Grade 1 Mathematics

Support Document for Teachers

Grade 1 Mathematics

Support Document for Teachers

2014
Manitoba Education and Advanced Learning

Manitoba Education and Advanced Learning Cataloguing in Publication Data

Grade 1 mathematics [electronic resource] : support document
for teachers

Includes bibliographical references
ISBN: 978-0-7711-5909-1

1. Mathematics—Study and teaching (Primary).
2. Mathematics—Study and teaching (Primary)—Manitoba.
I. Manitoba. Manitoba Education and Advanced Learning.
372.7044

Manitoba Education and Advanced Learning
School Programs Division
Winnipeg, Manitoba, Canada

Any websites referenced in this document are subject to change. Educators are advised to preview and evaluate websites and online resources before recommending them for student use.

Print copies of this resource can be purchased from the Manitoba Text Book Bureau (stock number 80644). Order online at <www.mtbb.mb.ca>.

This resource is also available on the Manitoba Education and Advanced Learning website at <www.edu.gov.mb.ca/k12/cur/math/supports.html>.

Available in alternate formats upon request.

Contents

List of Blackline Masters (BLMs)

Grade 1 Mathematics Blackline Masters

Acknowledgements

Manitoba Education and Advanced Learning wishes to thank the members of the Kindergarten to Grade 4 Mathematics Support Document Development Team for their contribution to this document. Their dedication and hard work have made this document possible.

Writer	Dianne Soltess	St. James-Assiniboia School Division
Kindergarten to Grade 4 Mathematics Support Document Development Team (2006–2008)	Rosanne Ashley	Winnipeg School Division
	Joanne Barre	Louis Riel School Division
	Debbie Furdyk	Lord Selkirk School Division
	Trish Goosen	Lord Selkirk School Division
	Brad Hayward	Fort la Bosse School Division
	Catherine Ko-Heinrichs	Winnipeg Mennonite Elementary School
	Carol Matsumoto	Seven Oaks School Division
	Shannon Oikawa	Pembina Trails School Division
	Louisa Petznick	Frontier School Division
	Donna Slobodzian	Red River Valley School Division
	Pat Steuart	St. James-Assiniboia School Division
Manitoba Education and Advanced Learning School Programs Division Staff	Heather Anderson Consultant (until June 2007)	Development Unit Instruction, Curriculum and Assessment Unit
	Carole Bilyk Project Manager	Development Unit Instruction, Curriculum and Assessment Unit
	Louise Boissonneault Coordinator	Document Production Services Unit Educational Resources Branch
	Lee-Ila Bothe Coordinator (until March 2010)	Document Production Services Unit Educational Resources Branch
	Lynn Harrison Desktop Publisher	Document Production Services Unit Educational Resources Branch
	Sherry Perih Project Leader	Development Unit Instruction, Curriculum and Assessment Unit

Introduction

Purpose of the Document

Grade 1 Mathematics: Support Document for Teachers provides various instructional activities, assessment strategies, and learning resources that promote the meaningful engagement of mathematics learners in Grade 1. The document is intended to be used as an aid to teachers as they work with students in achieving the prescribed outcomes and achievement indicators identified in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)* (Manitoba Education).

Background

Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes is based on *The Common Curriculum Framework for K–9 Mathematics*, which resulted from ongoing collaboration with the Western and Northern Canadian Protocol (WNCP). In its work, WNCP emphasizes

- common educational goals
- the ability to collaborate and achieve common goals
- high standards in education
- planning an array of educational activities
- removing obstacles to accessibility for individual learners
- optimum use of limited educational resources

The growing effects of technology and the need for technology-related skills have become more apparent in the last half century. Mathematics and problem-solving skills are becoming more valued as we move from an industrial to an informational society. As a result of this trend, mathematics literacy has become increasingly important. Making connections between mathematical study and daily life, business, industry, government, and environmental thinking is imperative. The Kindergarten to Grade 12 Mathematics curriculum is designed to support and promote the understanding that mathematics is

- a way of learning about our world
- part of our daily lives
- both quantitative and geometric in nature

Beliefs about Students and Mathematics Learning

The Kindergarten to Grade 8 Mathematics curriculum is designed with the understanding that students have unique interests, abilities, and needs. As a result, it is imperative to make connections to all students' prior knowledge, experiences, and backgrounds.

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

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

Students need frequent opportunities to develop and reinforce their conceptual understanding, procedural thinking, and problem-solving abilities. By addressing these three interrelated components, students will strengthen their ability to apply mathematical learning to their daily lives.

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.

Conceptual understanding: comprehending mathematical concepts, relations, and operations to build new knowledge. (Kilpatrick, Swafford, and Findell 5)

Procedural thinking: carrying out procedures flexibly, accurately, efficiently, and appropriately.

Problem solving: engaging in understanding and resolving problem situations where a method or solution is not immediately obvious. (OECD 12)

First Nations, Métis, and Inuit Perspectives

First Nations, Métis, and Inuit students in Manitoba come from diverse geographic areas with varied cultural and linguistic backgrounds. Students attend schools in a variety of settings including urban, rural, and isolated communities. Teachers need to recognize and understand the diversity of cultures within schools and the diverse experiences of students.

First Nations, Métis, and Inuit students often have a whole-world view of the environment; as a result, many of these students live and learn best in a holistic way. This means that students look for connections in learning, and learn mathematics best when it is contextualized and not taught as discrete content.

Many First Nations, Métis, and Inuit students come from cultural environments 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.

A variety of teaching and assessment strategies are 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).

Affective Domain

A positive attitude is an important aspect of the affective domain that has a profound effect on learning. Environments that create a sense of belonging, encourage risk taking, and provide opportunities for success help students 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 assessment of personal goals.

---

* In this document, the term *parents* refers to both parents and guardians and is used with the recognition that in some cases only one parent may be involved in a child’s education.

Early Childhood

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

Activities can contribute to the development of number and spatial sense in children. Curiosity about mathematics is fostered when children are engaged in 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.

Mathematics Education Goals for Students

The main goals of mathematics education are to prepare students to

- communicate and reason mathematically
- use mathematics confidently, accurately, and efficiently to solve problems
- appreciate and value mathematics
- make connections between mathematical knowledge and skills, and their application
- commit themselves to lifelong learning
- become mathematically literate citizens, using mathematics to contribute to society and to think critically about the world

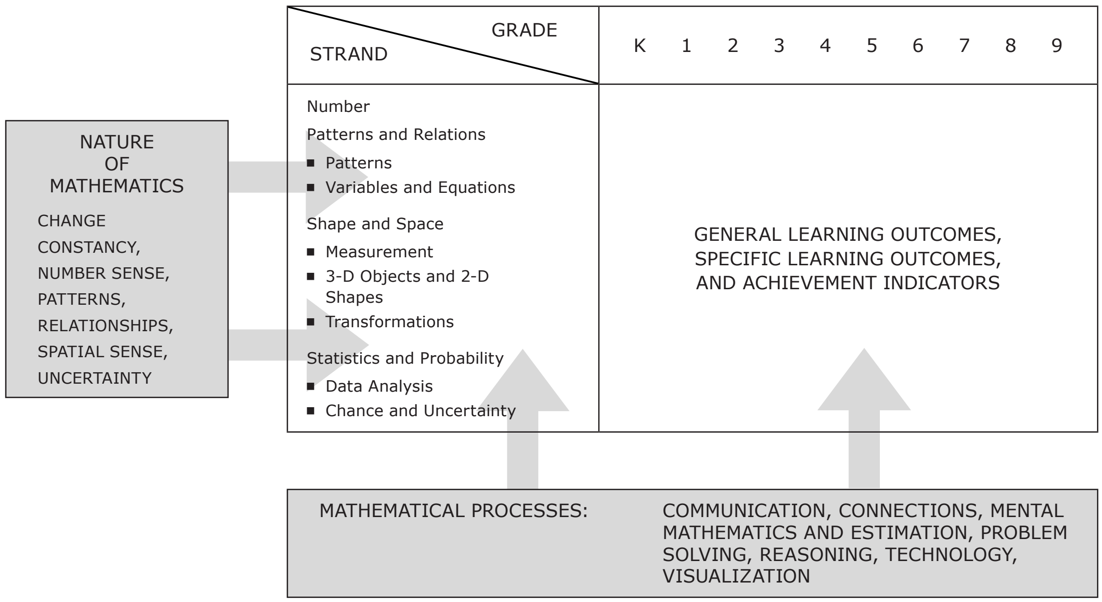
> Mathematics education must prepare students to use mathematics to think criticallly about the world.

Students who have met these goals will

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

Conceptual Framework for Kindergarten to Grade 9 Mathematics

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



Mathematical Processes

There are critical components that students must encounter in mathematics 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
- connect mathematical ideas to other concepts in mathematics, to everyday experiences, and to other disciplines
- demonstrate fluency with mental mathematics and estimation
- develop and apply new mathematical knowledge through problem solving
- develop mathematical reasoning
- select and use technologies as tools for learning and solving problems
- develop visualization skills to assist in processing information, making connections, and solving problems

The common curriculum framework incorporates these seven interrelated mathematical processes that are intended to permeate teaching and learning.

- **Communication [C]:** Students communicate daily (orally, through diagrams and pictures, and by writing) about their mathematics learning. They need opportunities to read about, represent, view, write about, listen to, and discuss mathematical ideas. This enables them to reflect, to validate, and to clarify their thinking. Journals and learning logs can be used as a record of student interpretations of mathematical meanings and ideas.

- **Connections [CN]:** Mathematics should be viewed as an integrated whole, rather than as the study of separate strands or units. Connections must also be made between and among the different representational modes—concrete, pictorial, and symbolic (the symbolic mode consists of oral and written word symbols as well as mathematical symbols). The process of making connections, in turn, facilitates learning. Concepts and skills should also be connected to everyday situations and other curricular areas.

- **Mental Mathematics and Estimation [ME]:** Mental mathematics and estimation are a combination of cognitive strategies that enhance flexible thinking and number sense. Strategies within mental mathematics and estimation enable students to calculate mentally without the use of external aids. In the process, they improve their computational fluency—developing efficiency, accuracy, and flexibility.

- **Problem Solving [PS]:** Students are exposed to a wide variety of problems in all areas of mathematics. They explore a variety of methods for solving and verifying problems. In addition, they are challenged to find multiple solutions for problems and to create their own problems.

- **Reasoning [R]:** Mathematics reasoning involves informal thinking, conjecturing, and validating—these help children understand that mathematics makes sense. Children are encouraged to justify, in a variety of ways, their solutions, thinking processes, and hypotheses. In fact, good reasoning is as important as finding correct answers.

- **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.

- **Visualization [V]:** Mental images help students to develop concepts and to understand procedures. Students clarify their understanding of mathematical ideas through images and explanations.

These processes are outlined in detail in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*.

Strands

The learning outcomes in the Manitoba curriculum framework are organized into four strands across Kindergarten to Grade 8. Some strands are further subdivided into substrands.

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

Number

- Develop number sense.

Patterns and Relations

- Patterns
  - Use patterns to describe the world and solve problems.
- Variables and Equations
  - Represent algebraic expressions in multiple ways.

Shape and Space

- 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

- Data Analysis
  - Collect, display, and analyze data to solve problems.
- Chance and Uncertainty
  - Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

Outcomes and Achievement Indicators

The Manitoba curriculum framework is stated in terms of general learning outcomes, specific learning outcomes, and achievement indicators.

- **General learning outcomes** are overarching statements about what students are expected to learn in each strand/substrand. The general learning outcome for each strand/substrand is the same throughout the grades from Kindergarten to Grade 8.
- **Specific learning outcomes** are statements that identify the specific skills, understanding, and knowledge students are required to attain by the end of a given grade.
- **Achievement indicators** are samples of how students may demonstrate their achievement of the goals of a specific learning outcome. The range of samples provided is meant to reflect the depth, breadth, and expectations of the specific learning outcome. While they provide some examples of student achievement, they are not meant to reflect the sole indicators of success.

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

Summary

The conceptual framework for Kindergarten to Grade 9 mathematics describes the nature of mathematics, mathematical processes, and the mathematical concepts to be addressed in Kindergarten to Grade 9 mathematics. The components are not meant to stand alone. Learning 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. The *Grade 1 Mathematics: Support Document for Teachers* is meant to support teachers to create meaningful learning activities that focus on formative assessment and student engagement.

ASSESSMENT

Authentic assessment and feedback are a driving force for the suggestions for assessment in this document. The purposes of the suggested assessment activities and strategies are to parallel those found in *Rethinking Classroom Assessment with Purpose in Mind: Assessment* for *Learning, Assessment* as *Learning, Assessment* of *Learning* (Manitoba Education, Citizenship and Youth). These include the following:

- assessing *for*, *as*, and *of* learning
- enhancing student learning
- assessing students effectively, efficiently, and fairly
- providing educators with a starting point for reflection, deliberation, discussion, and learning

Assessment *for* learning is designed to give teachers information to modify and differentiate teaching and learning activities. It acknowledges that individual students learn in idiosyncratic ways, but it also recognizes that there are predictable patterns and pathways that many students follow. It requires careful design on the part of teachers so that they use the resulting information to determine not only what students know, but also to gain insights into how, when, and whether students apply what they know. Teachers can also use this information to streamline and target instruction and resources, and to provide feedback to students to help them advance their learning.

Assessment *as* learning is a process of developing and supporting metacognition for students. Assessment *as* learning focuses on the role of the student as the critical connector between assessment and learning. When students are active, engaged, and critical assessors, they make sense of information, relate it to prior knowledge, and use it for new learning. This is the regulatory process in metacognition. It occurs when students monitor their own learning and use the feedback from this monitoring to make adjustments, adaptations, and even major changes in what they understand. It requires that teachers help students develop, practise, and become comfortable with reflection, and with a critical analysis of their own learning.

Assessment *of* learning is summative in nature and is used to confirm what students know and can do, to demonstrate whether they have achieved the curriculum outcomes, and, occasionally, to show how they are placed in relation to others. Teachers concentrate on ensuring that they have used assessment to provide accurate and sound statements of students' proficiency, so that the recipients of the information can use the information to make reasonable and defensible decisions.

Overview of Planning Assessment			
	Assessment *for* Learning	**Assessment *as* Learning**	**Assessment *of* Learning**
Why Assess?	▪ to enable teachers to determine next steps in advancing student learning	▪ to guide and provide opportunities for each student to monitor and critically reflect on his or her learning and identify next steps	▪ to certify or inform parents or others of student's proficiency in relation to curriculum learning outcomes
Assess What?	▪ each student's progress and learning needs in relation to the curriculum outcomes	▪ each student's thinking about his or her learning, what strategies he or she uses to support or challenge that learning, and the mechanisms he or she uses to adjust and advance his or her learning	▪ the extent to which each student can apply the key concepts, knowledge, skills, and attitudes related to the curriculum outcomes
What Methods?	▪ a range of methods in different modes that make a student's skills and understanding visible	▪ a range of methods in different modes that elicit the student's learning and metacognitive processes	▪ a range of methods in different modes that assess both product and process
Ensuring Quality	▪ accuracy and consistency of observations and interpretations of student learning ▪ clear, detailed learning expectations ▪ accurate, detailed notes for descriptive feedback to each student	▪ accuracy and consistency of a student's self-reflection, self-monitoring, and self-adjustment ▪ engagement of the student in considering and challenging his or her thinking ▪ the student records his or her own learning	▪ accuracy, consistency, and fairness of judgments based on high-quality information ▪ clear, detailed learning expectations ▪ fair and accurate summative reporting
Using the Information	▪ provide each student with accurate descriptive feedback to further his or her learning ▪ differentiate instruction by continually checking where each student is in relation to the curriculum outcomes ▪ provide parents or guardians with descriptive feedback about student learning and ideas for support	▪ provide each student with accurate, descriptive feedback that will help him or her develop independent learning habits ▪ have each student focus on the task and his or her learning (not on getting the right answer) ▪ provide each student with ideas for adjusting, rethinking, and articulating his or her learning ▪ provide the conditions for the teacher and student to discuss alternatives ▪ the student reports his or her learning	▪ indicate each student's level of learning ▪ provide the foundation for discussions on placement or promotion ▪ report fair, accurate, and detailed information that can be used to decide the next steps in a student's learning

Source: Manitoba Education, Citizenship and Youth. *Rethinking Classroom Assessment with Purpose in Mind: Assessment* for *Learning, Assessment* as *Learning, Assessment* of *Learning*. Winnipeg, MB: Manitoba Education, Citizenship and Youth, 2006, 85.

Instructional Focus

The Manitoba mathematics curriculum framework is arranged into four strands. These strands are not intended to be discrete units of instruction. The integration of learning 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:

- Routinely incorporating conceptual understanding, procedural thinking, and problem solving within instructional design will enable students to master the mathematical skills and concepts of the curriculum.
- Integration of the mathematical processes within each strand is expected.
- Problem solving, conceptual understanding, reasoning, making connections, and procedural thinking are vital to increasing mathematical fluency, and must be integrated throughout the program.
- Concepts should be introduced using manipulatives and gradually developed from the concrete to the pictorial to the symbolic.
- Students in Manitoba bring a diversity of learning styles and cultural backgrounds to the classroom and they may be at varying developmental stages. Methods of instruction should be based on the learning styles and abilities of the students.
- Use educational resources by adapting to the context, experiences, and interests of students.
- Collaborate with teachers at other grade levels to ensure the continuity of learning of all students.
- Familiarize yourself with exemplary practices supported by pedagogical research in continuous professional learning.
- Provide students with several opportunities to communicate mathematical concepts and to discuss them in their own words.

"Students in a mathematics class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways—individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice. In addition, mathematics requires students to learn concepts and procedures, acquire skills, and learn and apply mathematical processes. These different areas of learning may involve different teaching and learning strategies. It is assumed, therefore, that the strategies teachers employ will vary according to both the object of the learning and the needs of the students" (Ontario 24).

Document Organization and Format

This document consists of the following sections:

- **Introduction:** The Introduction provides information on the purpose and development of this document, discusses characteristics of and goals for Early Years learners, and addresses First Nations, Métis, and Inuit perspectives. It also gives an overview of the following:
  - **Conceptual Framework for Kindergarten to Grade 9 Mathematics:** This framework provides an overview of how mathematical processes and the nature of mathematics influence learning outcomes.
  - **Assessment:** This section provides an overview of planning for assessment in mathematics, including assessment *for*, *as*, and *of* learning.
  - **Instructional Focus:** This discussion focuses on the need to integrate mathematics learning outcomes and processes across the four strands to make learning experiences meaningful for students.
  - **Document Organization and Format:** This overview outlines the main sections of the document and explains the various components that comprise the various sections.
- **Number:** This section corresponds to and supports the Number strand for Grade 1 from *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*.
- **Patterns and Relations:** This section corresponds to and supports the Patterns and Relations strand for Grade 1 from *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*.
- **Shape and Space:** This section corresponds to and supports the Measurement and 3-D Objects and 2-D Shapes substrands of the Shape and Space strand for Grade 1 from *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*.
- **Blackline Masters (BLMs):** Blackline Masters are provided to support student learning. They are available in *Microsoft Word* format so that teachers can alter them to meet students' needs, as well as in *Adobe* PDF format.
- **Bibliography:** The bibliography lists the sources consulted and cited in the development of this document.

Guide to Components and Icons

Each of the sections supporting the strands of the Grade 1 Mathematics curriculum includes the components and icons described below.

Enduring Understanding(s):

These summarize the core idea of the particular learning outcome(s). Each statement provides a conceptual foundation for the learning outcome. It can be used as a pivotal starting point in integrating other mathematical learning outcomes or other subject concepts. The integration of concepts, skills, and strands remains of utmost importance.

Essential Question(s):

These are used to guide students' learning experiences and may be useful when planning assessments. Inquiring into essential questions gives teaching and learning purposeful and meaningful focus for achieving the specific learning outcome(s).

Specific Learning Outcome(s):	**Achievement Indicators:**
Specific learning outcome (SLO) statements define what students are expected to achieve by the end of the grade. A code is used to identify each SLO by grade and strand, as shown in the following example: **1.N.1** The first number refers to the grade (Grade 1). The letter(s) refer to the strand (Number). The last number indicates the SLO number. [C, CN, ME, PS, R, T, V] Each SLO is followed by a list indicating the applicable mathematical processes.	Achievement indicators are examples of a representative list of the depth, breadth, and expectations for the learning outcome. The indicators may be used to determine whether students understand the particular learning outcome. These achievement indicators will be addressed through the learning activities that follow.

Prior Knowledge

Prior knowledge is identified to give teachers a reference to what students may have experienced previously. Teachers should assess students' prior knowledge before planning instruction.

Background Information

Background information is identified to give teachers knowledge about specific concepts and skills related to the particular learning outcome.

Mathematical Language

Lists of terms students will encounter while achieving particular learning outcomes are provided. These terms can be placed on math word walls or used in a classroom math dictionary. *Kindergarten to Grade 8 Mathematics Glossary: Support Document for Teachers* (Manitoba Education, Citizenship and Youth) provides teachers with an understanding of key terms found in Kindergarten to Grade 8 mathematics. The glossary is available on the Manitoba Education and Advanced Learning website at <www.edu.gov.mb.ca/k12/cur/math/supports.html>.

Learning Experiences

Suggested teaching strategies and assessment ideas for the specific learning outcomes and achievement indicators are provided. In general, learning activities and teaching strategies related to specific learning outcomes are developed individually, except in cases where it seems more logical to develop two or more learning outcomes together. Suggestions for assessment include information that can be used to assess students' progress in their understanding of a particular learning outcome or learning experience.

Assessing Prior Knowledge:

Observation Checklist:

Assessing Understanding:

Suggestions are provided for assessing prior to and after lessons, and checklists are provided for observing during lessons to direct instruction.

Suggestions for Instruction

- **Achievement indicators appropriate to particular learning experiences are listed.**

The instructional suggestions include the following:

- **Materials/Resources:** Outlines the resources required for a learning activity.
- **Organization:** Suggests groupings (individual, pairs, small group, and/or whole class).
- **Procedure:** Outlines detailed steps for implementing suggestions for instruction.

Some learning activities make use of BLMs, which are found in the Blackline Masters section in *Microsoft Word* and *Adobe* PDF formats.

Putting the Pieces Together

Putting the Pieces Together tasks are found at the end of some learning outcomes and consist of a variety of assessment strategies. They may assess one or more learning outcomes across one or more strands and may make cross-curricular connections.

NOTES

Grade 1 Mathematics

Number

Grade 1: Number (1.N.1, 1.N.3)

Enduring Understanding:

Counting is a strategy for finding the answer to how many.

Essential Question:

Is there a quicker way to find the answer than counting by ones from one?

General Outcome:

Develop number sense.

Specific Learning Outcome(s):	Achievement Indicators:
1.N.1 Say the number sequence by ■ 1s forward and backward between any two given numbers (0 to 100) ■ 2s to 30, forward starting at 0 ■ 5s and 10s to 100, forward starting at 0 [C, CN, ME, V]	➛ 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 numeral (0 to 100) symbolically when it is presented orally. ➛ Read a numeral (0 to 100) when it is presented symbolically. ➛ Skip-count by 2s to 30 starting at 0. ➛ Skip-count by 5s to 100 starting at 0. ➛ Skip-count by 10s to 100 starting at 0. ➛ Identify and correct errors and omissions in a number sequence
1.N.3 Demonstrate an understanding of counting by ■ using the counting-on strategy ■ using parts or equal groups to count sets [C, CN, ME, R, V]	(It is intended that the sets be limited to less than 30 objects and that students count on from multiples of 2, 5, and 10 respectively.) ➛ Determine the total number of objects in a set, starting from a known quantity and counting on by 1s. ➛ Count number of objects in a set using groups of 2s, 5s, or 10s. ➛ Count the total number of objects in a set, starting from a known quantity and counting on by using groups of 2s, 5s, or 10s.

Prior Knowledge

Students may have had experience

- saying the number sequence by 1s, starting anywhere from 1 to 30 and from 10 to 1
- demonstrating an understanding of counting to 10 by indicating that the last number said identifies "how many"
- showing that any set has only one count

Background Information

Stages of Counting

Rote Counting (Ages 2 to 6): Most preschool children learn some counting words, even though they may not say these words in the correct order.

With experience they learn the proper sequence (stable order) but may be unable to make one-to-one correspondence between the object being counted and the number names that are applied to them.

Rational Counting (Ages 5 to 7): The students attach the correct number name to each object as it is counted (one-to-one correspondence).

The students understand that the final count number indicates the number of objects in a set (cardinality).

Strategic Counting (Ages 5 to 8): Counting on and counting back are two strategies that extend students' understanding of numbers and provide a basis for later development of addition and subtraction concepts.

In counting on, the students count forwards beginning at any number. Counting back is challenging for many young students, and students need many opportunities to gain skill and confidence in counting backwards from different numbers.

Counting Principles

The research related to how children learn to count identifies principles which children need to acquire to become proficient at counting. They include

Stable Order: Words used in counting must be the same sequence of words used from one count to the next.

Order Irrelevance: The order in which objects are counted doesn't matter. Counting things in a different order still gives the same count.

Conservation: The count for a set of objects stays the same whether the objects are spread out or close together. The only way the count can change is when objects are added to the set or removed from the set.

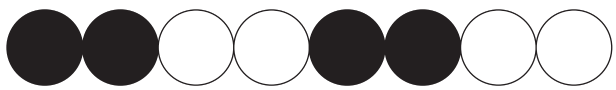
Abstraction: Different things can be counted and still give the same count. Things that are the same, different, or imaginary (ideas) can be counted.

One-to-one Correspondence: Each object being counted is given one count in the counting sequence.

Cardinality: After a set of objects has been counted, the last number counted represents the number of objects in that set. If students need to recount they don't understand the principle.

It is important that students realize that skip-counting sequences relate to putting groups of the same number together.

Example of counting by 2s



1 **2** 3 **4** 5 **6** 7 **8**

Therefore the count is: 2, 4, 6, 8 …

Mathematical Language

counting numbers: one to one hundred

count on

skip count

set

number

numeral

Learning Experiences

Assessing Prior Knowledge

Rote counting: Ask the students to

- start at 1 and count forward, stop at 32
- start at 15, stop at 24
- start at 14 and count backward, stop at 8
- start at 22 and count backward, stop at 12

Math Routine:
Counting should be done for a short period of time every day.

Place seven to ten objects in a line on a table. Have the students count them. Observe the students as they count.

Do the students

- touch or move the objects as they say the number word?
- count each object once only?
- say the number sequence correctly?

Ask: "How many objects are there?" Do the students reply without having to recount?

Point to an object located near the middle of the set. Ask: "How many objects will there be if you start counting here?" Do the students count on to the end of the row and ignore the objects at the beginning or do they reply immediately with the actual count or recount all objects?

Have students spread the objects out on the table. Ask: "Now how many objects are there?" Do the students reply without having to recount?

- **Recite forward and backward by 1s the number sequence between two given numbers (0 to 100).**

- Provide many opportunities for students to practise counting using a variety of concrete sets of objects, as well as pictures of sets.
- Use songs, poems, finger plays, and children's literature to support increasing and decreasing counting sequences.
- Relate each decade to a tone or action such as the spooky teens (said in a spooky voice), the wiggly twenties (wiggle fingers), for rote counting forward.

BLM
1.N.1&3.1

- Pocket Chart Counting: Place the digits 0 to 9 vertically in the pocket chart with 9 at the top and 0 at the bottom. Using a set of multiples of ten cards, have students count while the teacher places the appropriate ten cards behind the digit cards to make the number. For example, the 10 card will be placed behind the 1 to make the number 11 then moved to the 2 to make 12, etc.

BLM
1.N.1&3.2

- Place number cards 1 to 100 (modify to meet the needs of students) in a container. Have a student select two cards. The class/small group/individual starts counting with the first number selected and stops when they get to the second number drawn.

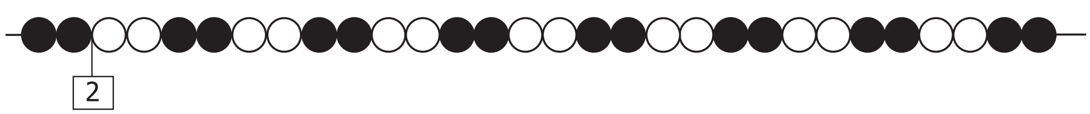
Observation Checklist

Students are able to

- ❑ confidently count forward by 1s from random starting points in the range
  - ______ within decades
  - ______ between decades
- ❑ confidently count backward by 1s from random starting points in the range
  - ______ within decades
  - ______ between decades

■ Skip-count by 2s (to 30), 5s, and 10s (to 100) starting at 0.

- **Beaded Number Line:** Use a beaded number line grouped in 2s to 30 to help students visualize the skip counting.



Use beaded number lines grouped in 5s and 10s to 100 to support skip counting by 5s and 10s.

Note: Bread tags with numbers written on them can be clipped to the bead line to show the counting sequence.

- **Whisper count:** Have students whisper odd numbers and say the multiples of two out loud in order to count by 2s (1, **2**, 3, **4**, 5, **6**, …).
- **Listen and Count:** Drop pennies into a tin can. Students listen and count, then give the total. Drop nickels and have students count by 5s. Drop dimes for counting by 10s.
- Have students solve oral problems such as, "How many eyes (ears, hands, fingers, toes, etc.) are in our classroom/group?" using skip counting.
- **Frog Jump:** Use a horizontal number line/ large floor chart with numerals well spaced or number 'stepping stones'. Have students jump on multiples of 2 or step on multiples of 5 as they skip count orally.
- Students skip count on a hundred (1 to 30, 1 to 50) chart (see below) and colour the patterns according to their skip count.

Before using the hundred chart, students should have an opportunity to see how it has been constructed. Start with a horizontal number line built in sections of ten. Show students how these move together to make the chart (1 to 30, 1 to 50, or 1 to 100).

BLM
1.N.1&3.3

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

10	20	30	40	50	60	70	80	90	100
9	19	29	39	49	59	69	79	89	99
8	18	28	38	48	58	68	78	88	98
7	17	27	37	47	57	67	77	87	97
6	16	26	36	46	56	66	76	86	96
5	15	25	35	45	55	65	75	85	95
4	14	24	34	44	54	64	74	84	94
3	13	23	33	43	53	63	73	83	93
2	12	22	32	42	52	62	72	82	92
1	11	21	31	41	51	61	71	81	91

Observation Checklist

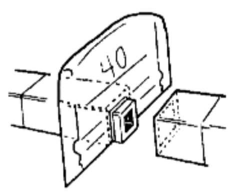
Students are able to

- ❑ orally count by
  - 2s to 20 or to ________
  - 5s to 100 or to ________
  - 10s to 100 or to ________

- **Count number of objects in set using groups of 2s, 5s, or 10s.**

- Teacher displays a large set of counters. Then asks, "How many counters do you think there are? Count them. Count by 2s. Organize them and count them by 5s.
- Teacher tells students, "Count the beads by 2s to make a set of 24."
- Teacher tells students, "Count the marbles by 5s to make a set of 35."
- With five students, make a *One Hundred Train*. Each student chooses two different colours of interlocking cubes and makes two segments of 10 (each one a different colour). Compare the segments to see that they are all equal. Practise counting them by 10s to 100. Make train cards, with small squares cut out of the bottom to fit over the joiners between the 10s. These will remain standing when the *One Hundred Train* is completely joined. Assist the students to print the numbers 10, 20, et cetera, on the cards and then colour them to look like a train. Make the engine for the front and assemble. Leave the train in the math centre for some time to allow the students to take it apart and use it like a puzzle. Students can make permanent trains on paper by colouring strips of squares to match the cubes.

Students may count the objects by 2s or 5s but remove or touch only one object at a time. These students see skip counting as a rote exercise only and are not yet thinking in groups.



Journal/Learning-Log Entry

In your journal, use pictures and words to explain how to count a set of 17 counters by 2s.

- **Determine the total number of objects in a set, starting from a known quantity and counting on by 1s.**

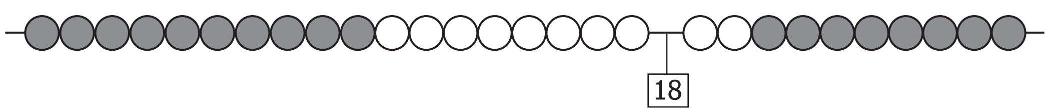
- **Counting On Jar:** Use a transparent container. Students count as the teacher drops counters into the jar. Make sure that all students agree with the total. Seal the container. Use the container along with additional counters and have students count on to find different totals.

- Use one regular 1 to 6 die with pips and one die with the numerals 1 to 6. Students roll the two dice, say the numeral shown and then count on using the dots/pips (the "spots" on a dice, playing card, or domino) on the regular die. **Note:** This will give practise with counting on but will not address selecting the largest number and counting on.

- Teacher says, "I have a set of 27. Finish the counting so the set will equal 35."

- Teacher tells students, "Here are 63 pennies. Count in more pennies until there are 80."

- Use a beaded number line. Have students count in their heads as beads are moved one at a time. Establish how many beads have been moved. Place a label with the numeral after the number of beads counted.



Now start from the label and move one bead at a time while students count on out loud.

Observation Checklist

Students are able to

- ❏ count on from a known quantity to find the total
- ❏ count both sets individually and then go back to the beginning and count all

- **Identify and correct errors and omissions in a number sequence.**

- Orally present a short number sequence with either omissions or errors (or both). Have students identify the errors or omissions and make appropriate corrections
- Materials: cards made with skip counting by 1s, 2s, 5s, and 10s.
  - Shuffle one set (count by 2s) and have student(s) order them in counting sequence.
  - Place the cards in sequence face up. Ask students to look away while teacher removes several cards. Students identify the missing numbers. Ask students to explain how they know.
  - Place the cards in a sequence that contains errors. Students identify errors and make appropriate corrections.

- **Read a numeral when it is presented symbolically and record a numeral symbolically when it is presented orally (0 to 100).**

- Have students sit in a circle. Place a set of number cards (within a range suited to the needs of the students) face down and in random order. Students take turns picking a card and reading the number aloud.
- Prepare a class/small group set of 'I Have… Who has…?' number cards (within a range suited to the needs of the students).

  Pass the cards out in random order. Select a student to read his or her card. Have the other students listen for the question to which they have the answer on their card. If they have the answer, they read their card. Play continues in this manner until returning to the start card.

  Example:

BLM
1.N.1&3.4

I have 22.	I have 38.
Who has 38?	Who has 17?

The recording of numerals should take place in meaningful contexts rather than through repetitive printing of numerals themselves.

- **Purpose:** Recording numerals

  Materials: set of number cards

  Directions: Have students work in pairs. Place the number cards face down. The first student draws a card making sure not to show it to his or her partner and reads the number shown. The partner records the number. The first student checks the written numeral. They then change roles.

Putting the Pieces Together

Investigation: Grade 1 Math Kits

Scenario: Mr./Mrs./Ms. ________ wants to make 8 (12) math kits for small group work. He or she wants each kit to have:

- 10 cubes
- 2 dice
- 5 beans

(Vary the items based on materials available.)

He or she wants to know how many of each item he or she will need

Have students work in partners.

Note: Groups can be working on one item or on all three depending on their level of readiness.

Provide each group with a large piece of paper and a marker. Allow them the freedom to try to solve the problem. Scaffold the task, if necessary, while students are working on the investigation (not before).

Select a variety of solutions to have students share in a whole-class meeting.

Grade 1: Number (1.N.2)

Enduring Understanding:

The quantity of a small collection can often be determined through instant recognition or by thinking of it in its parts.

Essential Questions:

How many dots/objects do you see?
How do you see them?

Specific Learning Outcome(s):	Achievement Indicators:
1.N.2 Subitize and name familiar arrangements of 1 to 10 dots (or objects). [C, CN, ME, V]	➢ Look briefly at a familiar dice arrangement of 1 to 6 dots, and identify the number represented without counting. ➢ Look briefly at a familiar ten-frame arrangement of 1 to 10 dots (or objects), and identify the number represented without counting. ➢ Look briefly at a finger arrangement, and identify how many fingers there are without counting. ➢ Identify the number represented by an arrangement of dots (or objects) on a ten frame, and describe the number's relationship to 5 and to 10.

Prior Knowledge

Students may have had experience

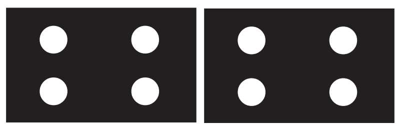
- subitizing and naming familiar (regular) arrangements of 1 to 6 dots/objects
- working with five frames to explore the relationship of a number to 5
- identifying the number represented by a given dot arrangement on a five frame and identifying the numbers that are one more and one less

Background Information

Subitizing is the ability to rapidly determine the quantity of a small group of objects without counting. Subitizing is a fundamental skill in a student's development of number understanding.

BLM 1.N.2.1

There are two types of subitizing; perceptual and conceptual. Perceptual subitizing is the ability to recognize the quantity of a set without counting. It is the basis for counting and cardinality. Conceptual subitizing is seeing number patterns within a set (part—whole) and then determining the quantity by putting the number patterns together . For example, when shown a domino with a pattern of 8 dots/pips the observer may break the 8 dots into two groups of 4 .



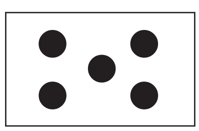
Conceptual subitizing is the basis of number and operation sense.

Dot representations can be regular and irregular. Regular representation show the dots as you would find them on a die or domino. Irregular representations group the dots in a variety of ways.

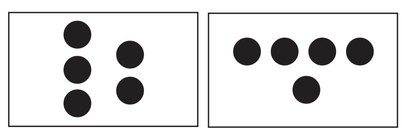
Examples:

Representations for 5:

BLM 1.N.2.2



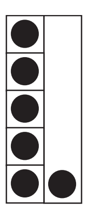
Regular



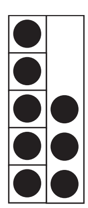
Irregular

Using five frames before introducing ten frames helps to develop additive thinking. Students think of numbers as 5 and some more rather than so many less than 10.

BLM 1.N.2.3



6 is 1 more than 5

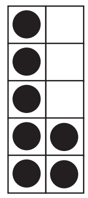


8 is 3 more than 5

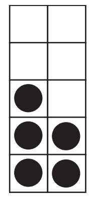
Note: Although groups of outcomes and achievement indicators are dealt with separately, they are all connected.

Ten frames can be filled in two different ways:

BLM
1.N.2.4



Filling the 5 first



Filling pairs

Students should be exposed to both representations.

Mathematical Language

sets

subitizing

"How many"

dots/pips

five frames

ten frames

Learning Experiences

Assessing Prior Knowledge

Observe students as they play a board game with a die. Which numbers do they recognize without counting the pips?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6

As a class or small group flash five-frame representations and have students indicate the number shown with their fingers.

- ❑ Are they correct?
- ❑ Are they confident in their decisions?

Look for evidence of counting such as head bobbing or finger counting.

- **Look briefly at a familiar dice arrangement of 1 to 6 dots, and identify the number represented without counting.**

BLM 1.N.2.5

- **Flash Math:** Prepare a set of dot cards with dot representations to 6. Flash the cards (3 seconds) and have the students record the number of dots seen.

- **Dice Roll:**

  Materials: 1 die, 10 counters

  Directions:

  Have students paired up with a partner.

  Player 1 rolls the die. Both players call out the number shown as quickly as they can. The first player to say the number takes one of the counters. Player 2 then rolls the die.

  Play continues until there are no counters left.

  The player with the greatest number of counters is the winner.

BLM 1.N.2.6

- **Dice and Dominoes!**

  Materials: two (1 to 6) dice, dominoes with totals to 6

  Directions: Place the dominoes face up on the table. Roll the dice. Be the first to find the domino that matches the dice representation. The player with the greatest number of dominoes is the winner.

Observations

Observe students as they play.

Which number representations do they recognize without counting the pips?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6

Have students make their own regular and irregular dot cards/plates for assigned numbers. Ask students to describe how they see their arrangements, for example, "I see 3 dots on one side and 2 on the other and I know that 3 and 2 are 5."

The cards/plates can be placed in a math centre for further practice.

Observation Checklist

Students are able to

❑ make regular and irregular dot cards for a given number

❑ recognize irregular representations for

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6

- **Look briefly at a finger arrangement, and identify how many fingers there are without counting.**

- **Show How Many:** Hold your two hands up showing no fingers at all, then flash a number of fingers (e.g., 7 for about a second—long enough to see, but not to count), then go back to closed fists. Ask students to use their hands to show how many fingers you held up.

BLM 1.N.2.7

- **Who's First?**

  Materials: a double set of finger representations for the numbers 1 to 10

  Directions: Work with a partner. Place the cards in a pile face down. Players take turns turning the top card over. The first person to identify the number shown gets the card. The person with the greatest number of cards is the winner.

Observation Checklist

Students are able to

❑ make regular and irregular dot cards for a given number

❑ recognize finger patterns for (see BLM 1.N.2.7)

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 ❑ 8 ❑ 9 ❑ 10

- **Look briefly at a familiar ten-frame arrangement of 1 to 10 dots (or objects), and identify the number represented without counting.**
- **Identify the number represented by an arrangement of dots (or objects) on a ten frame, and describe the number's relationship to 5 and to 10.**

- **Flash Math:** Prepare a set of ten-frame cards. Flash the cards (2 to 3 seconds) and have the students record the number of dots seen. Ask students to describe what they saw (e.g., "I saw 5 and 2 more and I knew that it was 7." or " I saw that 3 squares were empty and I know that 10 – 3 is 7." or "I saw 3 pairs of 2 and one more and that makes 7.").

- **Dice and Ten Frames!**

  Materials – two (0 to 5) dice and a double set of ten-frame cards

  Directions: Place the ten-frame cards face up on the table. Roll the dice. Be the first to find the ten-frame card that matches the dice representation. The player with the greatest number of cards is the winner.

- **Capture!**

  Materials – a set of ten-frame cards for each student.

  Directions: Players place their ten-frame cards face down in a pile in front of them. On a signal, both players turn over the top card and identify the number shown. The player with the largest (smallest) number keeps the cards. The player with the greatest number of cards at the end is the winner.

Observation Checklist

Students are able to

❑ recognize ten-frame patterns for

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 ❑ 8 ❑ 9 ❑ 10

Grade 1: Number (1.N.4)

Enduring Understanding:

Quantities can be represented in a variety of ways with objects, pictures, and numerals.

Essential Questions:

How can quantities be shown?
How many different ways can you represent a number?

Specific Learning Outcome(s):	Achievement Indicators:
1.N.4 Represent and describe numbers to 20 concretely, pictorially, and symbolically. [C, CN, V]	➛ Represent a number up to 20 using a variety of manipulatives, including ten frames and base-10 materials. ➛ Read number words to 20. ➛ Partition any quantity up to 20 into two parts, and identify the number of objects in each part. ➛ Represent a number to 20 in two parts, concretely, pictorially and symbolically. ➛ Determine compatible number pairs for 5, 10, and 20. ➛ Model a number using two different objects (e.g., 10 desks represents the same number as 10 pencils). ➛ Place numerals on a horizontal or vertical number line with benchmarks 0, 5, 10, and 20.

Prior Knowledge

Students may have had experience

- representing and describing numbers 2 to 10 in two parts concretely and pictorially
- ordering quantities using objects, five frames, ten frames, or dot cards
- ordering, using at least 2 benchmarks, numerals 1 to 10 on a vertical or horizontal number line
- relating a numeral, 1 to 10, to its respective quantity

Background Information

Part-whole relationships refer to the idea that numbers can be broken down into parts, and that these parts can be compared to the whole. According to John Van de Walle, to conceptualize a number as being made up of two or more parts is the most important relationship that can be developed about numbers.

A pair of numbers that is easy to work with mentally (also known as friendly or nice numbers) are said to be **compatible**.

Example:

$3 + 6 + 7 + 4 =$

$10 + 10 = 20$

When solving this number sentence, it is easier to look for combinations that make 10.

Whenever the sum of any two numbers equals the given number, the two numbers are said to be **complementary** (e.g., 6 and 4 = 10, 1 and 9 = 10, etc.).

Mathematical Language

whole

part

represent

combination(s)

number words one to twenty

number line

ten frames

Assessing Prior Knowledge

Show Yourself!: Say to students "Show yourself seven." Students show seven fingers, palms facing toward themselves. Now ask them to tell how many more to make ten. Repeat using different numbers.

Observe to see which students can show finger patterns without counting. If they do count, do they count from one or (for numbers 6 to 10) do they count on from five?

Hands Up: Have students put their hands by their ears with their fingers pointing up (like a rabbit). Pick a number from 2 to 10 (e.g., 8). Ask students to show the number with their fingers. Talk about the different ways they made the number (e.g., 5 and 3 or 4 and 4). Are there other ways that are not shown?

Observe to determine which students have difficulty showing the number when their fingers are not visible. Are they able to represent the number? Can they describe their representation?

BLM 1.N.2.8

Have students order sets of objects or pictorial (dot cards or five/ten frames) representations (1 to 10) and then place the matching numeral with the representation.

Observe to identify which students can order the representations and match the numeral. Do the students have to count in order to match the numeral or are they using subitizing?

- **Represent a number up to 20 using a variety of manipulatives, including ten frames and base-10 materials.**
- **Model a number using two different objects (e.g., 10 desks represents the same number as 10 pencils).**

- **Show Off!:** Have students work in groups of two. Each team picks a number between 11 and 20. They then work together to decide how they will show the class their number using their fingers (e.g., for the number 14—one student could show ten fingers and the other student four or both students could show seven, etc.). Groups take turns showing their representation to the class briefly and then having the number identified.

  Extension: Have the representations made using ten frames in place of fingers.

Note: Base-10 materials can be various types of interlocking cubes, craft sticks and elastics, straws, etc. The term does not relate specifically to the commecially made base-10 materials.

BLM 1.N.4.1

- **Flash and Build Five/Ten!** (source Manitoba Education Math website)

  Materials: counters, five/ten frame cards, five/ten frame game board

  Directions: Students play in pairs. Place a set of five- or ten-frame cards face down in a pile. The first player flashes a card to his or her partner. The second player identifies the number shown and builds it on his or her game board. They then check to see if they are correct and then change roles.

  Vary the game by having the players say the number shown without having to make the representation.
  Have students make the five/ten frame game cards.

- Provide multiple opportunities for students to represent numbers in meaningful contexts (e.g., cubes/clothes pins to show the number of students present/absent, use tallies to record a class vote, food items ordered for a special lunch day, etc.).

Observation Checklist

Students are able to:

- ❏ represent numbers 0 to 10 using a variety of materials
- ❏ represent numbers 11 to 20 using a variety of materials

- **Read number words to 20.**

BLM 1.N.4.2

- Students use cards with numerals and number words to play board games such as Concentration/Memory, Lotto.
- Have students write story problems using number words. The problems can be made into a class book for others to solve.
- **Scavenger Hunt:** Have students look through magazines, flyers, and newspapers to try and find numerals and number words for the numbers 1 to 20. (**Note:** This could be an activity that students do at home with parent support.)
- Read and discuss poems and stories containing number words.
- Students can make their own picture books using numerals, number words and pictures of sets.

Observation Checklist

Place cards with the number words to 20 in a container. Have students take turns drawing a card and reading the word.

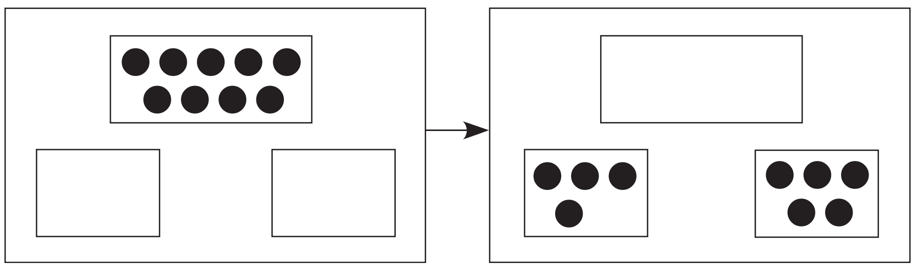
BLM 1.N.4.3

	One	Two	Three	Four	Five	Six	Seven	...Twenty
Student 1								
Student 2								

- **Partition any quantity up to 20 into two parts, and identify the number of objects in each part.**
- **Represent a number to 20 in two parts, concretely, pictorially, and symbolically.**
- **Determine compatible number pairs for 5, 10, and 20.**

BLM
1.N.4.4

- **Part-Whole Board:** Have students use a part-whole board and a given number of counters. Place their counters in the large rectangle. Have them partition the counters into the smaller rectangles. Ask students to tell how they made the number, for example, "How did you make 9?" Student answers, "Nine is 4 and 5."



BLM
1.N.4.5

- **Dominoes:** Use a set of double six dominoes. Students work with a partner to sort the dominoes finding all the representations for the numbers 0 to 12 and record their results. Extension: Use a set of double nine dominoes for representations to 18.
- **Twenty bead measures:** Have students make their own twenty bead measure using two contrasting colours of beads. The bead measure can be used to partition numbers while reinforcing relationships to five and ten.

Use the bead measure to show 14.

Some students will see 14 as two 5s and 4 more.

Some students will see 14 as 10 and 4 more.

- **Shake, Spill, and Record:** Use two-colour counters or lima beans that have been spray painted on one side. Students shake a set of counters and then spill them onto the table. They record the number of each colour shown. Continue until all combinations have been made.

- Provide many opportunities for problem solving (e.g., The pet store has 16 fish and two aquariums. How can the fish be shared between the two aquariums? Show as many different ways as you can.).

- **Five and Ten Frames:** Work with five and ten frames. Show students a frame and ask "How many dots do you see?" "How many more to make five/ten?" "How do you know?" Extend to double ten frames for numbers 11 to 20.

- **I say… You say…:** A target number is selected. The teacher or student leader gives a number less than the target number and the students reply with the number needed to make the target number (e.g., Target number is 20. The teacher says, "I say 11." Students reply saying, "We say 9.").

- **How many more…? game:**

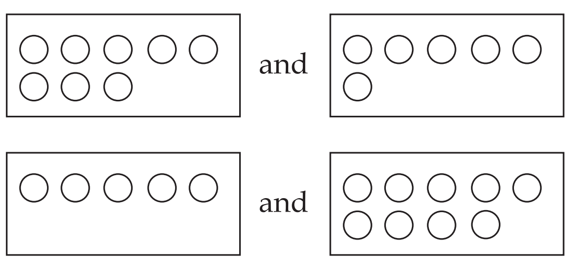
  Materials: game grid for each student, game markers, number cards

  BLM 1.N.4.6

  Directions: Decide on a target number. Have students write numbers between 0 and the target number anywhere on their grid. Numbers can be repeated. The teacher/leader draws a number card and calls it out. Students cover the compatible/complementary number on their game board. The first player to get three or four in a row is the winner.

Paper-and-Pencil Tasks

1. "Draw a picture to show 18 in three different ways."
2. "Tell what number this represents."



- **Place numerals on a horizontal or vertical number line with benchmarks 0, 5, 10, and 20.**

BLM
1.N.4.7

- **Number Clothesline:** Have a string clothesline in the math meeting space. Prepare number cards from 0 to 20—a 'tent' format works best. Place benchmark numbers (0 and 10; 0, 10 and 20; etc.). Have a few students take turns each day to put a card on the line and to explain their placement.

This can be used as a math routine.

BLM
1.N.4.8

0	10	20

Assessment for Learning

Record student responses to observe growth over time.

PUTTING THE PIECES TOGETHER

Performance Task: Class Number Book

Materials: large sheets of paper
markers
manipulative materials

Context:

Our class is going to make a number picture book. Each page will show how to represent one of the numbers from 1 to 20.

Have students work with a partner. Assign each group a different number from 1 to 20. (Each group will need to be responsible for more than one number.)

Provide a large sheet of poster paper and

a) have students use drawings, number sentences, materials (money, ten frames, base-10, counters, etc.) to represent each number. After the poster is complete use a camera to take a picture. The pictures can then be compiled into a class book.

or

b) have students draw and write the representations on the poster and compile the posters into a class book.

Set criteria with the class. Possible criteria might include

- defining the minimum number of representations expected
- the variety of representations
- the appearance itself (layout, print size, neatness, etc.)

Science Connection: Students can follow the design process from the science curriculum as they design their posters. Making a prototype first will allow for modifications (especially for option (b)) .

NOTES

Grade 1: Number (1.N.5, 1.N.6, 1.N.8)

Enduring Understanding:

Quantities can be counted and compared using numbers, words, and numerals.

Essential Questions:

How can sets and numbers be compared and ordered?
How can you tell if one set is more or less than another set?

Specific Learning Outcome(s):	Achievement Indicators:
1.N.5 Compare and order sets containing up to 20 elements to solve problems using ■ referents ■ one-to-one correspondence [C, CN, ME, PS, R, V]	➛ Build a set equal to another set that contains up to 20 elements. ➛ Build a set that has more, fewer, or as many elements as another set. ➛ Build several sets of different objects that have the same number of elements in the set. ➛ Compare two sets using one-to-one correspondence, and describe them using comparative words such as "more," "fewer," or "as many." ➛ Compare a set to a referent using comparative language. ➛ Solve a story problem (pictures and words) that involves the comparison of two quantities.
1.N.6 Estimate quantities to 20 by using referents. [C, ME, PS, R, V]	➛ Estimate a quantity by comparing it to a referent (known quantity). ➛ Select an estimate for a quantity by choosing between at least two possible choices, and explain the choice.
1.N.8 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]	➛ 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.

Prior Knowledge

Students may have had experience

- comparing quantities, 1 to 10
- constructing a set to show more than, fewer than, or as many as a given set.
- comparing two sets through direct comparison, and describe the sets using words such as "more," "fewer," "as many as," or "the same number"

Background Information

In order for students to be able to make reasonable estimates they need to use a referent. A referent is a known quantity.

Mathematical Language

Comparative language:

more

fewer

as many as

the same as

less than

greater than

equal to one/two more than

one/two less than

set

estimate

Learning Experiences

Assessing Prior Knowledge: Class Observation

Show students a set of counters in the range 1–10. Ask:

- "Make a set that has as many counters as mine."
- "Make a set that has fewer counters than mine."
- "Make a set that has more counters than mine."

Ask students to describe the sets they have made.

Observation Checklist

The students are able to

- ❑ understand and use comparative language
- ❑ make a set equal to a given set
- ❑ make a set that is less than a given set
- ❑ make a set that is more than a given set

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

- **Count and Copy:**

  Materials: a set of cards with dot representations for the numbers 1 to 20, 20 counters per student

  BLM 1.N.5&6&8.1

  Directions: Work with a small group. Deal out one card face up to each student. Have the student identify the number shown and then replicate the arrangement of dots. Deal a new card. Have each student predict whether the new card has more, less, or the same number of dots as the previous card and then rearrange their counters to match the new card.

BLM
1.N.5&
6&8.2

- **More, Less, or the Same:**

  Materials: dot cards from Count and Copy BLM; spinner with the words more, less, and same, 25 counters per student

  Directions: Work with a small group. Place the cards face down. Turn over the top card. Have students identify the number shown. Spin the spinner to determine whether students will make a set that is more than, less than, or the same as the one shown.

- **Partner Match:**

  Materials: 20 counters per student, a file folder or book for a screen

  Directions: Students work in pairs with the screen between them. Each student places a chosen set of counters on their side of the screen. The screen is then removed and the sets compared. Have students predict which set is larger. Check using one-to-one correspondence. Record their results using more than, less than, or the same as.

  Example:

BLM
1.N.5&
6&8.3

Turn	Number in MY set	Number in my PARTNER'S set	My set had (more than, less than, or the same as) my partner
1			less than
2			more than

- **Number Display:** Select a number (e.g., 10) and put it in the middle of a bulletin board. Have each student fill a baggie with 10 objects. Try to have them use different objects. (Baggies could be filled at home.) Display the baggies on the bulletin board. Change the numbers and display frequently.

- **Draw and Compare:**

  "Draw a set which has 8 in it. Now draw a set which has *more/less* than 8."

  "Draw a set which has 12 in it. Now draw a set which is *equal/not equal* to 12."

  Use children's drawings of sets to introduce the terms *greater than* and l*ess than* for comparisons of sets.

- **Problem Solving:** Use real-world contexts for problems whenever possible (e.g., attendance—comparing the number of boys present (absent) to the number of girls; weather—comparing the number of sunny, snowy, cloudy, etc., days in a week/month).

Interview (record anecdotally or on a checklist)

1. Put 15 counters on a mat. Ask the student to put on another mat
   - an equal amount
   - a set with more
   - a set with less
2. Teacher and students each take a handful of counters, placing them on separate mats. Ask the students to count each set and to tell which mat has more and which has less. To explore students' reasoning, ask, "How do you know?"

BLM 1.N.5& 6&8.4

Paper-and-Pencil Task

Provide three sets of objects which are not equal and have students number them, in order, from least to greatest. Students write comparative sentences about them. (Provide a frame sentence initially. Children will print sentences without frames later.)

Frame sentence example:

There are more __________ than __________ and __________ .

There are less __________ than __________ and __________ .

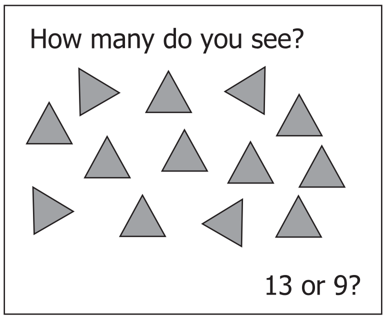
- **Estimate a quantity by comparing it to a referent (known quantity).**
- **Select an estimate for a quantity by choosing between at least two possible choices, and explain the choice.**

- **How Many?:** Place between 10 and 20 counters/cubes on the overhead projector. Turn the projector on for 5 seconds and then turn it off. Ask the students to write down their estimate. Turn the projector on and move 5 counters (referent) off to the side (but still on the screen). Tell students, "Here are 5 counters. Do you want to change your estimate? If you do will you change it to be more or less than your first estimate?" Ask students to explain their decision.
- **Estimation Jars:** Use three identical transparent containers. Fill one container. Use the other containers as referents (e.g., fill the first container with 16 blocks). Put five blocks in the second container and ten in the third. Have students use the referents to estimate the number of blocks in the full container.
- **Picture Estimation:** Find or create pictures of sets of objects. Show a picture and suggest two possible quantities. Have students make a selection and justify their choice.

- **Estimation Picture Book:** Have students
  - gather groups of classroom objects (between 5 and 20). Take a digital picture of the set, mount it, then have students identify two possible quantities or
  - use a computer draw program to create the page (LwICT connection)
  - use hand drawn pictures

Pages can be compiled into a class estimation book.

Example:



Observation Checklist

The students are able to

❏ use a referent to make reasonable estimates in the range

1 to 10

11 to 20

❏ select an appropriate estimate and justify their choice

BLM
1.N.5&
6&8.5

Student Self-Assessment

Handfuls: Provide three different sets of objects such as cubes, colour tiles, or pattern blocks. Have students take a handful of one of the objects, estimate, and then count to check. Record results on the record sheet. Students can then self-assess indicating whether they thought their estimate was too small, just right, or too large. They can then set a goal based on their findings.

Example:

Object	Estimate	Actual	My Estimate Was: (too small, just right, too large)
unifix cubes	15	16	just right
tiles	12	8	too large
pattern blocks	7	11	too small
Goal: I will try more activities so I know how much my hand can hold.			

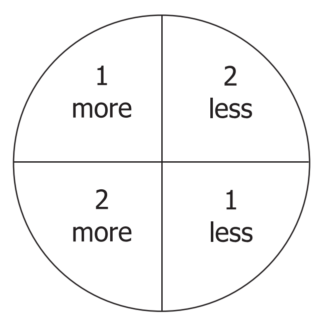
- **Name the number that is one more, two more, one less, or two less than a given number, up to 20.**
- **Represent a number on a ten frame that is one more, two more, one less, or two less than a given number.**

BLM
1.N.5&
6&8.6

- **Bucket Pull:**

  Materials: a container with numeral cards 1 to 20, a spinner or teacher-created die

  Directions: Spin the spinner to determine the game rule (e.g., give the number that is 1 more). Students take turns drawing a numeral card from the container, applying the rule and giving the new number.



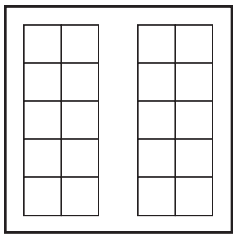
- **Ten-Frame Challenge:**

  Materials: a double ten-frame board and 20 counters for each student, set of ten-frame cards representing the numbers 0 to 20, spinner from Bucket Pull BLM

  Directions: Show students a ten-frame card and have them make the number shown on their ten-frame board. Spin the spinner. Before having students make the appropriate change on their boards ask them to predict the new number.

  Double Ten-Frame Board:

BLM
1.N.5&
6&8.7

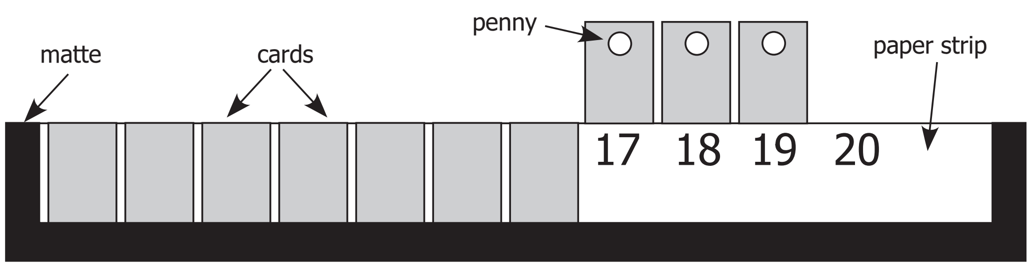


- **Hidden Numeral Boards:**

  Materials:

  - picture matting or heavy cover stock about 10 cm wide and 60 cm long
  - cards 6 cm x 9 cm
  - pennies or washers

  Tape the cards onto the matte with transparent tape so that the top is taped down and the card can be raised easily. On the underside of each card near the bottom, tape a penny or a washer. This helps to keep the card from flipping up.



Strips can be customized to meet student needs. **Hint:** When making a new number strip insert it into the numeral board and write the numbers in as you lift the flaps. This way the numbers will match up with the flaps.

Use the hidden numeral track to identify the number that is one or two more/less. Close the flaps (e. g., Lift one flap and point to the flap that is two away.). Have students predict the hidden number. Lift the flap to check.

Note: The Royal Canadian Mint has ceased the distribution of pennies to financial institutions. The penny will retain its value indefinitely. The penny is a representation for one. If you still have real or play pennies, use the penny to represent values and for counting. Pennies are a good support for counting and can be used to help build number sense.

Observation Checklist

Observe the students as they work on the suggested learning experiences. The students are able to identify the number that is

- ❑ one more than a given number
- ❑ one less than a given number
- ❑ two more than a given number
- ❑ two less than a given number

PUTTING THE PIECES TOGETHER

Investigation: I Have... Who Has...

BLM 1.N.5& 6&8.8

Materials: planning sheet BLM and markers
blank game cards
a sheet of ten-frame cards (0 to 20) reduced in size

Play a game of "I have… Who has…" with the class. After the game spread the cards out and have students help put the cards in order. Discuss the format.

Context

Our class likes to play "I have.. Who has…" games. I need your help to make some new ones.

Have students work in five small groups. Assign each group a game focus.

- Game 1—1 more than
- Game 2—1 less than
- Game 3—2 more than
- Game 4—2 less than
- Game 5—ten frame representations and a combination of ±1 or ±2*

* This game is more challenging to make.

The answer to the question on the first card is on the top of the second card, etc.

Set criteria with the class. Possible criteria might include

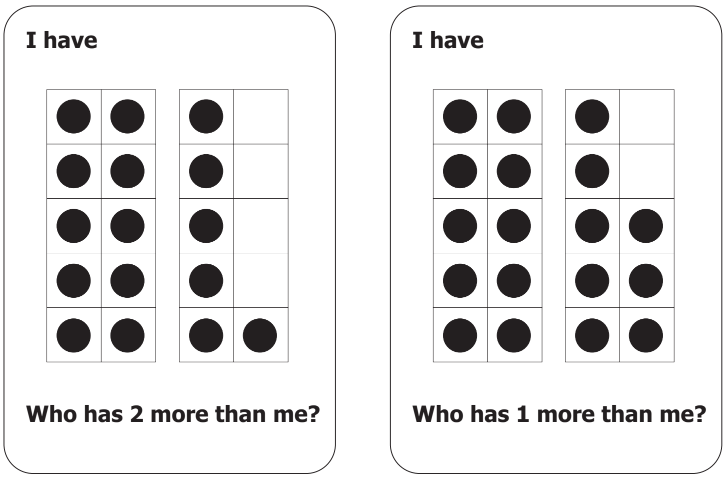
- number of cards in the game
- the answer to the question on the first card is on the top of the second card, etc.
- the answer to the question on the last card must be on the first card
- legibility/neatness

Students design their game on the planning sheet first before making their cards.

Questions to ask:

- How did you start your planning?
- How did you organize your work?
- Show me how your game works.

Sample card for Game 5



Grade 1: Number (1.N.7)

Enduring Understanding:

Quantities can be grouped in different ways.

Essential Questions:

How many ways can a quantity be grouped?

How many ways can a quantity be grouped so that there are no leftovers?

Specific Learning Outcome(s):	Achievement Indicators:
1.N.7 Demonstrate, concretely and pictorially, how a number, up to 30, can be represented by a variety of equal groups with and without singles. [C, R, V]	➛ Represent a 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, 3 groups of 5 and two singles, and 1 group of 10 with seven singles). ➛ Recognize that for a number of counters, no matter how they are grouped, the total number of counters does not change. ➛ Group a set of counters into equal groups with and without singles in more than one way, and explain which grouping makes counting easier.

Prior Knowledge

Students may have had no formal experience with grouping.

Background Information

Sharing a quantity into groups of a particular size is called quotitive sharing. Sharing a quantity into a specified number of groups is called partitive sharing. Partitive sharing is the basis of division.

This outcome explores 'thinking in groups' which is an important prerequisite to understanding place value. As students explore different groupings they will discover that it is easier to count objects that are grouped in 2s, 5s, or 10s. They will also discover that there is less counting to do when using groups of 10.

Mathematical Language

groups
equal groups
singles
leftovers
remainder
sets

Learning Experiences

Assessing Prior Knowledge

Have a class discussion about sharing/grouping. Chart their ideas.

- **Represent a 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, 3 groups of 5 and two singles, and 1 group of 10 with seven singles).**
- **Recognize that for a number of counters, no matter how they are grouped, the total number of counters does not change.**
- **Group a set of counters into equal groups with and without singles in more than one way and explain which grouping makes counting easier.**

- Read a story such as *Bean Thirteen* by Matthew McElligott , *A Remainder of One* by Elinor J. Pinczes, or *The Doorbell Rang* by Pat Hutchins. Have students act out the story using counters or beans.

  Give small groups of students each a different collection of counters/beans. Have students organize their materials into groups of 2, 3, 4, 5, etc. and record their findings on a chart.

  Example:

BLM 1.N.7.1

Our Number Is 21		
Group Size	**Number of Groups**	**Leftovers**
2	10	1
3	7	0
4	5	1

  As students are working ask questions such as

  - Before you group your counters into sets of ____ how many sets/groups do you think you will be able to make?
  - Do you think there will be leftovers?
  - Can you count your sets/groups for me?
  - Which groups were easier to count?

  Have groups share their findings with the class.

- **Grouping Game:** Play in partners.

BLM 1.N.7.2

Materials: a specified number of counters for each student
a (1 to 10) spinner or a 10-sided die

Directions: Player A spins the spinner or rolls the die. The student then groups his or her counters into sets of the number shown and counts the sets by the number shown. Any leftovers are removed. On Player A's next turn, he or she uses his or her remaining counters. The game continues until a player either runs out of counters or cannot do the grouping. For example

Player A starts with 30 counters.

1st turn—The player rolls a 9 and makes 3 sets/groups with 9 in each and counts "9, 18, 27." The leftover counters (3) are removed.

2nd turn—The player rolls a 5 and makes 5 sets/groups with 5 in each and counts "5, 10, 15, 20, 25." The leftover counters (2) are removed.

Observation Checklist

Observe students as they play the game.

Grade 1: Number (1.N.9, 1.N.10)

Enduring Understandings:

Quantities can be taken apart and put together.

Addition and subtraction are inverse operations.

Essential Questions:

How can symbols be used to represent quantities, operations, or relationships?

How can counting strategies be used to compare and combine numbers?

What questions can be answered using subtraction and/or addition?

Specific Learning Outcome(s):	Achievement Indicators:
1.N.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 [C, CN, ME, PS, R, V]	➛ Act out a story problem presented orally or through shared reading. ➛ Indicate if the scenario in a story problem represents additive or subtractive action. ➛ Represent the numbers and actions presented in a 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 story problem for a number sentence. ➛ Represent a story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem. *(continued)*

Specific Learning Outcome(s):	**Achievement Indicators:**
1.N.10 Describe and use mental mathematics strategies, including ■ counting on, counting back ■ using one more, one less ■ making 10 ■ starting from known doubles ■ using addition to subtract to determine the basic addition and related subtraction facts to 18. [C, CN, ME, PS, R, V] Recall of one more and one less, complementary (compatible) numbers that add up to 5 and 10, doubles (up to 5 + 5), and related subtraction facts is expected by the end of Grade 1.	(It is not intended that students show their understanding of strategies using manipulatives, pictorial representations, and/or patterns when determining sums and differences.) ➛ Use and describe a mental mathematics strategy for determining a sum. ➛ Use and describe a mental mathematics strategy for determining a difference. ➛ Use and describe the related addition facts for a subtraction fact (fact family) (e.g., 6 – 4 = 2 has two related addition facts: 4 + 2 = 6, 2 + 4 = 6). ➛ Use and describe the related subtraction facts for an addition fact (fact family) (e.g., 2 + 3 = 5 has two related subtraction facts: 5 – 3 = 2, 5 – 2 = 3).

Prior Knowledge

Students may have had experience

- representing numbers from 2 to 10 in two parts (part-part-whole)

Addition, subtraction, and the equal symbols may not have been previously introduced.

Background Information

Part-whole understanding is ability to conceptualize a number as being composed of other numbers. It is one of the most important number relationships. For example, the number 8 is a whole amount but it is also made up of smaller groups 7 and 1, 2 and 6, 3 and 5, 4 and 4. Part-part-whole understanding provides a foundation for addition and subtraction.

To help students become efficient with computational fluency, students need to develop mental math skills and recall math facts automatically. Learning math facts is a developmental process where the focus of instruction is on thinking and building number relationships. Facts become automatic for students through repeated exposure and practice. When a student recalls facts, the answer should be produced without resorting to inefficient means, such as counting. When facts are automatic, students are no longer using strategies to retrieve them from memory.

There are many different types of addition and subtraction problems. Students should have experience with all types.

Addition				**Both + and –**
Result Unknown **$(a + b = ?)$**	**Change Unknown** **$(a + ? = c)$**	**Start Unknown** **$(? + b = c)$**	**Combine** **$(a + b = ?)$**	**Compare**
Pat has 8 marbles. Her brother gives her 4. How many does she have now? $(8 + 4 = ?)$	Pat has 8 marbles but she would like to have 12. How many more does she need to get? $(8 + ? = 12)$	Pat has some marbles. Her brother gave her 4 and now she has 12. How many did she have to start with? $(? + 4 = 12)$	Pat has 8 blue marbles and 4 green marbles. How many does she have in all? $(8 + 4 = ?)$	Pat has 8 blue marbles and 4 green marbles. How many more blue marbles does she have? $(8 - 4 = ?$ or $4 + ? = 8)$
Subtraction				
Result Unknown **$(a - b = ?)$**	**Change Unknown** **$(a - ? = c)$**	**Start Unknown** **$(? - b = c)$**	**Combine** **$(a - b = ?)$**	**Compare**
Pat has 12 marbles. She gives her brother 4 of them. How many does she have left? $(12 - 4 = ?)$	Pat has 12 marbles. She gives her brother some. Now she has 8. How many marbles did she give to her brother? $(12 - ? = 8)$	Pat has some marbles. She gives her brother 4 of them. Now she has 8. How many marbles did she have to start with? $(? - 4 = 8)$	Pat has 12 marbles. 8 are blue and the rest are green. How many are green? $(12 - 8 = ?)$	Pat has 8 blue marbles and some green marbles. She has 4 more blue marbles than green ones. How many green marbles does she have? $(8 - 4 = ?$ or $4 + ? = 8)$

Note: Addition and subtraction should be taught together. This will enable students to see the relationships between the two operations.

MATHEMATICAL LANGUAGE

Operations:		Strategies:	
addition	subtract	counting on	making ten
add	difference	counting back	doubles
sum	less	one more	addition fact
total	story problem	one less	subtraction fact
more	subtraction fact		
subtraction	complementary (compatible)		

Assessing Prior Knowledge

Materials: paper bag with 6 blue cubes and 4 red cubes

Present the following problem:

> I have 10 cubes in my bag.
>
> Some are blue and some are red.

Stop here and ask, "What cubes might I have in the bag?" Give student time to talk with a partner or small group. Record the responses on a chart or white board. Once all the combinations have been recorded give the last clue.

> There are 2 more blue cubes than red cubes.
>
> How many blue cubes do I have? How many red cubes?

Observation Checklist

Students are able to

- ❏ understand the problem
- ❏ apply their part-part-whole understanding to give all possible combinations
- ❏ understand and use appropriate vocabulary

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

- Introductory activities: To ensure understanding of the processes of addition and subtraction, students need many experiences at each stage combining and breaking up sets. Use:
  - objects (e.g., counters)
  - pictures and words
  - numbers and words
  - numbers and symbols

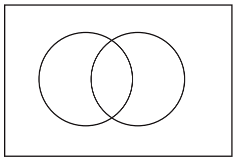
  Model the language for the operations and the symbols (+, — , =) used.
- Read a counting book such as *Ten Little Ladybugs* by Melanie Gerth for addition or *Ten Sly Piranhas* by William Wise for subtraction. Have students act out the story using counters. Reread the story and use pictures and number sentences to record the actions.

  Have students tell or write their own ladybug or piranha story problems.
- Model the telling of story problems. Have students orally tell story problems for other students to act out and answer. Story mats can be used for support.
- Use a story mat (e.g., a pond) and some counters (e.g., ducks) for each student. Present problem scenarios and have students act them out.

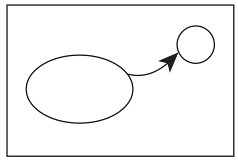
  Example:,
  - There are 3 ducks in the pond and 5 ducks on the shore. How many ducks are there altogether?
  - There are 10 ducks in the pond. Two ducks jump out. How many ducks are still in the pond?

- Read a series of story problems. Students decide whether the action is additive or subtractive. Have them fold their hands together to signify addition and hold their hands up and apart for subtraction. A double-sided card could also be used.

  Example:



Side 1: Addition



Side 2: Subtraction

- Have students make up their own story problems using a variety of real-life contexts (e.g., getting on and off the school bus, playing at recess, etc.).

> - **Create a story problem for a number sentence.**
> - **Represent a story problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.**

- Give students a number sentence and have them make up a problem to match. Have them represent their problem in pictures or number sentences, and solve the problem.
- Prepare a set of story problems using pictures and/or words along with the matching number sentence for each problem. Mix up the problems and number sentences. Have students match the problem with the correct number sentence.

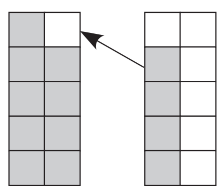
Assessing Understanding

Give each student a domino. Ask them to use the numbers on the domino to make up an addition and a subtraction story problem.

Problems can be shared with the class.

Mental Math

Note: The development of mental math strategies is greatly enhanced by sharing and discussion. Students should be given the freedom to adapt, combine, and invent their own strategies.

Strategy	Teaching Strategies
Counting on or counting back 4 + 2 student says **4**, 5, 6	■ Use a beaded number line. For example, for 7 + 3 slide the seven beads over as a unit and then move the remaining beads one at a time as students count on. For 14 – 2 slide the 14 beads as a unit and then remove one bead at a time as students count back. ■ Use a die labelled with the numbers 4 to 10 and one with pips showing 1, 1, 2, 2, 3, 3. Students roll the dice, say the number, and then count on the number of pips.
Using one more or one less 12 + 1 = ____ 14 – 1 = ____	■ Connect to forward and backward counting. ■ Use a number line and a hundred chart to help students see the pattern.
Making 10 9 + 4 = ____	■ Use a double ten frame to help students visualize the strategy. For example, when adding 9 + 4 students can see that moving one from the 4 to make 10 makes adding easier. This is a practical application of part-part-whole understanding. Eventually students will be able to show the steps without the ten frames.  $9 + 4 =$ $\underbrace{9 + 1}_{10} + 3$ $10 + 3 = 13$
Starting from known doubles	■ Have students brainstorm things that come in twos (pairs). Record their suggestions. Include pictures to support the vocabulary. ■ Read a book such as *Double the Ducks* by Stuart J. Murphy or *Two of Everything* by Lily Toy Hong. Have students represent the actions in the story using a double ten frame mat. ■ Fold small rectangular pieces of paper in half. Use a hole punch to punch a small number of holes. Ask students to predict what they will see when the paper is unfolded. Unfold the paper and have students describe what they see. Have students make their own doubles cards.
Using addition to subtract	■ **Note:** Thinking addition is an efficient strategy for subtraction. Teaching addition and subtraction at the same time helps students to see this relationship between the operations. For example, for 9 – 5, think "5 and how many more to make 9?" (5 + ___= 9)

- **Use and describe a mental mathematics strategy for determining a sum.**
- **Use and describe a mental mathematics strategy for determining a difference.**
- **Use and describe the related addition facts for a subtraction fact (fact family) (e.g., 6 – 4 = 2 has two related addition facts: 4 + 2 = 6, 2 + 4 = 6).**
- **Use and describe the related subtraction facts for an addition fact (fact family) (e.g., 2 + 3 = 5 has two related subtraction facts: 5 – 3 = 2, 5 – 2 = 3).**

- Strategies should be posted in the classroom and revisited on a regular basis.
- Prepare a set of addition and subtraction problem cards. Have students select a card and identify a strategy that could be used to find the answer. The cards can then be placed under/or above that strategy heading.

Assessing Understanding

Use this opportunity to make anecdotal notes on the strategies students are using.

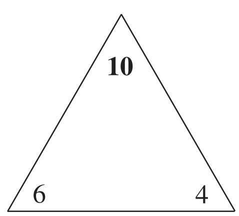
- Use different number frames to help develop the relationship between addition and subtraction (fact families). For example, Use a "7" frame to work on fact families for 7.

BLM 1.N.9& 10.1

Students can see that 5 + 2 = 7, 2 + 5 = 7, 7 – 2 = 5 and 7 – 5 = 2.

BLM 1.N.9& 10.2

- **Triangular Flashcards:** Use triangular flashcards to support fact family relationships. The relationship shown depends on which corner is covered. For example, If the 10 is covered students can give the addition number sentences 6 + 4 = 10 and 4 + 6 = 10. If the 6 is covered they can give the number sentences 10 – 4 = 6 or 4 + __ = 10.



- A series of math fact games, activities, and centres can be found in the mathematics group on <www.maple4teachers.ca>. Look under the K–4 Math Resources Wiki.

Assessing Understanding

Strategy Sort: Give students a set of addition and subtraction problem cards and strategy cards. Have them sort the problem cards under the strategy headings. Ask students to tell how they would use the strategy to arrive at the answer.

Give students numerals and have them write the related number sentences.

Putting the Pieces Together

Performance Task: Writing Problem Books

Have students work with a partner.

Tell students that they are going to write problem books for the class. Assign three fact family numbers to each group. Have students write a set of problems that use the three numbers.

Set criteria with the class.

Possible criteria:

- 2 addition problems (pictures can be included)
- 2 subtraction problems (pictures can be included)
- all problems should ask a question
- a number sentence and the answer for each problem should be written on the back of the problem or under a flap

Have the problems shared with the class.

Books can be placed at the math centre for others to read and solve.

NOTES

Grade 1 Mathematics

Patterns and Relations

Grade 1: Patterns and Relations

Mathematics is the study of patterns and relationships. Recognizing and exploring the inherent patterns in mathematics make it easier for children to see relationships and understand concepts.

Children first learn about patterns by discriminating similarities and differences as they sort. As they begin to understand the relationships between objects, they can start to make predictions. They then proceed to the recognition of visual, kinesthetic, and auditory patterns in their environment. From recognition, they progress to extension of patterns, translation of a given pattern to other modes, and finally to the creation of their own.

Teachers should be mindful of the needs of all students in the classroom including EAL, (English as an Additional Language) students. Manitoba's schools include young people of varied backgrounds and who have varying degrees of fluency in a number of different languages. When selecting activities and resources to support sorting and patterning, teachers are encouraged to ensure these choices support inclusion of all students that is respectful to the culture of the students.

Cultural background and language can influence the way children identify, translate, and create a pattern. For example, the patterns created by Aboriginal students may not fit English language criteria for patterns, but may make perfect sense to an Aboriginal language speaker. One of the reasons for this is that Aboriginal languages, such as Ojibwe, categorize things differently than they are categorized in English. Some Aboriginal language speakers categorize nouns, pronouns, and even verbs into animate or inanimate. Yet some things, such as rocks, would be classified as animate by an Aboriginal language speaker and inanimate or non-living by an English speaker depending on the circumstance of the situation.

Aboriginal languages do not follow a universal form and are diverse among the First Nation communities in Manitoba. Teachers are encouraged to seek support from within the community to ensure that classroom instruction and resources used are accurate and authentic and reflect sensitivity of the Aboriginal peoples of the community.

It is important to interview, in a non-judgmental manner, the students who appear not to have the concept of patterns. Children must feel comfortable communicating verbally about why a particular combination of objects, sounds, shapes, actions, or colours form a pattern. An interview will help clarify if the misunderstanding is culturally based or not. Further investigation into cultural background, either through reading or talking to the parents, may be necessary to verify the assessment made. Teachers should provide a wide variety of work and play with patterns of all kinds, including those from different cultures. Language and cultural activities should be carefully organized and incorporated into lesson plans to enrich the teaching content.

NOTES

Grade 1: Patterns and Relations (Patterns) (1.PR.1, 1.PR.2)

Enduring Understandings:

Patterns show order in the world.

Patterns can be found in many different forms.

Essential Questions:

What is the repeating unit (core) in the pattern?

Where are patterns found?

Specific Learning Outcome(s):	Achievement Indicators:
1.PR.1 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]	➛ Describe a repeating pattern containing two to four elements in its core. ➛ Identify errors in a repeating pattern. ➛ Identify the missing element(s) in a repeating pattern. ➛ Create and describe a repeating pattern using a variety of manipulatives, musical instruments, and actions. ➛ Reproduce and extend a repeating pattern using manipulatives, diagrams, sounds, and actions. ➛ Identify and describe, using everyday language, a repeating pattern in the environment (e.g., classroom, outdoors). ➛ Identify repeating events (e.g., days of the week, birthdays, seasons).
1.PR.2 Translate repeating patterns from one representation to another. [C, R, V]	➛ Represent a repeating pattern using another mode (e.g., actions to sound, colour to shape, ABC ABC to blue yellow green blue yellow green). ➛ Describe a repeating pattern using a letter code (e.g., ABC ABC…).

Prior Knowledge

Students may have had experience

- sorting objects using a single attribute
- copying, extending, describing, and creating a repeating pattern with a core of two or three elements using a variety of materials and modalities
- identifying the pattern core

Background Information

Patterns are everywhere. Children are surrounded by patterns in nature, in their homes, and in everything they do. Pattern, an ongoing theme in mathematics, can be explored in all the strands. Patterns and relationships also can be developed through connections with other areas, such as science, social studies, language arts, physical education, and music.

Activities, at this level, overlap and extend those addressed during Kindergarten.

Note: Repeating patterns can be extended in both directions.

It is difficult to identify a pattern from a small part of the pattern. Therefore, the pattern core should be repeated more than twice.

The teacher's role involves posing questions that alert students to patterns which occur naturally in the sequence of the day, such as in the songs sung, the books read, and the games played in gym. This is an ongoing and natural process. Activities should highlight patterns that are visual, kinesthetic, and auditory.

Mathematical Language

repeating pattern

core (the shortest string of elements that repeats in a repeating pattern is the core)

positional language (after, between, beside, before, next)

attribute vocabulary (colour, size, shape)

element

extend

translate

Assessing Prior Knowledge: Student or Small-Group Interview

1. Make an AB pattern with the cubes (e.g., red, blue, red, blue, red, blue).

   Ask the students to

   - copy the pattern
   - extend the pattern
   - describe the pattern
   - identify the core of the pattern

2. Make an ABC pattern with the cubes (e.g., green, yellow, blue, green, yellow, blue, green, yellow, blue).

   Ask the students to

   - extend the pattern
   - describe the pattern
   - identify the core of the pattern

3. Have the students create their own pattern.

BLM 1.PR.1& 2.1

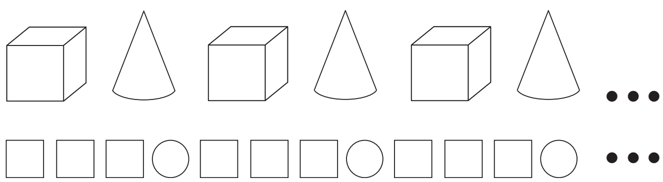
Recording Checklist

1. Copies the pattern ☐ Extends the pattern ☐
   Describes the pattern ☐ Identifies the pattern core ☐
2. Extends the pattern ☐ Describes the pattern ☐
   Identifies the core ☐
3. Creates an AB pattern ☐ Creates an ABC pattern ☐
   Other ______________________________

- **Describe a repeating pattern containing two to four elements in its core.**
- **Create and describe a repeating pattern using a variety of manipulatives, musical instruments, and actions.**
- **Reproduce and extend a repeating pattern using manipulatives, diagrams, sounds, and actions.**

Students should have opportunities to reproduce (concretely and in drawings), describe, extend, and create repeating patterns (up to 4 elements in the core) in a variety of forms and contexts, such as

- people patterns (e.g., 1 stands, 1 sits, 1 stands...; hand up, hand down, hand up...)
- geometric patterns, for example



Teacher's questions should focus students' attention on the underlying mathematical skills or concepts elicited by the learning experience(s).

BLM 1.PR.1& 2.2

- object patterns (e.g., leaf, stone, stick, leaf, stone...)
- action patterns (e.g., clap, snap, clap, snap...)
- music patterns (e.g., beat, beat, beat, pause, beat, beat, beat, pause...)

During these experiences ask questions such as:

- What comes next/before/after? How do you know?
- Can you extend the pattern to the left? to the right?
- Which part of the pattern repeats? What is the pattern core?
- Can you make a new pattern using the same materials?
- What other materials could you use to make the same pattern?
- Are these patterns the same?
- How is this pattern different from that pattern?

Observation Checklist

Students are able to

- ❏ reproduce and describe a pattern with a three element core
- ❏ reproduce and describe a pattern with a four element core
- ❏ extend a pattern with a three element core
- ❏ extend a pattern with a four element core
- ❏ create a pattern with a three element core
- ❏ create a pattern with a four element core

in a variety of contexts.

- **Identify errors in a repeating pattern.**
- **Identify the missing element(s) in a repeating pattern.**

- Seat students in a circle. Use pattern blocks or triangle cut-outs to make the following pattern.

Have students describe the pattern.

Ask:

What is happening to the triangle?

What will the next triangle in the pattern look like?

What part of the pattern is repeating?

What is the pattern core?

Have students add the next four elements to the pattern.

Ask students to close their eyes while you remove a shape from the pattern.

Give students an opportunity to look at the pattern before asking them to identify the missing element. Have students explain how they made their choice.

Extend the activity by removing more than one pattern element.

Note: Although these achievement indicators are dealt with separately, they should be incorporated into all work with patterns.

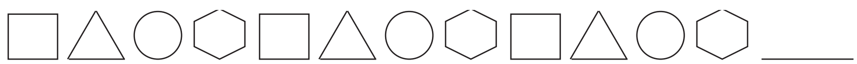
- Have several students form a line in the front of the class. Arrange them in a pattern (e.g., arms up, arms down, arms folded …) but have one student pose out of sequence. Ask the students who are observing if this is a pattern. Have them explain their thinking. Listen for the use of pattern language such as repeat, core, and positional language such as next, before, between, after, etc.

- Pattern Detective Centre

BLM 1.PR.1& 2.3

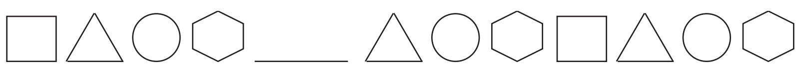
Prepare a set of pattern cards containing missing elements. Note: Cards with manipulative material representations (cubes, colour tiles, pattern block shapes) will allow students to fill in the missing elements with the actual material. The level of difficulty can be adjusted in order to meet the needs of all students. For example: Create cards that

  - limit the size of the pattern core to less than four elements
  - have the missing element(s) as an extension of the pattern on one end



  - have the missing element(s) as an extension on either or both ends

  - have one element missing in the middle of the pattern



  - have more than one element missing

- Prepare a second set of pattern cards containing errors. Students find the error(s) and make the correction. Cards with manipulative representations will allow students to correct the error(s) with the actual objects. Adjust the level of difficulty by increasing the number and position of the error(s).

Observation Checklist

Students are able to

- ❑ identify missing element(s) in a repeating pattern
- ❑ identify and correct errors in a repeating pattern

- **Identify and describe, using everyday language, a repeating pattern in the environment (e.g., classroom, outdoors).**

- **Pattern Walk:** Go for a walk in the playground or neighbourhood. Have students identify the patterns they see.
- Use a video or digital camera to take pictures of patterns in the environment. Students can describe the patterns orally on the video. Digital pictures can be compiled into a class book and students can write the pattern descriptions. (Literacy with ICT connection.)

- **Identify repeating events (e.g., days of the week, birthdays, seasons).**

- Connect to cluster 4, "Daily and Seasonal Changes" in the science curriculum (day/night, seasons, etc).
- Read books that are patterned after the days of the week (e.g., *The Very Hungry Caterpillar* and *Today is Monday* by Eric Carle; *Cookie's Week* by Cindy Ward) and the seasons (e.g., *The Seasons of Arnold's Apple Tree* by Gail Gibbons).

  Have students write their own pattern books.

Journal Entry

In your journal or math learning log tell about patterns that you see in the classroom.

- **Represent a repeating pattern using another mode (e.g., actions to sound, colour to shape, ABC ABC to blue yellow green blue yellow green).**
- **Describe a repeating pattern using a letter code (e.g., ABC ABC...).**

- Model how patterns can be translated from one medium to another, using objects, pictures, sounds, actions, or letters. Have students create their own patterns and translate them to a different medium, for example
  - concrete to action, to pictorial, or to auditory
    Example of concrete to action

clap	clap	clap	stamp	clap	clap	clap	stamp

  - action to pictorial, to concrete, to auditory
  - pictorial to concrete, to action, to auditory
    Example of pictorial to auditory, to letters

loo	loo	loo	lah	loo	loo	loo	lah
A	A	A	B	A	A	A	B

- Prepare a set of pictorial patterns and their letter descriptions. Have students match the picture to the correct letter description.

  During these learning experiences ask questions such as
  - Can you make a new pattern using the same materials?
  - What other materials could you use to make the same pattern?
  - Can you make a sound pattern to match this pattern?
  - Are these patterns the same?
  - How is this pattern different from this pattern?

Observation Checklist

Students are able to

- ❑ translate an action or sound pattern to a concrete or pictorial pattern
- ❑ translate a concrete pattern to a pictorial pattern
- ❑ translate a given pattern to letters
- ❑ justify why one pattern is the same or different from another
- ❑ apply their knowledge if pattern in different contexts
- ❑ demonstrate an interest in finding and creating patterns

Performance Task: Patterns

BLM 1.PR.1& 2.4

Materials: one pattern strip per group
paper
crayons, markers, or pencil crayons
stamps, stickers, cut out shapes, etc.
BLM 1.PR.1&2.4 Putting the Pieces Together: Representing Patterns
BLM 1.PR.1&2.5 Representing Patterns Group Assignment

Have students work with a partner. Give each group a pattern strip.

Directions:

BLM 1.PR.1& 2.5

Use the pattern on your pattern strip.

Represent this pattern in as many different ways as you can.

Present your work to the class.

Think about: sounds, actions, materials, pictures, shapes, letters

NOTES

Grade 1: Patterns and Relations (Variables and Equations) (1.PR.3, 1.PR.4)

Enduring Understandings:

"Equals" indicates equivalent sets.

Unknown quantities can be found by using the balance strategy.

Essential Questions:

How do you know the sets are equal?

How do you know the sets are not equal?

How is a number sentence like a balance scale?

Specific Learning Outcome(s):	Achievement Indicators:
1.PR.3 Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20). [C, CN, R, V]	➛ Construct two equal sets using the same objects (same shape and mass), and demonstrate their equality of number using a balance scale. ➛ Construct two unequal sets using the same objects (same shape and mass), and demonstrate their inequality of number using a balance scale. ➛ Determine if two concrete sets are equal or unequal, and explain the process used.
1.PR.4 Record equalities using the equal symbol (0 to 20). [C, CN, PS, V]	➛ Represent an equality using manipulatives or pictures. ➛ Represent a pictorial or concrete equality in symbolic form. ➛ Provide examples of equalities where the 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.

Prior Knowledge

Students may have had experience

- making sets that are equal to a given quantity using one-to-one matching
- knowing that a number can be decomposed into two or more parts

The operation and equal symbols may not have been introduced.

Background Information

The equal symbol represents a relation between two equal quantities.

Many students may have misconceptions about the equal symbol. Many think that the equal symbol means "give answer." As a result they have difficulty, for example

- 4 + ___ = 7
  Students will add across the equal sign and fill the blank with 11.
- ___ = 2 + 5
  Students will say that the question itself is incorrect because the blank is on the wrong side.
- 3 + 4 = 5 + ____
  Students will add all the numbers and put 12 in the blank.
- 5 = 5
  Students will not identify this as a true statement.

Mathematical Language

same

more

less

equal

not equal

balance

match

equal sign/symbol

Learning Experiences

Assessing Prior Knowledge: Student or Small-Group Interview

1. Give students a set (between 5 and 10) of counters. Ask them to make a set that is the same.
2. Make a duplicate set of dot cards. Have students match the ones that are the same or equal. Ask them to explain how they know they are equal or the same.

Observation Checklist

Students are able to

- ❑ reproduce an equivalent set
- ❑ match equal sets
- ❑ explain how they know they are equal

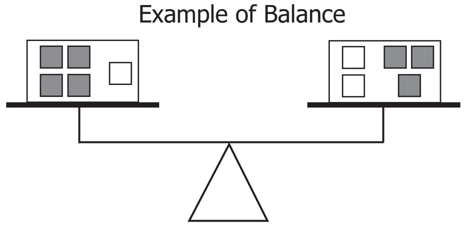
- **Construct two equal sets using the same objects (same shape and mass), and demonstrate their equality of number using a balance scale.**
- **Construct two unequal sets using the same objects (same shape and mass), and demonstrate their inequality of number using a balance scale.**
- **Determine if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

- Use a 2-pan balance scale. Explain how the scale works. When the scale is balanced the sets are equal (equivalent). Have students use equal weight objects (e.g., unifix or coloured cubes to practise making equivalent and non-equivalent sets). Sets can be described using colours (e.g., 2 red and 3 green on the left side is the same as 5 blue on the right side or 4 blue is not the same as 3 red).

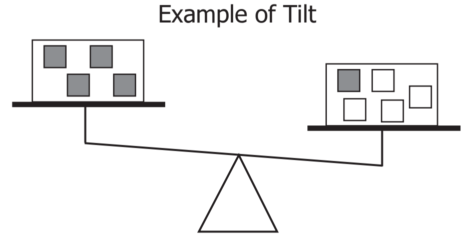
  Example of balance

Some students may have difficulty with the conservation of weight. These students will need experiences beyond the balance scales.

Example of Balance



Example of Tilt



Checking for Understanding

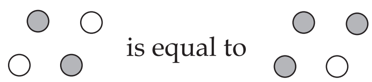
Use two sets of counters. Ask the student to determine whether they are equal or not equal. Have them explain/show how they found their answer.

Do students

- ❏ correctly identify the sets as equal or not equal
- ❏ explain using one-to-one matching/correspondence
- ❏ count each set and then use the numbers only to explain

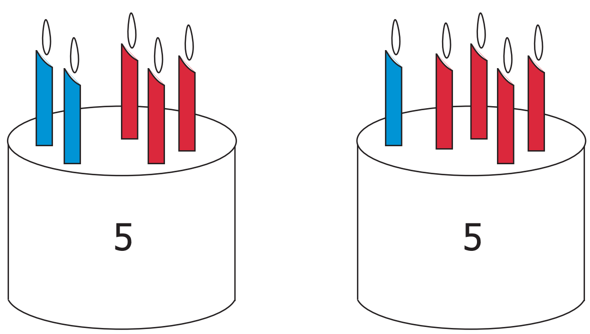
- **Represent an equality using manipulatives or pictures.**
- **Represent a pictorial or concrete equality in symbolic form.**

- Have students use materials and pictures to show an equality and then write the matching number sentence, for example



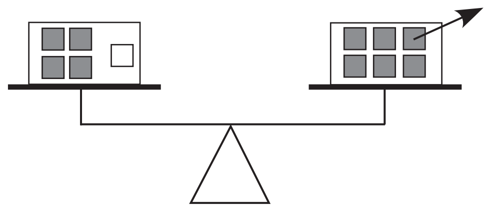
$2 + 2 = 3 + 1$

Example of birthday cakes and 2 colours of candles to represent the same age



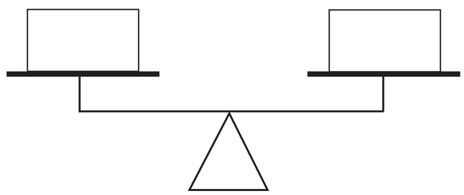
$2 + 3 \quad = \quad 1 + 4$

- Use a balance scale representation and have students write a number sentence to represent the equality.

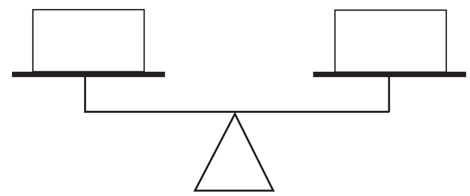


4 + 1 = 6 − 1

Have students fill in the missing objects on the balance scale.

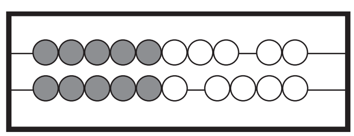


3 + 4 = 5 + 2



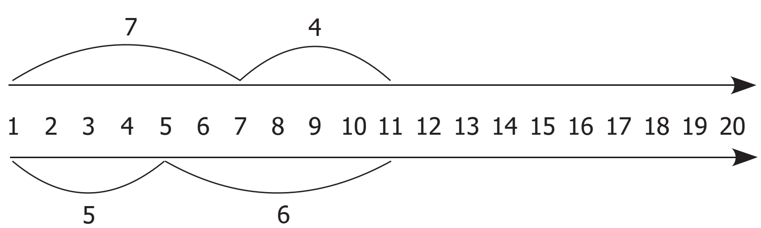
3 + 3 = 10 − 4

- Use a 20 bead frame to demonstrate equality with combinations to 10.



8 + 2 = 10
6 + 4 = 10
Therefore, 8 + 2 = 6 + 4.

- Use a double number line (e.g., show that 7 + 4 = 5 + 6).



- **Provide examples of equalities where the sum or difference is on either the left or right side of the equal symbol (=).**

- Have students create number sentences to match given templates, for example

______ + ______ = ______ and ______ + ______ = ______ + ______

______ – ______ = ______ and ______ – ______ = ______ – ______

- **Record different representations of the same quantity (0 to 20) as equalities.**

- **Classroom routine: "Nifty Number Sentences":** Use a laminated chart or white chalkboard. Write a number between 0 and 20 at the top of the chart each day. Students take turns writing a number sentence to equal the number on the chart. Encourage students to try to write a sentence that is different from the ones already on the chart.

Nifty Numbers

10

12 − 2
5 + 5
2 + 2 + 2 + 2 + 2
15 − 5
3 + 3 + 3 + 1
6 + 4
2 + 3 + 5
12 − 6 + 4

- **Pocket Chart:** Copy some of the expressions (the part of the number sentence without the equal sign, e.g., 3 + 8 or 16 - 9) from the Nifty Number Sentences chart each day onto cards.

  Note: Use the same colour of marker for all of them. Mix the expressions up. Place equal signs down the centre of a pocket chart. Have students make true number sentences by placing equivalent expressions on the either side of each equal sign.

Make True Number Sentences		
3 + 8	=	2 + 9
6 + 9	=	7 + 8

Assessing Understanding

True or False: Prepare a classroom set of cards with the word "True" on one side and the word "False" on the other. Present the following equations one at a time. Have students hold up their True/False card to indicate whether the equation is true or false. Ask students to justify their answer using materials, pictures, number lines, numbers, etc.

- ❑ 4 + 3 = 7
- ❑ 7 + 1 = 4 + 4
- ❑ 7 = 7
- ❑ 4 + 4 = 3 + 4
- ❑ 6 + 4 = 5 + 5
- ❑ 4 + 5 = 6 + 2
- ❑ 9 = 5 + 4

This assessment could be done with a small group or individual students.

Putting the Pieces Together

Performance Task: True or False Game

BLM 1.PR.3& 4.1

Materials: game board
true or false game cards
game pieces

Directions:

Game cards are placed face down on the table.

Players take turns drawing a card, stating whether the number sentence/equation is true or false. If correct, the players move their game marker two spaces for a true statement and one space for a false statement.

Scenario:

We have been asked to help design a True or False game for Grade 1 students. We already have the game board but we don't have the game cards. I need each of you to make five cards for the game. Each card needs to have a number sentence. The number sentence can be either true or false. The answer needs to be on the back of the card. Put a "T" for true or an "F" for false in the bottom right hand corner.

Sample:

$6 + 2 = 4 + 4$	T
Front	Back

Addressing student needs:

- Vary the number range assigned to each student
    - combinations to 10
    - combinations to 20
- Vary the operations used
    - use only addition
    - use only subtraction
    - use a combination of both operations
- Colour code the cards based on the complexity of the equation.

Grade 1 Mathematics

Shape and Space

Grade 1: Shape and Space (Measurement) (1.SS.1)

Enduring Understandings:

Objects can be compared using the same attribute.

Essential Question:

How can objects be compared?

SPECIFIC LEARNING OUTCOME(S):	ACHIEVEMENT INDICATORS:
1.SS.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 [C, CN, PS, R, V]	➛ Identify common attributes, such as length (height), mass (weight), volume (capacity), and area, which could be used to compare a set of two objects. ➛ Compare two objects and identify the attributes used to compare. ➛ Determine which of two or more objects is longest/shortest by matching, and explain the reasoning. ➛ Determine which of two or more objects is heaviest/lightest by comparing, and explain the reasoning. ➛ Determine which of two or more objects holds the most/least by filling, and explain the reasoning. ➛ Determine which of two or more objects has the greatest/least area by covering, and explain the reasoning.

PRIOR KNOWLEDGE

Students may have had experience

- using direct comparison to compare two objects based on a single attribute, such as length (height), mass (weight), and volume (capacity)

Background Information

In Grade 1 the comparisons are not limited to two objects.

Mass is the amount of matter in an object. It is measured using a pan balance and standard masses. The mass of an object is measured in grams and kilograms.

The word **weight** is the force that gravity exerts on an object. It is measured using a spring balance. Weight is frequently used when mass is intended. Weight is measured in Newtons.

Volume is the amount of space occupied by an object (solid, liquid, or gas).

Capacity is the amount a container is able to hold.

Students need to be aware of the common usage of the word *full*. A full glass of milk is one in which the volume of milk measures less than the capacity of the glass. If students fill a glass to the brim with milk, they are likely to be told that the glass is *too full*. There are many instances of this anomaly in daily life. (e.g., a full bottle of pop, a room full of people, a box full of blocks, etc.)

Area is the measurement of the surface of a 2-D shape.

Surface refers to the outer faces or outside of an object. A surface may be flat or curved.

The concept of area incorporates the idea of covering surfaces. At this level, students are expected to learn to cover a surface without leaving any gaps. Young students need to see the relevance of area to their lives.

Mathematical Language

longer	height
shorter	cover
taller	area
almost the same	full
lighter	empty
heavier	compare
less	comparison
more	volume
bigger	capacity
smaller	mass
length	weight

Learning Experiences

Assessing Prior Knowledge

1. Brainstorm with the class ways that objects can be compared. Note the vocabulary used.
2. Set up three comparing stations each with two different objects.
   - length
   - mass (weight)
   - volume (capacity)

BLM 1.SS.1.1

Observation Checklist

Observe students as they work at the stations. Look for the following.

The students

- ❑ compare the length of the two objects from a common starting point
- ❑ compare the mass (weight) of the two objects using an effective strategy such as their hands or a balance scale
- ❑ compare the volume (capacity) of the two objects using an effective strategy such as filling one and pouring it into the second container or fitting one container into the other
- ❑ use the appropriate language for comparison at each station

- **Identify common attributes, such as length (height), mass (weight), volume (capacity), and area, which could be used to compare a set of two objects.**
- **Compare two objects and identify the attributes used to compare.**

- Hold up two different objects. Ask students how they can compare them. Record their responses.

  Now, hold up two pieces of the same type of paper, each with a different area. Ask students how they can compare them. Students should recognize that the mass of each piece of paper will be hard to compare. They should also recognize that volume cannot be used for comparison. If the idea of area is not suggested ask, "How many colour tiles (unifix cubes, square pattern blocks, etc.) do you think it will take to cover each paper? Do you think that this might be another way to compare objects?"

  Have students work in groups to find the area of different pieces of paper by covering.

- **Grab Bag:** Place a collection of objects in a bag. Students take turns reaching in and selecting two objects. Compare them using as many attributes as they can. Record your observations anecdotally.

- **Determine which of two or more objects is longest/shortest by matching, and explain the reasoning.**

- Provide students with objects of different lengths. Model the language of comparison, then have them practise comparing objects using the following words:

longer than	*shorter than*	*taller than*
longest	*shortest*	*tallest*
as long as	*as short as*	*as tall as*
not as long as	*not as short as*	*not as short as*
the same length as	*the same height as*	*not the same . . .*
different length		

Ensure that students are comparing length/height from a common starting point.

- Provide a variety of materials (pencils, straws, blocks, paper rolls, etc.). Have students select three of them and order them according to length (e.g., tallest to shortest, shortest to longest). Ask them to justify the order using comparative language. Model the language of comparison: "The yellow pencil is longer than the green pencil, but shorter than the blue."

- **Yes or No:** Students answer "yes" or "no" to a series of comparative statements and explain their thinking, for example,
  - "My desk is longer than the bookshelf."
  - "The door is taller than the whiteboard."
  - "The whiteboard eraser is shorter than the paper clip."
  - "The chart stand is shorter than the skipping rope."

Assessing Understanding: Journal/Learning Log Entry

Find an object that is shorter than your pencil and one that is longer than your pencil.

Draw and write to record what you found.

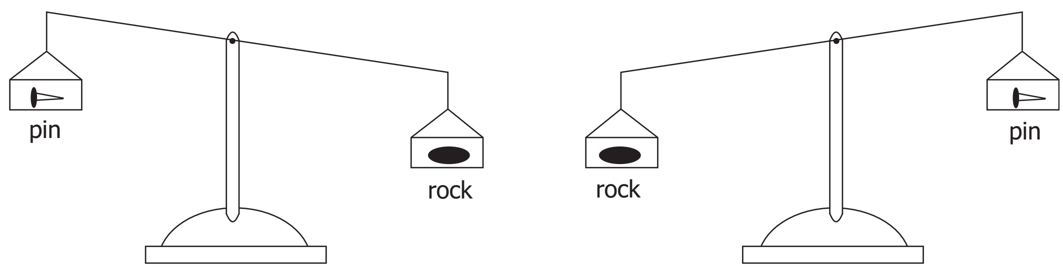
BLM
1.S.S.1.2

- **Determine which of two or more objects is heaviest/lightest by comparing, and explain the reasoning.**

- Provide students with experiences in comparing pairs of objects with significant differences in mass. This can be easily determined simply by lifting and holding one object in each hand.

  Note: As students demonstrate an understanding of significant differences in mass, introduce experiences with masses of minimal differences. This leads naturally into the need for a pan balance.

- Demonstrate the pan balance by showing what happens when two objects of different masses are placed in the pans. Exchange the objects to show that the heavier object will always be lower on the balance.



- Provide small groups with four or five different objects and a pan balance. Ask students to order the objects by mass without using the balance (estimate) and to record their estimates. Then have them compare the masses using the balance and record their results by drawing and writing.

  Model the use of frame sentences to record results. Then ask students to record their experimental results with frame sentences, such as the following:

  _______ has a greater mass than _______

  _______ has less mass than _______

  _______ has the same mass as _______

  _______ has the least mass

  _______ has the greatest mass

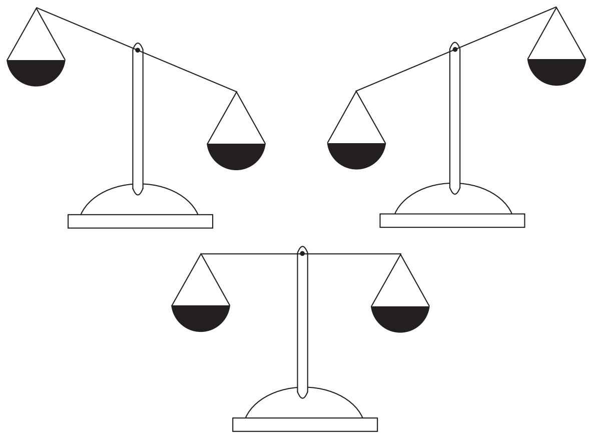
- Supply students with a malleable material such as playdough. Ask students to make two balls of different masses from the material and to verify their masses using a pan balance. Follow up: Have students make two or more balls with the same mass, and verify their masses using a pan balance.

  Observe students for strategies and language used, as well as for accuracy of models.

BLM
1.SS.1.3

Assessing Understanding: Performance Task

From a collection of objects, have students compare the mass of two objects by finding objects that cause the pan balance to look like the diagrams shown. Ask students to record on the diagrams which objects make the balance look like the diagrams below.



- **Determine which of two or more objects holds the most/least by filling, and explain the reasoning.**

- Have students explore the volume (capacity) of a variety of containers (e.g., boxes, cans, cups, jugs, scoops, spoons) with a variety of materials (e.g., water, sand, rice). Provide containers that have the same volume (capacity) but are different in shape, that are the same shape but have different volume (capacity), and those that will nest inside each other for ordering by volume (capacity). Ask questions such as
    - “Do you think there is another container that will hold the same amount of water? How could you prove it?”
    - “Which container might hold the most? How could you prove it?”

- Provide containers of varying sizes and shapes. Have students choose two containers, estimate which holds more, and check by filling and pouring. Record their findings on the chart. Choose two more containers and repeat the activity."

Containers:

BLM
1.SS.1.4

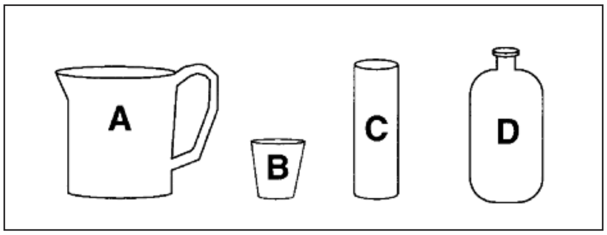


Chart:

Containers	Estimate Which Holds More	More	Less

Extend the activity by having students order the containers from least volume (capacity) to greatest.

Assessing Understanding: Performance Task

Provide three containers labelled A, B, and C. Ask students to

- ❏ predict the order of the containers from the least volume (capacity) to the greatest without filling or pouring (estimate)
- ❏ measure to confirm their predictions
- ❏ record their results
- ❏ write comparative sentences about the three containers

- **Determine which of two or more objects has the greatest/least area by covering, and explain the reasoning.**

- Draw students' attention to covering an area in natural situations, such as
  - covering a desk or table with newspaper for painting
  - putting a tablecloth on a playhouse
  - covering a doll with a blanket
- Provide opportunities for students to compare areas by
  - superimposing
  - comparing different sizes of the same shape
  - comparing different shapes

  Ask, "How do you know that the area of this is larger/smaller?" (Students will give visual clues—*I can see green around the edge where it isn't covered. It is so completely covered that I can't see the bottom one now*.)
- Allow students to explore covering areas with a variety of objects. Have them keep a record by drawing or writing. Discuss how objects must completely cover an area (discuss gaps and overlaps).
- Have students compare areas using concrete materials. For example, tell students to do the following: "Hide a shape by covering its surface with blocks. Record the number of blocks used. Hide another shape using blocks. Record the number of blocks used. Compare the number of blocks used to determine which area is larger."

  Extend the activity by having them order the shapes by area from least to greatest.

Assessing Understanding

Provide three shapes labelled A, B, and C. Ask students to

- ❑ predict the order of the shapes from the smallest area to the largest area without covering (estimate)
- ❑ measure to confirm their predictions
- ❑ record their results
- ❑ write comparative sentences about the three shapes

Performance Task: Comparison Centres

Prepare a set of cards with the words length, mass (weight), volume (capacity), and area. Depending on the size of the class you may need to duplicate some of the words.

BLM 1.SS.1.5

Divide the class into groups.

Have each group draw a word card.

Explain that the group is responsible for setting up a comparison centre based on the word they picked. Each centre should have three or four materials/objects for comparison and any other equipment necessary.

Groups need to

- select their materials and label them in some way
- compare the objects/materials
- order them in some way (group choice)
- record the order

Groups will also make up at least three comparison frames based on their materials leaving blanks for the answers. **Note:** Perhaps these can be copied and then placed at the centre to use as individual recording sheets.

Example

1. ________ has a larger area than ______.
2. ________ has a smaller area than _____.
3. ________ has the same area as _______.

Finally, have the group write the task directions for their centre.

Groups then rotate through the centres completing the activities and recording their findings.

At a class meeting have each group present the findings from their centre and answer any related questions.

Observation Checklist

- ❏ materials selected are appropriate for the concept
- ❏ correct comparisons are made
- ❏ materials/objects are ordered correctly
- ❏ appropriate comparison frames are written
- ❏ findings are clearly stated
- ❏ questions asked by other students are answered
- ❏ correct comparisons are made at each of the centres
- ❏ findings are recorded

Grade 1: Shape and Space (3-D Objects and 2-D Shapes) (1.SS.2, 1.SS.3, 1.SS.4)

Enduring Understandings:

Objects and shapes can be sorted by similarities.

Geometric shapes can be described and compared using their attributes

A 3-D object can be analyzed in terms of its 2-D parts.

Essential Questions:

How are the objects/shapes alike?

In which ways can the objects/shapes be sorted?

What is the sorting rule?

How can 3-D objects and 2-D shapes be described?

Specific Learning Outcome(s):	**Achievement Indicators:**
1.SS.2 Sort 3-D objects and 2-D shapes using one attribute and explain the sorting rule. [C, CN, R, V]	➛ Sort a set of familiar 3-D objects or 2-D shapes using a given sorting rule. ➛ Sort a set of familiar 3-D objects using a single attribute determined by the student, and explain the sorting rule. ➛ Sort a set of 2-D shapes using a single attribute determined by the student, and explain the sorting rule. ➛ Determine the difference between two pre-sorted sets of familiar 3-D objects or 2-D shapes, and explain a possible sorting rule used to sort them. *(continued)*

Specific Learning Outcome(s):	**Achievement Indicators:**
1.SS.3 Replicate composite 2-D shapes and 3-D objects. [CN, PS, V]	➛ Select 2-D shapes from a given set of 2-D shapes to reproduce a composite 2-D shape. ➛ Select 3-D objects from a given set of 3-D objects to reproduce a 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.
1.SS.4 Compare 2-D shapes to parts of 3-D objects in the environment.. [C, CN, V]	➛ Identify 3-D objects in the environment that have parts similar to a 2-D shape.

Prior Knowledge

Students may have had experience

- sorting 3-D objects using a single attribute

Background Information

Sorting and classifying are basic concepts that help students organize and understand their surroundings. Through sorting and classifying experiences students come to understand that objects can be grouped in different ways. This supports part-part-whole understanding (e.g., 8 can be grouped as 7 and 1 or 5 and 3).

In order to sort, students need to identify attributes such as colour, shape or size. This is the basis of patterning.

Pierre van Hiele and Dieke van Hiele-Geldof, mathematics teachers from the Netherlands in the 1950s, researched the development of geometry thinking. Through their research they identified five sequential levels of geometric thought.

There are four characteristics of these levels of thought:

- The levels of geometric reasoning/understanding are sequential. Students must pass through all prior levels to arrive at any specific level.
- These levels are not age-dependent.
- Geometric instructional experiences have the greatest influence on advancement through the levels.
- Instruction or language at a higher level than the level of the student may inhibit learning.

Level 0 (sometimes labelled as Level 1): **Visual**

At this level students can name and recognize shapes by their appearance, but cannot specifically identify properties of shapes. Students may think that a rotated square is a "diamond" and not a "square" because it looks different from their visual image of square. Most students in Kindergarten to Grade 3 will be at Level 0 (visualization).

Suggestions for instruction at this level include:

- sorting, identifying, and describing shapes
- working with physical models
- seeing different sizes and orientations of the same shape in order to distinguish the characteristics of the shape and to identify features that are not relevant
- building, drawing, making, putting together, and taking apart 2-D shapes and 3-D objects.

Mathematical Language

colour words

student chosen vocabulary for shape (round, flat, pointy, like a box, like a can, etc.)

vocabulary for size (big, small, heavy, light, long, short, etc.)

sort

classify

group

the same as

different

2-D shape

3-D object

set

Learning Experiences

Assessing Prior Knowledge

Provide a variety of 3-D objects for each small group. Have the group sort the objects and then raise their hands. Talk with the group about their sorting rule. If it is a correct sort have them re-sort the collection in a different way. Continue in this manner until each group has sorted in several different ways.

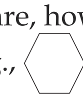
Observation Checklist

Students are able to

- ❑ identify attributes for sorting (colour, size, shape)
- ❑ sort accurately into two or more groups
- ❑ explain the sorting rule

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

- Read a book such as *The Button Box* by Margarette S. Reid to help to develop attribute language.
- Provide a collection of objects such as attribute (logic) blocks. Ask students to sort them by colour. Repeat sorting by size, by shape, and then by thickness.

  Note: Attribute blocks are 3-D objects because they have length, width, and thickness. They are, however, described using 2-D vocabulary (e.g.,  is described as a hexagon and not as a hexagonal prism). This is true for pattern blocks as well.

  3-D objects refer to objects in the environment not specifically to the set of 3-D objects typically purchased as math materials.

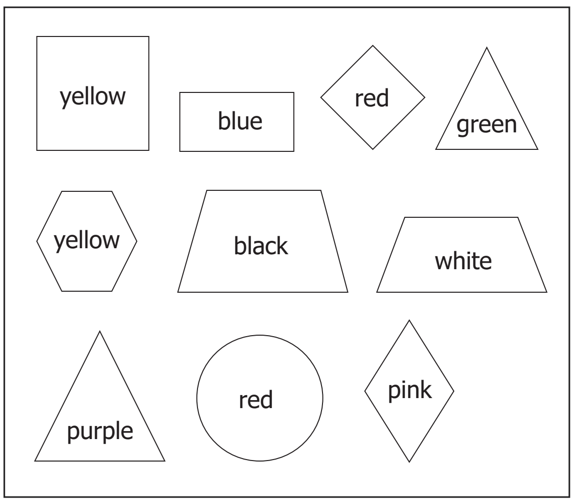
- Provide a collection of 3-D objects such as blocks, interlocking plastic building blocks, household food-stuff containers, buttons, etc. Have students sort them and then identify the sorting rule.

BLM 1.SS.4.1

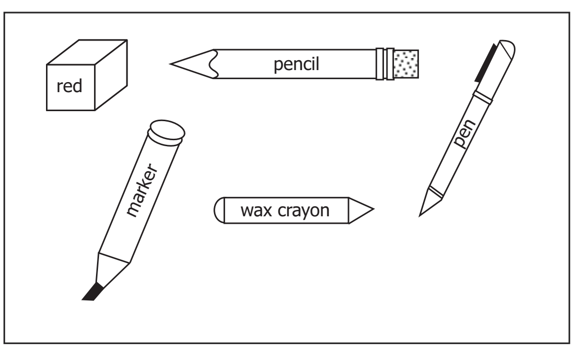
- Provide students with a collection of paper shapes of various sizes including triangles, rectangles, circles, and other shapes. Ask students to sort the collection into two groups and name the sorting rule. Then have students regroup the collection and sort it in other ways.
- Sort a collection of objects or shapes into two sets. Give students another object. Ask them to place it in one of the sets and explain why it belongs in that set.

  Note: The measurement outcomes provide many opportunities for sorting and classifying.
- Show students a set that contains an object or shape that does not belong. Ask the students to remove the object or shape that does not belong and explain why.
  - "Which shape/object does not belong? Why?"
  - "Find another shape/object that would belong to this set."

  Examples with shapes



  Examples with objects



Assessing Understanding

Give students a small group of 3-D objects.

1. Have them sort the objects and then state their sorting rule.
2. Ask them to re-sort the objects and then state their new sorting rule.
3. Sort a set of objects into two groups. Have students identify the sorting rule. Hold up another one of the sorted objects and ask them to identify where it should go.

Give students a small group of 2-D shapes.

1. Have them sort the shapes and then state their sorting rule.
2. Ask them to re-sort the shapes and then state their new sorting rule.
3. Sort a set of objects into two groups. Have students identify the sorting rule. Hold up another one of the sorted objects and ask them to identify where it should go.

Observation Checklist

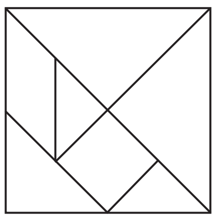
Students are able to

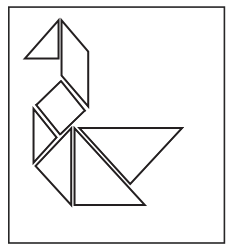
- ❏ sort a collection of 3-D objects using self-selected attribute(s)
- ❏ sort a collection of 2-D shapes using self-selected attribute(s)
- ❏ state the sorting rule of 3-D objects
- ❏ state the sorting rule of 2-D shapes
- ❏ re-sort a set of 3-D objects in another way
- ❏ re-sort a set of 2-D shapes in another way
- ❏ identify the sorting rule of a pre-sorted 3-D set
- ❏ identify the sorting rule of a pre-sorted 2-D set
- ❏ identify the placement of an additional 3-D object
- ❏ identify the placement of an additional 2-D shape

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

- Read a book such as *Tangram Magician* by Lisa Campbell Ernst or *Grandfather Tang's Story* by Ann Tompert. In each of these books tangram pieces (tans) are used to create composite 2-D pictures. (Note: Tans are labelled with 2-D names although they are actually 3-D objects.) Have students use a set of tangrams (commercial or paper) to create pictures.

BLM 1.SS.2& 3&4.1

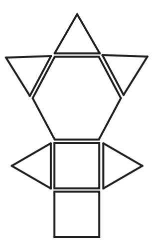




Templates for tangrams (such as the bird example) and pattern blocks can be purchased or found online. Students can directly match the shapes. Games, such as Tangoes, provide figures made from tangrams. Most are more challenging because the individual shapes are not marked.

- **Pattern Block Pictures:** Have students work with a partner. The first student makes a pattern block design with a specified number of pattern blocks. The second student selects the appropriate shapes and replicates the design. Students then reverse roles.

  Example:



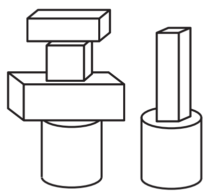
  Shapes can be traced, cut out, and glued down to record the design.

- **Shape Pictures:** Students make a picture using different-sized paper shapes, including circles, squares, rectangles, and triangles. As students are working, ask students to describe the shapes they are using. Students glue their pictures onto paper, add additional features, and describe their picture in sentences.

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

- **Copy Me!:** Build a composite 3-D object. Have students select the appropriate 3-D objects and reproduce the composite.

  Example:

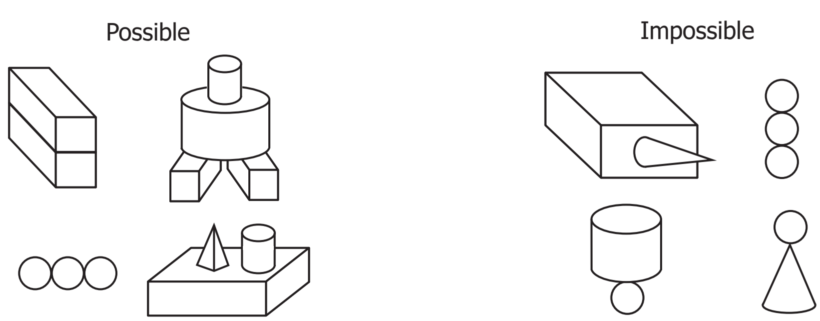
  

- **Behind the Wall:** Work in partners. Set up a screen between students or have partners sit back-to-back. Have one student create a composite 3-D object using a specified number of objects and then describe it to his or her partner. The partner uses the description to reproduce the composite object. They then lift the barrier to check. Make note of the vocabulary students are using.

- Use the overhead projector and a set of attribute or pattern blocks.
  a) Place a shape on the overhead. Have students match the shadow to a shape in their collection.
  b) Show shapes partially covered and ask students to predict the shape by selecting one from their collection. Have students justify their predictions.

- Provide a set of pictures of composite objects that are possible or impossible to build. Ask students to sort the pictures and to justify their choices. Then ask students to build the possible composite objects using the solids shown in the pictures.

  Examples:

Assessing Understanding

Give students a small group of 3-D objects.

1. Give students a composite 2-D shape and have them reproduce it.
2. Give students a composite 3-D shape and have them reproduce it.

Observation Checklist

Students are able to

- ❏ reproduce a composite 2-D shape
- ❏ reproduce a composite 3-D object
- ❏ predict and select the 2-D shapes used to create a 2-D composite shape
- ❏ predict and select the 3-D objects used to create a 3-D composite object
- ❏ verify their predictions by decomposing the composite shape/object

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

- Read a book such as *Cubes, Cones, Cylinders & Spheres* by Tana Hoban. The pictures show everyday objects that resemble cubes, cones, cylinders, and spheres.
- **Shape Hunt**

  Materials:

  - cards (each with a different 2-D shape)
  - a wide variety of 3-D objects (classroom objects, food-stuff containers, and small boxes, etc.)

  Directions:

  Students work in small groups. Each group draws a 2-D shape card and then hunts for 3-D objects that have parts similar to their shape. Groups can either gather the actual objects or record their findings in pictures and words. A digital camera could also be used to take pictures of the objects (Literacy with ICT connection). Have groups share their findings with the class. Ask questions such as

  - Did any groups find/record the same objects? How is this possible?
  - Are some shapes easier to find? More difficult to find?

- **Social Studies Connection:** The *Connecting and Belonging: A Foundation for Implementation* (2005) document suggests the following activity:

  "Post pictures of significant places and landmarks in the local community. Each day, provide clues about one of the pictures, describing its relative position in the community (e.g., I am thinking about a landmark on the grass; I am thinking about a landmark in the park…). Students guess the landmark being described and, once it is identified, describe its relative position."

  Extend the activity by having students use measurement and geometric terms to describe the significant places and landmarks.

- **Mystery Bag:** Students work with a partner or in small groups.

  Materials:

  - a different 3-D composite object for each student
  - a collection of 3-D objects needed to reproduce the composite objects
  - a bag large enough to hold the collection of 3-D objects

  Directions:

  Student A reaches into the bag and selects a 3-D object that he or she thinks is needed in order to reproduce a 3-D composite object. If correct he or she keeps the object, if not, the object is returned into the bag. Student B then takes a turn. Play continues in this manner until a student has reproduced a composite 3-D object.

  Note: This activity can be done with 2-D composites shapes.

Assessing Understanding

Journal/Learning Log: Have students select two 2-D shapes and identify in words and/or pictures three or four objects in the environment that have parts similar to their 2-D shapes.

Problem Solving: I traced around one of the faces/sides of an object in the classroom.

This is the shape it made: ○

What object could I have used?

PUTTING THE PIECES TOGETHER

Performance Task: Design Challenge

Materials:

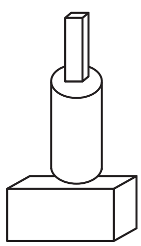
- a collection of 3-D objects such as food-stuff containers, classroom objects, blocks, etc.
- large sheets of mural paper or tag/bristol board
- markers

Directions:

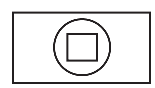
Have students work in small groups.

Tell students that they have been asked to design and make a model community. They are going to build it on the large piece of mural paper using the classroom collection of 3-D objects. Once the community has been designed the group is going to take the structures apart. (**Note:** If possible take a picture of the community for later comparison.) As they do this they are going to record the objects used by tracing the face of each object used.

Example



This structure would be recorded as:



Once complete, groups trade places and try to reconstruct the community by following the 2-D shape diagrams.

Have the original groups assess the success of the reconstruction.

Assessing Understanding

Listen to the language used as they build, record, and reconstruct their communities.

Observation Checklist:

Students are able to

- ❏ identify the 3-D object using the 2-D face
- ❏ reconstruct a composite 3-D object from the drawings

Grade 1 Mathematics

Bibliography

Bibliography

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

Carle, Eric. *The Very Hungry Caterpillar.* New York, NY: Philomel Books, 1994.

______. *Today is Monday*. New York, NY: Philomel Books, 1993.

Ernst, Lisa Campbell, and Lee Ernst. *Tangram Magician*. New York, NY: Harry N. Abrams, Inc., 1990.

Girth, Melanie. *Ten Little Ladybugs*. Atlanta, GA: Piggy Toes Press, 2001.

Gibbons, Gail. *The Seasons of Arnold's Apple Tree.* San Diego, CA: Harcourt Brace & Company, 1984.

Hoban, Tana. *Cubes, Cones, Cylinders, & Spheres*. New York, NY: Greenwillow Books, 2000.

Hong, Lily Toy. *Two of Everything: A Chinese Folktale*. Morton Grove, IL: Albert Whitman & Company, 1993.

Hutchins, Pat. *The Doorbell Rang*. Richmond Hill, ON: Scholastic Inc., 1987.

Kilpatrick, J., J. Swafford, and B. Findell, eds. *Adding it Up: Helping Children Learn Mathematics*. Washington, DC: National Academy Press, 2001.

Manitoba Education. *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*. Winnipeg, MB: Manitoba Education, 2013. Available online at <www.edu.gov.mb.ca/k12/cur/math/framework_k-8/index.html>.

Manitoba Education, Citizenship and Youth. *Grade 1 Social Studies Connecting and Belonging: A Foundation for Implementation.* Winnipeg, MB: Manitoba Education, Citizenship and Youth, 2005.

______. *Kindergarten to Grade 8 Mathematics Glossary: Support Document for Teachers.* Winnipeg, MB: Manitoba Education, Citizenship and Youth, 2009.

______. *Rethinking Classroom Assessment with Purpose in Mind: Assessment for Learning, Assessment as Learning, Assessment of Learning*. Winnipeg, MB: Manitoba Education, Citizenship and Youth, 2006.

McElligott, Matthew. *Bean Thirteen.* New York, NY: G.P. Putnam's Sons, 2007.

Murphy, Stuart J. *Double the Ducks*. MathStart Level 1 series. New York, NY: HarperCollins Publishers, 2002.

OECD (Organisation for Economic Co-operation and Development). *PISA 2012 Field Trial Problem Solving Framework*. September 30, 2012. <www.oecd.org/pisa/pisaproducts/46962005.pdf>.

Ontario. Ministry of Education. *The Ontario Curriculum Grades 1–8: Mathematics.* Ontario: Ministry of Education, 2005. Available online at <www.edu.gov.on.ca/eng/curriculum/elementary/math18curr.pdf>.

Pinczes, Elinor J. *A Remainder of One*. New York, NY: Houghton Mifflin Company, 2002.

Reid, Margarette S. *The Button Box*. New York, NY: Putnam, 1995.

Tompert, Ann. *Grandfather Tang's Story*. New York, NY: Dragonfly Books, 1997.

Van de Walle, John A. *Elementary and Middle School Mathematics: Teaching Developmentally*. 5th ed. Boston, MA: Pearson Education, Inc., 2004.

Ward, Cindy. *Cookie's Week*. New York, NY: Putnam, 1988.

Wise, William. *Ten Sly Piranhas.* New York, NY: Dial Books for Young Readers, 1993.

Wright, R., G. Stanger, A.K. Stafford, and J. Martland. *Teaching Number in the Classroom with 4-8 Year-Olds*. Thousand Oaks, CA: Sage Publications Inc., 2006.

Printed in Canada
Imprimé au Canada