objects such as building blocks, cups, shoes, clothing, buttons, farm animals, toys, etc. Students need to be able to recognize attributes before they are expected to sort objects and name the sorting rule. Playing a button game is a great way to introduce this concept. Students form a circle and select a button from a button collection to examine. Allow time for students to identify one attribute of the button. Descriptions may include: "My button is round", "My button has corners", "My button has four holes", "My button is blue", etc. Students take turns for three or four rounds naming different attributes of the same button. During each round the student has to verbalize a different attribute until all possibilities have been stated. Through this exploration, students gain opportunities to learn that objects have many attributes that are similar or different. This experience is beneficial when learning to sort objects. Many varied opportunities need to be provided throughout Term One to ensure that students have a solid understanding of the sorting process.

When sorting by a single attribute, students may apply a sorting rule by simply grouping items that are alike. The cubes in the example below are sorted by the attribute of colour and placed in groups of the same colour such as red, blue and yellow.



Students may also sort objects according to one attribute in a different way. The cubes in the example below are sorted according to the characteristics of 'red' or 'not red'. Other examples of this type of sorting may include: 'round' and 'not round', 'objects that slide and objects that do not slide,' etc.



General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Provide a student with a scoop and a collection of small 3-D objects in a bucket. Items from the *Alphabet Sounds Teaching Tubs* may be selected and used for this activity. Ask the student to fill the scoop with items from the bucket. Students will sort the items collected on the scoop into groups, by attribute and explain their reasoning. Observe how students sort the collection and note their reasoning.

  (KSS2.1, KSS2.2)

- Ask students to remove their shoes and/or bring in their outdoor shoes to sort. Observe how they sort the shoes. Do they sort by:

  - colour?

  - with or without stripes?

  - with or without laces?

  - velcro?

  - light up shoes?

  - theme pictures or words?

  (KSS2.1, KSS2.2)

- Place a basket of odd socks in the home centre for sorting. Ask students to sort the socks. They may choose to sort by colour, foot size, length, stripes or no stripes, etc. Ask students to explain the sorting rule that is used.

  (KSS2.2)

- Observe a pair of students playing a barrier game using a set of familiar 3-D objects and a barrier, such as a book or a box. One of the students will sort the objects behind their side of the barrier. Once sorted, the barrier is removed and the other student will guess the sorting rule used. The game continues with players taking turns re-sorting the objects and naming the sorting rule. Observe and note how students sort and name sorting rules for sets created by a partner.

  (KSS2.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 1:

Launch, p. 11

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 70-73

Suggested Resource

Other curriculum resources

- *Alphabet Sounds Teaching Tubs* (ELA Kindergarten)
- *First Steps Oral Language Resource Book*, Barrier Games, p. 109 (ELA Kindergarten)
- *Kindergarten Teacher's Resource Book*, by Miriam Trehearne, Barrier Games, pp. 208-209 (ELA Kindergarten)

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- games and activities involving patterns

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

Outcomes

Students will be expected to

KSS2 Continued

Achievement Indicators:

KSS2.1 (Continued) Identify a common attribute in a given set of 3-D objects.

KSS2.2 (Continued) Sort a set of objects including familiar 3-D objects, using a single attribute such as size or shape, and explain the sorting rule.

Elaborations—Strategies for Learning and Teaching

Provide students with many experiences to sort objects such as paper clips, blocks, toys of various sizes, beads, buttons, crayons, marker tops, snap cubes, counters, etc. Natural objects in our environments such as rocks, leaves, pine cones, apples, etc. lend themselves to more in depth thinking about common attributes other than colour. They allow students to explore attributes such as texture, shape, and size.

Select a group of students who share things in common such as those wearing glasses, choice in footwear or clothing (sneakers or shoes, solid, striped or patterned shirts) and eye colour. Once the students are grouped, the remaining classmates should identify the common attribute amongst the group members and name and explain the sorting rule. After completing this activity, discuss other possible rules that might apply. Regroup the students accordingly and determine the new sorting rule.

It is important to provide students with opportunities to verbalize their sorting rule to build and solidify reasoning skills. Give students the opportunity to play the role of the teacher by choosing the rule, selecting the students and asking a classmate to identify the sorting rule. It is important for teachers to model this activity frequently before expecting students to take on the teacher role.

Set up three or four sorting centers around the classroom with different objects in each centre. Students visit each centre and sort the objects.
Ask:

- What is your sorting rule?
- Is there another way to sort these objects?
- How about another way?

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Interview

- Using the little book, *Which Two Are the Same?,* select a visual and ask the student to identify which objects on the page have common attributes. For example, two of the four balls on page two are identical. Questions about this visual may include:
  - Can you find the balls that are exactly alike?
  - How are the balls alike?
  - Which ones are different?
  - Why are they different?

  Record student responses to questions asked about the visuals. (KSS2.1)

Performance

- Give students a set of 3-D objects with a common attribute. Objects may include buttons, animal counters or Link-Its™. Ask questions such as, "How are these objects the same? How are they different?" Record student responses. Responses might include:
  - All of the buttons are round.
  - These buttons have only two holes and these buttons have four holes.
  - These animals live in the water but these animals don't live in the water.
  - These Link-Its™ are red and these are not red. (KSS2.1)
- Provide students with a container or tray of coloured tiles or cubes. Ask the student to sort the manipulatives into groups according to colour. Observe and note how students sort by colour. (KSS2.2)
- After a nature walk, give students the opportunity to sort collected items. Observe and note how objects have been sorted. (KSS2.1, KSS2.2)

Journal

- Divide a journal page into four sections. Give each student a set of stickers that can be sorted into four groups. Stickers may include images of animals, stars, happy faces, or flowers. Ask the student to determine a sorting rule before affixing the stickers in the journal entry. (KSS2.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 1:

Lesson 1: pp. 12-14

Activity Bank

- *Colored Blocks*, p. 15
- *Feely Boxes,* p. 15
- *How Are They Alike?*, p. 15
- *Shirt Buttons*, p. 15

Big Math Book: p. 6

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

Outcomes

Students will be expected to

KSS2 Continued

Achievement Indicator:

KSS2.3 Determine the difference between two pre-sorted sets by explaining a sorting rule used to sort them.

Elaborations—Strategies for Learning and Teaching

Students will require a lot of practice recognizing and stating a sorting rule for a pre-sorted set of objects. Games provide this reinforcement. Play a game requiring students to select a set of objects or toys which have been sorted into two groups. For example, dolls may be sorted by hair colour, height, clothing with long or short sleeves, etc. Ask students to identify and explain the sorting rule used.

Place collections of familiar 3-D objects on student tables. In small groups, students decide on a sorting rule for the collection and sort the items accordingly. After each group finishes, students take turns visiting the collections sorted by the other groups and decide on the sorting rule applied to the objects.

Give students two pre-sorted sets of 3-D objects (such as a ball, a globe, and an orange; a boxed present, tissue box and a block). Ask them to explain the sorting rule for each set.

While lining up to leave the classroom, call the students by their names based on a particular attribute such as boy/girl, clothing colour or glasses/no glasses. The remaining students try to name the mystery sorting rule used by the teacher.

Invite students to set up a toy store using items from a play center. One student assumes the role of the shop keeper and sorts the toys into two sets based upon a single attribute. Other students in the class visit the store and try to determine the shop keeper's sorting rules.

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Present students with pre-sorted sets of familiar objects based on a single attribute such as texture, colour and shape. Ask: "What do you think the sorting rule is?" If the student cannot give the answer, ask: "How are things in one set different from the things in the other set?" Note how students determine the difference between two pre-sorted sets and their explanation for sorting.

  (KSS2.3)

- Ask students to sort familiar objects into two sets using sorting mats or trays. Afterwards, ask students to exchange their sorted set with a partner to see if their sorting rule can be identified. Ask students to explain the differences between the two sets and how the objects may be sorted differently. Note student responses.

  (KSS2.2, KSS2.3)

- After students become familiar with the lyrics of the *Sorting Song*, which is sung to the tune of *London Bridge*, invite them to sort a set of objects using a *Two-Part Mat*. After the objects are sorted, sing the second verse of the song to the student:

  How are these things all the same,
  All the same, all the same?
  How are these things all the same,
  I can tell, can you?

  The student responds by changing the lyrics in the third verse of the song to describe their sorting rule.

  All these things are <u>very small</u>,
  <u>Very small, very small</u>.
  All these things are <u>very small</u>,
  That was fun to do!

  Some students may prefer not to sing. Therefore, they may be asked individually to name the sorting rule. Students may compare their sets to their classmates' and explain any differences.

  (KSS2.1, KSS2.2, KSS2.3)

- Using two of the illustrations in the little book title, *Which Belong Together?,* ask students to determine the difference between two of the pre-sorted sets by explaining a sorting rule used to sort them. Note student responses.

  (KSS2.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 1:

Lesson 2: pp. 16-18

Line Master 4: p. 43

Activity Bank

- *Sorting Search*, p. 19
- *Guess My Sorting Rule,* p. 19
- *Touch and Tell*, p. 19
- *Mystery Sets*, p. 19

Big Math Book: p. 7

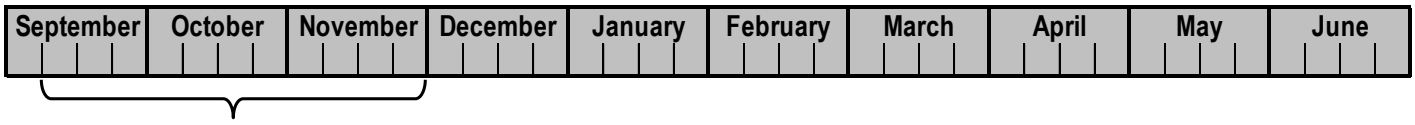
Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 78-81

Math Makes Sense K Audio CD 1:

Selections 1 and 2

Exploring Geometry (Describing/Sorting) and Measurement (Length/Height)

Suggested Percentage of Time in Term One: 15%



Exploring Number: 1 to 5
Lessons 1 - 9

Exploring Patterns: Sorting and Classifying
Lessons 1 and 2

Exploring Geometry (Describing/Sorting) and Measurement (Length/Height)
Lessons 1, 2, 5 and 6

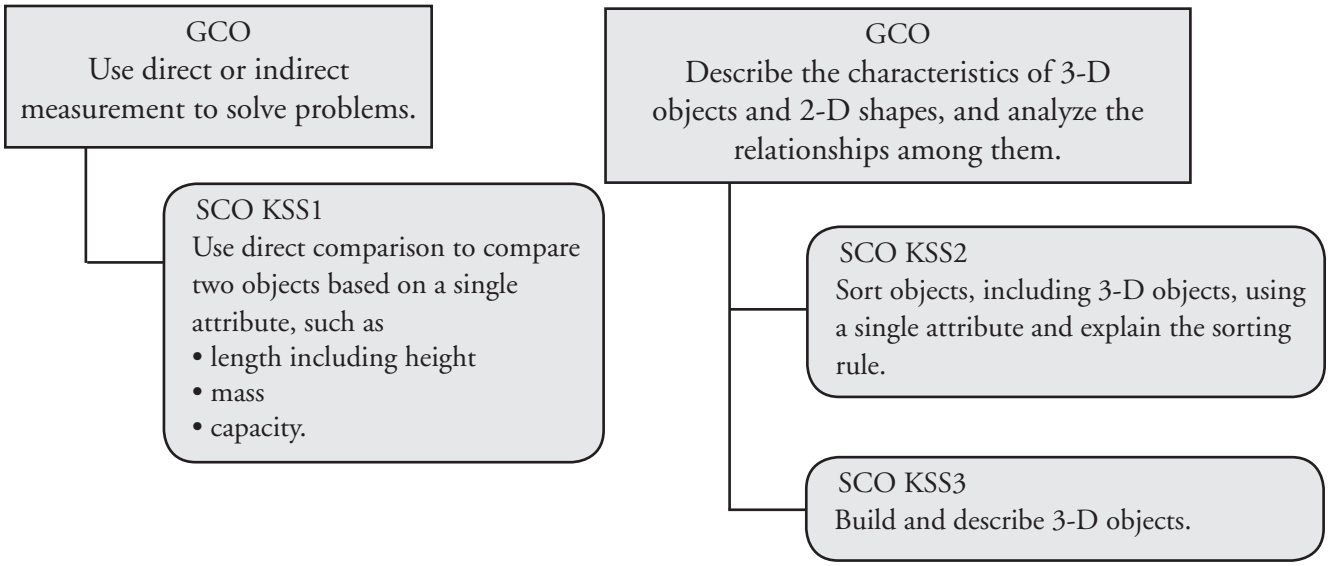
Unit Overview

Focus and Context

This unit provides students with experiences in sorting 3-D objects that are symbolic representations of 3-D geometric solids (e.g., blocks of different shapes, sponges, paper towels, cans, boxes, spools of thread). The focus of teaching and learning is on sorting and comparing 3-D objects using one attribute (e.g., all roll, all slide, all look like a box) rather than on naming shapes and objects. Teachers may expose students to correct mathematics terms such as circle, square, triangle, rectangle, cube, cylinder, cone and sphere using an informal approach. In Grade One, students will continue sorting, comparing and describing 3-D objects and will be formally introduced to 2-D shapes.

This unit launches the teaching and learning of measurement. Students will use direct comparison to compare two objects based on the single attribute of length/height. Students will also make statements of comparison in communicating their understanding of measurement, in terms of length/height. In Grade One, students will compare two or more objects using the single attribute of length.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Shape and Space (Measurement)	
Specific Outcomes	**Specific Outcomes**
KSS1. Use direct comparison to compare two objects based on a single attribute, such as • length including height • mass • capacity. [C, CN, PS, R, V]	1SS1. Demonstrate an understanding of measurement as a process of comparing by: • identifying attributes that can be compared • ordering objects • making statements of comparison • filling, covering or matching. [C, CN, PS, R, V]

Kindergarten	Grade 1
Strand: Shape and Space (3-D Objects and 2-D Shapes)	
Specific Outcomes	**Specific Outcomes**
KSS2. Sort objects, including 3-D objects, using a single attribute and explain the sorting rule. [C, CN, PS, R, V] KSS3. Build and describe 3-D objects. [CN, PS, V]	1SS2. Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule. [C, CN, R, V] 1SS3. Replicate composite 2-D shapes and 3-D objects. [CN, PS, V] 1SS4. Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]

Mathematical Processes

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

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

Outcomes

Students will be expected to

KSS2 Sort 3-D objects using a single attribute and explain the sorting rule.

[C, CN, PS, R, V]

Achievement Indicators:

KSS2.1 Identify a common attribute in a given set of 3-D objects.

KSS2.2 Determine the difference between two pre-sorted sets by explaining a sorting rule used to sort them.

Elaborations—Strategies for Learning and Teaching

Sorting or classifying shapes, using models, is a good way to introduce geometric ideas. Students come to school with exposure to 3-D objects in their environment such as cans, paper towel rolls, and boxes. Structuring meaningful contexts for students which provide opportunities to explore, touch, manipulate, play, sort and build with 3-D objects is important in the development of spatial sense. Early school experiences should include sorting 3-D objects and describing how they are alike and how they differ (smooth sides, sharp corners, rolls, looks like a ball, etc.). Kindergarten students consider the overall appearance and not necessarily the specific properties when describing, sorting and comparing figures. When describing attributes of 3-D objects, expose students to mathematical language such as cube, cylinder, cone and sphere. However, students should not be expected to identify objects using these mathematical terms in Kindergarten.

Ask students to bring a 3-D object from home to share with the class. Suggest items such as juice and soup cans, empty juice tetra paks, Toblerone™ candy bar packages, balls, marbles, kaleidoscopes, straws, marker tops, cone paper cups, birthday hats, empty gift wrap rolls, and spools. Ask students to tell one or two things that they find interesting about the 3-D object that they bring from home. Display all of the items. Show one of the items from the table and invite students to find other 3-D objects that have similar attributes. After all of the items are sorted, students should match the sorted groups to the 3-D geometric solids included in the Kindergarten Manipulative Kit.

Students need practice recognizing and stating a sorting rule for a pre-sorted set of 3-D objects. Display two pre-sorted sets of 3-D objects. One set may include objects that can roll and the other set may include objects that cannot roll. Ask students to tell how the objects in the sets are the same and how they are different. A graphic organizer for same and different may be used to sort the sets. Responses may include:

All of these can roll like a ball.

None of these can roll.

Ask students what else they can tell about the shapes of the objects. Responses may include:

They are round.

They cannot slide.

They don't look like a box.

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Present students with a pre-sorted set of 3-D objects (e.g., a tissue box, eraser, book and sponge). Ask them to identify how the objects are the same. Responses may include:
  They can all slide.
  They all have flat sides.
  They all have points.
  Use a checklist to record student responses.

(KSS2.1)

Interview

- Place 2 pre-sorted sets of 3-D objects on a table and ask, *What is the sorting rule for each set?* One of the sets may include an ice cream cone, a birthday party hat, and a pylon. The other set may include a tennis ball, a marble, a globe and a golf ball. Record how students explain their thinking.

(KSS2.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Lesson 2, pp. 18-20

Line Master 2: p. 56

Kindergarten Math Manipulative Kit

- large geometric solids (6 piece set)
- 35mm shapes for lacing

Suggested Resource

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- games and activities involving shapes and measuring

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

Outcomes

Students will be expected to

KSS2 Continued

Achievement Indicator:

KSS2.3 Sort a set of 3-D objects, using a single attribute such as size or shape, and explain the sorting rule.

Elaborations—Strategies for Learning and Teaching

Once students have spent time explaining a sorting rule for pre-sorted sets, they should begin sorting objects themselves.

To begin, teachers could ask students to sort based on a given attribute. Make a ramp using a wooden plank and some blocks. Select an object such as a cube-shaped block and ask, "Do you think this block will roll or slide down the ramp?" Provide students with a collection of objects to test on the ramp to see if they will slide or roll. Prior to testing, ask them to predict the result and explain their thinking. Based on their findings, ask students to sort the objects into two sets: objects that roll and objects that slide.

Students should then move to sorting a set of objects using an attribute that they identify themselves. Teachers should first model how a set of objects can be sorted by using a common attribute and naming the sorting rule. In a centre, provide pairs of students with 3-D objects to sort. Ask each student to create a set with a common attribute and explain the sorting rule to each other. Students may use sorting criteria such as size, flat sides, thickness of the shape and whether it rolls and/or stacks. Non-geometric criteria such as colour, function and texture may also be used.

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Sort a rock or bean collection according to a single attribute. Ask students to name the sorting rule and tell how the rocks or beans are the same and how are they different. The sorting rule may be determined by the way the objects move - roll/slide, the texture, how they look - flat, pointy, round, curved or straight. Ask the student if there is another way that the rocks or beans may be sorted. Observe how students sort and note the sorting rule used.

  (KSS2.1, KSS2.3)

- Provide pairs of students with a barrier, such as a book or box. Students are given a set of familiar 3-D objects to sort behind their barrier. Once sorted, the barrier is removed and students take turns guessing each others' sorting rule. Students re-sort the objects and repeat the activity. Observe student play and note how the attribute is determined and the sorting rule is explained.

  (KSS2.1, KSS2.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Activity Bank

- *Guess My Rule*, p. 21
- *What Doesn't Belong?*, p. 21
- *Magpie Collections*, p. 21

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

Outcomes

Students will be expected to

KSS3 Build and describe 3-D objects.

[CN, PS, V]

Achievement Indicator:

KSS3.1 Describe a given 3-D object, using words such as big, little, round, like a box and like a can.

Elaborations—Strategies for Learning and Teaching

It is important to provide young students with opportunities to explore 3-D objects so that they may describe, analyze and understand the world in which they live. Students need to see and feel, build and take apart, sort and identify sorting rules, and share observations with their classmates. Early school experiences should include descriptions of how 3-D objects are alike and how they differ. Attributes of 3-D objects that students should explore may include:

- flat sides
- sharp corners
- will roll/stack/slide
- looks like a ball

When describing attributes of 3-D objects, students may be exposed to mathematical language such as square, circle, triangle and rectangle.

Display objects on a tray for students to play *I Spy.* Give clues about one of the items on the tray which describes the shape and size of the object. For example, "I spy with my little eye, something that is round. It's shaped like a can. It is shaped like my mug." Once the item is identified, discuss the clues that were provided and how they helped to identify the object. *I Spy* may also be played using objects in the classroom and the game can easily be included in daily routines.

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Partner students to play a barrier game. After a barrier such as a hard cover book is placed between the pair, one of the partners selects a 3-D object from a collection and hides it on their side of the barrier. The other partner tries to identify the object by asking questions that can be answered "yes" or "no." Observe and note if questions asked include descriptive language (e.g., Are all the sides flat? Is it round?). Afterwards, ask partners to switch roles. Observe student play and note the descriptive language used to identify 3-D objects.

  (KSS3.1)

- Observe and note student responses as they play a version of the game *One of These Things is Just Like the Other*. Show two objects such as a marble and a pencil and ask:
  - Which one of these objects is like a can?

  Show an eraser and an apple and ask:
  - Which one of these objects is like a box?

  Include other questions such as:
  - Which one is bigger?
  - Can you show me which one is little?
  - Can you find the round object?

  (KSS3.1)

- Place a set of 3-D geometric objects (cone, cube, cylinder and sphere) on a display table. Create a "Feely Box" by placing a footless sock or a leg warmer through the opening on the lid of a box. Hide an object in the box that matches one of the geometric objects in the displayed set. Tell the students that there is an object in the "Feely Box" that is the same as one of the objects on display. Ask a student to reach into the opening of the sock and feel the hidden object in the bottom of the box. The student describes the shape and size of the object and finds the matching 3-D geometric object resembling the hidden object. Record student descriptions of hidden objects in comparison to the 3-D geometric object.

  (KSS3.1)

- Provide students with a "Mystery Bag" to collect a secret 3-D object from their home environment. Once the bags are returned, partner students and ask them to take turns posing questions to each other that will help them identify the object in the bag. Observe students interacting with one another and note the language used as they formulate questions to determine the attributes of the object.

  (KSS3.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Launch, p. 13

Lesson 1: pp. 14-17

Teaching Tip: p. 15

Activity Bank

- *I Spy an Object*, p. 17
- *What's Missing?*, p. 17
- *What is Hidden?*, p. 17

Big Math Book: p. 30

Math Makes Sense K Audio CD 2:

Selection 1

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

KSS1 Use direct comparison to compare two objects based on a single attribute, such as

- **length including height**
- mass
- capacity.

[C, CN, PS, R, V]

Achievement Indicators:

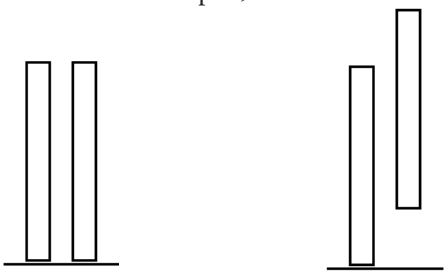
KSS1.1 Compare the height of two given objects; and explain how they compare using the words shorter, taller, or the same as.

KSS1.2 Compare the length of two given objects; and explain how they compare using the words shorter, longer, or the same as.

Elaborations—Strategies for Learning and Teaching

Measurement involves identifying and comparing similar attributes. Through measurement activities, students should realize that the same object can have many measurable attributes. Students should use terminology involving measurement, including: longest, shortest, heaviest, lightest, most, least, or almost the same as. It is important that students explore measurement within context throughout each day using direct comparison. To develop measurement skills, engage students in a wide variety of hands-on measurement activities.

First experiences with measurement for Kindergarten students usually involves height since many students may have a growth chart at home. Direct comparisons of two or more objects are important. Height should be compared by positioning objects at the same base line. Students may need an explanation of the concept of a base line so that they will understand that both objects need to be measured from the same starting point. In the figure below, for example, the first pair of towers are positioned at the same base line and can be compared by height whereas the second pair of towers are not placed on the base line so that the heights can not be compared. Use a variety of contexts to support the idea of a base line, such as a train at the station, rocket at the launch pad, or a runner at the start line.



Students' early experiences of measurement of length involve comparing objects and familiar things in their environment. Students' understanding of length is developed through measuring activities using materials such snap cubes, pencils, links, paper clips, plastic straws, crayons, tables, strings, ribbons, sneakers, paint brushes, books, shelving, bulletin boards, etc.). It is important to remind students to establish a base line when measuring lengths.

General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Interview

- Display two towers of different heights and ask a student:
  - What can you tell me about the two towers?

  Display several play-dough snakes of varying lengths, including some which are the same length and ask a student to choose two. Then ask:
  - What can you tell me about the snakes you chose?

  Record the student's use of mathematical language to compare the lengths and the heights. (KSS1.1)

Performance

- Ask students to find things in the classroom that are taller, shorter than, or as tall as themselves or other objects, e.g., pencil, or block tower. Ask students to identify the tallest or shortest in a group of objects, e.g., a bunch of carrots, a group of crayons or straws. Observe how students compare heights and note the responses. (KSS1.1)

Journal

- Make a large visual of a seasonal or theme character such as a pumpkin, snowman, scarecrow, or Santa Claus. Display the visual using the floor as a baseline. Compare the height of each student with the character on the visual. Capture the differences in height using a digital camera. Students may use the photograph or illustrate in their journals and record a sentence indicating if they are taller, shorter or the same height as the character. Examples of clozed sentences include:

  I am <u>taller</u> than the snowman.

  I am <u>shorter</u> than the snowman. (KSS1.1)

- Ask students to select 3 items in the classroom that are taller, shorter and the same height as themselves. Paste three clozed sentences in their journals stating:

  I am taller than _____.

  I am shorter than _____.

  I am the same as _____.

  Students may use words or drawings to represent their responses.

  (KSS1.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Lesson 5, pp. 30-32

Lesson 6: pp. 34-36

Activity Bank

- *Tall and Short Snowmen,* p. 33
- *Which Teddy Is Taller?,* p. 33
- *Tall Rocketships,* p. 33
- *Tall-Short Patterns,* p. 33
- *Shoe Lengths,* p. 37
- *Picking Straws,* p. 37
- *Whose Arm Is Longer?,* p. 37

Unit Centres:

- *Exploration: Compare It,* p. 10
- *Imaginative Play: Join the Band,* p. 10

Big Math Book: pp. 34 - 35

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 74-77

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

KSS1 Continued

Achievement Indicator:

KSS1.2 (Continued) Compare the length of two given objects; and explain how they compare using the words shorter, longer, or the same as.

Elaborations—Strategies for Learning and Teaching

Sing or chant the song, *What's Bigger than a Bear?* Afterwards, encourage students to answer the questions posed in the song and compare the objects using the words shorter, longer, or almost the same.

What's Bigger than a Bear?

What's Bigger than a Bear? What's Bigger than a Bear?

... smaller than a chair? ... smaller than a chair?

... slower than a snail? ... slower than a snail?

... faster than a whale? ... faster than a whale?

...longer than a chopstick? ...longer than a chopstick?

...shorter than a toothpick? ...shorter than a toothpick?

...louder than a cry? ...louder than a cry?

...softer than a sigh? ...softer than a sigh?

We contrast this and that

here there and everywhere

but when it comes to you my friend nothing can compare.

What's brighter than a flashlight? ...brighter than a flashlight?

...dimmer than the sunlight? ...dimmer than the sunlight?

...smoother than a pine cone? ...smoother than a pine cone?

...rougher than a dog's bone? Rougher than a dog's bone?

Heavier than a bowling ball? Heavier than a bowling ball?

Lighter than a baseball? Lighter than a baseball?

Faster than a plane? Faster than a plane?

Slower than a train? Slower than a train?

We contrast this and that

here there and everywhere

but when it comes to you my friend nothing can compare

because you're one of a kind and you're lucky to find the one and only you!

General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- Present a toothpick and a chopstick to students so that they can identify the objects and their contrasting sizes. Place the toothpick and the chopstick in a collection of objects of varying sizes (hockey stick, paint brush, nail, pencils, etc.) and ask students to select objects to answer the following questions:

  - What's shorter than a toothpick?

  - What's longer than a toothpick?

  - What's shorter than a chopstick?

  - What's longer than a chopstick?

  - Can you find two objects that are the same?

(KSS1.2)

Resources/Notes

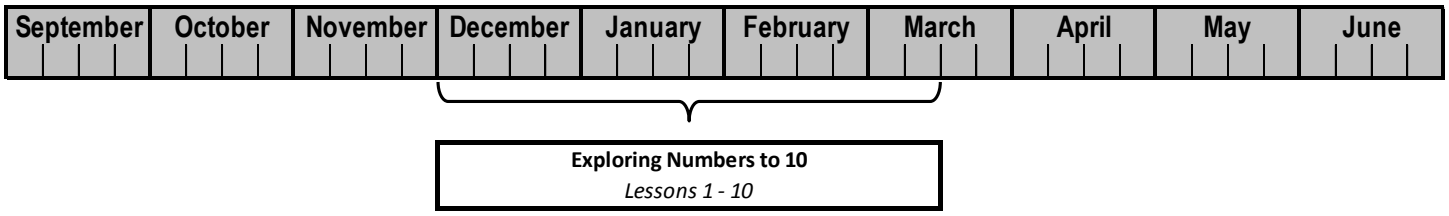
Authorized Resource

Math Makes Sense K Audio CD 2:

Selection 2

Exploring Numbers to 10

Suggested Percentage of Time in Term Two: 70%



Exploring Numbers to 10
Lessons 1 - 10

Exploring Patterns: Two Elements
Lessons 3, 4, and 5

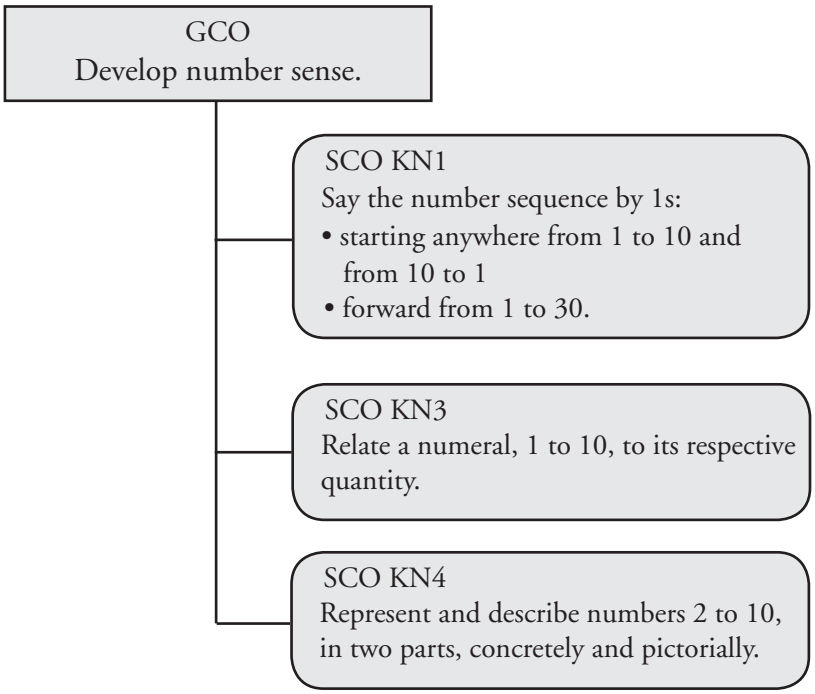
Exploring Geometry (Building 3-D Objects)
and Measurement (Mass)
Lessons 3, 4, and 8

Unit Overview

Focus and Context

In Term Two, as students become confident working with numbers from one to five, they should begin working with the numbers six to ten. Groups of more than five objects are not as easily recognized by students at a glance. Focus will be given in guiding students to make connections between their knowledge of the numbers one to five in relation to the larger numbers. Students will continue to build on their experiences working with part-part-whole activities to help them recognize that a given number can be represented by two smaller numbers. They will create sets to represent numbers to ten and make comparisons to tell which set is larger or smaller.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Number	
Specific Outcomes	**Specific Outcomes**
KN1. Say the number sequence by 1s: • starting anywhere from 1 to 10 and from 10 to 1 • forward from 1 to 30. [C, CN, V] KN3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V] KN4. Represent and describe numbers 2 to 10, in two parts, concretely and pictorially. [C, CN, ME, R, V]	1N1. Say the number sequence 0 to 100 by: • 1s forward between any two given numbers • 1s backward from 20 to 0 • 2s forward from 0 to 20 • 5s and 10s forward from 0 to 100. [C, CN, ME, V] 1N2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 10 objects or dots. [C, CN, ME, V] 1N3. Demonstrate an understanding of counting by: indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets. [C, CN, ME, R, V]

Mathematical Processes

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

Strand: Number

Outcomes

Students will be expected to

KN1 Say the number sequence by 1s:

- **starting anywhere from 1 to 10 and from 10 to 1**
- **forward from 1 to 30.**

[C, CN, V]

Achievement Indicators:

KN1.1 Say the number that comes after a given number, 0 to 9.

KN1.2 Say the number that comes before a given number, 2 to 10.

KN1.3 Count on from a given number to a stated number, forward 1 to 10 and backward 10 to 1.

KN1.4 Rote count from 1 to 30.

Elaborations—Strategies for Learning and Teaching

This unit of work revisits three of the outcomes addressed in the initial unit, *Exploring Number:1 to 5*. Many of the elaborations suggested in this earlier unit for numbers one to five may be repeated throughout this unit with a focus on using numbers six to ten.

Kindergarten students continue to develop an understanding of number sequence through play and daily interactions throughout the year. Within the context of counting, the concepts before and after are introduced at the beginning of the year and may require direct teaching and reinforcement as numbers increase.

While counting forward from 1 to 30 is the expectation for the end of the year, the focus for Term Two is on counting from one to twenty. Provide opportunities during the daily routines to recite the number sequences up to 30. As students line up for dismissal, for example, have them recite the numbers starting with the first student saying a number and the others will continue saying the number sequence forward or backward to a given number.

Continue to pose questions such as the following which encourage students to count for authentic purposes.

- How many chairs are in the library?
- How many counters are in the container?
- In this story, how many pages did we read?
- How many letters are in the mailbox?

Teaching activities may include:

- singing or chanting number songs or chants
- counting while performing finger plays, chants or exercises
- counting while skipping, hopping, bouncing a ball, or taking part in other physical activities
- counting the number of students in various groups during morning routines

Invite students to bring six to ten objects from a collection to class for a "Mystery Show and Tell". A number from six to ten is secretly assigned to, or chosen by, each student to identify the number of objects required for their collection. Students are assigned a specific day to bring and present their set of objects that represents their "secret" number. The set of items should be concealed in a bag, tin, box, etc. The other students may ask questions to help them guess how many items there are in the set. The student presenting may only respond with yes or no. Prior to doing this, brainstorm ideas with the students to prepare a list of possible questions that may be asked. Sample questions include:

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Place ten chairs in a row and invite ten students to stand in front of the chairs. As students say the number sequence one to ten, they will sit down one at a time. Afterwards, say the number sequence backwards ten to one and invite students to stand up one at a time. Vary the activity by counting on from a given number to a stated number, forward one to ten and backward ten to one. Observe students as they take their turn counting forwards and/or backwards.
(KN1.1, KN1.2, KN1.3)
- Play a variation of 'Pass The Bean Bag' by beginning with number one and continuing to pass the bean bag around the circle until students recite the number sequence to 30. The student holding the bean bag on number 30, begins the game the next time that it is played.
(KN1.4)

Interview

- Individually, ask students to start counting from one and to count as high as they can. Record the highest number that a student rote counts and note the date.
(KN1.4)
- Individually or in small groups, say a numeral from two to ten and ask the student(s) to say the numeral that comes before. Repeat this activity and say a numeral from zero to nine and ask the student(s) to say the numeral that comes after. Record the accuracy of student responses on a checklist.
(KN1.1, KN1.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 4:

Lesson 12, pp. 50-52

Line Master 3: p. 68

Line Master 4: p. 69

Big Math Book: p. 47

Activity Bank

- *Making Designs,* p. 53
- *Forward and Backward,* p. 53
- *Before and After,* p. 53
- *Colour the Numerals,* p. 53

Suggested Resource

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- counting games and activities

Strand: Number

Outcomes

Students will be expected to

KN1 Continued

Achievement Indicators:

KN1.1 (Continued) Say the number that comes after a given number, 0 to 9.

KN1.2 (Continued) Say the number that comes before a given number, 2 to 10.

KN1.3 (Continued) Count on from a given number to a stated number, forward 1 to 10 and backward 10 to 1.

KN1.4 (Continued) Rote count from 1 to 30.

Elaborations—Strategies for Learning and Teaching

Are there more than 4?
Is it between 2 and 7?
Is it less than Sam had yesterday?
Does the number of objects in the set come after the number 8?

Once students have guessed the number, the collection is revealed and the objects are counted forwards and backwards by the whole group. Provide frequent opportunities to read children's literature, chant, sing songs, perform action rhymes that involve counting numbers and engage in finger plays. All of these oral language experiences provide opportunities for students to hear number sequence and use mathematical language. Use the audio CDs to sing counting songs and rhymes. *Ten Little Kittens* is one of the selections which can be chanted along with the audio CD. Students may bring along their collections of animals and make up additional verses to the chant. *The Ants Go Marching* may be sung while holding up fingers on each hand to show the number of ants marching as the lyrics are sung.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Invite students to form a circle and begin counting by starting with the number one. The student to the right will continue counting until the tenth individual reaches the number ten (e.g., 1, 2, 3 . . .). Repeat this activity in reverse order and ask the students to continue counting backwards to zero (e.g., 10, 9, 8, 7, 6, 5 . . . etc). The number used to begin counting should vary and not always be one. Also, consider counting to ten while omitting some of the numbers in the sequence and asking students to say the missing numbers when they reach them in the sequential order (e.g., 1, 2, 3, …, 5, 6, …, …, 9, 10. Observe student responses as they take their turn counting forwards and/or backwards.

  (KN1.1, KN1.2, KN1.3)

Interview

- Meet individually with students to determine their level of competency when saying the number sequence. Questions may include:

  "Can you say the numbers for me starting at one?" If the student is unable to say the number sequence, provide a hint to get him/her started, e.g., " one, two. . .," to see if the student is able to continue. A visual may also be used.

  "Can you name the number that comes before eight? Before six?"

  "Can you start at six and say the numbers to ten?" Ask this question when the student demonstrates correct number sequence from zero to ten.

  "Can you start at ten and say the number sequence backward to one?" Ask this question when the student is comfortable saying the number sequence backward from ten.

  (KN1.1, KN1.2, KN1.3)

Resources/Notes

Authorized Resource

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 2-41

Math Makes Sense K Audio CD 2:

Selections 11 - 15

Supplementary Resource

Kindergarten Math Manipulative Kit:

- two-colour counters (200)
- overhead two-colour counters (50)
- links (200)
- jumbo foam dominoes

Suggested Resource

Other curriculum resources

- Appendix (ELA Kindergarten)

Strand: Number

Outcomes

Students will be expected to

KN3 Relate a numeral, 1 to 10, to its respective quantity.

[CN, R, V]

Achievement Indicator:

KN3.1 Identify the number of objects in a set.

Elaborations—Strategies for Learning and Teaching

It is important for students to continue engaging in activities involving manipulatives so that they can relate numerals six to ten to respective quantities. Emphasis should continue to be placed on counting concrete objects rather than counting images on reproducible worksheets. Use of a variety of materials such as Link-Its™, counters, pattern blocks, snap cubes, beans, popsicle sticks, etc. is essential. Containers of small toys, cubes, cars, and pasta, may be arranged on plates, cookie sheets, trays, or hula hoops to present sets of a given quantity. Students will continue to pass through many stages when learning to visually count a set of objects in a set with up to ten objects as they do when working with numbers up to and including five. As the number of objects in the set increase to ten, students may continue to scan the set, touch the objects to keep track, move objects as they count, group the objects, or they may recognize a known quantity at a glance from the visual arrangement. As students develop the "counting on" strategy with numerals up to ten, some or all of these behaviors may be exhibited by some of the students.

Kindergarten students will continue to need authentic opportunities to count the number of objects in a set, including numbers up to ten. As the year progresses, numbers up to ten may easily be incorporated into the daily routines that are established in Term One using numbers one to five. For example, ask students to count the number of students who take the bus, the number of boys or girls in a class, crayons in a package, pencils in a tub, etc. Use any opportunity throughout the day which allows for authentic counting. Reinforcement of this concept in a meaningful way encourages students to count using one-to-one correspondence rather than simply counting by rote. Remind students that the starting point and the order of counting does not affect the quantity and the arrangement or types of objects in a set does not affect the count. Opportunities to count sets of objects may be explored using visuals projected from the electronic big book. After the visual is projected students should be asked, *What do you see?*

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Interview

- Present sets of six to 10 manipulatives to students and ask them to count the objects in the set. Ask, "How many are in the set?" Observe and note how the sets are counted.

(KN3.1)

- Using the visuals in the *Addison Wesley Mathematics Little Books* which depict sets containing six to ten objects, ask students to count and identify the number of items in sets with up to ten objects.

(KN3.1)

- Use numeral plates or cards with representations for numerals six to ten and ask students to count the number of dots on the plates or cards as they are turned over. Record student responses on a checklist.

(KN3.1)

Performance

- Give each student a paper plate and strips of tissue paper (approximately 3 cm x 30 cm). Students select six to 10 strips to create number creatures with legs made from tissue paper. Ask students to name their number monster by counting the number of legs glued on the plate.

(KN3.1)

Journal

- Read children's literature selections which focus on numbers up to ten to create opportunities for journal writing. For example, Eric Carle's selection, *Today is Monday*, is a great selection to focus on the number seven. Students may draw their seven favourite animals and identify the number of objects in the set.

(KN3.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit Four:

Launch, p. 15

Lesson 1: pp.

Lesson 3: pp. 22-23

Lesson 5: pp. 28 - 29

Lesson 7: pp. 34-35

Lesson 9: pp. 40 - 41

Big Math Book: p. 39

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 22-41

Suggested Resource

- *Today is Monday* by Eric Carle

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicator:

KN3.1 (Continued) Identify the number of objects in a set.

Elaborations—Strategies for Learning and Teaching

Continue to use chants to enrich oral language, literacy, and numeracy experiences for students. Sing the song, *Six Little Ducks* and select seven students to dramatize the role of "Mother Duck" and her six ducklings. Assign each duckling a numeral from one to six by giving the students a number badge or necklace to wear. As the lyrics of the song are sung, ducklings will waddle away from or return to the group.

Six Little Ducks

Six little ducks went out one day, over the hills and far away.
Mother duck said, quack quack quack quack, but only five little ducks came back.
Five little ducks went out one day, over the hills and far away.
Mother duck said, quack quack quack quack, but only four little ducks came back.

The song continues with four ducks, three ducks, then two ducks.

One little duck went out one day, over the hills and far away.
Mother duck said, quack quack quack quack, but none of the six little ducks came back.
Sad mother duck went out one day over the hills and far away.
Mother duck said, quack quack quack quack, and all of the six little ducks came back.

Chant the rhyme, *Mr. Crocodile.* Invite seven students to play the role of a monkeys. One student may wear the crocodile hand puppet and the other students join in and add actions as the rhyme is chanted on the audio CD.

Mr. Crocodile

Seven little monkeys swinging from a tree, teasing Mr Crocodile, " you can't catch me." Along came Mr. Crocodile quiet as can be....

Six little monkeys swinging from a tree, teasing Mr Crocodile, " you can't catch me." Along came Mr. Crocodile quiet as can be ....

The song continues with five monkeys to two monkeys.

One little monkey swinging from a tree, teasing Mr Crocodile, " you can't catch me." Along came Mr. Crocodile quiet as can be ....

Missed me!

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Create a set of ten ducks using toy ducks or visuals of ducks. Ask students to count the number of ducks in the set. After the set is counted, use a barrier to secretly remove some of the ducks. Ask students to count the new set. Observe how the set is counted and make anecdotal notes.

(KN3.1)

- Using the alligator puppet, capture sets with up to and including ten monkeys. Visuals of monkeys, plastic figurines or stuffed toys may be used to create the sets. Ask students to count the number of monkeys in sets up to and including ten. Record student responses on a checklist.

(KN3.1)

Interview

- After students become familiar with the poem, *10 on the Couch,* cover the numerals on the visual in the *Big Book* with sticky notes and ask students to count the number of mice in each one of the ten sets. Record student responses for counting sets up to and including ten on a checklist. The e-book version of the *Big Book* may also be used to display the sets.

(KN3.1)

Resources/Notes

Authorized Resource

Math Makes Sense K Audio CD 2: Selections 4 - 6

Big Math Book: p. 44

Suggested Resource

Other curriculum resources

- Alphabet Puppets: The letter "Aa" puppet (ELA Kindergarten)

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicators:

KN3.2 Recognize and name numerals 1 to 10.

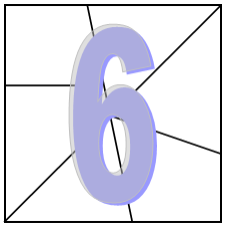
KN3.3 Construct a set of objects corresponding to a given number.

Elaborations—Strategies for Learning and Teaching

Provide students with recycled magazines, catalogues, flyers, foam shapes, feathers, etc. Ask students to find, cut out or assemble sets of six to ten objects and glue them into the entry with the corresponding number.

Once students have developed a familiarity with giving a high five from work with numbers to five, introduce a "high ten" using two hands. Brainstorm other ways that two hands may be used to give "high sixes, sevens, eights and nines". Throughout the day, repeat the activity to transition students from one activity to another. Particular numbers may be focused on at different times.

Prepare number puzzles for numerals six to ten and create the same number of puzzle pieces as the number that is written on the puzzle. For example, the puzzle board shown is cut into six pieces since the number six is on the puzzle board. Students put the puzzle pieces together to form the numeral and glue the puzzle on a piece of construction paper. Students may decorate their puzzle board using items such as lima beans, buttons, feathers, etc. to create a set of objects corresponding to the number on the puzzle. The numeral may also be printed on the white space of each puzzle piece.



In a centre, place fish counters with five containers to represent fish bowls. The bowls should be labeled with the numerals six to ten. Students should fill the bowls with the appropriate number of fish.

During the daily routine, ask students to show the appropriate number of fingers for a given numeral. Students may be given snap cubes to place on the tips of their fingers, on one or two hands. Show a number card or call out a numeral and ask students to hold up the corresponding number of fingers. Discuss the different ways that the numeral was shown by different students.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Present numeral cards (six to ten) to students in a random order. Ask the student to name the numeral on the card one at a time. Note student responses using a checklist.

(KN3.2)

- Select numeral cards (six to ten) randomly and ask students to place the correct number of snap cubes on each card one at a time to correspond with the numeral. Ask students:

  Can you make me a set with the same number of counters as the number on this card?

  Observe and note how students construct sets to corresponding numbers.

(KN3.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit Four:

Activity Bank:

- *Number Lineup* and *Dots and Fingers*, p. 21
- *Ring and Count* and *What Comes After?*, p. 27
- *8 Up!*, p. 33
- *Pot of Gold*, p. 33
- *Mixed-Up Orders*, p. 39
- *Nifty 9*, p. 39
- *Finger Fling!*, p. 45
- *Fish Pond*, p. 45

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicators:

KN3.4 Print numerals from 1 to 10 to represent the number of objects in a given set.

KN3.5 Match numerals with pictorial representations.

Elaborations—Strategies for Learning and Teaching

Students should continue to practise printing the numbers from one to five. As numbers six to ten are introduced, they should also be recorded and practised through meaningful activities.

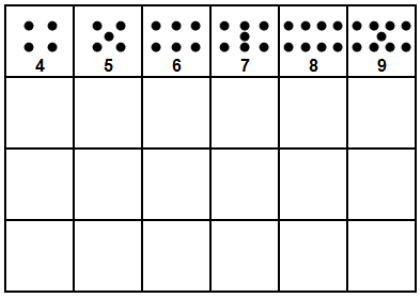
Teachers could read the story, *Ten Black Dots* by Donald Crews. In a centre, provide bingo dabbers, stamps or stickers and an activity sheet so that students will recognize numerals to ten and create corresponding sets. An additional column should also be added to print numerals representing the number of objects in the set.

Count to 10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

During the daily routine, project sets of six to ten overhead counters and ask students to print, on individual whiteboards, the numeral which represents the set of counters.

Using beautiful stuff and a defined space such as a piece of construction paper or a tray, encourage students to experiment with materials such as feathers, buttons, corks, marker tops, etc. to form numerals. Since materials are not pasted onto the surface, a digital photograph may be taken and displayed in the math centre on a number display board.

In the block centre, students could work in pairs building a tower using snap cubes, a game board and a number cube (four to nine). Partner one rolls the number cube and builds a tower using the number of cubes that is rolled on the cube. The tower is placed on the game board in the column that corresponds with the number of snap cubes used to build it. Partner two rolls the die and the building continues. Students continue taking turns rolling the number cube and building towers until an entire column on the game board is filled. The size of the game board may vary when extra rows are added.



General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

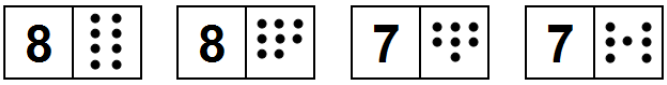
- Daily routines may be assessed in a large group. After sets of six to ten overhead counters are projected, ask students to print the numeral on their individual whiteboards which represents the set of counters. Students must wait to flash their individual whiteboards with their recorded numerals when they are prompted by the word, *Flash!* Record observations on a checklist after each flash.

(KN3.4)

- Include numeral formation in movement activities in the gymnasium. For example, ask five students to use their bodies kinesthetically to form the numeral nine.

(KN3.4)

- Observe pairs of students playing a memory card game with dot and numeral cards. Observe how students determine if selected cards are a match and record observations using anecdotal notes.



(KN3.5)

Interview

- Pick a number card from six to ten and ask students to build a tower using snap cubes. Ask students:
  - How many cubes did you use to make your tower?
  - Can you print the numeral?
  - What numeral is on this card?

(KN3.1, KN3.2, KN3.3, KN3.4)

Journal

- Place sets of six to ten overhead counters on an overhead projector and ask, "How many are in the set?" Ask individual students to count the set. Afterwards, ask students to represent the number of objects in the set in a journal and write the numeral to identify the number of counters in the set.

(KN3.1, KN3.2, KN3.3, KN3.4)

- Observe students as they create sets using six to ten small stickers or stamps. Note how students match the sets to the numerals recorded on the journal entry.

(KN3.5)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit Four:

Unit Centres: pp. 12-13

- *Arts and Crafts: Number Picture*
- *Construction: Number Town*
- *Exploration: Nature Counters*
- *Imaginative Play: Puppet Theatre*
- *Literacy: Number Book*
- *Sand and Water: Sand Numbers*

Supplementary Resource

Kindergarten Math Manipulative Kit

- overhead two-colour counters (200)

Strand: Number

Outcomes

Students will be expected to

KN3 Continued

Achievement Indicator:

KN3.6 Recognize that the original count of a set is maintained when objects are spatially re-arranged (conservation of number).

Elaborations—Strategies for Learning and Teaching

Students have previously worked with conservation of number to five. An activity similar to one used with smaller numbers could be revisited with sets of six to ten.

Select six to ten students to stand and form a line at the front of the classroom. Ask the students who remain seated to count the number of students standing. Direct students to change their positions in the line. Ask a volunteer to count the number of students in the second formation. Ask, "How many now?" Repeat this activity by directing students to stand further apart, closer together, pointing in different directions, dispersed throughout the room and bunched together. These formations should be created without adding or removing a student. Repeatedly ask, "How many now?, How do you know?, Did anyone join/leave the line?" An extension of this activity may be reinforced in the gymnasium to allow for more movement. If students understand the concept of conservation of number from previous work, they should be able to generalize this to larger sets as well.

During the daily routine, include an activity for conservation of number using the classroom whiteboard and magnets. Invite a student to arrange six to ten magnets on the board and count the arrangement aloud with the whole class. Invite another student to change the spatial arrangement using the same number of magnets and ask "How many now?, How do you know?, Were other magnets placed on or removed from the board?"

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide students with two-sided visuals of happy/sad faces on popsicle sticks to be used to give yes and no responses. On an overhead projector, display a set of six to ten snap cubes using different spatial arrangements. Ask students to count the first arrangement. Afterwards, using the same number of snap cubes, re-arrange the set and ask if there are the same number of snap cubes in the set. Students show a happy face if the answer is yes and a sad face if the answer is no. Emphasize the importance of students watching as the arrangement of the cubes are changed. Observe how students respond and note the students who must recount the cubes to determine a response and are not displaying conservation of number. (KN3.6)

- Spatially arrange a set of six to ten objects on a surface. For example, place ten clothes pins on a plastic clothes hanger. Afterwards, space the ten clothespins on the hanger differently and ask the students, "How many clothespins now?" If the student recounts the clothespins he/she is not demonstrating conservation of number. If a student gives you the correct answer, ask, "How do you know?" He/she may say, "I watched you move them" or "You did not add any so it is still 10." Repeat the activity, spacing the clothespins in different arrangements. (KN3.6)
- Provide students with six to ten miniature marshmallows to spatially arrange on skewers. Ask students to compare the spatial layout of skewers with the same number of marshmallows used in other arrangements. (KN3.6)

Resources/Notes

Supplementary Resource

Kindergarten Math Manipulative Kit

- overhead two-colour counters (200)

Strand: Number

Outcomes

Students will be expected to

KN4 Represent and describe numbers 2 to 10, in two parts, concretely and pictorially.

[C, CN, ME, R, V]

Achievement Indicators:

KN4.1 Show a given number as two parts, using fingers, counters or other objects, and name the number of objects in each part.

KN4.2 Show a given number as two parts, using pictures, and name the number of objects in each part.

Elaborations—Strategies for Learning and Teaching

Students became familiar with representing numbers in two parts when they worked with numbers one to five. They will continue to develop their number sense as they work with numbers six to ten. Partitioning a set of objects will help students determine a larger quantity without counting each object.

Using a clothes hanger and six to ten clothespins, display a number of clothespins on a hanger. Ask students to show a combination for the selected numeral by partitioning the clothespins into two groups. Invite students to find as many combinations as they can for selected numerals between six and ten.

Working in partners, students could form snap cube trains that are made using a total of ten snap cubes in two different colours by two students. Use a set of one to nine numeral cards and nine snap cubes in a different colour for each partner. The first student selects a card to determine the number of snap cubes that will be used to build the first section of the train. The second student adds different coloured snap cubes to the train to make a train with ten. Students should continue building snap cube trains and alternate picking cards until all numeral cards have been used.

After students have been introduced to representing part-part-whole relationships using objects, they should also represent numbers in two parts. Chant the poem, *10 on the Couch.* To improvise ten people sitting on a couch, use a blanket to define the space on the floor. Invite ten students to sit in a row on the blanket. As each line of the poem is chanted, the student at the beginning of the row will remove himself from the blanket and assemble in an assigned space. The remainder of the group will hold up their fingers to show how many are on and off the couch after each line of the poem. After students become familiar with this chant, begin chanting the poem with a different number.

10 on the Couch

10 on the couch and the little mouse said, "Move over! Move over!"

So they all moved over and one fell off.

9 on the couch and the little mouse said, "Move over! Move over!"

So they all moved over and one fell off.

The chant continues to two.

1 on the couch and the little mouse said, "Alone at last!"

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Students make trains using six to ten snap cubes of the same colour. Sitting in a circle, students put their train behind their back. Count to two and on the count of three say, *Snap it*! Students should break apart their train in two pieces. Each student shows the two parts of the train and describes it by saying,

  My number 6 train is 4 and 2.

  My number 8 train is 5 and 3.

  My number 10 train is 6 and 4.

  My number 9 train is 7 and 2.

  (KN4.1)

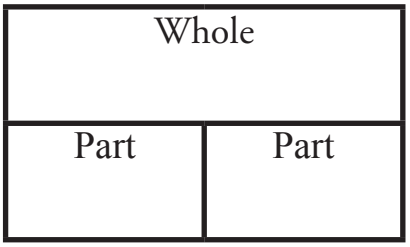
- Provide students with pattern blocks in two different shapes. Ask students to select six to ten blocks and make a design showing combinations of the numeral selected between six and ten. Display on a mat and have students record the combinations.

  (KN4.1)

- Provide each student with six to ten two colour counters. Ask students to shake the counters onto a surface and count the number of counters for each colour by describing the number. For example, "My seven is four and three."

  (KN4.1)

- Using 'Part-Part-Whole mats' and counters, ask students to make sets of six to ten objects by placing counters on the whole and part sections of the mat. Ask students to partition the counters into two parts. Ask students to describe their number: E.g., "My 6 is 3 and 3." "My 8 is 6 and 2". "My 7 is 4 and 3." "My 10 is 8 and 2." "My 9 is 3 and 6."



  (KN4.1)

Resources/Notes

Authorized Resource
Math Makes Sense K Teacher Guide
Unit Four:

Lesson 2: pp. 18-20

Lesson 4: pp. 24-26

Lesson 6: pp. 30-32

Lesson 8: pp. 36-39

Lesson 10: pp. 42-44

Big Math Book: p. 44

Math Makes Sense K Audio CD 2:
Selection 7

Strand: Number

Outcomes

Students will be expected to

KN4 Continued

Achievement Indicators:

KN4.1 (Continued) Show a given number as two parts, using fingers, counters or other objects, and name the number of objects in each part.

KN4.2 (Continued) Show a given number as two parts, using pictures, and name the number of objects in each part.

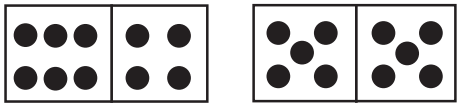
Elaborations—Strategies for Learning and Teaching

Students will continue to need encouragement to create their own representations of mathematical ideas for numbers up to ten. Journal entries may provide opportunities for students to represent numbers in two parts using pictures, stamps, stickers, bingo blotters, etc.

When students represent mathematical ideas, they are making sense by constructing and refining their thinking. Representations may involve dramatizing, drawing, painting, or using concrete materials. Some students may be able to begin using numerals and words in their representations. Opportunities for students to generate multiple representations of the same idea are critical components when developing a deeper understanding of mathematical concepts.

Provide opportunities for students to represent numbers using two-part mats. Draw five two-part mats on a large sheet of paper. Using two bingo dabbers in different colours, ask students to create five different combinations for ten on the mats.

Provide students with domino templates and bingo dabbers. Students make dominos to represent ten and present the dominos, naming the dots in each part.



Create centres using the activity bank suggestions to provide opportunities for students to work collaboratively in pairs.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Using Link-Its™ in two colours, ask students to create chains made of six to ten Link-Its™. Students draw and colour the chain in a journal entry and record the numeral combination. Afterwards, ask them to name and draw as many other combinations as possible.

(KN4.1, KN4.2)

Performance

- Observe students working in pairs and give each student a die and a numeral card. Each student selects a numeral card and rolls a die at the same time. If the combined dots on the dice represent the number on one of the cards, both students draw the combination and record the numerals in each part.

(KN4.1, KN4.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit Four:

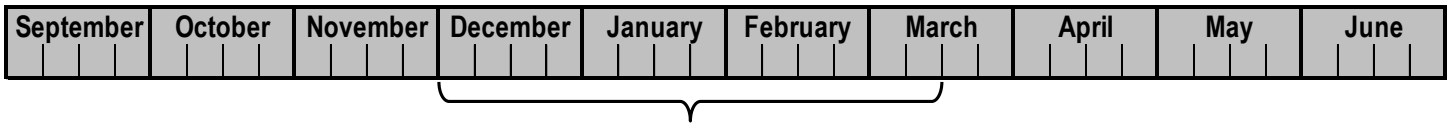
Activity Bank:

- *Muffin Mystery*, p. 21
- *Stick Dice*, p. 21
- *Turning 7*, p. 27
- *7 Trains*, p. 27
- *Grab Bag*, p. 33
- *Tower Building*, p. 33
- *9 Dots Please*, p. 39
- *Spilling 9*, p. 39
- *Is There Enough Room?*, p. 45
- *Ways to Make 10*, p. 45

Math Makes Sense K Audio CD 2: Selection 8

Exploring Patterns: Two Elements

Suggested Percentage of Time in Term Two: 15%



Exploring Numbers to 10
Lessons 1 - 10

Exploring Patterns: Two Elements
Lessons 3, 4, and 5

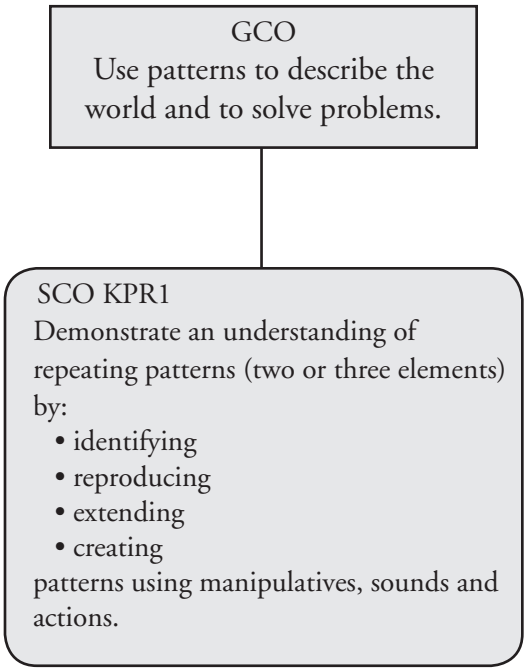
Exploring Geometry (Building 3-D Objects) and Measurement (Mass)
Lessons 3, 4, and 8

Unit Overview

Focus and Context

In Kindergarten, students are formally introduced to repeating patterns of two to three elements. Students verbalize and communicate rules to help them understand the predictability of a pattern. As students have more experiences with this, they will begin to understand that patterns exist all around us and can be used to solve a variety of everyday problems. In Grade One students will continue working with repeating patterns, extending their knowledge to include four elements. By the end of Term Two, Kindergarten students will be expected to identify, reproduce, extend and create two element patterns. Three element patterns will be the focus of teaching and learning during the third term.

Outcomes Framework



SCO Continuum

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

Mathematical Processes

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

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Demonstrate an understanding of repeating patterns (two or three elements) by:

- **identifying**
- **reproducing**
- **extending**
- **creating**

patterns using manipulatives, sounds and actions.

[C, CN, PS, V]

Achievement Indicator:

KPR1.1 Distinguish between repeating patterns and non-repeating sequences in a given set by identifying the part that repeats.

Elaborations—Strategies for Learning and Teaching

Patterning experiences should be an ongoing part of Mathematics throughout the year. At the beginning of Term Two, students will have experiences sorting and classifying a variety of manipulatives from the previous term. These experiences should continue as it will enhance students' understanding of patterns in their environment. Students should be given the opportunities to describe patterns orally as it helps them interpret the patterns they experience visually and it solidifies their understanding of the concept. It also allows students to learn from each other.

Students further develop an understanding of patterns as they extend and create patterns while engaging in activities in small groups or pairs. The focus during Term Two should be two element patterns. Two element patterns may be created using a collection of snap cubes in two different colours and sorted into two groups. Provide opportunities for students to use the coloured snap cubes and create a two element pattern.

A pattern is an extension of a repeating sequence beyond what the student can actually see. Students need many experiences predicting the extended sequence of a given pattern. The **core** of a repeating pattern is the shortest string of elements that repeats. For example, the AB pattern red, blue, red, blue, red, blue... has a core of two different elements. It is important to repeat the core of the pattern at least three times before expecting students to describe, reproduce, or extend a pattern. Please note that colour should not be the only focus when teaching patterning. Two element patterns using objects that differ in size, shape, texture, etc. should also be explored. Suggested manipulatives for creating patterns include:

- snap cubes
- rubber stamps and adding machine paper rolls
- stickers
- pattern blocks
- collections (each collection should consist of 60 – 100 small items of one kind, such as bread tags, marker tops, buttons, shells, etc.)
- two-sided counters

It is important to note that students need varied experiences with both teacher-directed and independent activities. Teacher-directed activities should encourage students to analyze a variety of patterns. Independent activities provide students with opportunities to explore, reproduce, extend, and create patterns appropriate to their level of understanding.

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

Suggested Assessment Strategies

Performance

- Display two towers made of snap cubes. One of the towers has a two element repeating pattern and the other does not have a pattern. Students will select the tower that has a repeating pattern and identify the part of the pattern that repeats. Use a checklist or anecdotal notes to record observations.

  (KPR1.1)

- Form a circle or a line and begin a people pattern by directing gestures to the students to do a particular action such as: *hands up, hands down, hands up, etc*. Select one student prior to creating the pattern to turn away from the group until the pattern is formed. Be sure to include non-repeating sequences such as: *stand up, sit down, stand up, hands up, kneel down, etc.*. Afterwards, the student is asked:

  - Do you see a pattern?
  - What is the repeating part of the pattern*?*

  Discuss the students' responses. Use a checklist to record observations.

  (KPR1.1)

Interview

- The teacher presents two sequences of manipulatives to the student. The student will distinguish between the pattern and the non-pattern. For example, create the pattern red block, blue block, red block, blue block, etc. and the non-pattern red, green, orange, purple, red, yellow. Ask the student:

  - Which one is a pattern?
  - How do you know?

  Use a checklist to record observations.

  The teacher will demonstrate a two element action pattern such as,

  - sit down, stand up, sit down, stand up,

  - snap fingers, clap hands, snap fingers, clap hands,

  Ask the student to show or to tell the repeating part of the pattern.

  (KPR1.1)

Resources/Notes

Authorized Resource
Math Makes Sense K Teacher Guide
Unit 1:
Lesson 3, pp. 20-22

Note:

Although Lesson 3 in the resource includes two and three element patterns, the focus will be on two element patterns during this instructional time of the year. The lesson should be readdressed in Term Three with a focus on three element patterns.

Activity Bank
- *Follow the Pattern*, p. 23
- *Is it a Pattern?*, p. 23
- *I Spy*, p. 23
- *Pattern Strips*, p. 23

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html
- games and activities involving patterns

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Continued

Achievement Indicators:

KPR1.1 (Continued) Distinguish between repeating patterns and non-repeating sequences in a given set by identifying the part that repeats.

KPR1.2 Copy a given repeating pattern, e.g., actions, sound, colour, size, shape, orientation, and describe the pattern.

Elaborations—Strategies for Learning and Teaching

Kindergarten students will describe, reproduce, extend, and create patterns using actions, rhythms and sounds, shapes, attributes, size and numbers. Examples of these patterns include:

- Action pattern: e.g., sit, stand, sit, stand, sit, stand, …
- Rhythmic/Sound patterns: e.g., clap, snap, clap, snap, clap, snap, …
- Colour patterns: e.g. red, yellow, red, yellow, red, yellow, …
- Shape patterns: e.g., circle, square, circle, square, circle, square, …
- Patterns of attributes: e.g., using buttons (four holes, two holes, four holes, two holes, …)
- Patterns of size: e.g., long, short, long, short, long, short, …
- Number patterns: e.g., 1, 2, 1, 2, 1, 2, …

Students' first experiences copying patterns will rely on teacher modeling of patterns using manipulatives for the students to copy the pattern.

It is necessary for all students to have an opportunity to copy a pattern. During daily routines, ask the helper of the day to copy a given pattern to share with the whole group.

Students may be provided with task cards showing a variety of patterns as well as materials to copy the pattern. The teacher should also model how to interpret patterns from task cards before students work independently.

Rhythmic patterns are one of the easiest and most effective ways to begin exploring the concept of patterns. Using rhythmic patterns should be ongoing throughout the mathematics program, interspersing simple patterns with more complicated ones. Act out a rhythmic pattern such as tapping legs, clapping hands, tapping legs, clapping hands, tapping legs, clapping hands, … and ask students to join in when they are comfortable acting out the rhythmic pattern. Continue the pattern until all students can join in and copy the sequence of the pattern. The rhythm of a pattern may be slowed down until all students join in. Afterwards, return to the original tempo to get the flow of the pattern.

Project the lyrics of the song, *Head and Shoulders* and discuss the visuals that display the actions which accompany the song. Invite students to sing the song and dramatize the actions. After each verse, ask students:

- How do you know this is a pattern?
- What actions repeat?
- How do you hear patterns in the words?

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

Suggested Assessment Strategies

Performance

- Model a pattern such as the rhythmic pattern below:

  Stomp, snap, stomp, snap, stomp, snap…

  Tap your head, shrug your shoulders, tap your head, shrug your shoulders,...

  Ask students to describe the pattern and copy the pattern.

  Record observations using anecdotal notes.

  (KPR1.2)

- Provide students with task cards showing a variety of patterns. Using an assortment of manipulatives such as Link-Its™, snap cubes, elastic bands, paper clips or bread tags, ask students to copy a pattern from a selected task card. Ask, "What part of the pattern is repeating?" Use a checklist to record observations.

  (KPR1.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide
Unit 1:

Unit Centres
- *Literacy: Book Talk*, p. 9

Big Math Book: p. 8

Math Makes Sense K Audio CD 1:
Selections 2 and 3

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Continued

Achievement Indicator:

KPR1.3 Extend repeating patterns to two more repetitions.

Elaborations—Strategies for Learning and Teaching

Regardless of whether students are working with simple or complex patterns, encourage them to extend their pattern for two more repetitions using manipulatives. This repetition will help them solidify their understanding that patterns continue.

Present the core of a two element pattern at least three times using manipulatives such as counters, blocks, or coloured tiles. Present manipulatives, for example, using the following core of a two element pattern: big bear, little bear, big bear, little bear, big bear, little bear. Model many examples and provide opportunities for students to extend the pattern. A variation of this activity may be modelled by concealing the last two or three manipulatives and asking students to predict the hidden elements in the pattern.

Encourage students to look for patterns within the environmental print of their world. For example, find patterns on gift wrap, clothing, or packaging and extend the pattern to two more repetitions. Repeating and extending patterns can also be nurtured through exposure to rich, quality literature such as *The Shape of Things* by Dayle Ann Dodds. The colourful pattern borders may lead to discussions and explorations on repeating patterns.

Provide each student with a two colour counter and ask them to form a circle. While sitting in the circle, create a coloured pattern using two colour (red and yellow) counters. An example of a pattern may be red, yellow, red, yellow, red, yellow. Explain to students that they will extend the pattern starting from the teacher's right and around the circle. The student to the right continues the pattern by placing the correct side of the two colour counter in front of them. The next student continues the pattern by doing the same, and so on. Pause occasionally to describe the repeated core of the pattern. Afterwards, ask students to switch places and determine if the colour of the counter will change sitting in a different position in the circle. This activity may be repeated using other combinations of patterns.

During circle time, or when lining up, begin a repeating pattern using the students as the elements of the pattern. For example, sit, stand, sit, stand, sit, stand.., boy, girl, boy, girl, boy, girl…, etc. Ask students to describe and extend the pattern. Have them take turns creating and extending other repeating patterns.

Nursery rhymes provide excellent opportunities for students to see action, size, shape etc. in patterns. For example, red pieces of construction paper in two lengths representing short and long bricks may be used to create a patterned wall for *Humpty Dumpty.* Small and big bowls may be placed in the home centre for patterning. They may represent the bowls used by *Goldilocks and The Three Bears*.

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

Suggested Assessment Strategies

Performance

- Place strips of paper, stampers, stickers, sponge shapes, etc. in an art centre for patterning. The strips should include repeating patterns for students to extend. Ask students to select a strip and extend the pattern to create a border for a bulletin board display.

(KPR1.3)

Interview

- Present students with a snap cube tower displaying a two element pattern using snap cubes using two different colours. For example, red, green, red, green, red, green.... Ask students to extend the given two element pattern.

(KPR1.3)

- Create and display two element patterns made from buttons, shells, cubes, etc. Ask students the following questions and note their responses:
  - How can you tell if this is a pattern?
    I look to see if the cubes, buttons, or shells repeat in the same way.
  - How would you describe this pattern?
    The part that repeats is shell, cube, shell, cube, shell, cube.
  - What comes next?
    The pattern shows shell, cube, shell, cube, over and over, so a shell comes next.

(KPR1.3)

- Using the Teacher Lap Book, *Which One is Next?* show one of the two-page spreads on pages two through nine and ask, *Which tile comes next?* If tiles are available, students may copy the pattern and determine which tiles come next by selecting the tiles from a collection of manipulatives. Observe and note:
  - Can the student accurately identify the pattern rule?
  - Can the student copy the pattern?
  - Can the student extend the pattern by telling you what comes next?
  - Can the student extend the pattern?

(KPR1.2, KPR1.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide
Unit 1:
Lesson 4, pp. 24-26

Note:

Although Lesson 4 in the resource includes two and three element patterns, the focus will be on two element patterns during this instructional time of the year. The lesson should be readdressed in Term Three with a focus on three element patterns.

Activity Bank
- *Last Car*, p. 27
- *Keep It Going*, p. 27
- *What's Hiding?*, p. 27
- *Extending a Pattern*, p. 27

Big Math Book: p. 9

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 94-97

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Continued

Achievement Indicators:

KPR1.4 Create a repeating pattern, using manipulatives, musical instruments or actions, and describe the pattern.

KPR1.5 Identify and describe a repeating pattern in the classroom, school and outdoors; e.g., in a familiar song, in a nursery rhyme.

Elaborations—Strategies for Learning and Teaching

For a student to have mathematical understanding, he or she must realize that patterns may be constructed in different ways using materials which represent the same pattern. For example, a two element pattern may be represented with shapes of triangles and squares as well as with actions which include a clap and a snap.

Provide opportunities for students to explore patterns using different rhythms using a musical triangle, miniature cymbals, a drum or other musical instruments. A two element pattern using instruments, for example, may be represented and described with one drum beat, one cymbal crash, one drum beat, one cymbal crash, one drum beat, one cymbal crash.

Kinesthetic movements may be used by students to create patterns using their own bodies as they click their tongues, snap their fingers, pat their lap or tap their toes, etc.

Provide students with opportunities to describe patterns within the environment (e.g., in the classroom, outdoors, on clothing). The teacher may begin by using patterns that are visible on students' clothing to play a game of "I SPY." For example, the teacher says, *I spy a pattern on Mary's dress. Can you describe this pattern?* A sample response may include: *Blue flower, yellow flower, blue flower, yellow flower, blue flower, yellow flower.* The teacher and the students may also find patterns on food packaging, wall paper and fences.

Some patterns that may be less obvious include:

- Landscapes (tree, flower, tree, flower, tree, flower…)
- Dishes (heart, stripe, heart, stripe, heart, stripe…)
- Buildings (window, wall, window, wall, window, wall…)
- Books (words, pictures, words, pictures, words, pictures…)

Take advantage of opportunities that arise in the classroom to identify patterns. Students could be lined up to go out for gym according to different patterns. For example:

- boy, girl, boy, girl, boy, girl, …
- short sleeve, long sleeve, short sleeve, long sleeve, …
- legs crossed, arms crossed, legs crossed, arms crossed, …
- sneakers, shoes, sneaker, shoes,...

When playing outdoor activities and games have students organize the equipment they are using into patterns. Ask others to identify and describe the pattern made. For example:

- big ball, small ball, big ball, small ball …
- bat, glove, bat, glove, bat, glove, ...

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

Suggested Assessment Strategies

Performance

- Place students in pairs to create a two element pattern. One partner constructs a rhythmic pattern such as snap, tap, snap, tap, snap, tap or clap, stomp, clap, stomp, clap, stomp, etc. The other partner describes the pattern and then they both reverse roles. Observe students as they create and describe patterns.

(KPR1.4)

- Listen to the audio selection, *I Know an Old Lady Who Swallowed a Fly,* and ask students to describe the pattern in the song. After the song has been re-visted several times, observe students as they participate in the singing of the song and note if they can identify the pattern.

(KPR1.5)

Portfolios

- In a block centre, place a variety of concrete materials such as blocks, buttons, stickers, keys, and coloured tiles. Encourage students to create patterns using the materials. Once patterns are created, students document their patterns using a digital camera. Allow time in the day for students to show and describe the patterns that are documented digitally. Record descriptions to accompany photographs and place in student portfolios.

(KPR1.4)

Interview

- Ask students to look around the classroom and find a pattern to photograph. Afterwards, ask students to share their photograph with you and to tell you about the pattern. Record student descriptions to accompany photographs.

(KPR1.5)

- Display a collection of objects from the environment, some with obvious visible patterns and some without. Discuss each object by naming it and observing its features. Ask:
  - Do you see an object with a pattern? How do you know?
  - Do you see an object that does not have a pattern? How do you know?
  - Where do you see patterns in the classroom?

(KPR1.1, KPR1.5)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide
Unit 1:
Lesson 5, pp. 28 - 30

Note: Although Lesson 5 in the resource includes two and three element patterns, the focus will be on two element patterns during this instructional time of the year. The lesson should be readdressed in Term Three with a focus on three element patterns.

Activity Bank
- *Music Patterns,* p. 31
- *All Kinds of Patterns*, p. 31
- *Decorator Patterns,* p. 31
- *Act It Out*, p. 31

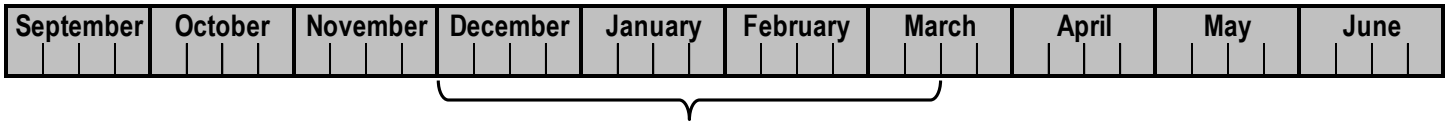
Unit Centres
- *Art and Crafts: Bracelets*, p. 8
- *Construction: Towers and Trains,* p. 8
- *Exploration: Nature,* p. 8
- *Sand and Water: Patterns in the Sand,* p. 8

Big Math Book: p. 10

Math Makes Sense K Audio CD 1:
Selections 5 - 10

Exploring
Geometry (Building 3-D Objects)
and
Measurement (Mass)

Suggested Percentage of Time in Term Two: 15%



Exploring Numbers to 10
Lessons 1 - 10

Exploring Patterns: Two Elements
Lessons 3, 4, and 5

Exploring Geometry (Building 3-D Objects) and Measurement (Mass)
Lessons 3, 4, and 8

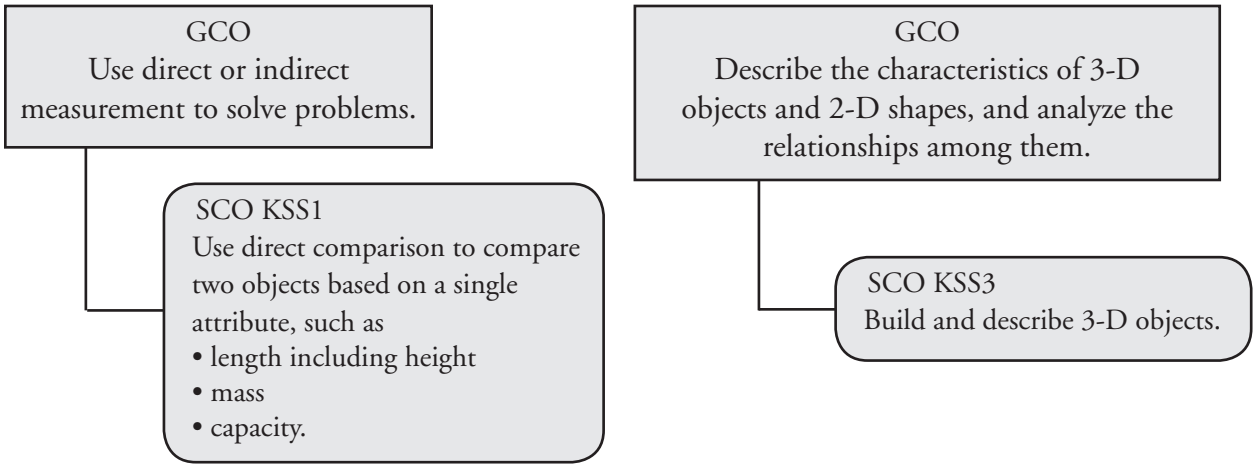
Unit Overview

Focus and Context

In this unit, students will use building materials, such as blocks of different shapes, sponges, paper towels, cans, boxes, Lego™, snap cubes, as well as 3-D geometric models to build 3-D structures, create 3-D structures using modelling clay and describe the structures they build and create. When building with 3-D geometric solids, teachers may expose students to correct mathematical terms such as cube, cylinder, cone and sphere, but emphasis should be on providing language such as: *easy to stack, it's shaped like a box, the round blocks rolled away, the flat blocks were easy to stack*, when describing a structure they have built. In Grade One, students will sort, compare, describe, construct and represent 2-D shapes and 3-D objects.

In this unit, students will use direct comparison to compare two objects based on the single attribute of mass. Students will also make statements of comparison in communicating their understanding of measurement, in terms of mass. In Grade One, students will compare two or more objects using the single attribute of mass.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Shape and Space (Measurement)	
Specific Outcomes	**Specific Outcomes**
KSS1. Use direct comparison to compare two objects based on a single attribute, such as • length including height • mass • capacity. [C, CN, PS, R, V]	1SS1. Demonstrate an understanding of measurement as a process of comparing by: • identifying attributes that can be compared • ordering objects • making statements of comparison • filling, covering or matching. [C, CN, PS, R, V]

Kindergarten	Grade 1
Strand: Shape and Space (3-D Objects and 2-D Shapes)	
Specific Outcomes	**Specific Outcomes**
KSS3. Build and describe 3-D objects. [CN, PS, V]	1SS3. Replicate composite 2-D shapes and 3-D objects. [CN, PS, V] 1SS4. Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]

Mathematical Processes

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

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

Outcomes

Students will be expected to

KSS3 Build and describe 3-D objects.

[CN, PS, V]

Achievement Indicators:

KSS3.1 Describe a given 3-D object, using words such as big, little, round, like a box and like a can.

KSS3.2 Create a representation of a given 3-D object, using materials such as modelling clay and building blocks, and compare the representation to the original 3-D object.

Elaborations—Strategies for Learning and Teaching

Students were exposed to 3-D objects in Term One. Teachers could re-visit the concept of describing 3-D objects by going on a 3-D walk throughout the school. Look for 3-D objects in the school environment, such as a clock, garbage can, locker, globe, pylon, door, eraser, crayon. Students may photograph the objects as they are found and use the photographs to describe and create representations of the found 3-D objects.

Centres with various building materials, such as Lego™, snap cubes, blocks and play-dough, are important places for students to regularly explore and experiment with 3-D objects. 3-D objects have dimensions which include length, width, and depth. Once objects are constructed, students may describe and explain how they built their representations. Teachers should model and encourage use of mathematical vocabulary, such as *as tall as*, *round like...*, *flat*, *curved*, *sides*, and *points*. Engaging students in conversation while they create 3-D objects can provide valuable information regarding their understanding. Use the term 'objects', rather than '3-D objects' when talking to students. Students begin to learn about the attributes of the various objects while constructing. It is through these investigations that they are able to learn the characteristics and properties of objects. Use question such as:

- How is your creation the same as this object?
- How is it different than this object?
- What words can you use to describe your object? (round, flat, shaped like a box)

During outdoor play, students may build a snow sculpture, snowman, or fort using different materials such as shovels, pails, and containers of different shapes and sizes. These activities may also include freezing and thawing activities.

General Outcome: Describe the Characteristics of 3-D Objects and 2-D Shapes, and Analyze the Relationships Among Them

Suggested Assessment Strategies

Performance

- Ask students to select a 3-D object from the collection found on the 3-D walk throughout the school and create a representation of the selected object using materials such as Lego™, building blocks, scrap materials, play-dough, etc. Students will describe their representation and compare it to the original object. Take a digital photograph of the representation beside the actual object and note the use of mathematical language in student descriptions of the objects.

  (KSS3.1, KSS3.2)

- As students are playing in the block centre, have them take turns building a tower for their partner to reconstruct using modelling clay or play-dough. Listen for, and record the use of, mathematical vocabulary.

  (KSS3.1, KSS3.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Lesson 3, pp. 22-25

Lesson 4, pp. 26-28

Activity Bank

- *Build an Inukshuk*, p. 25
- *Another Block*, p. 25
- *Object Trains*, p. 25
- *Nests,* p. 25
- *What Can You Say About It?*, p. 29
- *Copy a Copy*, p. 29
- *Sorting Models*, p. 29
- *Paper Mache Bugs*, p. 29

Unit Centres

- *Construction: Be A Builder,* p. 10
- *Literacy: Alphabet City,* p. 11

Big Math Book; pp. 32-33

Suggested Resource
Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- games and activities involving shapes and measuring

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

KSS1 Use direct comparison to compare two objects based on a single attribute, such as:

- **length including height**
- **mass**
- **capacity.**

[C, CN, PS, R, V]

Achievement Indicator:

KSS1.3 Compare the mass of two given objects; and explain how they compare, using the words lighter, heavier or the same as.

Elaborations—Strategies for Learning and Teaching

Students should recognize that mass relates to the 'heaviness' of an object. Investigations can be performed using a pan balance scale. Students need to develop the understanding that when they place the objects in the two pans of the balance, the pan that goes down can be understood to hold the heavier object. Another way for students to experience the mass of two objects is by holding one of the objects in each hand. By extending their arms and feeling the downward pull of each object, they can determine which is heavier, lighter or about the same.

Sometimes students confuse size with mass. They should have experiences of comparing something 'big and light', such as a tissue box, with something 'small and heavy' such as a golf ball. This will ensure that the attribute that is being measured is the one the students are focusing on.

In a centre, provide a number of objects to compare mass using a pan balance scale. Students place an object in each pan of the scale to determine which object is lighter, heavier or almost the same. Students continue until all of the objects have been placed in the pan balance scale and the mass is compared with the mass of another object. A recording sheet may be included in the centre for students to compare the mass of the objects. They may select two of the objects to draw in a journal and label the objects as lighter, heavier or almost the same.

General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- Ask students to select two objects and place one in each hand to predict which one is heavier, lighter, or the same. Ask them to use a pan balance to confirm their prediction. Encourage students to use words such as heavier, lighter or the same as when making comparisons. Select another object and ask them to find another object that is heavier, lighter or the same as. Use the pan balance to confirm their findings and ask the following questions:
  - Why is one side of the balance scale lower than the other?
  - Why is one side of the balance scale higher than the other?
  - Why are the two sides the same? (KSS1.3)

- Using a pan balance, place a medium sized rock in one of the pans. Ask students to choose, from a rock collection, a rock which is heavier, lighter or the same as the original rock. Observe how they determine their selections.

  (KSS1.3)

- Ask students to hold a glue stick in their hand to get a sense of its mass. Keeping the glue stick in their hand, ask them to find an object that is heavier. This activity may be repeated using lighter and the same as. Observe if students have an understanding of the concept and note how the comparison was determined.

  (KSS1.3)

Observation

- Observe students as they consider the mass of objects in the math centre. Note whether or not they use terms such as heavier, lighter, or the same as.

  (KSS1.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Lesson 8, pp. 42-44

Activity Bank

- *Compare Cookies,* p. 45
- *Talk About a Heavy Snack*, p. 45
- *Rock On*, p. 45

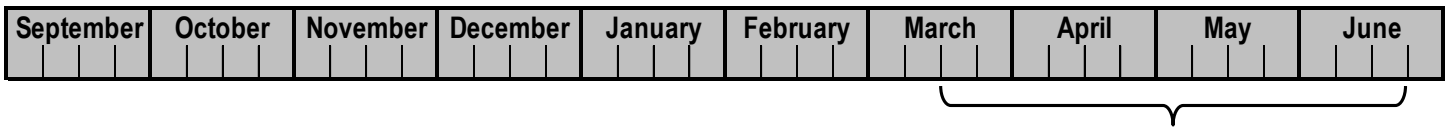
Unit Centres

- *Arts and Crafts: Sock Fish*, p. 10
- *Sand and Water: Which is Heavier?*, p. 10

Big Math Book: p. 37

Exploring Numbers to 10: Ten-Frame/Counting

Suggested Percentage of Time in Term Three: 70%



Exploring Numbers to 10: Ten-Frame/Counting
Lessons 11 and 12

Exploring Patterns: Three Elements
Lessons 3, 4, and 5

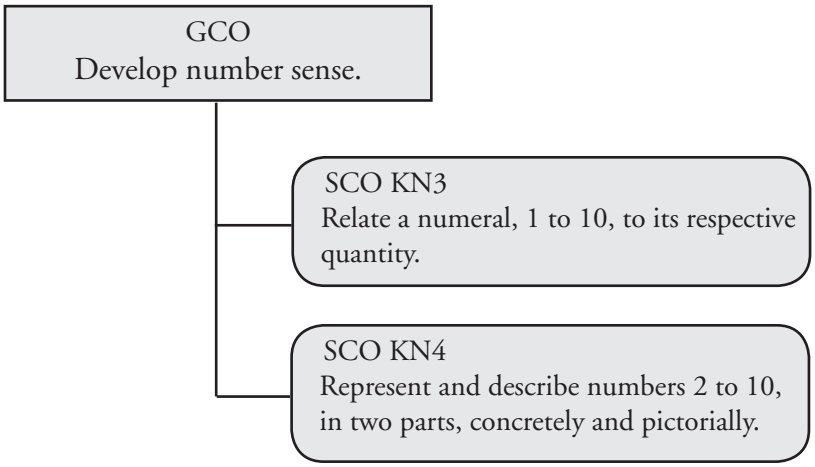
Exploring Geometry and Measurement (Capacity)
Lesson 7

Unit Overview

Focus and Context

The ten-frame will be introduced as an extension of the five-frame. Through repeated experiences, students will discover relationships between numbers, and begin to see five and ten as benchmark numbers. Students will continue to build on their previous knowledge about part-part-whole number relationships and apply this knowledge while working with ten-frames. It is important that these experiences are not rushed, as students must be given the time needed to make connections between numbers. These connections are the foundation for developing number operations in the later grades.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Number	
Specific Outcomes	**Specific Outcomes**
KN3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V] KN4. Represent and describe numbers 2 to 10, in two parts, concretely and pictorially. [C, CN, ME, R, V]	1N3. Demonstrate an understanding of counting by: • indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets. [C, CN, ME, R, V] 1N4. Represent and describe numbers to 20, concretely, pictorially and symbolically. [C, CN, V] 1N5. Compare sets containing up to 20 elements, using: • referents (known quantities) • one-to-one correspondence to solve problems. [C, CN, ME, PS, R, V]

Mathematical Processes

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

Strand: Number

Outcomes

Students will be expected to

KN3 Relate a numeral, 1 to 10, to its respective quantity.

[CN, R, V]

Achievement Indicators:

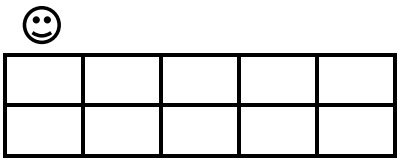
KN3.1 Identify the number of objects in a set.

KN3.2 *Recognize and name numerals 1 to 10.*

KN3.3 Construct a set of objects corresponding to a given numeral.

Elaborations—Strategies for Learning and Teaching

This unit of work revisits two of the outcomes addressed in previous terms of the Kindergarten year. Students will transfer and build on their experiences using a five-frame as they are introduced to numbers on a ten-frame. A ten-frame is a two by five array in which dots or counters are placed to represent numbers. How students use the ten-frame provides insight into students' number concept development. The ten-frame is simply an extension of the five-frame which students were introduced to earlier in the school year. Ten-frames focus on the relationship to five and ten as anchors for numbers. Introduce the following rules for showing numbers on a ten-frame:



- only one counter is permitted in each box of the ten-frame
- use counters of the same colour
- always fill the top row first and start from left to right using left-right directionality that is used for reading and writing. A visual reminder, such as a 'smiley face' above the first square on the left, will support students when they begin filling the frame.
- when the top row is filled, begin placing counters in the bottom row using left to right directionality.

Teachers could create a large ten-frame on a rug using tape. Each space on the ten-frame should be large enough for a student to stand in. Play the song, *The Elephants.* As each of the ten elephants are introduced in the song, a student will take their place on the ten-frame filling it up from left to right on the top and then the bottom of the frame. After each line of the song is played and an elephant is added to the ten-frame, stop the audio and ask, *How many now? How many more will come? How do you know?*

The Elephants

***One** elephant went out to play, upon a spider's web one day.*

They had such enormous fun that they called for another elephant to come.

***Two** elephants went out to play, upon a spider's web one day.*

They had such enormous fun that they called for another elephant to come...

These verses continue until all 10 elephants are invited to play and then the final verse of the song is sung:

...The web went crick, the web went crack and all of a sudden they all went back.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide each student with counters and a ten-frame. Hold up a dot plate or number card. Ask students to fill the ten-frame with counters according to the number shown. Observe students filling in their individual ten-frames and note how each student fills the frame.

(KN3.1, KN3.2)

- Place matching sets of ten-frame cards face down in an array. Pairs of students take turns turning over any two cards to find matches. After the cards are selected, the student must identify the number represented on each card. If both cards are the same, the student collects the pair. If the cards are not a match, they turn the cards face down again. The play continues until all matches have been found. Observe how students identify the number of dots on the ten-frame cards.

(KN3.1)

Interview

- Show a ten-frame filled with counters representing a numeral from six to ten. Ask the student to identify the number represented on the ten-frame. Provide the student with counters and a ten-frame to construct the same numeral on their ten-frame. Observe how the ten-frame is filled. Repeat using different numerals.

(KN3.1, KN3.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 4:

Lesson 11, pp. 46-48

Line Masters 3 and 4: pp. 68-69

Line Master 6: p. 71

Activity Bank

- *Jump, Jump, Jump,* p. 49
- *How Many Counters?,* p. 49
- *The Last One,* p. 49
- *Move Your Counters,* p. 49

Big Math Book: pp. 45-46

Teacher Guide on CD with Microsoft Word™ files:
Assessment Masters

- Assessment Master 3.6: *Ongoing Observations Checklist: Numbers to 10,* p. 63

Math Makes Sense K Audio CD 2:
Selection 9

Supplementary Resource

Kindergarten Math Manipulative Kit:

- two-colour counters (200)
- overhead two-colour counters (50)
- links (200)

Strand: Number

Outcomes

Students will be expected to

KN4 Represent and describe numbers 2 to 10, in two parts, concretely and pictorially.

[C, CN, ME, R, V]

Achievement Indicators:

KN4.1 Show a given number as two parts, using fingers, counters or other objects, and name the number of objects in each part.

KN4.2 Show a given number as two parts, using pictures, and name the number of objects in each part.

Elaborations—Strategies for Learning and Teaching

There are different views on the placement of counters on the ten-frame; however, it is important to consider why ten-frames are used. The main purpose of a ten-frame is to visualize numbers in relation to five and ten, or relate numbers to five and ten as benchmarks. Relating numbers to benchmark numbers, specifically five and ten, is useful when thinking about various combinations of numbers. It should be emphasized to students, for example, that a six on a ten-frame is also a number that is one more than five. This helps students to develop an understanding of representing numbers in two parts (five and one is six). Students may also see numbers that are less than ten. Nine, for example, is the number that is one less than ten. These experiences with number are necessary for students in Kindergarten and filling five and ten-frames left to right with no empty spaces is strongly recommended. This provides opportunities for students to internally visualize numbers as two parts. When students see seven counters on a ten-frame, for example, they can also see that three more counters are needed to make ten; it is three away from ten; or seven and three make ten.

Read children's literature selections, such as *10 for Dinner* by J.E. Bogart, that encourage students to think about number combinations for ten. Encourage students to use a ten-frame and double-sided counters to create their own story showing their two part combinations for ten. Six red balloons, for example, can be represented using 6 red-sided counters and 4 yellow balloons can be represented using 4 yellow-sided counters.

Partner students and ask them to take turns shaking and spilling two dice from a cup. On one of the die, cover the dots representing numbers five and six with masking tape so that numbers will not go beyond ten. Students will name the number of pips (dots) on each die.

Project the ten-frame in the *Electronic Big Book* on a whiteboard. Using dry erase markers, ask students to roll two number cubes and represent the number using two different colours to fill the ten-frame on the whiteboard.

General Outcome: Develop Number Sense

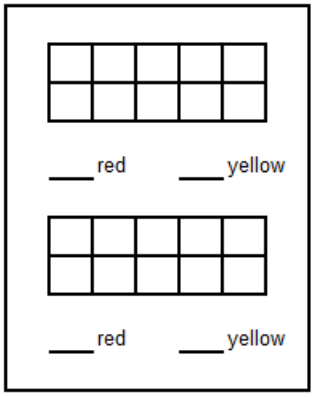
Suggested Assessment Strategies

Performance

- Provide pairs of students with a ten-frame, two-sided counters, and a set of number cards from one to ten. Player A picks a card and covers the ten-frame with the corresponding number of red counters. Player B fills up the remaining spaces on the ten-frame with yellow counters. Each student identifies the number of counters that were used in each colour to make ten. Observe student conversations and note their thinking or use a recording device to capture student conversations during play.

(KN4.1)

- Provide each student with a sheet of ten-frame templates. Select a numeral card from six to ten and ask students to represent their ten-frame number combinations on the ten-frame using red and yellow crayons. This activity may be repeated with a second numeral. Ask students to name the number represented in each coloured part.



(KN4.2)

Journal

- Using an affixed ten-frame template in a journal, ask students to show a given number as two parts on the ten-frame using two different crayons. Afterwards, students may name the number of objects in each part by writing the two numerals beneath the ten-frame. For example, to name two purple circles and seven green circles on the ten-frame a student will write *2* and *7* beneath the ten-frame.

(KN4.2)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 4:

Lesson 11, pp. 46-48

Lesson 12, pp. 50-52

Line Masters 3 and 4: pp. 68-69

Line Master 6: p. 71

Big Math Book: p. 46

Teacher Guide on CD with Microsoft Word™ files:
Assessment Masters

- Assessment Master 3.6: *Ongoing Observations Checklist: Numbers to 10,* p. 63

Supplementary Resource

Kindergarten Math Manipulative Kit:

- two-colour counters (200)
- overhead two-colour counters (50)
- links (200)
- jumbo foam dominoes

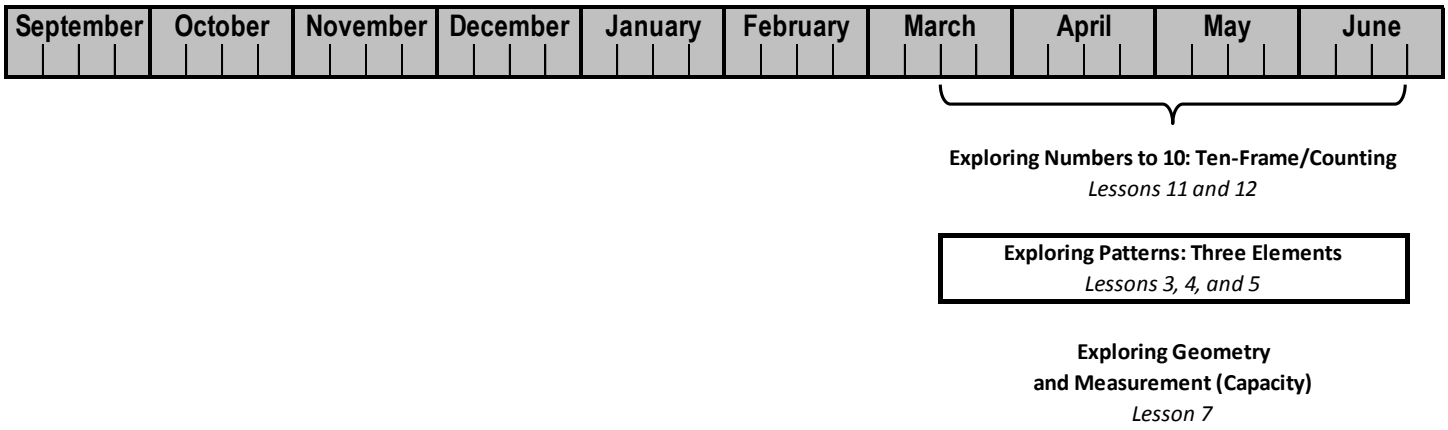
Suggested Resource

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- counting games and activities
- interactive ten-frame

Exploring Patterns: Three Elements

Suggested Percentage of Time in Term Three: 15%

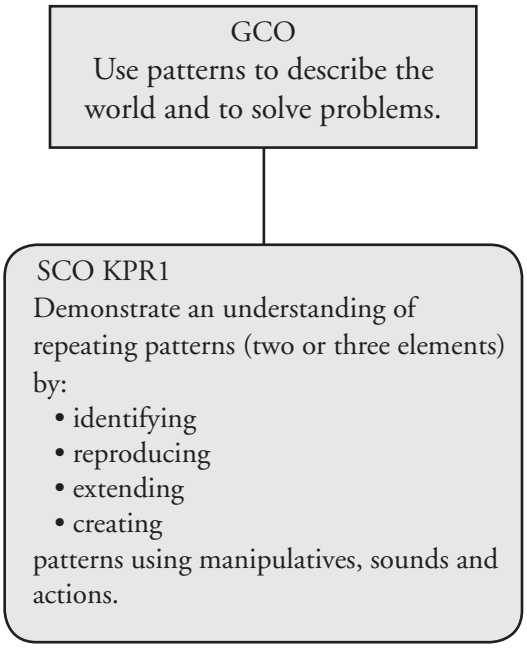


Unit Overview

Focus and Context

This unit explores patterns containing three elements, such as red, red, green, red, red, green, red, red, green or button, paper clip, eraser, button, paper clip, eraser. Students need to be provided with a variety of patterns from simple to complex to meet the range of their varying abilities. Because students progress at different rates, it is unlikely that they will all master a pattern before the teacher moves on to others. However, all students will improve over time if provided with many authentic experiences.

Outcomes Framework



SCO Continuum

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

Mathematical Processes

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

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Demonstrate an understanding of repeating patterns (two or three elements) by:

- **identifying**
- **reproducing**
- **extending**
- **creating**

patterns using manipulatives, sounds and actions.

[C, CN, PS, V]

Achievement Indicators:

KPR1.1 Distinguish between repeating patterns and non-repeating sequences in a given set by identifying the part that repeats.

KPR1.2 Copy a given repeating pattern, e.g., actions, sound, colour, size, shape, orientation, and describe the pattern.

KPR1.3 Extend repeating patterns to two more repetitions.

Elaborations—Strategies for Learning and Teaching

Three element patterns are introduced in Term Three. Students build on their experiences from Term Two, identifying, reproducing, extending and creating two element patterns. It is essential to use a variety of manipulatives, musical and tactile rhythms and beats to model examples of repeating patterns and non-repeating sequences. This activity will help students to identify which sequences contain a pattern by determining if the modeled sequence has a repeating core. Sample patterns should be created using three elements. An example of a three element pattern may include snap cube trains in colours red, blue, yellow, red, blue, yellow, etc. A non-repeating sequence may include snap cube trains in colours red, green, orange, purple, red, yellow. Once students are comfortable identifying sequences with or without repeating patterns, emphasis should be placed on the repeating core with three elements for each snap cube train.

Students should copy modelled patterns which are described and created by the teacher using manipulatives, actions and sounds. Provide students with a pattern to copy by creating it using snap cubes or Link-Its™. A pattern of Link-Its™ may be modelled using red, green, green, red, green, green, red, green, green, for example. Descriptions, using colour words to describe the attribute of colour used in the three element pattern should be included. Ask students to describe their patterns after they have been copied. Patterns may also be modelled using actions such as sit, stand, kneel, sit, stand, kneel, sit, stand, kneel. Students will copy the pattern using the actions modelled. After varied experiences copying patterns using manipulatives, actions, sounds etc., they may copy patterns using various text formats such as stamp designs on paper or graphics on electronic devices.

While using manipulatives to copy patterns, students may be curious and want to explore and extend their patterns. Some students may do this naturally while others may require direct instruction. It cannot be assumed that students will understand repetitions and it may require frequent modelling and opportunities to extend repeating patterns. Modelled patterns should have at least three repetitions of a three element pattern. For example, red block, green block, blue block, red block, green block, blue block, red block, green block, blue block. Invite students to extend the pattern to two more repetitions. Patterns may also be created by forming a circle and using some of the students in the circle to create a three element pattern(e.g., facing forward, facing forward, facing backward, facing forward, facing forward, facing backward, facing forward, facing forward, facing backward, etc.) The remaining students extend the pattern by facing forward or backward depending on their position in the circle.

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

Suggested Assessment Strategies

Performance

- Using a musical instrument such as a drum, model a repeating sound pattern and a non-repeating sound sequence. Ask students to distinguish which of the two has a repeating pattern by identifying the part that repeats. The repeating core of the sound pattern may include two loud drum beats followed by a soft drum beat. The non-repeating sound sequence may include a loud drum beat, a soft drum beat, three loud drum beats and four soft drum beats. After the repeating pattern is identified, ask students to copy the pattern using the instrument.

  (KPR1.1, KPR1.2)

- Show students a pattern using actions and ask them to copy the pattern and extend it to two more repetitions. The following action pattern may be modeled: clap, clap, stamp, clap, clap, stamp. Ask:
  - How can you tell if this is a pattern?

    I listen to hear if the sounds repeat in the same way.
  - How would you describe this pattern?

    The part that repeats is clap, clap, stamp.
  - What comes next?

    The pattern shows clap, clap, stamp over and over, so a clap comes next

  (KPR1.1, KPR1.2, KPR1.3)

- Using a collection of pattern blocks, show students a pattern using shapes like the one below and ask them to describe, copy and extend the pattern.

(KPR1.1, KPR1.2, KPR1.3)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide
Unit 1:
Lesson 3, pp. 20-22
Lesson 4, pp. 24-26

Note:

Although Lessons 3 and 4 in the resource includes two and three element patterns, the focus is on three element patterns during this instructional time of the year. The lessons are also addressed in Term Two with a focus on two element patterns.

Activity Bank
- *Follow the Pattern*, p. 23
- *Is it a Pattern?*, p. 23
- *I Spy*, p. 23
- *Pattern Strips*, p. 23
- *Last Car*, p. 27
- *Keep It Going*, p. 27
- *What's Hiding?*, p. 27
- *Extending a Pattern*, p. 27

Big Math Book: pp. 8-9

Unit Centres
- *Literacy: Book Talk*, p. 9

Math Makes Sense K Audio CD 1:
Selections 2-6, 8 and 9

Addison Wesley Mathematics Little Books Teacher's Guide/Emergent Level, pp. 94-97

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

KPR1 Continued

Achievement Indicators:

KPR1.4 Create a repeating pattern, using manipulatives, musical instruments or actions, and describe the pattern.

KPR1.5 Identify and describe a repeating pattern in the classroom, school and outdoors; e.g., in a familiar song, in a nursery rhyme.

Elaborations—Strategies for Learning and Teaching

Continue to provide opportunities for students to create patterns using different materials. A collection of musical instruments, such as triangles, miniature cymbals and drums, may be used to encourage students to explore patterns in small groups using different rhythms (e.g., one drum beat, one cymbal, one triangle, one drum beat, one cymbal, one triangle). Invite students to showcase their rhythms to the class and encourage students to describe the pattern.

Listen to the audio recording of *Mortimer* by Robert Munsch. Invite students to create a song with a repeating pattern such as the one sang by Mortimer:

Clang, clang, rattle, bing-bang, going to make my noise all day.

Take advantage of daily opportunities that arise in the classroom to create and identify patterns. Patterns may be created in the following ways when students line up to leave the room:

- boy, boy, girl, boy, boy, girl, …
- short sleeve, long sleeve, long sleeve, short sleeve, long sleeve, long sleeve…
- sneakers, sneakers, shoes, sneaker, sneakers, shoes,...

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

Suggested Assessment Strategies

Portfolios

- In a block centre, place a variety of concrete materials such as blocks, buttons, stickers, keys, and coloured tiles. Encourage students to create patterns using the materials. Once patterns are created, students document their patterns using a digital camera. Allow time in the day for students to show and describe the patterns that are documented digitally. Record descriptions to accompany photographs and place in student portfolios.

  (KPR1.4)

Performance

- Select a student to identify and describe a "mystery pattern" created by a group of students. The first three students will create the pattern. Students may create the pattern by arranging themselves in a line or circle. A sample pattern may include students in the following positions:

  sit, stand, kneel, sit, stand, kneel, sit, stand, kneel, etc.

  Invite the student back to the group to identify and describe the pattern. Observe and note if the student can accurately identify and describe the repeating pattern and how the group members created their pattern.

  (KPR1.5)

- When playing outdoor activities and games select students to create repeating patterns with three elements using the equipment. Ask other students to identify and describe the pattern created. For example:

  skipping rope, bat, ball ... (KPR1.4, KPR1.5)

Interview

- Take students on a community walk in search of patterns. Take photographs of patterns that are discovered and record audio clips of student descriptions of the patterns they find. Students may find fence designs, flower arrangements in gardens, brick patterns on houses, advertisements, etc.

  (KPR1.5)

- Display a collection of objects from the environment, some with obvious visible patterns and some without. Discuss each object by naming it and observing its features. Ask:
  - Do you see an object with a pattern? How do you know?
  - Do you see an object that does not have a pattern? How do you know?
  - Where do you see patterns in the classroom? (KPR1.1, KPR1.5)

Resources/Notes

Authorized Resource
Math Makes Sense K Teacher Guide
Unit 1:
Lesson 5, pp. 28-30

Note:

Although Lesson 5 in the resource includes two and three element patterns, the focus is on three element patterns during this instructional time of the year. The lesson is also addressed in Term Two with a focus on two element patterns.

Activity Bank
- *Music Patterns,* p. 31
- *All Kinds of Patterns,* p. 31
- *Decorator Patterns,* p. 31
- *Act It Out,* p. 31

Unit Centres
- *Art and Crafts: Bracelets,* p. 8
- *Construction: Towers and Trains,* p. 8
- *Exploration: Nature,* p. 8
- *Sand and Water: Patterns in the Sand,* p. 9

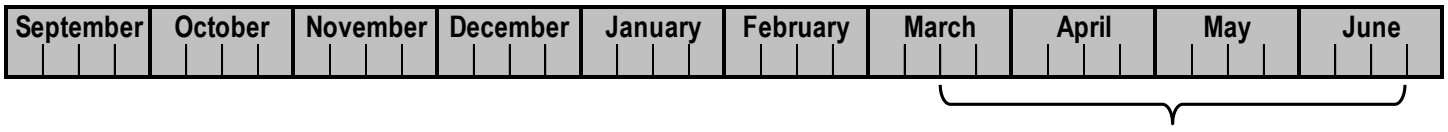
Math Makes Sense K Audio CD 1:
Selection 10

Suggested Resources
- *Mortimer* by Robert Munsch

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html
- games and activities involving patterns

Exploring Geometry and Measurement (Capacity)

Suggested Percentage of Time in Term Three: 15%



Exploring Numbers to 10: Ten-Frame/Counting
Lessons 11 and 12

Exploring Patterns: Three Elements
Lessons 3, 4, and 5

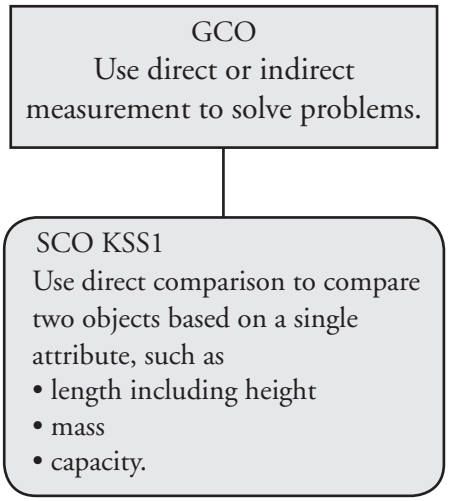
Exploring Geometry and Measurement (Capacity)
Lesson 7

Unit Overview

Focus and Context

In this unit, students will use direct comparison to compare two objects based on the single attribute of capacity. Students will also make statements of comparison in communicating their understanding of measurement, in terms of capacity. In Grade One, students will compare two or more objects using the single attribute of capacity.

Outcomes Framework



SCO Continuum

Kindergarten	Grade 1
Strand: Shape and Space (Measurement)	
Specific Outcomes	**Specific Outcomes**
KSS1. Use direct comparison to compare two objects based on a single attribute, such as • length including height • mass • capacity. [C, CN, PS, R, V]	1SS1. Demonstrate an understanding of measurement as a process of comparing by: • identifying attributes that can be compared • ordering objects • making statements of comparison • filling, covering or matching. [C, CN, PS, R, V]

Mathematical Processes

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

Strand: Shape and Space (Measurement)

Outcomes

Students will be expected to

KSS1 Use direct comparison to compare two objects based on a single attribute, such as:

- length including height
- mass
- **capacity.**

[C, CN, PS, R, V]

Achievement Indicator:

KSS1.4 Compare the capacity of two given objects; and explain how they compare, using the words less, more, (bigger, smaller) or the same as.

Elaborations—Strategies for Learning and Teaching

In Term Three, students re-visit measurement activities with a focus on capacity to determine how much a container holds. Strategies to directly compare the capacities of two or more containers should be investigative in nature. Students need time in water centres to explore filling and emptying a variety of containers and funnels in different sizes. While developing measurement skills for capacity, students should use terms such as 'holds more', 'holds less', 'holds the same', 'full' and 'empty'. Direct measurement involves filling one container and then pouring the contents into another one to find out which holds more. Students can compare the capacity of two containers by filling one container with a pourable material such as water, sand, rice and beans and then pouring the contents into the other container. Students can observe that the capacity of a container can be determined by height, width and the configuration of the container.

Using two objects at a time from a collection of teapots, jugs, kettles, bottles, etc., ask students to make predictions about the capacity of the containers. Use water, rice or sand to verify their predictions.

Goldilocks and the Three Bears could also be used to explore capacity. Ask students to identify the containers used in the story, such as cups, honey pots and bowls, and make predictions about the capacity of each one. Invite students to bring three recyclable containers to class to represent the bowls used by the three bears in the story. Provide rice, sand or beans to determine which container holds the most, least or the same amount. Challenge students to find another container that may hold the same amount.

General Outcome: Use Direct or Indirect Measurement to Solve Problems

Suggested Assessment Strategies

Performance

- Provide containers of various sizes and shapes and include two that are identical. Ask students to select two containers and compare the capacity of each using rice and a large scoop. Ask questions such as:
  - Can the taller container hold more/less?
  - Can the wider container hold more/less?
  - Which containers may hold the same amount?

  (KSS1.4)

- Display two identical transparent containers that are filled with different amounts of coloured water, rice, pasta or sand. Ask students which container holds more? Which container holds less? How do you know?

  (KSS1.4)

- Provide two identical empty containers. Fill the first container three quarters full with water. Ask students to fill the second container with less water. Afterwards, ask students to fill the container with the same amount of water as the first container. Finally, ask students to fill the container with more water than the first container. Observe students to see how they determine the amount of water to add to the container and the language used to compare the capacity of each container.

  (KSS1.4)

- Observe students while playing in the kitchen centre. Have students compare the sizes of tea cups, glasses, bowls, and pots while playing store/restaurant, preparing pretend meals, or having a tea party. Note if they use words such as more, less or the same as.

  (KSS1.4)

Resources/Notes

Authorized Resource

Math Makes Sense K Teacher Guide

Unit 3:

Lesson 7, pp. 38-40

Activity Bank

- *Plant Pots for Jack's Beans,* p. 41
- *Sand Buckets*, p. 41
- *Boxes of Sand*, p. 41

Big Math Book: pp. 26-29, 36

Suggested Resource

Resource Link: www.k12pl.nl.ca/curr/k-6/math/kinder/links.html

- games and activities involving shapes and measuring

Appendix:

Outcomes with Achievement Indicators Organized by Strand (With Curriculum Guide References)

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

Strand: Number	**General Outcome: Develop number sense.**	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
KN1 Say the number sequence by 1s: • starting anywhere from 1 to 10 and from 10 to 1 • forward from 1 to 30. [C, CN, V]	KN1.1 Say the number that comes after a given number from 0 to 9.	pp. 22-24, 78-80
	KN1.2 Say the number that comes before a given number from 2 to 10.	pp. 22-24, 78-80
	KN1.3 Count on from a given number to a stated number, forward 1 to 10 and backward 10 to 1.	pp. 22-24, 78-80
	KN1.4 Rote count from 1 to 30.	pp. 22-24, 78-80
KN2 Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects, dots or pictures. [C, CN, ME, V]	KN2.1 At a glance, identify the number of a given arrangement of 1 to 5 objects or dots, without counting.	p. 34
	KN2.2 Identify the number represented by an arrangement on a five frame.	p. 36
KN3 Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V]	KN3.1. Identify the number of objects in a set.	pp. 26, 82-84, 120
	KN3.2 Recognize and name numerals 1 to 10.	pp. 28, 86, 120
	KN3.3 Construct a set of objects corresponding to a given numeral.	pp. 28-30, 86, 120
	KN3.4 Print numerals from 1 to10 to represent the number of objects in a given set.	pp. 30, 88
	KN3.5 Match numerals with pictorial representations.	pp. 30, 88
	KN3.6 Recognize that the original count of a set is maintained when objects are spatially re-arranged (conservation of number).	pp. 32, 90
KN4 Represent and describe numbers 2 to 10, in two parts, concretely and pictorially. [C, CN, ME, R, V]	KN4.1 Show a given number as two parts, using fingers, counters or other objects, and name the number of objects in each part.	pp. 38, 92-94, 122
	KN4.2 Show a given number as two parts, using pictures, and name the number of objects in each part.	pp. 40, 92-94, 122

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

Strand: Number (Continued)	**General Outcome: Develop number sense.**	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
KN5 Compare quantities 1 to 10: • using one-to-one correspondence • by ordering numbers representing different quantities. [C, CN, V]	KN5.1 Compare and describe two given sets using words such as more, fewer, as many as or the same number. KN5.2 Using a given set, construct another set to show more than, fewer than or as many as. KN5.3 Order quantities of objects in given sets in sequential order from fewer to most.	pp. 42-48 p. 48 p. 48

Strand: Patterns and Relations (Patterns)	**General Outcome: Use patterns to describe the world and to solve problems.**	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
KPR1 Demonstrate an understanding of repeating patterns (two or three elements) by: • identifying • reproducing • extending • creating patterns using manipulatives, sounds and actions. [C, CN, PS, V]	KPR1.1 Distinguish between repeating patterns and non-repeating sequences in a given set by identifying the part that repeats. KPR1.2 Copy a given repeating pattern, e.g., actions, sound, colour, size, shape, orientation, and describe the pattern. KPR1.3 Extend repeating patterns to two more repetitions. KPR1.4 Create a repeating pattern, using manipulatives, musical instruments or actions, and describe the pattern. KPR1.5 Identify and describe a repeating pattern in the classroom, school and outdoors; e.g., in a familiar song, in a nursery rhyme.	pp. 100-102, 128 pp. 102, 128 pp. 104, 128 pp. 106, 130 pp. 106, 130

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

Strand: Shape and Space (Measurement)	**General Outcome: Use direct or indirect measurement to solve problems.**	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
KSS1 Use direct comparison to compare two objects based on a single attribute, such as • length including height • mass • capacity. [C, CN, PS, R, V]	KSS1.1 Compare the height of two given objects; and explain how they compare using the words shorter, longer, taller, or almost the same.	p. 70
	KSS1.2 Compare the length of two given objects; and explain how they compare using the words shorter, longer, or almost the same.	pp. 70-72
	KSS1.3 Compare the mass of two given objects; and explain how they compare, using the words lighter, heavier or almost the same.	p. 114
	KSS1.4 Compare the capacity of two given objects; and explain how they compare, using the words less, more, (bigger, smaller) or almost the same.	p. 136

Strand: Shape and Space (Measurement)	**General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.**	**Page:**
Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators help determine whether students have met the corresponding specific outcome.*	
KSS2 Sort 3-D objects using a single attribute and explain the sorting rule. [C, CN, PS, R, V]	KSS2.1 Identify a common attribute in a given set of 3-D objects.	pp. 54-56, 64
	KSS2.2 Sort a set of 3-D objects, using a single attribute such as size or shape, and explain the sorting rule.	pp. 54-56, 64
	KSS2.3 Determine the difference between two pre-sorted sets by explaining a sorting rule used to sort them.	pp. 58, 68
KSS3 Build and describe 3-D objects. [CN, PS, V]	KSS3.1 Describe a given 3-D object, using words such as big, little, round, like a box and like a can.	pp. 68, 112
	KSS3.2 Create a representation of a given 3-D object, using materials such as modelling clay and building blocks, and compare the representation to the original 3-D object.	p. 112

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