Mathematics Grade 1 Curriculum

Implemented September 2008

New Nouveau Brunswick

Be...in this place • Être...ici on le peut

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Educational Programs and Services

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BACKGROUND AND RATIONALE

Mathematics curriculum is shaped by a vision which fosters the development of mathematically literate students who can extend and apply their learning and who are effective participants in society.

It is essential the mathematics curriculum reflects current research in mathematics instruction. To achieve this goal, the Western and Northern Canadian Protocol (WNCP) *Common Curriculum Framework for K-9 Mathematics* (2006) has been adopted as the basis for a revised mathematics curriculum in New Brunswick. The Common Curriculum Framework was developed by the seven ministries of education (Alberta, British Columbia, Manitoba, Northwest Territories, Nunavut, Saskatchewan and Yukon Territory) in collaboration with teachers, administrators, parents, business representatives, post-secondary educators and others. The framework identifies beliefs about mathematics, general and specific student outcomes, and achievement indicators agreed upon by the seven jurisdictions. This document is based on both national and international research by the WNCP and the NCTM.

There is an emphasis in the New Brunswick curriculum on particular key concepts at each grade which will result in greater depth of understanding and ultimately stronger student achievement. There is also a greater emphasis on number sense and operations concepts in the early grades to ensure students develop a solid foundation in numeracy.

The intent of this document is to clearly communicate high expectations for students in mathematics education to all education partners. Because of the emphasis placed on key concepts at each grade level, time needs to be taken to ensure mastery of these concepts. Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge (NCTM Principles and Standards, 2000).

BELIEFS ABOUT STUDENTS AND MATHEMATICS LEARNING

The New Brunswick Mathematics Curriculum is based upon several key assumptions or beliefs about mathematics learning which have grown out of research and practice. These beliefs include:

- mathematics learning is an active and constructive process;
- learners are individuals who bring a wide range of prior knowledge and experiences, and who learn via various styles and at different rates;
- learning is most likely to occur when placed in meaningful contexts and in an environment that supports exploration, risk taking, and critical thinking and that nurtures positive attitudes and sustained effort; and
- learning is most effective when standards of expectation are made clear with on-going assessment and feedback.

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

Students develop a variety of mathematical ideas before they enter school. Children make sense of their environment through observations and interactions at home and in the community. Mathematics learning is embedded in everyday activities, such as playing, reading, storytelling and helping around the home. Such activities can contribute to the development of number and spatial sense in children. Curiosity about mathematics is fostered when children are engaged in activities such as comparing quantities, searching for patterns, sorting objects, ordering objects, creating designs, building with blocks and talking about these activities. Positive early experiences in mathematics are as critical to child development as are early literacy experiences.

Students learn by attaching meaning to what they do and 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. The use of models and a variety of pedagogical approaches can address the diversity of learning styles and developmental stages of students, and enhance the formation of sound, transferable, mathematical concepts. At all levels, students benefit from working with and translating through a variety of materials, tools and contexts when constructing meaning about new mathematical ideas. Meaningful discussions can provide essential links among concrete, pictorial and symbolic representations of mathematics.

The learning environment should value and respect all students' experiences and ways of thinking, so that learners are comfortable taking intellectual risks, asking questions and posing conjectures. Students need to explore problem-solving situations in order to develop personal strategies and become mathematically literate. Learners must realize that it is acceptable to solve problems in different ways and that solutions may vary.

GOALS FOR MATHEMATICALLY LITERATE STUDENTS

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

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

Students who have met these goals will:

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

OPPORTUNITIES FOR SUCCESS

A positive attitude has a profound effect 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. Students with positive attitudes toward learning mathematics are likely to be motivated and prepared to learn, participate willingly in classroom activities, persist in challenging situations and engage in reflective practices. Teachers, students and parents need to recognize the relationship between the affective and cognitive domains, and attempt to nurture those aspects of the affective domain that contribute to positive attitudes. To experience success, students must be taught to set achievable goals and assess themselves as they work toward these goals. Striving toward success, and becoming autonomous and responsible learners are ongoing, reflective processes that involve revisiting the setting and assessing of personal goals.

DIVERSE CULTURAL PERSPECTIVES

Students attend schools in a variety of settings including urban, rural and isolated communities. Teachers need to understand the diversity of cultures and experiences of all students.

Aboriginal students often have a whole-world view of the environment in which they live and learn best in a holistic way. This means that students look for connections in learning and learn best when mathematics is contextualized and not taught as discrete components. Aboriginal students come from cultures where learning takes place through active participation. Traditionally, little emphasis was placed upon the written word. Oral communication along with practical applications and experiences are important to student learning and understanding. It is also vital that teachers understand and respond to non-verbal cues so that student learning and mathematical understanding are optimized. It is important to note that these general instructional strategies may not apply to all students.

A variety of teaching and assessment strategies is required to build upon the diverse knowledge, cultures, communication styles, skills, attitudes, experiences and learning styles of students. The strategies used must go beyond the incidental inclusion of topics and objects unique to a culture or region, and strive to achieve higher levels of multicultural education (Banks and Banks, 1993).

ADAPTING TO THE NEEDS OF ALL LEARNERS

Teachers must adapt instruction to accommodate differences in student development as they enter school and as they progress, but they must also avoid gender and cultural biases. Ideally, every student should find his/her learning opportunities maximized in the mathematics classroom. The reality of individual student differences must not be ignored when making instructional decisions.

As well, teachers must understand and design instruction to accommodate differences in student learning styles. Different instructional modes are clearly appropriate, for example, for those students who are primarily visual learners versus those who learn best by doing. Designing classroom activities to support a variety of learning styles must also be reflected in assessment strategies.

CONNECTIONS ACROSS THE CURRICULUM

The teacher should take advantage of the various opportunities available to integrate mathematics and other subjects. This integration not only serves to show students how mathematics is used in daily life, but it helps strengthen the students' understanding of mathematical concepts and provides them with opportunities to practise mathematical skills. There are many possibilities for integrating mathematics in literacy, science, social studies, music, art, and physical education.

ASSESSMENT

Ongoing, interactive assessment (*formative assessment*) is essential to effective teaching and learning. Research has shown that formative assessment practices produce significant and often substantial learning gains, close achievement gaps and build students' ability to learn new skills (Black & William, 1998, OECD, 2006). Student involvement in assessment promotes learning. Interactive assessment, and encouraging self-assessment, allows students to reflect on and articulate their understanding of mathematical concepts and ideas.

Assessment in the classroom includes:

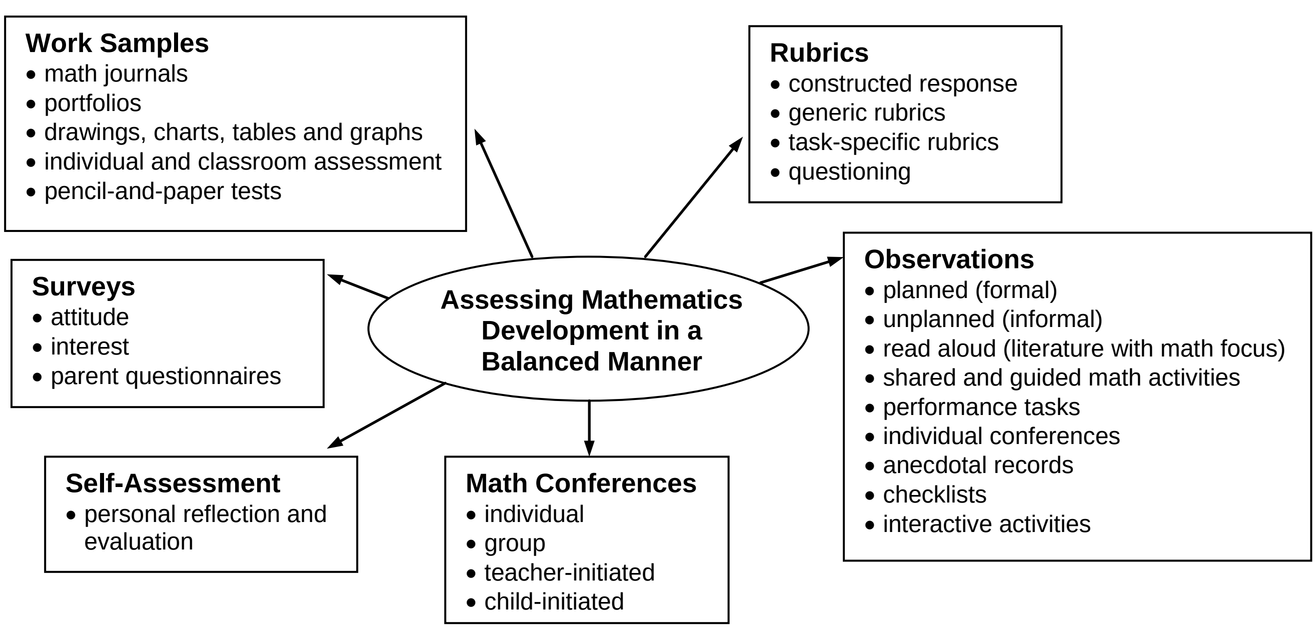
- providing clear goals, targets and learning outcomes
- using exemplars, rubrics and models to help clarify outcomes and identify important features of the work
- monitoring progress towards outcomes and providing feedback as necessary
- encouraging self-assessment
- fostering a classroom environment where conversations about learning take place, where students can check their thinking and performance and develop a deeper understanding of their learning (Davies, 2000)

Formative assessment practices act as the scaffolding for learning which, only then, can be measured through summative assessment. *Summative assessment,* or assessment *of* learning, tracks student progress, informs instructional programming and aids in decision making. Both forms of assessment are necessary to guide teaching, stimulate learning and produce achievement gains.

Student assessment should:

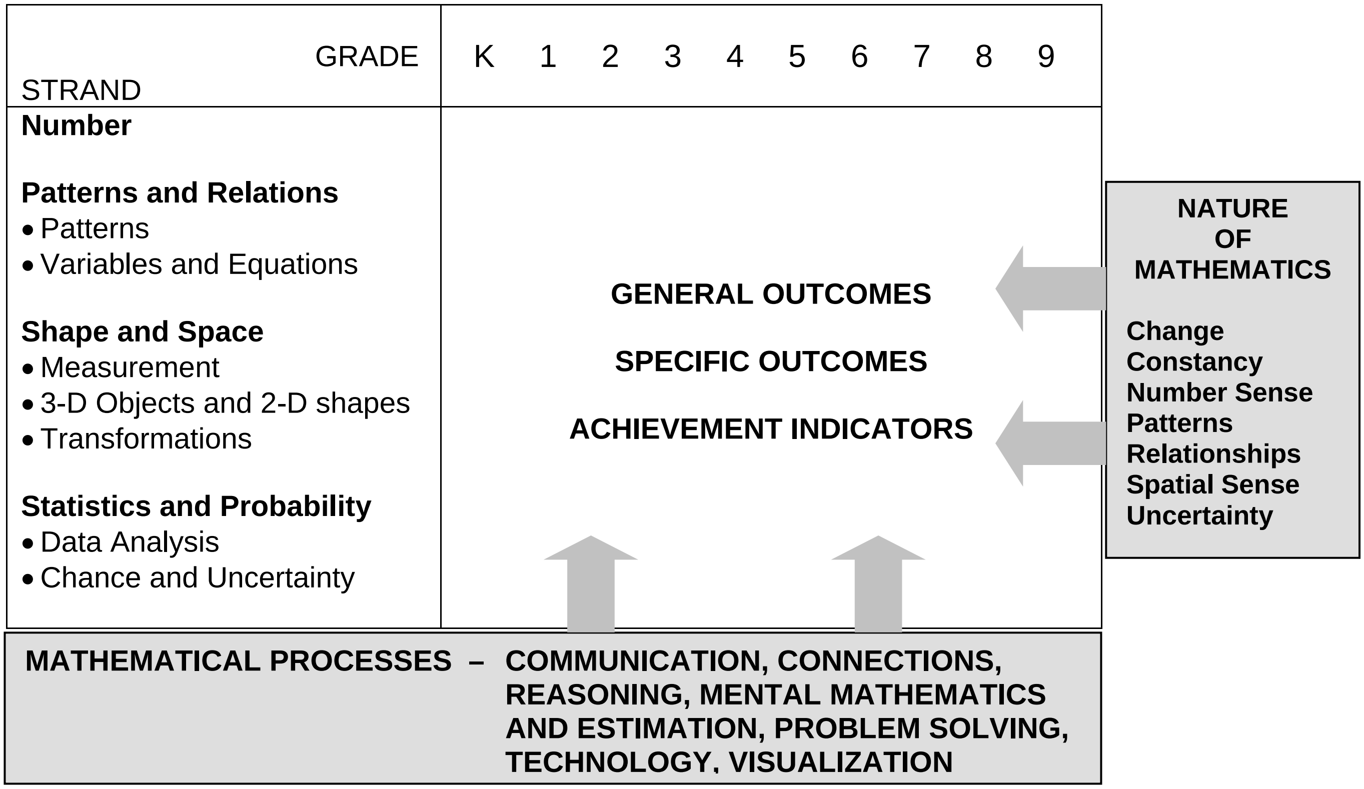
- align with curriculum outcomes
- use clear and helpful criteria
- promote student involvement in learning mathematics during and after the assessment experience
- use a wide variety of assessment strategies and tools
- yield useful information to inform instruction

(adapted from: NCTM, Mathematics Assessment: A practical handbook, 2001, p.22)



CONCEPTUAL FRAMEWORK FOR K – 9 MATHEMATICS

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



INSTRUCTIONAL FOCUS

The New Brunswick Curriculum is arranged into four strands. These strands are not intended to be discrete units of instruction. The integration of outcomes across strands makes mathematical experiences meaningful. Students should make the connection between concepts both within and across strands. 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 models and gradually developed from the concrete to the pictorial to the symbolic.
- There is a greater emphasis on mastery of specific curriculum outcomes.

The mathematics curriculum 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 stem from a problem-solving approach, be based on mathematical processes and lead students to an understanding of the nature of mathematics through specific knowledge, skills and attitudes among and between strands.

MATHEMATICAL PROCESSES

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

- communicate in order to learn and express their understanding of mathematics (Communications: C)
- connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other disciplines (Connections: CN)
- demonstrate fluency with mental mathematics and estimation (Mental Mathematics and Estimation: ME)
- develop and apply new mathematical knowledge through problem solving (Problem Solving: PS)
- develop mathematical reasoning (Reasoning: R)
- select and use technologies as tools for learning and solving problems (Technology: T)
- develop visualization skills to assist in processing information, making connections and solving problems (Visualization: V).

The New Brunswick Curriculum incorporates these seven interrelated mathematical processes that are intended to permeate teaching and learning.

Communication [C]

Students need opportunities to read about, represent, view, write about, listen to and discuss mathematical ideas. These opportunities allow students to create links between their own language and ideas, and the formal language and symbols of mathematics. Communication is important in clarifying, reinforcing and modifying ideas, knowledge, 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 can help students make connections among concrete, pictorial, symbolic, verbal, 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 can begin to view mathematics as useful, relevant and integrated. Learning mathematics within contexts and making connections relevant to learners can validate past experiences, and increase student willingness to participate and be actively engaged. The brain is constantly looking for and making connections.

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

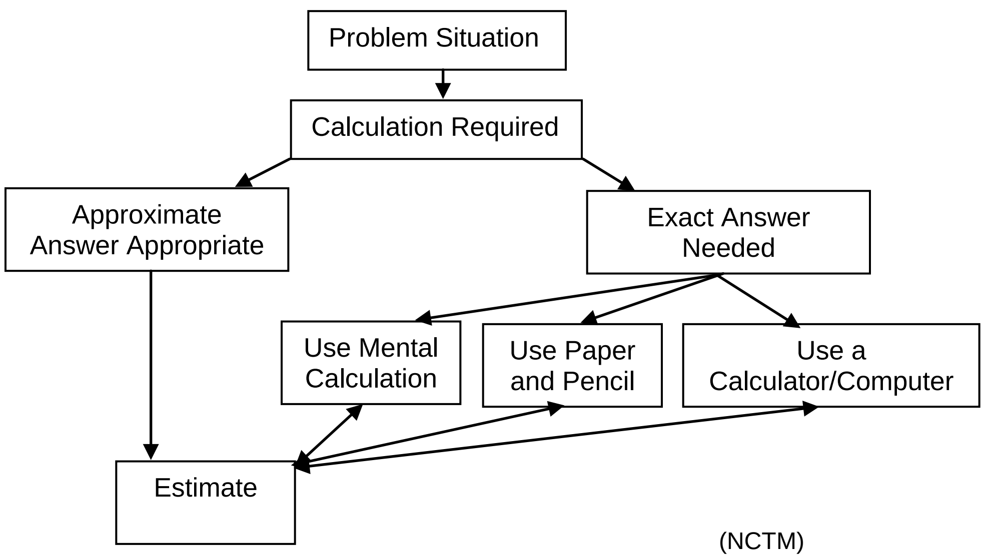
Reasoning [R]

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 inductive and deductive reasoning. Inductive reasoning occurs when students explore and record results, analyze observations, make generalizations from patterns and test these generalizations. Deductive reasoning occurs when students reach new conclusions based upon what is already known or assumed to be true.

Mental Mathematics and Estimation [ME]
Mental mathematics is a combination of cognitive strategies that enhance flexible thinking and number sense. It is calculating mentally without the use of external memory aids. Mental mathematics enables students to determine answers without paper and pencil. It improves computational fluency by developing efficiency, accuracy and flexibility. Even more important than performing computational procedures or using calculators is the greater facility that students need—more than ever before—with estimation and mental mathematics (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). Mental mathematics "*provides a cornerstone for all estimation processes offering a variety of alternate algorithms and non-standard techniques for finding answers*" (Hope, 1988).

Estimation is a strategy for determining approximate values or quantities, usually by referring to benchmarks or using referents, or for determining the reasonableness of calculated values. Students need to know how, when and what strategy to use when estimating. Estimation is used to make mathematical judgments and develop useful, efficient strategies for dealing with situations in daily life.

Students need to develop both mental mathematics and estimation skills through context and not in isolation so they are able to apply them to solve problems. Whenever a problem requires a calculation, students should follow the decision making process as described below.



(NCTM)

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

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

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

Technology [T]
Technology contributes to the learning of a wide range of mathematical outcomes and enables students to explore and create patterns, examine relationships, test conjectures and solve problems.
Calculators and computers can be used to:

- explore and demonstrate mathematical relationships and patterns
- organize and display data
- extrapolate and interpolate
- assist with calculation procedures as part of solving problems
- decrease the time spent on computations when other mathematical learning is the focus
- reinforce the learning of basic facts and test properties
- develop personal procedures for mathematical operations
- create geometric displays
- 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. While technology can be used in K–3 to enrich learning, it is expected that students will meet all outcomes without the use of technology.

Visualization [V]
Visualization "*involves thinking in pictures and images, and the ability to perceive, transform and recreate different aspects of the visual-spatial world*" (Armstrong, 1993, p. 10). The use of visualization in the study of mathematics provides students with opportunities to understand mathematical concepts and make connections among them. Visual images and visual reasoning are important components of number, spatial and measurement sense. Number visualization occurs when students create mental representations of numbers.

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

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

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

NATURE OF MATHEMATICS

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 document. These components include: **change**, **constancy**, **number sense**, **relationships**, **patterns**, **spatial sense** and **uncertainty**.

Change

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:

- 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

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 area of a rectangular region is the same regardless of the methods used to determine the solution
- the sum of the interior angles of any triangle is 180°
- the theoretical probability of flipping a coin and getting heads is 0.5.

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

Number Sense

Number sense, which can be thought of as intuition about numbers, is the most important foundation of numeracy (The Primary Program, B.C., 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. Number sense develops when students connect numbers to real-life experiences, and use benchmarks and referents. This results in students who are computationally fluent, flexible with numbers and have intuition about numbers. The evolving number sense typically comes as a by-product of learning rather than through direct instruction. However, number sense can be developed by providing rich mathematical tasks that allow students to make connections.

Relationships

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 the collection and analysis of data, and describing relationships visually, symbolically, orally or in written form.

Patterns
Mathematics is about recognizing, describing and working with numerical and non-numerical patterns. Patterns exist in all strands and it is important that connections are made among strands. 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 problems. Learning to work with patterns in the early grades helps develop students' algebraic thinking that is foundational for working with more abstract mathematics in higher grades.

Spatial Sense
Spatial sense involves visualization, mental imagery and spatial reasoning. These skills are central to the understanding of mathematics. Spatial sense enables students to reason and interpret among and between 3-D and 2-D representations and identify relationships to mathematical strands. 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. Spatial sense offers a way 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 objects. Spatial sense allows students to make predictions about the results of changing these dimensions. For example:

- knowing the dimensions of an object enables students to communicate about the object and create representations
- the volume of a rectangular solid can be calculated from given dimensions
- doubling the length of the side of a square increases the area by a factor of four.

Uncertainty
In mathematics, interpretations of data and the predictions made from data may lack certainty. Events and experiments generate statistical data that can be used to make predictions. It is important to recognize that these predictions (interpolations and extrapolations) are based upon patterns that have a degree of uncertainty. The quality of the interpretation is directly related to the quality of the data. An awareness of uncertainty allows students to assess the reliability of data and data interpretation. Chance addresses the predictability of the occurrence of an outcome. As students develop their understanding of probability, the language of mathematics becomes more specific and describes the degree of uncertainty more accurately.

STRUCTURE OF THE MATHEMATICS CURRICULUM

STRANDS

The learning outcomes in the New Brunswick Curriculum are organized into four strands across the grades, K–9. Strands are further subdivided into sub-strands which are the general curriculum outcomes.

OUTCOMES AND ACHIEVEMENT INDICATORS

The New Brunswick Curriculum is stated in terms of general curriculum outcomes, specific curriculum outcomes and achievement indicators.

General Curriculum Outcomes (GCO) are overarching statements about what students are expected to learn in each strand/sub-strand. The general curriculum outcome for each strand/sub-strand is the same throughout the grades.

Specific Curriculum Outcomes (SCO) are statements that identify specific concepts and related skills underpinned by the understanding and knowledge attained by students as required for a given grade.

Achievement Indicators are one example of a representative list of the depth, breadth and expectations for the outcome. Achievement indicators are pedagogy and context free.

Strand	General Curriculum Outcome (GCO)
Number (N)	**Number:** Develop number sense
Patterns and Relations (PR)	**Patterns**: Use patterns to describe the world and solve problems
	Variables and Equations: Represent algebraic expressions in multiple ways
Shape and Space (SS)	**Measurement**: Use direct and indirect measure 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 (SP)	**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

CURRICULUM DOCUMENT FORMAT

This guide presents the mathematics curriculum by grade level so that a teacher may readily view the scope of the outcomes which students are expected to meet during that year. Teachers are encouraged, however, to examine what comes before and what follows after, to better understand how the students' learnings at a particular grade level are part of a bigger picture of concept and skill development.

As indicated earlier, the order of presentation in no way assumes or prescribes a preferred order of presentation in the classroom, but simply lays out the specific curriculum outcomes in relation to the overarching general curriculum outcomes (GCOs).

The specific curriculum outcomes (SCOs) are presented on individual four-page spreads as illustrated below.

GCO:
SCO: (specific curriculum outcome and mathematical processes)
Key for mathematical processes

Scope and Sequence
Current Grade

Elaboration
Guiding Questions

(Describes the "big ideas" and what the students should learn this year in regards to this concept.)

Page 1

GCO:
SCO:

Achievement Indicators

Guiding Questions

(Describes what could be observed to determine whether students have met the specific outcome.)

Page 2

GCO:
SCO:

Planning for Instruction
Guiding Questions

Choosing Instructional Strategies
(Lists general strategies to assist in teaching this outcome.)

Suggested Activities
(Lists possible specific activities to assist students in learning this concept.)

Possible Models

Page 3

GCO:
SCO:

Assessment Strategies
Guiding Questions

(Overview of assessment)

Whole Class/Group/Individual Assessment
(Lists sample assessment tasks.)

Follow-up on Assessment
Guiding Questions

Page 4

SCO: **N1: Say the number sequence, 0 to 100, by:** **• 1s forward and backward between any two given numbers** **• 2s to 20, forward starting at 0** **• 5s and 10s to 100, forward starting at 0.** [C, CN, V, ME]
[C] Communication **[PS]** Problem Solving **[CN]** Connections **[ME]** Mental Math and Estimation **[T]** Technology **[V]** Visualization **[R]** Reasoning

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
N1 Say the number sequence by 1s starting anywhere from 1 to 10 and from 10 to 1.	**N1** Say the number sequence, 0 to 100, by: • 1s forward and backward between any two given numbers • 2s to 20, forward starting at 0 • 5s and 10s to 100, forward starting at 0.	**N1** Say the number sequence from 0 to 100 by: 2s, 5s and 10s, forward and backward, using starting points that are multiples of 2, 5 and 10 respectively; 10s using starting points from 1 to 9; 2s starting from 1.

ELABORATION

Guiding Questions:

• What do I want my students to learn?
• What do I want my students to understand and be able to do?

Students are developing an understanding of **number** and **counting**. They are able to count forwards and backwards and count on to 10. They should continue to practise rote counting and begin to skip count various number sequences**.** Include situations which require:

- counting forwards and backwards
- counting on by ones from a given number
- skip counting (e.g., 2, 4, 6, 8 ...)

Although it is unlikely that children at this age will understand place value, students should experience a wide variety of situations which require counting beyond 10. (Students will be expected, however, to deal only with 2-digit numbers at this grade level.). Students should become familiar with **counting patterns** to 100. Include:

- skip counting by 2s, 5s, 10s (starting from 0, as well as from other numbers)
- counting using coins (pennies, nickels, dimes)
- counting on from a given number
- counting back from a given number

SCO: **N1: Say the number sequence, 0 to 100, by:**
- **1s forward and backward between any two given numbers**
- **2s to 20, forward starting at 0**
- **5s and 10s to 100, forward starting at 0.**

[C, CN, V, ME]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Recite forward by 1s the number sequence between two given numbers (0 to 100).
- Recite backward by 1s the number sequence between two given numbers.
- Record a given numeral (0 to 100) symbolically when it is presented orally.
- Read a given numeral (0 to 100) when it is presented symbolically.
- Skip count by 2s to 20 starting at 0.
- Skip count by 5s to 100 starting at 0.
- Skip count forward by 10s to 100 starting at 0.
- Identify and correct errors and omissions in a given number sequence.

SCO: **N1: Say the number sequence, 0 to 100, by:**
- **1s forward and backward between any two given numbers**
- **2s to 20, forward starting at 0**
- **5s and 10s to 100, forward starting at 0.**

[C, CN, V, ME]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Use literature such as, *What Comes in 2's, 3's and 4's?* by Suzanne Aker or *Feet Go Two by Two* by Adria Klein to help develop students' understanding of this concept.
- Use a hundred chart or hundred mat (i.e., Learning Carpet®). Both are excellent tools to explore counting patterns. For example, when skip counting by 5s, students might put a counter on every 5th number, reading the number as the counter is placed on it.
- Have students use a walk-on number line (on the floor). An open number line can also be used to explore skip counting.
- Create a number line in the classroom by adding another number for each day the students are in school. This can be used to reinforce counting sequences (by 1s, 2s, 5s, and 10s).
- Organize attendance charts in pocket charts in rows of 5 or 10 using different colours for each group. This chart can then be used to count on and skip count.
- Use calendars as another effective model to support counting.

Suggested Activities

- Ask students to use the repeat function on the calculator to skip count to a target number. For example, if you start at 0 and want to end on 40, by which number(s) could you skip count? What if you started at a different point? What if you wanted to end at a different point?
- Ask students to count items which occur naturally in two's (e.g., shoes, hands, eyes).
- Invite students to sing songs and recite poems which involve counting backwards and forwards and skip counting. For example: "Ten In A Bed", "One, Two, Buckle My Shoe", "This Old Man".
- Invite students to use calculators to count. For example, as some students place cookies into a bag and count aloud, others may repeatedly add one on calculators to keep track of the count electronically.
- Ask the student to count aloud to 50 by 5s while using the "constant function" on the calculator (Enter "5", press "+ 5", press "=". Each time the "=" is pressed another 5 is added: 10, 15, 20, 25…)
- Have students work with a partner to create a number sequence with a missing number. Exchange sequence with another pair and identify the missing number.
- Ask students how many ways they can count to 30. Have students talk about their findings.

Possible Models: counters, hundred chart, walk-on number line, open number line, linking cubes, coins, Learning Carpet®

SCO: **N1: Say the number sequence, 0 to 100, by:**
• 1s forward and backward between any two given numbers
• 2s to 20, forward starting at 0
• 5s and 10s to 100, forward starting at 0.
[C, CN, V, ME]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions
• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Ask students to count by 2s (5s or 10s) as you clap. Have students tell you or record the final number when you finish clapping.
- Show students a number sequence with an error or a missing number. Have students correct the sequence.
- Have students “count-off” by 1s, 2s, 5s, and 10s. Observe whether students are able to follow the number sequence.
- Give each student in class a card with a number symbol on it. Have students put themselves in order using the number cards. The cards can be by one’s, two’s, or five’s.
- Ask the student to count backwards starting at 18.
- Ask the student: If you count by twos, starting at 0, will you say 7? Why or why not?
- Ask the student to begin counting at 13 and stop at 25.
- Provide a hundred chart. Tell the student: I counted from 10 to 50 and only said 5 numbers. What do you think I said?
- Tell the student: I said, "10, 20, 25", when I was counting some coins. What coins do you think I had?

FOLLOW-UP ON ASSESSMENT

Guiding Questions
• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **N2: Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.** [C, CN, ME, V]			
[C] Communication **[T]** Technology	**[PS]** Problem Solving **[V]** Visualization	**[CN]** Connections **[R]** Reasoning	**[ME]** Mental Math and Estimation

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
N2 Recognize, at a glance, and name familiar arrangements of 1 to 5 objects or dots.	**N2** Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.	

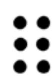
ELABORATION

Guiding Questions:
- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

Children need to be able to recognize, without counting, configurations or spatial patterns for small numbers of items (up to 10). This is called **subitizing** and will encourage reflective thinking while deepening their number sense. At first, children will count the dots or the objects. Eventually, children must be able to recognize the arrangements without counting. To avoid the misconception that an arrangement can only represent a specific quantity if it is arranged in a certain way, it is very important to vary the orientation of the objects, dots, or pictures. When asking children to identify the number of fingers, use different combinations of fingers so that children do not believe that there is only one way to represent the number. For example, the number six can be represented with five fingers on one hand and one on the other, two fingers on one hand and four on the other, three fingers on each hand, etc.

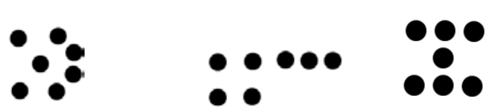
Subitizing will be useful with respect to:

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

  and 6 = 3 + 3 or 2 + 2 + 2 is apparent from: 

- place value**:** for example, groups of 10 can be easily observed in:

Provide opportunities for students to discover which configurations are easier to recognize. For example, ask students to show 7 in several ways, and then decide which configuration(s) is (are) easiest to identify. Possible configurations might include:



(Note: using dice and other games strengthen recognition of many configurations of numbers.)

SCO: **N2: Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.**
[C, CN, ME, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Look briefly at a given familiar arrangement of objects or dots and identify the number represented without counting.
- Look briefly at a given familiar arrangement and identify how many objects there are without counting.
- Identify the number represented by a given arrangement of objects or dots on a ten-frame.

SCO: **N2: Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.**
[C, CN, ME, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

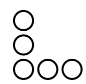
Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Focus subitizing activities initially on arrangements of numbers from 1 to 5 and gradually increase.
- Use “dot cards” and other models with easily recognizable configurations of numbers frequently so that students increase their familiarity with them. The level of difficulty can be adjusted by the arrangements used.
- Use less familiar arrangements often to promote greater automaticity in recognizing quantities.

Suggested Activities

- Show students 5 counters arranged in an “L-shape” with equal sides. Ask what other numbers of counters can be arranged to form "L’s"?



- Arrange counters on an overhead projector or interactive whiteboard. Show the counters to the students for a few seconds, but not long enough for them to count the counters. Ask: What number was represented? (Repeat several times, using different configurations of the same number.) Ask: Which configuration was easiest to recognize? Why?
- Hold up a dot card for a few seconds. Ask: How many dots? What did you see first (all of the dots or a smaller group)?
  Include dot cards with both familiar and unfamiliar arrangements. Consider also using cards with two colors of dots.
- State a number or hold up a numeral card and have students find the corresponding dot card from a collection on their desks.
- Play a “Concentration Game”. (Materials: 2 sets of dot cards that show the same number.) Place 20 dot cards face down in a 5 x 4 array (or whatever number of cards that are being used). Students take turns turning over two cards at a time trying to find a match. If the student finds a match, he/she keeps the pair. If he/she does not make a match the cards are turned back over. Play continues until all pairs of dot cards are found.
- Play a favourite board game with your students using dot cards instead of a number cube.
- Have students sort dot card arrangements into groups that display the same number.

Possible Models: number cubes, dot cards, five-frames and ten-frames, dominoes, playing cards, collections of counters or objects, Rekenrek®

SCO: **N2: Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.**
[C, CN, ME, V]

ASSESSMENT STRATEGIES

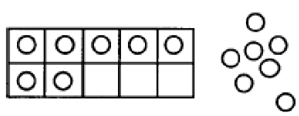
Look back at what you determined as acceptable evidence.

Guiding Questions
• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Show the class a dot card or an arrangement on a ten-frame. Ask them to respond by writing the numeral on their individual board or paper.
- Ask students to draw an arrangement of counters that makes it easy to recognize 6.
- Ask the student to arrange 8 counters (or another number) in a way that will make it easy to tell that there are 8.
- Ask the student to make a sketch showing how he/she "sees" 9 (or another number).
- Have a set of cards or objects in your pocket. At any time during the day, show a student one of the cards or group of objects and ask them to tell you how many.
- Use prepared dot arrangements for numbers 0 to 10. Hold up a dot plate for one to three seconds. Say: ‘‘How many? How did you see it?’’ Children might say, ‘‘I saw 6. I saw 3 on one side and 3 on the other.’’ Observe how quickly children can recognize the number of dots without counting.
- Provide children with a set of counters. Flash a ten-frame card with dots for approximately three seconds. Have the children take the number of counters they think they would need to cover the dots displayed on the ten-frame. After students have made their sets of counters, place the card in front of one child who should then place his or her counters on the dots, while the other children count and check. Ask the child to explain how they identified the number represented on the ten-frame. Repeat this activity using other ten-frame cards with different representations of numbers to 10.
- Explain why it might be easier to count the number of counters on the left than the counters on the right.



FOLLOW-UP ON ASSESSMENT

Guiding Questions
• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **N3: Demonstrate an understanding of counting by:** **• indicating that the last number said identifies "how many"** **• showing that any set has only one count** **• using the counting on strategy** **• using parts or equal groups to count sets.** [C, CN, ME, R, V]
[C] Communication **[PS]** Problem Solving **[CN]** Connections **[ME]** Mental Math and Estimation **[T]** Technology **[V]** Visualization **[R]** Reasoning

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
N3 Relate a numeral, 1 to 10, to its respective quantity.	**N3** Demonstrate an understanding of counting by: • indicating that the last number said identifies "how many" • showing that any set has only one count • using the counting on strategy • using parts or equal groups to count sets.	

ELABORATION

Guiding Questions:

• What do I want my students to learn?
• What do I want my students to understand and be able to do?

Counting is considered significant for children as it enables them to decide how many are in a collection. As contrasted with rote counting, meaningful counting involves an understanding of the following **principles**:

- One number is said for each item in the group and is counted once and only once. (**one-to-one correspondence**)
- Counting begins with the number 1 and there is a set number sequence. (**stable order**)
- The starting point and order of counting the objects does not affect the quantity. (**order irrelevance**)
- The arrangement or types of objects does not affect the count. (**conservation**)
- The number in the set is the last number said. (**cardinality**)
- It does not matter what is being counted, the resulting count will always be the same. (**abstraction**)

The meaning attached to counting is the foundation on which all other number concepts are developed. For this reason, it is necessary to assess each child individually in order to determine their understanding of number, not only in the oral expression of numbers, but also in counting abilities and sense of number.

Children will struggle with counting on. It requires an understanding that numbers are inclusive. Counting on from 6 implies knowing that 1, 2, 3, 4, and 5 are included in the number 6. Students typically require lots of time and experience to develop a deep understanding of this concept. Counting on and counting back are fundamental prerequisites for addition and subtraction and their importance should not be underestimated.

Counting larger collections is more efficient using skip counting as a strategy. This skill is best developed through a constructivist approach. Give students frequent experiences counting collections. Once students have more experience with counting, they are able to count larger quantities using groups and skip counting to be more efficient. Include discussions and comparison of different counting strategies.

SCO: **N3: Demonstrate an understanding of counting by:**
- **indicating that the last number said identifies "how many"**
- **showing that any set has only one count**
- **using the counting on strategy**
- **using parts or equal groups to count sets.**

[C, CN, ME, R, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Answer the question, "How many are in the set?" using the last number counted in a given set.
- Identify and correct counting errors in a given counting sequence.
- Show that the count of the number of objects in a given set does not change regardless of the order in which the objects are counted.
- Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction.
- Determine the total number of objects in a given set, starting from a known quantity and counting on.
- Count quantity using groups of 2s, 5s or 10s and counting on.
- Count sets of the same type of objects, but in various sizes.

SCO: **N3: Demonstrate an understanding of counting by:**
- **indicating that the last number said identifies "how many"**
- **showing that any set has only one count**
- **using the counting on strategy**
- **using parts or equal groups to count sets.**

[C, CN, ME, R, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcome and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Observe how the students count. Students, who are successful counters, have strategies to keep track of their count, such as touching and moving each object as it is counted.
- Encourage students to count items in natural situations that arise in the classroom.
- Count objects in the classroom. When there are large collections, have students group or bundle objects in 5s or 10s.
- Play a variety of games which require counting. For example:
  - bowling (counting both the pins knocked down and the pins left standing)
  - board games (counting the number of spaces to be moved based on a spin)
  - throwing bean bags (counting how many land in the target box)

Suggested Activities

- Request that a student draw a picture of his/her favourite toys, and then ask him/her to count the number of toys in the picture.
- Allow students to count the number of napkins, cups, plates, etc. that are on the table or are needed for snack time or a special party.
- Tell students: I am thinking of something in the classroom of which there are exactly 5. What do you think it could be?
- Ask students to count items which occur naturally in twos (e.g., shoes, hands, eyes). (This can be extended to five's and ten's.)
- Place 5 counters under a cup and tell the students that there are five underneath. Show 3 more beside the cup. Ask: How many counters are there altogether?
- Use a walk-on number line. Have a student roll 2 number cubes. He/she chooses the value on one of the cubes to stand on that number on the number line and then moves along the number line by counting on the amount shown on the other number cube.
- Provide students with a bag of counters. Tell them they must find out how many there are in total without counting by ones. Have children illustrate or demonstrate to the class how they counted and discuss which way of counting was the most efficient.

Possible Models: collections of objects, hundred chart, five-frames and ten-frames, number cubes, dot cards, number lines, walk-on number lines, open number lines, coins, calculators, pentominoes

SCO: **N3: Demonstrate an understanding of counting by:**
• indicating that the last number said identifies "how many"
• showing that any set has only one count
• using the counting on strategy
• using parts or equal groups to count sets.
[C, CN, ME, R, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Provide students with a number of objects. Ask them to count them. After they have counted them once, rearrange the objects and get them to tell you how many. Observe children to determine their understanding of each of the principles underlying meaningful counting. Note the way in which students count:
  - Do they touch each object as they count?
  - Do they set items aside as they count them?
  - Do they show confidence in their count or feel the need to check?
  - Do they check their counting in the same order as the first count or in a different order?
- Ask students to count a large number of items in a photo. Observe how they count.
- Ask the student to count out sixteen blocks/counters onto the table. Rearrange them by moving them around the table and then display them in two groups to display a "16" combination, (e.g., 9 in one group, 7 in the other). Ask the student how many you have altogether. Repeat using different combinations. Observe the student's method of determining how many.
- Show two groups of objects. Hide one under a piece of paper labelled with its amount. Leave the other group showing. Ask the student how many objects there are in all.
- Ask the student to count out six counters. Once they have six counters, ask them to show you a total of 14 counters. Observe whether the student is able to count on from six or recounts starting at one.

FOLLOW-UP ON ASSESSMENT

Guiding Questions

• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **N4: Represent and describe numbers to 20 concretely, pictorially and symbolically.**
[C, CN, V]
N5: Compare sets containing up to 20 elements to solve problems using:
- **referents**
- **one-to-one correspondence.**

[C, CN, ME, PS, R, V]
N6: Estimate quantities to 20 by using referents.
[C, ME, PS, R, V]

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
N4 Represent and describe numbers 2 to 10, concretely and pictorially. **N5** Compare quantities 1 to 10, using one-to-one correspondence.	**N4** Represent and describe numbers to 20, concretely, pictorially and symbolically. **N5** Compare sets containing up to 20 elements, using: • referents • one-to-one correspondence to solve problems. **N6** Estimate quantities to 20 by using referents.	**N4** Represent and describe numbers to 100, concretely, pictorially and symbolically. **N5** Compare and order numbers up to 100. **N6** Estimate quantities to100, using referents.

ELABORATION

Guiding Questions:
- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

In grade one, students will need many various opportunities to explore numbers between 10 and 20 to develop a deep understanding of these numbers. The uniqueness of the **"teen" numbers** must not be underestimated. Students need to investigate these with concrete materials before moving on to pictorial and symbolic representations. Students should make connections to how these numbers are used in their everyday lives.

Teachers must ensure that students have a strong **number sense** to prepare them for other outcomes where the relationships of one more than, two more than, one less than and two less than are explored. Making connections to **benchmarks of 5 and 10** (and their multiples) are critical. For example, students use 15 as a benchmark, knowing that two more than 15 is 17 and they use 20 as a benchmark, seeing 18 as two fewer than 20. The ability to **estimate**, a key reasoning skill in mathematics, should develop with regular practice over the course of the year. Estimation helps to develop useful benchmarks for thinking about numbers. Include situations in which sets have the same number of items but differ in the amount of physical space they cover. Teachers need to listen to students while at the same time challenging them to share their ideas about numbers.

Using numerals is society's way of communicating about number size. It is important, therefore, that students become familiar with **standard symbols** at this time. **Numeral** symbols have meaning for children only when they are introduced as labels for quantities. Children learn to write numbers as they gain a deeper understanding of number. Opportunities should begin at first by focusing on counting and recording numbers to 10. As children acquire a deeper understanding of number, children should count and record numbers beyond ten. Students need to create or collect sets, given a numeral and assign numerals to sets. Some students will need additional practice recording numerals. Tactile experiences such as tracing numerals and copying them are useful.

SCO: **N4: Represent and describe numbers to 20 concretely, pictorially and symbolically.**
[C, CN, V]
N5: Compare sets containing up to 20 elements to solve problems using:
- **referents**
- **one-to-one correspondence.**

[C, CN, ME, PS, R, V]
N6: Estimate quantities to 20 by using referents.
[C, ME, PS, R, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

N4
- Represent a given number up to 20, using a variety of manipulatives, including ten-frames and base ten materials.
- Read given number words to 20.
- Partition any given quantity up to 20 into two parts and identify the number of objects in each part.
- Model a given number, using two different objects; e.g., 10 desks represents the same number as 10 pencils.
- Place given numerals on a number line with benchmarks 0, 5, 10 and 20.
- Find examples of a given number in the environment.
- Record the number of objects in a set using the numeral symbol.

N5
- Build a set equal to a given set that contains up to 20 elements.
- Build a set that has more, fewer or as many elements as a given set.
- Build several sets of different objects that have the same given number of elements in the set.
- Compare two given sets, using one-to-one correspondence, and describe them, using comparative words such as more, fewer or as many.
- Compare a set to a given referent, using comparative language.
- Solve a given problem (pictures and words) that involves the comparison of two quantities.

N6
- Estimate a given quantity by comparing it to a given referent (known quantity).
- Select an estimate for a given quantity from at least two possible choices and explain the choice.

SCO: **N4: Represent and describe numbers to 20 concretely, pictorially and symbolically.**
[C, CN, V]
N5: Compare sets containing up to 20 elements to solve problems using:
- **referents**
- **one-to-one correspondence.**

[C, CN, ME, PS, R, V]
N6: Estimate quantities to 20 by using referents.
[C, ME, PS, R, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Provide students with many opportunities to represent numbers concretely.
- Allow students to make purposeful links between concrete, pictorial, and symbolic representations of numbers.
- Provide students with a number of counting activities in which sets of items numbering 11 through 19 are counted. Students will be developing number sense and recognizing that certain groupings, such as a group of ten and 7 more, make it easier to determine the size of the set (a pre-place value concept).
- Use objects that are familiar to students whenever possible when representing numbers.
- Expect students to explain their answers about numbers verbally.
- Provide students with a variety of estimation activities. For small groups, ask: Is it closer to 5 or 10? For large collections, one might be asking whether the group is closer to 20 or 50.
- Develop an understanding of the concept of "about" as it relates to estimation activities.
  Use language like:
  More or less than ___? Are there more or less than 15 counters on the overhead projector?
  Closer to ___ or to ___? Do I have closer to 10 cubes or closer to 15 cubes in the clear glass?
  Less than ___, between ___ and ___ or more than ___? If I use this ruler to measure my desk, will it be less than 10 rulers, between 10 and 20 rulers or more than 20 rulers?
  About ___. Use one of the numbers 5, 10, 15, 20. About how many triangles are on the overhead?

Suggested Activities

- Have students find objects in the classroom that represent numbers from 1 to 20 (e.g., twelve: there are twelve windows in the classroom).
- Tell students, "There are 16 monkeys at the zoo. Where they live, there is one big tree and one small tree. When it rains, the monkeys like to climb up a tree. One day when I visited the zoo, all the monkeys were in the trees. How many monkeys could be in the big tree and in the small tree? Are there other answers?" Draw two trees on the board and have construction paper monkeys to place in the trees. Change the position of the monkeys as students offer alternative answers.
- Display a hundred chart and ask the students, “What can you tell me about the number 17?”

Possible Models: various number lines, linking cubes, hundred chart, ten-frames and double ten-frames, base ten blocks, collections of objects, coins

SCO: **N4: Represent and describe numbers to 20 concretely, pictorially and symbolically.**
[C, CN, V]
N5: Compare sets containing up to 20 elements to solve problems using:
- **referents**
- **one-to-one correspondence.**

[C, CN, ME, PS, R, V]
N6: Estimate quantities to 20 by using referents.
[C, ME, PS, R, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions
• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Ask children to show the number 15 in as many different ways as they can.
- Tell students, "In my bowl, I have apples and bananas. There are 14 pieces of fruit altogether. How many apples are there? Draw a picture of the fruit. Are there other possibilities?"
- Give small groups of students interlocking cubes. Give a variety of directions that use “more” or “fewer” and have students build towers. For example: build a tower that is one more than 11; build a tower that is two fewer than nine; build a tower that is two more than 18. Challenge students by saying, "What number do you think is one fewer than 15? Let's build a tower and see."
- Show the student a set of 13 cubes. Without counting, tell me about how many cubes there are.
- Ask individual students, "I was counting objects in our classroom. I counted exactly 18 of the same thing. What could I have been counting? Tell me why. What are some things I could not have been counting? Why could they not be the objects I was counting?"
- Fill a container with cubes. The container should hold almost 20 cubes. Show it to the student and then ask, "How many cubes do you think are in the container?" Have the student count the cubes. Then ask, "Are there more cubes or fewer cubes than you predicted?"

FOLLOW-UP ON ASSESSMENT

Guiding Questions
• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **N7: Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.** [C,R,V]
[C] Communication **[T]** Technology **[PS]** Problem Solving **[V]** Visualization **[CN]** Connections **[R]** Reasoning **[ME]** Mental Math and Estimation

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
	N7 Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.	**N7** Illustrate, concretely and pictorially, the meaning of place value for numerals to 100.

ELABORATION

Guiding Questions:

- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

Once students have demonstrated a competency in one-to-one counting, they should be encouraged to develop flexible thinking about numbers. Students need to explore ways in which previously learned number concepts are connected to the "breaking apart" of numbers (**part-whole thinking**). This development will lead the students toward increased understanding of the relative size of numbers and will enable students to construct meaning regarding the composing and decomposing of numbers.

Students will learn to trust that a quantity will not change if that quantity is thought of as being made up of parts. Students will also know the quantity remains the same if some from one of those parts is moved to the other part. Students will need many opportunities to model this concretely before they move to other representations (pictorial and symbolic). Activities should lead students to understand that a quantity can be thought of as the sum or difference of other numbers in different ways.

SCO: **N7: Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.**
[C,R,V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Represent a given number in a variety of equal groups with and without singles, e.g., 17 can be represented by 8 groups of 2 and one single, 5 groups of 3 and two singles, 4 groups of 4 and one single, and 3 groups of 5 and two singles.
- Recognize that for a given number of counters, no matter how they are grouped, the total number of counters does not change.
- Group a set of given counters into equal groups in more than one way.

SCO: **N7: Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.**
[C,R,V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

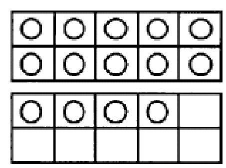
Choosing Instructional Strategies

Consider the following strategies when planning lessons:

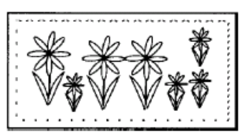
- Provide students with one type of material, such as linking cubes or squares of coloured paper. Explore how many different combinations for a particular number can be made using two parts or more parts.

Suggested Activities

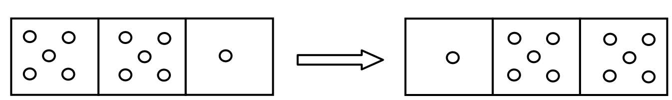
- Provide 2 ten-frames and 20 counters for each student. Ask students to model numbers with the counters. (Note: for numbers greater than 10, one ten-frame must be completely filled; for 5 and under, use only the top row of the ten-frame.) Have them say the total and explain their reasoning. Practise with other numbers. Observe the students as they model additional numbers.
  - Do they remove all the counters?
  - Do they remove all the counters on the bottom frame?
  - Do they add to/remove counters on the bottom frame?
  - Are they able to verbalize appropriately?



- Give the students a picture card and ask them to model or tell a number story about a part/whole relationship.



- Provide students with pattern blocks (one or two shapes at a time). The task is to create a two part design for a particular number. This can be extended to multiple shapes.
- Hold out a bar of linking cubes, a dot strip, a two-column strip, or a dot plate showing 6 or fewer. Say, “I wish I had six.” The students should respond with the part that is needed to make 6. Counting on can be used to check. The game can focus on a single whole, or the “I wish I had…” number can change each time.
- Have students count out 11 counters beside a 3-part mat. Have them place 5 counters on one side, 5 in the middle and 1 on the other side. Together count all the counters by ones. Say "Five and five and one is eleven.” Turn the mat around and say, "One and five and five is eleven.” Repeat with other numbers on the three sections of the mat without changing the total of eleven counters. This activity could also be used for other numbers.



Possible Models: ten-frames, double ten-frames, linking cubes, pattern blocks, dot cards, counters

SCO: **N7: Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.**
[C,R,V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

- *What are the most appropriate methods and activities for assessing student learning?*
- *How will I align my assessment strategies with my teaching strategies?*

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Provide a selection of buttons, linking cubes, or bread tags to represent any number less than 20 and ask students to sort them into two or more equal groups, with or without "leftovers". Have the students draw their groupings on paper. Students should describe their thinking to their group members or to the class as a whole.
- Give the children a number and ask them to represent that number with drawings in more than one way using equal groups and "leftovers".
- Explain why it might be easier to know how many counters there are on the left as compared to the number of counters on the right.

- Explain why it is possible to have a number such as 13 described using two or more parts in more than one way.
- Ask a student to model a number in two or more parts. Ask them to represent that number in as many different ways they can.

FOLLOW-UP ON ASSESSMENT

Guiding Questions

- *What conclusions can be made from assessment information?*
- *How effective have instructional approaches been?*
- *What are the next steps in instruction?*

SCO: **N8: Identify the number, up to 20, that is one more, two more, one less and two less than a given number.** [C, CN, ME, R, V]			
[C] Communication **[T]** Technology	**[PS]** Problem Solving **[V]** Visualization	**[CN]** Connections **[R]** Reasoning	**[ME]** Mental Math and Estimation

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
	N8 Identify the number, up to 20, that is one more, two more, one less and two less than a given number.	**N8** Demonstrate and explain the effect of adding zero to or subtracting zero from any number.

ELABORATION

Guiding Questions:

• What do I want my students to learn?

• What do I want my students to understand and be able to do?

Students do not necessarily reflect on the connection between two numbers when they are counting. In order to relate numbers like 6 and 8, students need to explore the "two more than," and "two less than" relationship. Numbers with a difference of one could be similarly explored. These experiences "**counting on**" and "**counting back**" allow them to deepen their understanding of numbers and their relationships. Student's initial exploration of numbers that are one more than, one less than, two more than, and two less than should be done concretely using sets of objects.

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

- the sizes of the sets are the same
- the sizes of the sets differ

This will lead to exploring number relationships such as "**one more than**," "**one less than**," "**two more than**," and "**two less than**" a given number. The words "fewer" and "less" are often used incorrectly. The word **fewer** should be used when referring to **countable quantities** and the word **less** is used and when referring to **measures** and **non-countable items** (e.g., There are fewer students in this class. There is less water in this bottle.). However, when **comparing numbers**, the phrases, "less than" and "greater than", should be used. While it is important to use proper language, such as this, as a model for students, it is not an expectation of this outcome for students to correctly use these terms.

SCO: **N8: Identify the number, up to 20, that is one more, two more, one less and two less than a given number.**
[C, CN, ME, R, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Name the number that is one more, two more, one less or two less than a given number, up to 20.
- Represent a number on a ten-frame that is one more, two more, one less or two less than a given number.

SCO: **N8: Identify the number, up to 20, that is one more, two more, one less and two less than a given number.**
[C, CN, ME, R, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcome and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

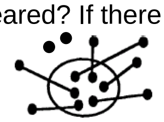
Choosing Instructional Strategies

Consider the following strategies when planning lessons:

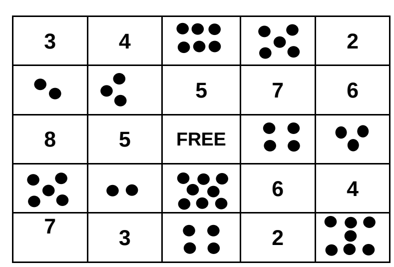
- Ensure that students' initial exploration of numbers that are "one more than," "one less than," "two more than," and "two less than" is done concretely using sets of objects.
- Give students frequent opportunities to transfer their thinking from one representation to another. For example, showing 6 and 7 with linking cubes and then displaying the same numbers with counters on a ten-frame.
- Ensure students are able to create a set which is
  - one more than a given set
  - one less than a given set
  - two more than a given set
  - two less than a given set

Suggested Activities

- Invite students to make up story problems to solve. For example, if the tooth fairy gives me a quarter for each tooth, and I have 4 quarters so far, how many teeth have I lost? How many quarters will you have when you lose one more tooth? Two more teeth?
- Invite students to create their own "dot" stories. For example, if the dots inside the circle are seats on a bus and the dots outside the circle are children, the story might be that there are just enough children to fill the seats. What would happen if two more children appeared? If there were two more seats, how many children could travel on the bus?



- Show students a number of counters on an overhead projector or interactive whiteboard. Have the students count them. Have students close their eyes while you change the amount of counters by one or two. Ask the students to open their eyes and tell you how the group of counters has changed.
- Have students play "One More Than Dot Bingo".
  Create cards using symbols and dot patterns of numbers up to 8.
  Rules:
  Take turns rolling a number cube.
  Cover any one square that is one more than the top number on the die.
  The player who first covers three in a row is the winner.
  This game could be extended using dice with more sides and changing the student cards.



Sample Bingo Card

Possible Models: buttons, five-frames, ten-frames, number cubes, dominoes, counters, dot cards, calculator, Rekenrek®

SCO: **N8: Identify the number, up to 20, that is one more, two more, one less and two less than a given number.**
[C, CN, ME, R, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions
- *What are the most appropriate methods and activities for assessing student learning?*
- *How will I align my assessment strategies with my teaching strategies?*

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Create two groups of students: 7 boys and 5 girls. Ask: What must be changed to make the number of girls equal to the number of boys? What must be changed to make the number of boys equal to the number of girls?
- Have students, working in small groups, write down several of their favourite names (not their own). Ask them to sort the names into groups comparing the number of letters in the names (e.g., names having one more letter than the other; names with two less than the other). Have the students share their findings with another group.
- Ask children to sort a collection of buttons by various criteria into two sets so that the sets are one more or one less than each other. Compare the size of the sets.
- Students should be able to create a set equal in number to a given set. Ask students to change their set to equal a number that is two more (less) than their current set. For example, change your set of 8 counters to show 10.
- Place 3 red counters and 3 blue counters in one group and 3 blue and 2 red in another, as shown:

  RRR BBB   BBB RR

  Ask: How do you know that there are more blue counters than red in the second group? How many more?
- Give students dot cards and some counters. Ask them to create sets that are “one more than,” “one less than,” “two more than,” and “two less than” the dot cards.

FOLLOW-UP ON ASSESSMENT

Guiding Questions
- *What conclusions can be made from assessment information?*
- *How effective have instructional approaches been?*
- *What are the next steps in instruction?*

SCO: **N9: Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by:**
- **using familiar and mathematical language to describe additive and subtractive actions from their experience**
- **creating and solving problems in context that involve addition and subtraction**
- **modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.**

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

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
	N9 Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by: • using familiar and mathematical language to describe additive and subtractive actions from their experience • creating and solving problems in context that involve addition and subtraction • modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.	**N9** Demonstrate an understanding of addition (limited to 1 and 2-digit numerals) with answers to100 and the corresponding subtraction by: using personal strategies for adding and subtracting with and without the support of manipulatives; creating and solving problems that involve addition and subtraction; explaining that the order in which numbers are added does not affect the sum; explaining that the order in which numbers are subtracted may affect the difference.

ELABORATION

Guiding Questions:
• What do I want my students to learn?
• What do I want my students to understand and be able to do?

As with many early concepts, the development of the meaning of addition and subtraction cannot be rushed. It is desirable to explore adding and separating situations in a context. Students should have extensive investigative experiences in which they use a variety of concrete materials to model both operations and investigate the relationship between the operations, before moving to recording the process symbolically. It is important that problems be personalized, but students also need experience interpreting how addition and subtraction situations are portrayed in print. Include examples of:
- **active situations** which involve the physical joining/separating of sets
- **static situations** involving the implied joining/separating of sets

It is important that **all** of the following **4 structures of problems** be presented and that these are developed from students' experiences.
These structures include:
- **Join Problems**: result unknown, change unknown, initial unknown
- **Separate Problems**: result unknown, change unknown, initial unknown
- **Part-Part-Whole Problems:** whole unknown, part unknown
- **Compare Problems:** difference unknown, larger unknown, smaller unknown

(Van de Walle & Lovin, vol. 1, 2006, p. 67-69)

SCO: **N9: Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by:**
- **using familiar and mathematical language to describe additive and subtractive actions from their experience**
- **creating and solving problems in context that involve addition and subtraction**
- **modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.**

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

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Act out a given story problem presented orally or through shared reading.
- Indicate if the scenario in a given story problem represents additive and/or subtractive action.
- Represent the numbers and actions presented in a given story problem by using manipulatives, and record them using sketches and/or number sentences.
- Create a story problem for addition that connects to student experience and simulate the action with counters.
- Create a story problem for subtraction that connects to student experience and simulate the action with counters.
- Create a word problem for a given number sentence.
- Represent a given story problem pictorially or symbolically to show the additive and/or subtractive action and solve the problem.

SCO: **N9: Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by:**
- **using familiar and mathematical language to describe additive and subtractive actions from their experience**
- **creating and solving problems in context that involve addition and subtraction**
- **modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.**

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

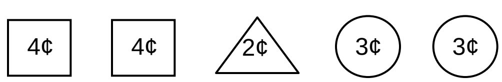
PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions
- *What learning opportunities and experiences should I provide to promote learning of the outcome and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies
Consider the following strategies when planning lessons:
- Personalize word problems for children. Encourage students to create a variety of meaningful problems based on situations with which they are familiar.
- Manipulate concrete materials to represent the context as you or students relate a solution to a word problem. Verbalize the process as you manipulate the model.
- Provide a wide variety of problem types and include all four problem structures (see Elaboration).
- Provide story boards for students to use with manipulatives to create, model, and solve story problems. Story boards can be created by drawing a simple scene, such as a fence, an ocean, or a tree, on a half-sheet of 8 ½ X 11 paper. As well, a piece of black construction paper can be used to represent outer space or night time, sandpaper for a beach, and blue paper for the sky. Many different problems can be created using the same story boards. Students should share their story problems with others and record the corresponding number sentence for each of their problems.

Suggested Activities
- Choose a book, or make up a story, which tells about an addition (subtraction) situation and ask a student to model the situation with counters as you read the book.
- Present a number of shapes worth various amounts; for example,



  Have the children create various designs, using the shapes, in each case describing how much the design would be worth.
- Pose story problems such as "Janet has 6 baseball cards. Mario gives her some hockey cards. She now has 13 sports cards. How many sports cards did Mario give her?" Provide the cards and observe how students solve the problem. Students should be encouraged to share strategies with their classmates.
- Ask students to make a drawing to model this and other structures of problems: Robert had some baseball cards. His brother convinced him to give him 2 of the cards. He now has 8 cards. How many cards did Robert have to start?
- Ask students to think of a situation in a restaurant when someone might add. Ask students to think of a situation when they might subtract.

Possible Models: counters, ten-frames, linking cubes, number cubes, dominoes

SCO: **N9: Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by:**
- **using familiar and mathematical language to describe additive and subtractive actions from their experience**
- **creating and solving problems in context that involve addition and subtraction**
- **modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.**

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

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

- *What are the most appropriate methods and activities for assessing student learning?*
- *How will I align my assessment strategies with my teaching strategies?*

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Model this problem for a pair of students: I had 5 pennies and now I have 9. How many pennies did I earn? Ask the pair to make up a similar problem, using objects of their choice, and to model and describe it.
- Ask students to tell an addition/subtraction story involving 8 and 5 while manipulating a model.
- Tell the students that you have a nickel and 4 pennies. You want to buy a candy that costs 3¢. Ask: How much money will be left? How do you know?
- Place a large number line on the floor, positioning a child on the 8 and facing the higher numbers. Ask: Where would you be if you moved 4 spaces forward? (Ask additional questions, such as, where would you be if you moved 3 spaces back?)
- Provide the children with a given number of counters. Ask them to add/remove 3 or another number of counters and tell how many are now there. Ask them to represent this symbolically.
- Tell the student that Jake had 9 pencils and lost 3, while Martha had 7 pencils and lost 2. Ask: Who has more pencils left? Explain how you know.
- Tell the student that you had 9 marbles, but lost some. There are only 4 marbles left. Ask: How many did I lose? Show how you know.

FOLLOW-UP ON ASSESSMENT

Guiding Questions

- *What conclusions can be made from assessment information?*
- *How effective have instructional approaches been?*
- *What are the next steps in instruction?*

SCO: **N10: Describe and use mental mathematics strategies (memorization not intended), such as:** **• counting on and counting back** **• making 10** **• doubles** **• using addition to subtract** **to determine the basic addition facts to 18 and related subtraction facts.** [C, CN, ME, PS, R, V]			
[C] Communication **[T]** Technology	**[PS]** Problem Solving **[V]** Visualization	**[CN]** Connections **[R]** Reasoning	**[ME]** Mental Math and Estimation

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
	N10 Describe and use mental mathematics strategies (memorization not intended), such as: • counting on and counting back • making 10 • doubles • using addition to subtract for the basic addition and subtraction facts to 18.	**N10** Apply mental mathematics strategies, such as: • using doubles • making 10 • one more, one less • two more, two less • addition for subtraction to determine basic addition facts to 18 and related subtraction facts.

ELABORATION

Guiding Questions:

• What do I want my students to learn?
• What do I want my students to understand and be able to do?

When students' thinking has developed at least to the point where they are counting on from the large number, **strategy** learning should begin. Students should be encouraged to use the relationships between facts to learn new facts, rather than using counting to find **sums** or **differences**. For example, if students want to add 3 + 3 and know that 2 + 3 = 5, they might think that 3 + 3 is one more than 2 + 3, so it must be 6. Students will construct number relationships by making connections with prior knowledge. These relationships will lead to the development of a network of patterns that children will be able to access to recall number facts.

It is not intended that students recall the basic facts, but become familiar with strategies to mentally determine sums and differences. If the focus is on over-practicing or rote practicing without ensuring that students understand the process, they often forget or incorrectly remember computational methods.

Students need many rich experiences to explore strategies **concretely** and **pictorially** as this will lead them to the understanding that all of the facts are conceptually related. It is important that opportunities for student discussion and sharing of a wide variety of strategies, including their own, are provided.

When engaging in mental math activities students should be given opportunities to:
- develop their own strategies for determining a given sum or difference;
- invent strategies for solving problems that include making doubles, making 10, using compensation (using addition to solve subtraction problems) and using known facts;
- employ as many representations as possible for determining sums and differences, including physically acting them out.

SCO: **N10: Describe and use mental mathematics strategies (memorization not intended), such as:**
• counting on and counting back
• making 10
• doubles
• using addition to subtract
to determine the basic addition facts to 18 and related subtraction facts.
[C, CN, ME, PS, R, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
• What evidence will I look for to know that learning has occurred?
• What should students demonstrate to show their understanding of the mathematical concepts and skills?

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Use and describe a personal strategy for determining a given sum.
- Use and describe a personal strategy for determining a given difference.
- Write the related subtraction fact for a given addition fact.
- Write the related addition fact for a given subtraction fact.

(It is not intended that students recall the basic facts from memory, but become familiar with strategies to mentally determine sums and differences.)

SCO: **N10: Describe and use mental mathematics strategies (memorization not intended), such as:**
• counting on and counting back
• making 10
• doubles
• using addition to subtract
to determine the basic addition facts to 18 and related subtraction facts.
[C, CN, ME, PS, R, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

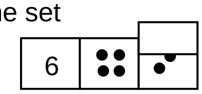
Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Provide students with opportunities to develop their own strategies for determining a given sum or difference.
- Encourage students to invent strategies for solving problems that include making doubles, making 10, using compensation and using known facts.
- Ask students to employ as many representations as possible for determining sums and differences, including physically acting out, drawing pictures, verbally explaining their ideas, using concrete materials and writing number sentences.
- Provide students with time to learn basic facts, so they understand the operation and can invent their strategies rather than memorizing.
- Facilitate the learning addition and subtraction facts by having students solve word problems with familiar contexts.
- Encourage students to create their own word problems. They can write the problems or dictate them to a scribe.

Suggested Activities

- Ask students to choose any number, add 10 and then take away 1. Get students to model this activity using ten-frames. Have students repeat this activity with other starting numbers and discuss what they observe.
- Give students a bag containing 8 counters. Have students reach in the bag and remove some of the counters. Ask how many counters are still in the bag.
- Make missing part cards: Each card has a numeral for the whole and two dot sets with one set covered by a flap. Ask students how many are covered and write the number sentence.



- Ask students to build a linking cube train of 9 cubes with two colours in different ways.
- Have a group of approximately eight students stand in front of the room. Ask the class how many students are at the front. Divide the group into two smaller groups and ask the class how many students are at the front now and how do they know. Explore the different ways that we could partition the larger group.

Possible Models: counters, ten-frames, linking cubes, coins, hundred chart, Rekenrek®, dot cards, dominoes

SCO: **N10: Describe and use mental mathematics strategies (memorization not intended), such as:**
• counting on and counting back
• making 10
• doubles
• using addition to subtract
to determine the basic addition facts to 18 and related subtraction facts.
[C, CN, ME, PS, R, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Provide students with materials and present them with one of the following number problems. Ask students to solve the problem and record the number sentence.
  - Chen has eight dimes. David has four more dimes than Chen. How many dimes does David have?
  - Brodie has 18 coins. Eight of his coins are dimes and the rest are quarters. How many quarters does Brodie have?
  - Sophie had 12 nickels. She gave some to her mother and now she has eight nickels. How many did she give to her mother?
  - Shona had 15 quarters. Her dad gave her some more. Now she has 18 quarters. How many did dad give her?
- Have students create their own word problems for the number family 7, 9 and 16 (numbers related by addition and subtraction). Ask them to write a problem that uses these numbers in addition and another problem that uses these numbers in subtraction.
- Have students explain how they solve each of the following computations.
  8 + 9   6 + 4   7 + 8   4 + 7   9 + 6
- Ask students to write a related subtraction/addition fact for the following facts.
  12 + 6 = 18   14 + 3 = 17   16 – 9 = 7   12 – 8 = 4
- Ask the student how he/she could use 6 - 4 = 2 to figure out 6 - 3. Students may use materials to model this.
- Have students work in pairs and answer the following question. If you did not know the answer to 9 + 6, what are some really good strategies you can use to get the answer? Encourage students to come up with more than one strategy to find the sum. Students discuss their ideas with their partner and then present their ideas to the class.

FOLLOW-UP ON ASSESSMENT

Guiding Questions

• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **PR1: 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]

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

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
PR1 Demonstrate an understanding of repeating patterns (two or three elements) by: identifying; reproducing; extending; creating patterns using manipulatives, sounds and actions.	**PR1** Demonstrate an understanding of repeating patterns (two to four elements) by: • describing • reproducing • extending • creating patterns using manipulatives, diagrams, sounds and actions. **PR2** Translate repeating patterns from one representation to another.	**PR1** Demonstrate an understanding of repeating patterns (three to five elements) by: describing; extending; comparing; creating patterns using manipulatives, diagrams, sounds and actions. **PR2** Demonstrate an understanding of increasing patterns by: describing; reproducing; extending; creating patterns using manipulatives, diagrams, sounds and actions (numbers to 100).

ELABORATION

Guiding Questions:
- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

The foundation of algebraic thinking is investigating patterns and their representations. We are always looking for ways to generalize and formalize regularity in mathematics. These outcomes focus on patterns and regularity and ways of representing patterns. Not only do students need to **recognize** the pattern, but they must also be able to **extend** and generalize in both **words** and **symbols**. They will identify **similarities** and **differences** between and among patterns.

Patterns occur regularly in students' everyday life. Students will be able to identify patterns in their daily living, including physical and geometric situations as well as numbers. The type of patterns being explored in grade one are **repeating patterns**. Teachers should be aware that some students may extend this concept and create growing patterns. The focus for these outcomes is on the core of a repeating pattern; patterns should be written having the core repeat at least three times so the pattern is clear to students.

Young students need to experience both teacher-directed and independent activities. Teacher-directed activities should encourage students to analyze a variety of patterns. Independent activities provide students with the opportunity to explore, **reproduce**, extend, and **create** patterns appropriate to their level of understanding. Students should be given the opportunity to **describe** patterns verbally; as it helps them interpret the patterns they experience visually and solidify their understanding of the concept.

Students should recognize many different forms of the same pattern. They need to see that patterns constructed with different materials are the same pattern. Translating two or more patterns that are alike to a common format helps children see beyond the materials making up the pattern.

SCO: **PR1: 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]

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

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

PR1
- Describe a given repeating pattern containing two to four elements in its core.
- Identify and describe errors in a given repeating pattern.
- Identify and describe the missing element(s) in a given repeating pattern.
- Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.
- Reproduce and extend a given repeating pattern, using manipulatives, diagrams, sounds and actions.
- Identify and describe a repeating pattern in the environment, e.g., classroom, outdoors, using everyday language.
- Identify repeating events; e.g., days of the week, birthdays, seasons.

PR2
- Represent a given repeating pattern, using another mode; e.g., actions to sound, colour to shape, ABCABC to bear eagle fish bear eagle fish.
- Describe a given repeating pattern, using a letter code; e.g., ABCABC.

SCO: **PR1: 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]
PR2: Translate repeating patterns from one representation to another.
[C, R, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

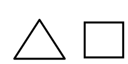
- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Provide students with many opportunities to represent patterns concretely.
- Allow students to identify patterns in their daily lives. This can include repetitive songs and rhythmic chants that are based on repeating and growing patterns. Songs and poems can be used to explore patterns, such as “The Hokey Pokey”.
- Provide a variety of examples of patterns to explore: rhythmic/sound patterns; action patterns; colour patterns; shape patterns; patterns of attributes; patterns of size; and number patterns.
- Use concrete representations of patterns so students can explore how patterns can be created with a variety of items such as cubes or pattern blocks.
- Provide students with opportunities to create patterns and to identify the core of a pattern visually.
- Integrate patterns in physical education, music, art and other subject areas to provide a context.
- Expect students to explain their solutions for patterns.

Suggested Activities

- Request that the student use pattern blocks or attribute blocks to construct a simple pattern. Ask her/him to explain the pattern to another student.
- Provide students with a calendar. Present a problem, such as: Your mom, your sister and you take turns tidying up the living room floor at the end of each day. If your next turn is on Friday, on which days will your following two turns be?
- Have students create clapping patterns, or use stickers or coloured counters, to make visual patterns.
- Show students a pattern with an error or missing part in the pattern. Ask students to identify and correct the error or add the missing piece.
- Ask the student to continue the pattern begun (at right) in two different ways. 
- Give students pattern blocks and ask them to create an ABBABB pattern. Then ask students, "What would this pattern sound like?" Continue asking for other patterns, such as ABCABC, AABAAB or ABBCABBC.
- Give students a variety of patterns. Ask students to translate these patterns into other representations, such as letters, actions, manipulatives, or sounds.

Possible Models: attribute blocks, linking cubes, pattern blocks, calendars, dot cards, stamps and ink pads, geometric solids, stickers

SCO: **PR1: 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]

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

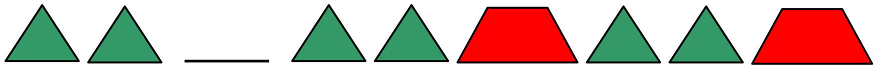
ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions
- *What are the most appropriate methods and activities for assessing student learning?*
- *How will I align my assessment strategies with my teaching strategies?*

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment
- Show a pattern of cubes, e.g., RGGRGGRGG (red, green, green…), and ask students to tell you what the pattern is. Then show a different pattern of cubes; e.g., YYBYYBYYB (yellow, yellow, blue…). Have students identify the new pattern. Then ask students to tell you how the patterns are different and how they are the same.
- Tell students, "Mary has six green triangles and three orange squares." Show students the pieces on the overhead. Ask, "Can she make two different patterns?" Ask students to draw two possible patterns that Mary could make and explain the patterns. Ask, "What comes next in the pattern?"
- Ask the student to make a pattern so that a triangle is the third item.
- Tell the student that you think there is a pattern to the days (Monday, Tuesday ...) in a week. Ask the student to explain the pattern.
- Have children look at a repeating visual pattern, or listen to a repeating sound pattern, that contains an error. Ask students to correct the error and explain how they know.
- Take students on a walk around the inside and outside of the school looking for patterns. Students can draw a pattern they found and describe the pattern to a classmate.
- Show the student patterns like the one below and have them draw the missing part of the pattern.



FOLLOW-UP ON ASSESSMENT

Guiding Questions
- *What conclusions can be made from assessment information?*
- *How effective have instructional approaches been?*
- *What are the next steps in instruction?*

SCO: **PR3: Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).**
[C, CN, R, V]
PR4: Record equalities using the equal symbol.
[C, CN, PS, V]

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
	PR3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). **PR4** Record equalities, using the equal symbol.	**PR3** Demonstrate and explain the meaning of equality and inequality, concretely and pictorially. **PR4** Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.

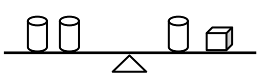
ELABORATION

Guiding Questions:

- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

When students begin the study of **equality**, it is important for them to see that the **equal sign** represents a **relation**, not an operation. It shows the relationship that the quantity on the left is the same as the quantity on the right. Using concrete and pictorial representations, students should come to understand that an expression which may include an operation is an **equivalent** form that represents a single quantity. A common misconception for students is they believe that the equal sign means, “the answer is” or “get the answer”.

Students should work with materials to show that the equal sign indicates equality on both sides. Using a balance scale, students can begin to understand the concept of equating two quantities (you start with two different quantities and adjust them to make them equal). Working with balance scale problems, students build the foundation for further study in the area of algebra and solving equations. Students should also explore equality through a variety of number sentences.



5 + 3 = 8   8 = 3 + 5
5 + 3 = 3 + 5

In everyday life, we sort things by comparison relationships. For example, we might note that Jacob is taller than Marie. Comparison relationships also apply to number. We might note that five is two less than seven or 12 is two more than ten. When comparing numbers, many students may recognize that 5 is greater than 4, but do not automatically realize, that 4 is less than 5. Both sides of the relationship need to be considered when completing the tasks. Whenever possible, use mathematical language (e.g., ‘‘5 is greater than 4’’ and ‘‘4 is less than 5’’). Eventually students will use the greater-than symbol and less than symbol (e.g., 5 > 4 or 3 < 5), but is not required at this grade level.

Students need to explore the concept of **inequalities** and recognize the relationship between these inequalities. Given two expressions, students should be able to identify if the quantities they represent are **equal** or **unequal**. Begin with activities using numbers 1 - 6. As students become confident in their ability to represent these numbers in different ways, they can work with numbers up to 10. A strong foundation in number combinations to 10 is essential before moving to numbers between10 and 20.

SCO: **PR3: Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).**
[C, CN, R, V]
PR4: Record equalities using the equal symbol.
[C, CN, PS, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

PR3
- Construct two equal sets, using the same objects (same shape and mass), and demonstrate their equality of number, using a balance limited to 20 elements.
- Construct two unequal sets, using the same objects (same shape and mass), and demonstrate their inequality of number, using a balance limited to 20 elements.
- Determine if two given concrete sets are equal or unequal and explain the process used.

PR4
- Represent a given equality, using manipulatives or pictures.
- Represent a given pictorial or concrete equality in symbolic form.
- Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).
- Record different representations of the same quantity (0 to 20) as equalities.

SCO: **PR3: Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).**
[C, CN, R, V]
PR4: Record equalities using the equal symbol.
[C, CN, PS, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

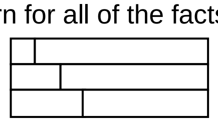
Consider the following strategies when planning lessons:

- Provide students with a variety of experiences so they come to understand that the equal sign represents a relation, not an operation. Use of the words "the same as" for the equal sign will help them see the relation. Avoid misuse of the equal sign, such as ★★★ = 3 or Alisa = 5.
- Use balance activities to assist with developing an understanding equality. Use concrete materials so students can examine how a balance operates like the seesaw in the playground.
- Have students create equations and describe the equations verbally.
- Provide students with many opportunities to represent number sentences concretely.
- Ensure that students learn to read number sentences from left to right <u>and</u> right to left.
- Expect students to explain their answers about equalities and inequalities. Number sentences that demonstrate "is greater than" and "is less than" are known as "inequalities" and students should become familiar with that terminology. Number sentences using an equal sign are known as "equalities."

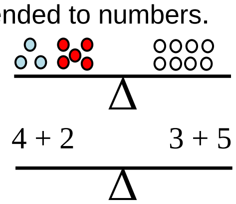
Suggested Activities

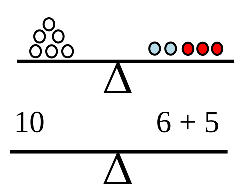
- Ask the student to use Cuisenaire rods® (or another suitable manipulative material such as linking cubes) to show the pattern for all of the facts for 8; for example:

  1 + 7 = 8
  2 + 6 = 8
  3 + 5 = 8

- Give students the following problems and ask, "Will the balance tilt?" This activity can also be extended to numbers.

- Create dots cards representing number sentences, like flash cards. Ask students to record the number sentence symbolically.
- Have students working in pairs to show as many different ways as possible to make a number from 1 to 20.

<u>Possible Models</u>: linking cubes, Cuisenaire rods®, dot cards, pan balance

SCO: **PR3: Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).**
[C, CN, R, V]
PR4: Record equalities using the equal symbol.
[C, CN, PS, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions
- *What are the most appropriate methods and activities for assessing student learning?*
- *How will I align my assessment strategies with my teaching strategies?*

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Working in partners, one student puts cubes in a paper bag and places the bag on a balance scale. The partner predicts the number of cubes in the bag. (He/she may change their prediction as the scale begins to balance). The partner then begins to add cubes to the other side of the balance to verify his/her prediction. Once the scale is balanced, ask: How many cubes do you think are in the bag? How do you know? The partners count and compare the number of cubes on both sides.
- Provide students with two bags of counters and ask them to determine if the sets are equal or unequal and to explain how they know.
- Use materials on an overhead or interactive whiteboard to show a problem, such as:
  Kyle saw five sparrows feeding at the birdfeeder. He went away and later he looked and counted 14 sparrows at the birdfeeder. How many more sparrows flew to the birdfeeder while he was away?
  Ask the students to write a number sentence to solve the problem.
- Have students write an expression for each of the following, (either a whole number or a combination of numbers showing an operation) to complete the number sentence. Encourage student to explore these using materials, such as linking cubes of different colours.

_______ = 7 + 6	4 + 2 = _______
5 + 3 = ________	_______ = 8 + 7

- Ask a student to list all the pairs of numbers that can be added for a total of 4, then repeat the process for totals of 5 and 6. Have him/her arrange the lists so that the first number increases by one each time. Ask: What is the pattern? For example:
  1 + 3
  2 + 2
  3 + 1

FOLLOW-UP ON ASSESSMENT

Guiding Questions
- *What conclusions can be made from assessment information?*
- *How effective have instructional approaches been?*
- *What are the next steps in instruction?*

SCO: **SS1 : 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]

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
SS1 Use direct comparison to compare two objects based on a single attribute, such as length (height), mass (weight) and volume (capacity).	**SS1** 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.	**SS3** Compare and order objects by length, height, distance around and mass (weight) using non-standard units, and make statements of comparison.

ELABORATION

Guiding Questions:
- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

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 a variety of words involving measurement including "longest," "heaviest", "most", "least", etc. It is important that students explore measurement in context throughout each day using **direct comparison**. For example, "Which bean plant grew the tallest?"

Students should recognize that **length** tells about the extent of an object along one dimension. Direct measurement consists of comparing lengths by lining up items side by side, beginning at a common base. (Note: Students should be led to see why a common starting point is important.) Students should order objects from longest to shortest.

Students should recognize that **capacity** tells how much something will hold. They should investigate strategies to compare the capacities of two or more containers. Direct measurement involves filling one container and then pouring the contents into another to find which holds more.

In comparing **areas**, students are examining the amount of space taken up by an object. For example, one place mat might cover more of the table than another. Direct measurement involves placing one surface on top of another to see which "sticks out."

Students should recognize that **mass** tells about the "heaviness" of an object. They should explore methods to compare and order masses. Direct measurement involves, for instance, placing two objects on a balance simultaneously and comparing the mass of one with that of the other.

In the development of measurement skills, students must engage in a wide variety of activities that promote measurement experiences. Students must have first-hand experiences to gain deep understanding of this skill. Measuring activities will enable students to better incorporate computational skills and make the connection between basic geometric concepts and number concepts.

SCO: **SS1 : Demonstrate an understanding of measurement as a process of comparing by:**
- **identifying attributes that can be compared**
- **ordering objects**
- **making statements of comparison**
- **filling, covering or matching.**

[C, CN, PS, R, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

- Identify common attributes, such as length (height), mass (weight), volume (capacity) and area, which could be used to compare a given set of two objects.
- Compare two given objects and identify the attributes used to compare.
- Determine which of two or more given objects is longest or shortest by matching and explain the reasoning.
- Determine which of two or more given objects is heaviest/lightest by comparing and explain the reasoning.
- Determine which of two or more given objects holds the most/least by filling and explain the reasoning.
- Determine which of two or more given objects has the greatest/least area by covering and explain the reasoning.

SCO: **SS1 : 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]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions
- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies
Consider the following strategies when planning lessons:
- Have students participate in “dramas” in which someone measures incorrectly and the other students figure out what is wrong. For example, one student could play a part in which he/she lines up pencils of different lengths to measure an item, or uses uniform units, but counts, “1, 2, 4, 5...”
- Use two objects of different sizes and ask students how they could compare the objects. For example, two glasses could be compared by height, mass, as well as capacity. Working with a variety of objects will allow many opportunities for students to make comparisons relating to measurement, using many attributes.
- Have students order objects from shortest to longest, shortest to tallest, lightest to heaviest, holds least to holds most, covers least space to covers more space. Include situations in which students are dealing with an independent variable, such as objects which are not straight and objects which are also wide or thick.

Suggested Activities
- Provide students with a pan balance and two items. Ask students to use the balance to find out which item has the greater mass. Observe students’ strategies.
- Provide the student with 3 containers (of various shapes) and filling material (e.g., beans, Styrofoam packing material). Ask the student to order the containers based on how much they hold.
- Ask two students to perform standing long jumps. Encourage them to find a way to determine who jumped farther. Emphasize with the students the importance of a common starting point.
- Have the student make 3 play dough balls and determine which of the balls is the heaviest.
- Display a set of five objects of similar size and a sixth “target” object. Ask the student to sort them into groups with masses less than and greater than the” target”.
- Provide students with various sizes of storybooks. Have students compare the storybooks to determine which has the greatest area.

Possible Models: pan balance, various everyday objects, play dough

SCO: **SS1 : 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]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Have students prepare a set of ribbons for first, second, and third places in a race, so that the faster runner gets a longer ribbon.
- Provide students with two objects such as an eraser and a book. Ask:
  - Can you tell which of these two objects is longer?
  - Can you tell which of these two objects is heavier?
  - Can you tell which of these two objects takes up the most space?
  - Can you tell which of these two objects holds more?

  After each question, have students explain their thinking.
  (Children should recognize that capacity is an attribute that cannot be used to measure these objects.)
  Use the questions as identified above, repeating the activity with other sets containing two objects.
- Show the students a coffee mug and a drinking glass. Ask them how they would find out which holds more.
- Give students sets of tangrams and have them compare the areas of the triangles in the sets.
- Provide students with "trains" of various lengths made from linking cubes. Ask them to order the trains from shortest to longest.
- Ask: What does "holds more" mean? Have the student explain his/her thinking.
- Ask the students to compare the mass of two sets of objects, for example, the mass of 10 pennies to 5 marbles. Have them identify which set is heavier or lighter and explain their thinking.
- Give students a geometric shape, such as an attribute block or a pattern block, and have them draw another shape with a larger area. Have students explain how they know their drawn shape is larger.

FOLLOW-UP ON ASSESSMENT

Guiding Questions

• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

SCO: **SS2 : Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule.**
[C, CN, R, V]
SS3: Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V]
SS4: Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V]

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

Scope and Sequence of Outcomes

Kindergarten	Grade One	Grade Two
SS2 Sort 3-D objects using a single attribute. **SS3** Build and describe 3-D objects.	**SS2** Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule. **SS3** Replicate composite 2-D shapes and 3-D objects. **SS4** Compare 2-D shapes to parts of 3-D objects in the environment.	**SS6** Sort 2-D shapes and 3-D objects using two attributes, and explain the sorting rule. **SS7** Describe, compare and construct 3-D objects, including: cubes, spheres, cones, cylinders, pyramids. **SS8** Describe, compare and construct 2-D shapes, including: triangles, squares, rectangles, circles. **SS9** Identify 2-D shapes as parts of 3-D objects in the environment.

ELABORATION

Guiding Questions:
- *What do I want my students to learn?*
- *What do I want my students to understand and be able to do?*

The study of **two-dimensional shapes** and **three-dimensional objects** is essential as students begin to describe, analyze and understand the world in which they live. Activities selected in geometry should provide students with the opportunity to explore a variety of geometric shapes and objects. They need to see and feel, to build and take apart, to sort and identify their rule(s), and to share their observations with their classmates. Sorting activities help to develop visual discrimination. Therefore, it is important to encourage students explore alternative ways of sorting which will require further investigation of objects.

It is through such activities that students will become familiar with the names of 2-D shapes and 3-D objects and begin to recognize their attributes. It is very important to encourage students to use accurate language when describing shapes, though knowledge of geometric names is not an expectation of this outcome. As pattern blocks are regularly used for geometric inquiry, it would seem reasonable that students may become familiar with the terms that describe them which include triangle, square, rectangle, trapezoid, kite, hexagon, and rhombus. Students should become comfortable using such terms as **cylinder**, **sphere**, **cone**, **cube**, and may extend their exploration to prisms and pyramids.

Explorations (i.e., sorting and building) with 2-D shapes involve the attributes of the number of sides and vertices and how shapes can be put together and taken apart to make other shapes. Students should be able to distinguish between shapes such as squares and rectangles and also to see that the squares are rectangles. Explorations with 3-D objects involve how these objects are alike and how they are different (e.g., Will both objects roll?). Students may note other attributes, such as the number of faces and edges.

Children should recognize 2-D shapes and 3-D objects in their environment. These real-world associations are very important in the development of geometric concepts.

SCO: **SS2 : Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule.**
[C, CN, R, V]
SS3: Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V]
SS4: Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V]

ACHIEVEMENT INDICATORS

Guiding Questions:
- *What evidence will I look for to know that learning has occurred?*
- *What should students demonstrate to show their understanding of the mathematical concepts and skills?*

Use the following set of indicators as a guide to determine whether students have met the corresponding specific outcome.

SS2
- Sort a given set of familiar 3-D objects or 2-D shapes using a given sorting rule.
- Sort a given set of familiar 3-D objects using a single attribute determined by the student and explain the sorting rule.
- Sort a given set of 2-D shapes using a single attribute determined by the student and explain the sorting rule.
- Determine the difference between two given pre-sorted sets of familiar 3-D objects or 2-D shapes and explain a possible sorting rule used to sort them.

SS3
- Select 2-D shapes from a given set of 2-D shapes to reproduce a given composite 2-D shape.
- Select 3-D objects from a given set of 3-D objects to reproduce a given composite 3-D object.
- Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.
- Predict and select the 3-D objects used to produce a composite 3-D object, and verify by deconstructing the composite object.

SS4
- Identify 3-D objects in the environment that have parts similar to a given 2-D shape.

SCO: **SS2 : Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule.**
[C, CN, R, V]
SS3: Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V]
SS4: Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V]

PLANNING FOR INSTRUCTION

Before introducing new material, consider ways to assess and build on students' knowledge and skills.

Guiding Questions

- *What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?*
- *What teaching strategies and resources should I use?*
- *How will I meet the diverse learning needs of my students?*

Choosing Instructional Strategies

Consider the following strategies when planning lessons:

- Ensure students have many opportunities to represent 2-D shapes and 3-D objects concretely.
- Provide an assortment of 2-D shapes cut from cardboard. Ask students to work in small groups to sort the shapes. Encourage discussion and have the groups share their sorting rules with their classmates.
- Have students explore the properties of 3-D objects prior to identifying 3-D objects in the environment. Explorations may include tracing the faces of the solids, or pressing the faces in play dough to investigate the attributes of the 2-D shapes and 3-D objects.
- Allow students to identify 2-D shapes and 3-D objects in their daily lives. This should include common everyday objects.

Suggested Activities

- Provide several different 3-D objects. Ask the student to sort them and to explain the sorting criteria. Ask him/her to sort them again, using different criteria.
- Ask students to cut a square, rectangle, or triangle into three parts. Have them exchange their pieces and ask their partner to rearrange them to make the original shape. (Activities such as these, in which a student is required to assemble a figure from its parts, further develop figure-ground perception skills.)
- Have the students work in pairs with a geoboard to create a large square with a smaller square inside it.
- Display pictures of various 3-D objects, such as a rocket or sculpture. Ask students what 3-D objects were used to build the object. Students can then build their own composite 3-D objects from individual 3-D objects, such as small cardboard boxes or modeling clay. Once the models are built, display the creations in class and ask students to identify the 3-D objects used to build the composite object.
- Have students examine a collection of objects found in their environment; e.g., cans, cereal boxes, ice cream cones, tissue boxes. Ask them to identify the shape of each face of each 3-D object. Ask, "What shape is the face? Do all of the faces have the same shape?" Have students the attributes of the shapes.
- Invite children to hunt around the school to find various shapes (e.g., trapezoids, squares, triangles). Have them share their findings and speculate on why certain shapes are more common than others.

Possible Models: attribute blocks, geometric solids, tangrams, pattern blocks, Polydrons®, pentominoes, geoboards, dot or grid paper

SCO: **SS2 : Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule.**
[C, CN, R, V]
SS3: Replicate composite 2-D shapes and 3-D objects.
[CN, PS, V]
SS4: Compare 2-D shapes to parts of 3-D objects in the environment.
[C, CN, V]

ASSESSMENT STRATEGIES

Look back at what you determined as acceptable evidence.

Guiding Questions

• What are the most appropriate methods and activities for assessing student learning?
• How will I align my assessment strategies with my teaching strategies?

Assessment can and should happen every day as a part of instruction. A variety of approaches and contexts should be used for assessing all students: as a class, in groups, and individual students. Consider the following **sample activities** (that can be adapted) for either formative (for learning; as learning) or summative (of learning) assessment.

Whole Class/Group/Individual Assessment

- Ask small groups of students to sort a collection 2-D shapes or 3-D objects and record their sorting rule.
- Make an assortment of 2-D shapes from poster board. Ask the student to sort them and to give the sorting rule.
- Give each student, or pair of students, a collection of pattern blocks. Say, "I am going to build a design with pattern blocks. I want you to use your pattern blocks to build a design just like mine." Observe their construction.
- Provide students with a tangram puzzle outline and ask them to predict and select the tangram pieces required to replicate the shape. Students may then replicate the shape to verify their predictions. Pattern blocks may also be used for this activity.
- Give each student, or pair of students, a collection of pattern blocks. Say to them, "I want you to build the following shape with your pattern blocks. Place a red trapezoid on your desk. On top of the trapezoid place a green triangle. On the left place a blue rhombus and on the right place another blue rhombus." Observe their construction.
- Show a student a square that has been folded along the diagonal. Ask: What shape will this be when I unfold it?
- Provide students with a variety of 3-D solids. Show a composite 3-D object, such as a tower, and ask students to predict and select which solids they need to replicate the object. Students build the object using the solids they selected. They may then decompose the given object to verify their predictions.
- Ask the student to examine a variety of containers (such as, yogurt container, cereal box, etc.). Ask: What shapes would be used to make this container? How do you know?
- Show students a triangle. Ask students to find three things in the classroom that make them think of that shape.
- Provide students with a set of paper 2-D shapes and have them circulate in the classroom or another environment, finding parts of 3-D objects. Students may record their findings in their math journal.

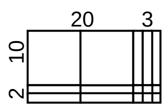
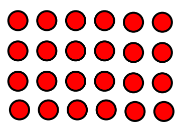
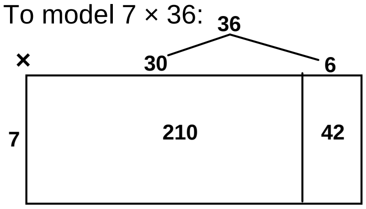
FOLLOW-UP ON ASSESSMENT

Guiding Questions

• What conclusions can be made from assessment information?
• How effective have instructional approaches been?
• What are the next steps in instruction?

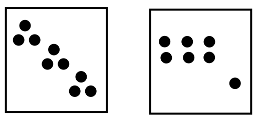
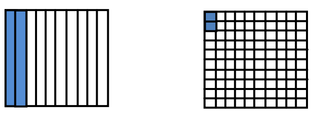
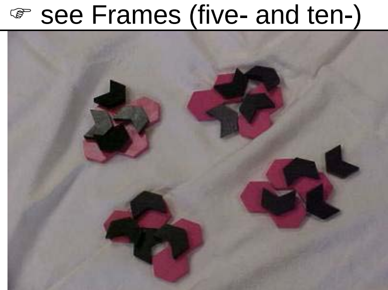
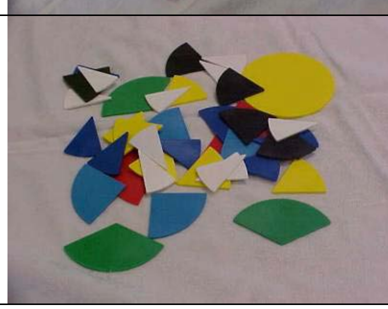
GLOSSARY OF MODELS

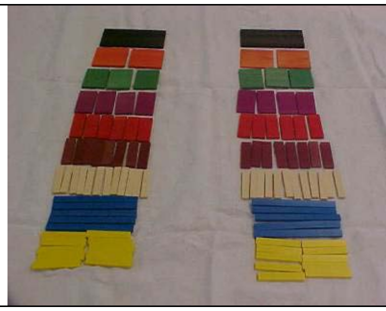
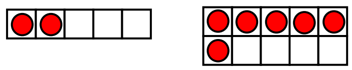
This glossary is identical for all grade levels (kindergarten to grade 8). Most of the models have a variety of uses at different grade levels. More information as to which models can be used to develop specific curriculum outcomes is located on the *Instructional Strategies* section of each four-page spread in this curriculum document. The purpose of this glossary is to provide a visual of each model and a brief description of it.

Name	Picture	Description
Algebra tiles		• Sets include “X” tiles (rectangles), “X^2” tiles (large squares), and integer tiles (small squares). • All tiles have a different colour on each side to represent positive and negative. Typically the “X” tiles are green and white and the smaller squares are red and white. • Some sets also include “Y” sets of tiles which are a different colour and size than the “X” tiles.
Area Model	To model 12 × 23: 	• Use base ten blocks to represent the parts of each number that is being multiplied. • To find the answer for the example shown, students can add the various parts of the model: 200 + 30 + 40 + 6 = 276. • This model can also be used for fraction multiplication.
Arrays and Open Arrays	To model 4 × 6:  To model 7 × 36: 	• Use counters arranged in equal rows or columns or a Blackline Master with rows and columns of dots. • Helpful in developing understanding of multiplication facts. • Grids can also be used to model arrays. • Open arrays allows students to think in amounts that are comfortable for them and does not lock them into thinking using a specific amount. These arrays help visualize repeated addition and partitioning and ultimately using the distributive property.
Attribute Blocks		• Sets of blocks that vary in their attributes: o 5 shapes circle, triangle, square, hexagon, rectangle o 2 thicknesses o 2 sizes o 3 colours
Balance (pan or beam) scales		• Available in a variety of styles and precision. • Pan balances have a pan or platform on each side to compare two unknown amounts or represent equality. Weights can be used on one side to measure in standard units. • Beam balances have parallel beams with a piece that is moved on each beam to determine the mass of the object on the scale. Offer greater accuracy than a pan balance.

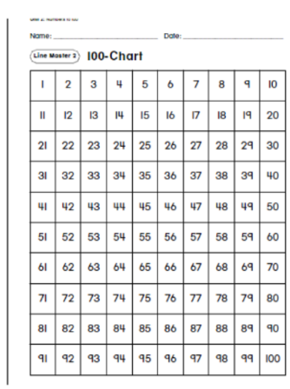
<table>
<tr><td>Base Ten Blocks</td><td></td><td>Include unit cubes, rods, flats, and large cubes.
Available in a variety of colours and materials (plastic, wood, foam).
Usually 3-D</td></tr>
<tr><td>Beam Balance</td><td colspan="2">☞ see Balance (pan or beam)</td></tr>
<tr><td>Carroll Diagram</td><td>Example:<table><tr><td></td><td>1-digit</td><td>2-digit</td></tr><tr><td>Even</td><td>2, 4, 6, 8</td><td>26, 34</td></tr><tr><td>Odd</td><td>1, 3, 5, 7, 9</td><td>15, 21</td></tr></table></td><td>Used for classification of different attributes.
The table shows the four possible combinations for the two attributes.
Similar to a Venn Diagram.</td></tr>
<tr><td>Colour Tiles</td><td></td><td>Square tiles in 4 colours (red, yellow, green, blue).
Available in a variety of materials (plastic, wood, foam).</td></tr>
<tr><td>Counters (two colour)</td><td></td><td>Counters have a different colour on each side.
Available in a variety of colour combinations, but usually are red & white or red & yellow.
Available in different shapes (circles, squares, bean).</td></tr>
<tr><td>Cubes (Linking)</td><td></td><td>Set of interlocking 2 cm cubes.
Most connect on all sides.
Available in a wide variety of colours (usually 10 colours in each set).
Brand names include: Multilink, Hex-a-Link, Cube-A-Link.
Some types only connect on two sides (brand name example: Unifix).</td></tr>
<tr><td>Cuisenaire Rods®</td><td></td><td>Set includes 10 different colours of rods.
Each colour represents a different length and can represent different number values or units of measurement.
Usual set includes 74 rods (22 white, 12 red, 10 light green, 6 purple, 4 yellow, 4 dark green, 4 black, 4 brown, 4 blue, 4 orange).
Available in plastic or wood.</td></tr>
</table>

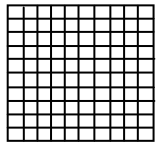
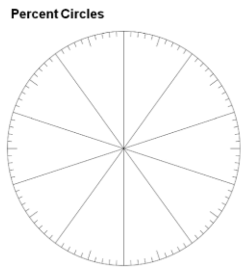
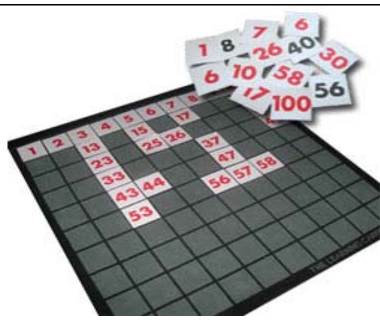
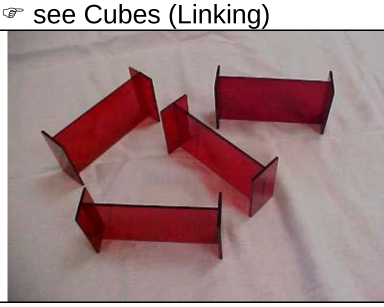
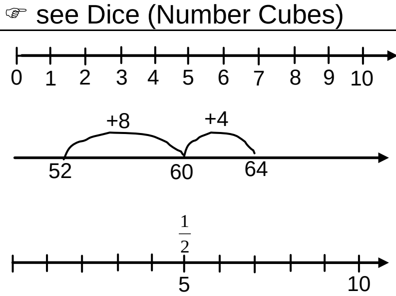
Dice (Number Cubes)		• Standard type is a cube with numbers or dots from 1 to 6 (Number cubes).
		• Cubes can have different symbols or words.
		• Also available in:
		    o 4-sided (tetrahedral dice)
		    o 8-sided (octahedral dice)
		    o 10-sided (decahedra dice)
		    o 12-sided, 20-sided, and higher
		    o Place value dice

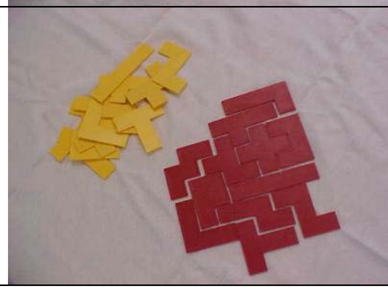
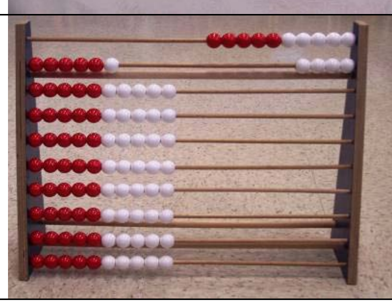
Dominoes		• Rectangular tiles divided in two-halves. • Each half shows a number of dots: 0 to 6 or 0 to 9. • Sets include tiles with all the possible number combinations for that set. • Double-six sets include 28 dominoes. • Double-nine sets include 56 dominoes.
Dot Cards		• Sets of cards that display different number of dots (1 to 10) in a variety of arrangements. • Available as free Blackline Master online on the “Teaching Student-Centered Mathematics K-3” website (BLM 3-8).
Decimal Squares®		• Tenths and hundredths grids that are manufactured with parts of the grids shaded. • Can substitute a Blackline Master and create your own class set.
Double Number Line	☞ see Number lines (standard, open, and double)	
Five-frames	☞ see Frames (five- and ten-)	
Fraction Blocks		• Also known as Fraction Pattern blocks. • 4 types available: pink “double hexagon”, black chevron, brown trapezoid, and purple triangle. • Use with basic pattern blocks to help study a wider range of denominators and fraction computation.
Fraction Circles		• Sets can include these fraction pieces: $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{3}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \frac{1}{12}$ • Each fraction graduation has its own colour. • It is helpful to use ones without the fractions marked on the pieces for greater flexibility (using different piece to represent 1 whole).

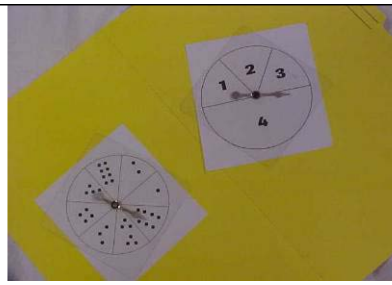
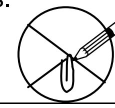
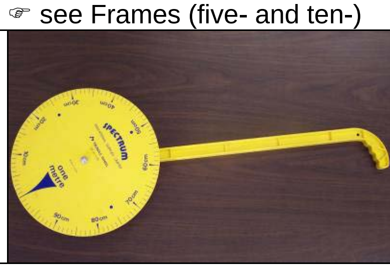
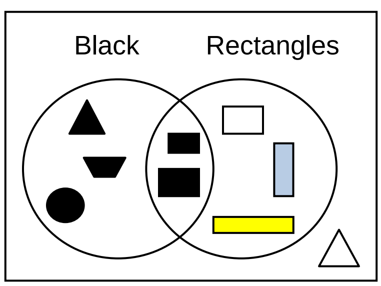
Fraction Pieces		• Rectangular pieces that can be used to represent the following fractions: $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \frac{1}{12}$ • Offers more flexibility as different pieces can be used to represent 1 whole. • Each fraction graduation has its own colour. • Sets available in different quantities of pieces.
Frames (five- and ten-)		• Available as a Blackline Master in many resources or you can create your own. • Use with any type of counter to fill in the frame as needed.

Geoboards		• Available in a variety of sizes and styles.
		  o 5 × 5 pins
		  o 11 × 11 pins
		  o Circular 24 pin
		  o Isometric
		• Clear plastic models can be used by teachers and students on an overhead.
		• Some models can be linked to increase the size of the grid.

Geometric Solids		• Sets typically include a variety of prisms, pyramids, cones, cylinders, and spheres. • The number of pieces in a set will vary. • Available in different materials (wood, plastic, foam) and different sizes.
Geo-strips		• Plastic strips that can be fastened together with brass fasteners to form a variety of angles and geometric shapes. • Strips come in 5 different lengths. Each length is a different colour.
Hundred Chart		• 10 × 10 grid filled in with numbers 1-100 or 0 - 99. • Available as a Blackline Master in many resources or you can create your own. • Also available as wall charts or “Pocket” charts where cards with the numbers can be inserted or removed.

Hundred Grid		• 10 × 10 grid. • Available as Blackline Master in many resources.
Hundredths Circle		• Circle divided into tenths and hundredths. • Also known as “percent circles”.
Learning Carpet®	 http://www.thelearningcarpet.ca	• 10 × 10 grid printed on a floor rug that is six feet square. • Number cards and other accessories are available to use with the carpet.
Linking Cubes	☞ see Cubes (Linking)	
Mira®		• Clear red plastic with a bevelled edge that projects reflected image on the other side. • Other brand names include: Reflect-View and Math-Vu™.
Number Cubes	☞ see Dice (Number Cubes)	
Number Lines (standard, open, and double)		• Number lines can begin at 0 or extend in both directions. • Open number lines do not include pre-marked numbers or divisions. Students place these as needed. • Double number lines have numbers written above and below the line to show equivalence.
Open Arrays	☞ see Arrays and Open Arrays	
Open Number Lines	☞ see Number Lines (standard, open, and double)	
Pan Balance	☞ see Balance (pan or beam)	

Pattern Blocks		• Standard set includes: Yellow hexagons, red trapezoids, blue parallelograms, green triangles, orange squares, beige parallelograms. • Available in a variety of materials (wood, plastic, foam).
Pentominoes		• Set includes 12 unique polygons. • Each is composed of 5 squares which share at least one side. • Available in 2-D and 3-D in a variety of colours.
Polydrons		• Geometric pieces snap together to build various geometric solids as well as their nets. • Pieces are available in a variety of shapes, colours, and sizes: Equilateral triangles, isosceles triangles, right-angle triangles, squares, rectangles, pentagons, hexagons • Also available as Frameworks (open centres) that work with Polydrons and another brand called G-O-Frames™.
Power Polygons™		• Set includes the 6 basic pattern block shapes plus 9 related shapes. • Shapes are identified by letter and colour.
Rekenrek		• Counting frame that has 10 beads on each bar: 5 white and 5 red. • Available with different number of bars (1, 2, or 10).

Spinners		• Create your own or use manufactured ones that are available in a wide variety: o number of sections; o colours or numbers; o different size sections; o blank. • Simple and effective version can be made with a pencil held at the centre of the spinner with a paperclip as the part that spins. 
Tangrams		• Set of 7 shapes (commonly plastic): o 2 large right-angle triangles o 1 medium right-angle triangle o 2 small right-angle triangles o 1 parallelogram o 1 square • 7-pieces form a square as well as a number of other shapes. • Templates also available to make sets.
Ten-frames	☞ see Frames (five- and ten-)	
Trundle Wheel		• Tool for measuring longer distances. • Each revolution equals 1 metre usually noted with a click.
Two Colour Counters	☞ see Counters (two colour)	
Venn Diagram		• Used for classification of different attributes. • Can be one, two, or three circles depending on the number of attributes being considered. • Attributes that are common to each group are placed in the interlocking section. • Attributes that don't belong are placed outside of the circle(s), but inside the rectangle. • Be sure to draw a rectangle around the circle(s) to show the "universe" of all items being sorted. • Similar to a Carroll Diagram.

List of Grade 1 Specific Curriculum Outcomes

Number (N)

1. Say the number sequence, 0 to 100, by: 1s forward and backward between any two given numbers; 2s to 20, forward starting at 0; 5s and 10s to 100, forward starting at 0.
2. Recognize, at a glance, and name familiar arrangements of 1 to 10 objects or dots.
3. Demonstrate an understanding of counting by: indicating that the last number said identifies “how many”; showing that any set has only one count; using the counting on strategy; using parts or equal groups to count sets.
4. Represent and describe numbers to 20 concretely, pictorially and symbolically.
5. Compare sets containing up to 20 elements to solve problems using: referents; one-to-one correspondence.
6. Estimate quantities to 20 by using referents.
7. Demonstrate, concretely and pictorially, how a given number can be represented by a variety of equal groups with and without singles.
8. Identify the number, up to 20, that is one more, two more, one less and two less than a given number.
9. Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically by: using familiar and mathematical language to describe additive and subtractive actions from their experience; creating and solving problems in context that involve addition and subtraction; modelling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.
10. Describe and use mental mathematics strategies (memorization not intended), such as: counting on and counting back; making 10; doubles; using addition to subtract for the basic addition and subtraction facts to 18.

Patterns & Relations (PR)

(Patterns)

1. Demonstrate an understanding of repeating patterns (two to four elements) by: describing; reproducing; extending; creating patterns using manipulatives, diagrams, sounds and actions.
2. Translate repeating patterns from one representation to another.

(Variables and Equations)

3. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).
4. Record equalities using the equal symbol.

Shape and Space (SS)

(Measurement)

1. Demonstrate an understanding of measurement as a process of comparing by: identifying attributes that can be compared; ordering objects; making statements of comparison; filling, covering or matching.

(3-D Objects and 2-D Shapes)

2. Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule.
3. Replicate composite 2-D shapes and 3-D objects.
4. Compare 2-D shapes to parts of 3-D objects in the environment.

(Transformations)

Statistics and Probability (SP)

(Data Analysis)

(Chance and Uncertainty)

REFERENCES

Alberta Education. *LearnAlberta.ca: Planning Guides K, 1, 4, and 7*, 2005-2008.

American Association for the Advancement of Science [AAAS-Benchmarks]. *Benchmark for Science Literacy*. New York, NY: Oxford University Press, 1993.

Banks, J.A. and C.A.M. Banks. *Multicultural Education: Issues and Perspectives*. Boston: Allyn and Bacon, 1993.

Black, Paul and Dylan William. "Inside the Black Box: Raising Standards Through Classroom Assessment." *Phi Delta Kappan*, 20, October 1998, pp.139-148.

British Columbia. Ministry of Education. *The Primary Program: A Framework for Teaching*, 2000.

Caine, Renate Numella and Geoffrey Caine. *Making Connections: Teaching and the Human Brain*. Menlo Park, CA: Addison-Wesley Publishing Company, 1991.

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

Davies, Anne. *Making Classroom Assessment Work*. British Columbia: Classroom Connections International, Inc., 2000.

Hope, Jack A. et.al. *Mental Math in the Primary Grades* (p. v). Dale Seymour Publications, 1988.

National Council of Teachers of Mathematics (NCTM). *Curriculum Focal Points for Prekindergarten through Grade 8: A Quest for Coherence*. Reston, VA: NCTM, 2006.

_____, *Mathematics Assessment Sampler, Grades 3-5*. edited by Jane Reston, VA: NCTM, 2000.

_____, *Principles and Standards for School Mathematics*. Reston, VA: NCTM, 2000.

OECD Centre for Educational Research and Innovation. *Formative Assessment: Improving Learning in Secondary Classrooms*. Paris, France: Organization for Economic Co-operation and Development (OECD) Publishing, 2006.

Rubenstein, Rheta N. *Mental Mathematics beyond the Middle School: Why? What? How?* September 2001, Vol. 94, Issue 6, p. 442.

Shaw, J.M. and Cliatt, M.F.P. (1989). "Developing Measurement Sense." In P.R. Trafton (Ed.), *New Directions for Elementary School Mathematics* (pp. 149–155). Reston, VA: National Council of Teachers of Mathematics.

Small, M. *Making Math Meaningful to Canadian Students, K-8*. Toronto: Nelson Education Ltd., 2008.

Steen, L.A. (ed.). *On the Shoulders of Giants – New Approaches to Numeracy.* Washington, DC: National Research Council, 1990.

Stenmark, Jean Kerr and William S. Bush, Editor. *Mathematics Assessment: A Practical Handbook for Grades 3-5*. Reston, VA: National Council of Teachers of Mathematics, Inc., 2001.

Van de Walle, John A. and Louann H. Lovin. *Teaching Student-Centered Mathematics, Grades K-3.* Boston: Pearson Education, Inc. 2006.

Van de Walle, John A. and Louann H. Lovin. *Teaching Student-Centered Mathematics, Grades 3-5.* Boston: Pearson Education, Inc. 2006.

Van de Walle, John A. and Louann H. Lovin. *Teaching Student-Centered Mathematics, Grades 5-8.* Boston: Pearson Education, Inc. 2006.

Western and Northern Canadian Protocol. *Common Curriculum Framework for K-9 Mathematics*, 2006.