Saskatchewan
Learning

Grade 7 Mathematics Curriculum

Recycled Paper

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Saskatchewan Learning
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Table of Contents

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- other field personnel.

This curriculum in based on the Western and Northern Canadian Protocol (WNCP) Common Curriculum Framework (CCF) (2006) for Kindergarten to Grade 9 Mathematics.

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Grade 7 Mathematics

Purpose

The Grade 7 Mathematics Curriculum defines the outcomes to be attained by grade seven students during the 200 minutes of instruction and learning time allocated per week for the entire school year. It is designed to support teachers in providing students with learning opportunities to develop appropriate mathematics knowledge and abilities within a learning environment that supports students' development of positive attitudes and beliefs towards mathematics. Indicators are included for each of the outcomes in order to clarify the breadth and depth of learning intended by the outcome. These indicators are a representative list of the kinds of things a student needs to know and/or be able to do in order to achieve the learnings intended by the outcome.

Outcomes are statements identifying what students are expected to know, and be able to do by the end of a particular grade level.

This curriculum also provides information for teachers to understand how the outcomes of the Grade 7 Mathematics Curriculum connect to the K-12 Goals for Mathematics, the Cross-curricular Competencies of all areas of study, and the Broad Areas of Learning that define the purpose of education for Saskatchewan students.

Indicators are a representative list of things students could be asked to know or do in order to show their attainment of the outcome. The indicators are intended to clarify the breadth and the depth of the outcome.

Appendix A provides explanations of some of the mathematical terminology you will find in this curriculum. Appendix B: Three Grades at a Glance has been included to help teachers see how the Grade 7 outcomes are related to the Grade 6 and 8 outcomes.

This curriculum also provides an introduction to pedagogical understandings necessary for the effective teaching of Grade 7 mathematics. Additional support resources that explore and demonstrate these pedagogical understandings are also available.

This curriculum has been designed to address current research in mathematics education as well as the needs of students. The Mathematics 7 Curriculum outcomes have been influenced by changes to the outcomes in K-6 mathematics, and will also impact the content of 8-12 mathematics. Changes throughout all of the grades have been made for a number of reasons including:

- decreasing content in each grade to allow for more depth of understanding
- rearranging concepts to allow for greater depth of learning in one year and to align related mathematical concepts
- increasing the focus on numeracy (understanding numbers) beginning in Kindergarten
- introducing algebraic thinking earlier.

Aim and Goals of K-12 Mathematics

When we ask good questions in math class, we invite our students to think, to understand, and to share a mathematical journey with their classmates and teachers alike. Students are no longer passive receivers of information when asked questions that challenge their understandings and convictions about mathematics. (Sullivan, 2002, p. 1)

The aim of the mathematics program is to prepare individuals who value mathematics and appreciate its role in society. The K-12 mathematics curricula are designed to prepare students to cope confidently and competently with everyday situations that demand the use of mathematical concepts including interpreting quantitative information, estimating, performing calculations mentally, measuring, understanding spatial relationships, and problem solving. The mathematics program is intended to stimulate the spirit of inquiry within the context of mathematical thinking and reasoning.

The four goals for K-12 mathematics are broad statements that identify the knowledge, skills, and attitudes in mathematics that students are expected to develop and demonstrate by the end of grade twelve. Within each grade level, outcomes are directly related to the development of one or more of these goals. The goals for K-12 mathematics are:

Logical Thinking: *Develop and be able to apply mathematical reasoning processes, skills, and strategies to new situations and problems*.

This goal encompasses all of the processes and strategies that are foundational to understanding mathematics as a discipline. These processes and strategies include:

- inductive and deductive thinking
- abstracting and generalizing
- exploring, identifying, and describing patterns
- verifying and proofing
- exploring, identifying, and describing relationships
- modeling and representing (concretely, visually, physically, and symbolically)
- hypothesizing and asking "what if" (mathematical play).

Number Sense: *Develop an understanding of the meaning of, relationships between, properties of, roles of, and representations (including symbolic) of numbers and apply this understanding to new situations and problems.*

Key to developing number sense is students having ongoing experience with:

- decomposing and composing of numbers
- relating different operations to each other
- modeling and representing numbers and operations (concretely, visually, physically, and symbolically)

- understanding the origins and need for different types of numbers
- recognizing operations on different number types as being the same operations
- understanding equality and inequality
- recognizing the variety of roles for numbers
- understanding algebraic representations and manipulations in terms of extending numbers
- looking for patterns and ways to describe those patterns numerically and algebraically.

Spatial Sense: *Develop an understanding of 2-D shapes and 3-D objects, and the relationships between geometrical shapes and objects and numbers, and apply this understanding to new situations and problems.*

Development of a strong spatial sense requires students to experience:

- construction and deconstruction of 2-D shapes and 3-D objects
- investigations into relationships between 2-D shapes and 3-D objects
- explorations of how numbers (and algebra) can be used to describe 2-D shapes and 3-D objects
- exploration of the movement of 2-D shapes and 3-D objects
- exploration of the dimensions of 2-D shapes and 3-D objects
- exploration of different forms of measurement and their meaning.

To teach [adding fractions] as if it were A Rule, or (even more intimidating), The Law, is to pretend that what took years of experiment and ingenuity is as obvious as your nose. And then, because you never really had a chance to understand what was going on …, [a rule] whenever you need this rule again it will come as just that …, enforced by Them. And so the whole integrity of mathematics is compromised. (Kaplan & Kaplan, 2007, p. 9)

Mathematical Attitude: *Develop a positive attitude towards their ability to understand mathematics and to use it to solve problems.*

Mathematical ability and confidence is built through playing with numbers and related concepts in a supportive environment. Students can persevere when challenged if provided with opportunities to learn mathematics within an environment that:

- supports risk taking (mathematically and personally)
- honours students' ideas
- provides engaging and responsive learning experiences.

Students who have a positive attitude towards mathematics demonstrate:

- confidence in their mathematical insights and abilities
- enjoyment, curiousity, and perseverance when encountering new problems
- appreciation of the structure and value of mathematics.

Although there are many "real-world" applications of the mathematics within the K-12 mathematics program, this content first and foremost serves as the vehicle through which the students can achieve the four goals of K-12 mathematics in Saskatchewan. Attainment of these four goals will result in students with mathematical confidence and the tools necessary to succeed in any future mathematical endeavours.

Connections to the Broad Areas of Learning

There are three Broad Areas of Learning that reflect Saskatchewan's Goals of Education. K-12 mathematics contributes to the Goals of Education through helping students achieve knowledge, skills, and attitudes related to these Broad Areas of Learning.

Students who are provided with a variety of ways to seek, use, evaluate and create information are able to approach learning with curiosity, flexibility, and perseverance.

Building a Disposition for Learning

Students who are engaged in constructing and applying mathematical knowledge naturally build a positive disposition towards learning. Throughout their study of mathematics, students should be learning the skills (including reasoning strategies) and developing the attitudes that will enable the successful use of mathematics in daily life. Moreover, students should be developing understandings of mathematics that will enable the learning of new mathematical concepts and applications that are encountered within both career and personal interest choices. Students who successfully complete their study of K-12 mathematics should feel confident about their mathematical abilities and have developed the understandings necessary to make future use and/or studies of mathematics meaningful and attainable. In order for mathematics to contribute to this Broad Area of Learning, students must actively learn the mathematical content in the outcomes through using and developing mathematical reasoning, number sense, spatial sense, and mathematical attitude (the four goals of K-12 mathematics). It is crucial that the *students uncover* the mathematics outlined in the curriculum rather than the *teacher covering* it.

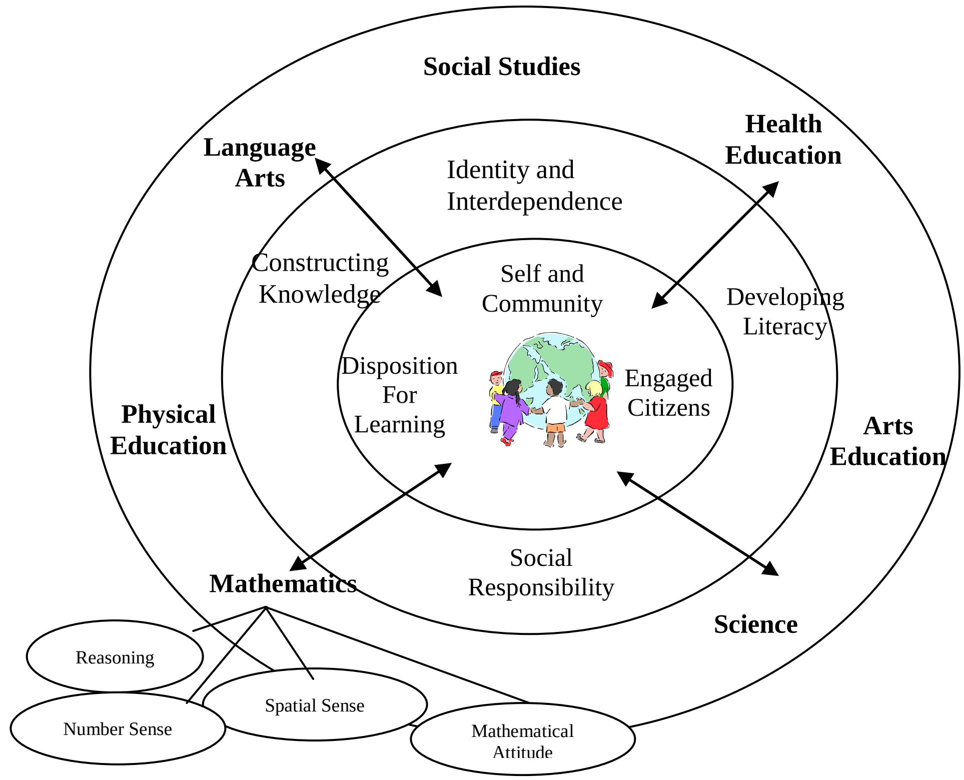
Building a Sense of Self and Community

To learn mathematics for deep understanding, students need to not only interact with the mathematical content but with each other as well. Mathematics needs to be taught in a dynamic environment where students work together to share and evaluate strategies and understandings. Students who are involved in a supportive mathematics environment that is rich in dialogue are exposed to a wide variety of perspectives and strategies from which to construct a sense of the mathematical content. In such an environment, students also learn and come to value how they as individuals and as members of a group or community can contribute to understanding and social well-being through a sense of accomplishment, confidence, and relevance. When encouraged to present ideas that represent different perspectives and ways of knowing, students in mathematics classrooms develop a deeper understanding of the mathematics while learning to respect and value the contributions of others. Mathematics also provides many opportunities for students to enter into communities beyond the classroom walls by engaging with people in the neighbourhood or around the world. By working towards developing a deeper understanding of mathematics and its role in the world, students will necessarily develop their personal and social identity, and learn healthy and positive ways of interacting and working together with others.

Building Engaged Citizens

Mathematics brings a unique perspective and way of knowing to the analysis of social impact and interdependence. Doing mathematics requires students to "leave their emotions at the door" and to engage in different situations for the purpose of understanding what is really happening and what can be done. Mathematical analysis of topics that interest students such as trends in global warming, homelessness, technological health issues (oil spills, hearing loss, carpal tunnel syndrome), and discrimination can be used to engage the students in interacting and contributing positively to their classroom, school, community, and world. With the understandings that students can derive through mathematical analysis, they become better informed and have a greater respect for and understanding of the different opinions and options. With these understandings, students can then make better informed and more personalized decisions regarding roles and contributions to the various communities in which students are members.

Students will contribute to the environmental, economic, and social sustainability of their community through positive life, career, and consumer choices.



Connections to Cross-curricular Competencies

There are four cross-curricular competencies that together contribute to an individual student's development within the four Broad Areas of Learning. These competencies are synthesized from the Common Essential Learnings. It is important, therefore, that the learning of mathematics also supports the students in their attainment of these competencies.

Constructing knowledge is how people make sense of the world around them.

Constructing Knowledge

It is important that within their study of mathematics, students are engaged in personal construction and understanding of mathematical knowledge. This most effectively occurs through student engagement in inquiry and problem solving where they are challenged to think critically and creatively. Moreover, students need to experience mathematics in a variety of contexts in which students are asked to consider questions such as "what would happen if …", "could we find …", and "what does this tell us?" Students need to be engaged in a social construction of mathematics to develop an understanding and appreciation of mathematics as a tool which can be used to consider different perspectives, connections, and relationships. Mathematics is a subject that depends upon the effective incorporation of independent work and reflection with interactive contemplation, discussion, and resolution.

Identity and Interdependence

Given an appropriate learning environment in mathematics, students can develop both their self-confidence and self-worth. An interactive mathematics classroom in which the ideas, strategies, and abilities of individual students are valued develops personal and mathematical confidence. It can also help students realize their role in the classroom environment and accept responsibility for choices, decisions, and actions. A positive learning environment combined with strong pedagogical choices that engage students in learning support them in behaving respectfully towards themselves and others.

Students need to develop a positive self-concept and the ability to live in harmony with others, and with the natural and constructed world.

Developing Literacy

Through their mathematics learning experiences, students should be engaged in developing their understandings of the language of mathematics and their ability to use mathematics as a language. Students should be regularly engaged in exploring a variety of representations for mathematical concepts and should be expected to communicate in a variety of ways about the mathematics being learned. An important part of learning mathematical language is to communicate one's own understandings and to develop strategies to explore what and how others know about mathematics. The study of mathematics should also encourage the appropriate use of technology. Moreover, students should be aware of and able to communicate about the appropriate use of technology in mathematics and mathematics learning. It is important to encourage students to use a variety of forms of representation (concrete manipulatives, physical movement, visual, and symbolic) when exploring mathematical ideas, solving problems, and communicating understandings. All too often, it is assumed that symbolic representation is the only way to communicate mathematically. The more flexible students are in using a variety of representations to explain and work with the mathematics being learned, the deeper students' understanding becomes.

Mathematics enables individuals to understand, represent, and explore their world and communicate and participate in a variety of roles and settings in their home, school and community.

Social Responsibility

As students progress in their mathematical learning, they need to experience opportunities to share and consider ideas, and resolve conflicts between themselves and others. This requires that the learning environment be co-constructed by the teacher and students to support respectful, independent, and interdependent behaviours. Every student should feel empowered to help others in developing

By encouraging students to explore mathematics in social contexts, students can be engaged in understanding the situation, concern, or issue and then in planning for responsible reactions or responses.

their understanding, while finding respectful ways to seek help from others. By encouraging students to explore mathematics in social contexts, students can be engaged in understanding the situation, concern, or issue and then in planning for responsible reactions or responses. Mathematics is a subject dependent upon social interaction and, as a result, social construction of ideas. Through the study of mathematics, students learn to become reflective and positively contributing members of their communities. Mathematics allows for different perspectives and approaches to be considered, assessed for situational validity, and used to strengthen solutions.

Curriculum Integration

There are many possibilities for the integration of mathematics and other subject areas. In doing this integration, however, teachers must be cautious to not lose the integrity of any of the subjects. Integration gives students experiences with transfer of knowledge and provides rich contexts in which the students are able to make sense of their learnings. Below are just a few of the ways in which mathematics can be integrated into other subject areas (and other subject areas into mathematics) at grade seven.

When students experience mathematics as a lens through which they can view other subjects, and other subjects as lenses through which to view mathematics, students' learning and confidence in all of the subjects benefits greatly.

Arts Education – In Grade 7 arts education, three concepts in the Dance strand that students are exploring are patterns, relationships, and transitional movements. These concepts can be related to the mathematics that the students are learning through integrated learning activities in which the students describe, replicate and create patterns, relationships, and transitional movement using a wide variety of representations. Drama contexts can be used to explore mathematical relationships and the students' relationship to mathematics. Improvisation in music requires students to establish, recognize, and interpret patterns and relationships, thus paralleling much of the mathematics that the students are learning. Mathematical relationships and patterns can be represented in a variety of ways, including musical. In Visual Art, students can be asked to explore and create works of visual art that relate their understandings and attitudes towards mathematics.

English Language Arts **–** The variety of texts in English language arts can engage students in topics that inspire students to pose questions that can be researched and explored through mathematical inquiry and reasoning. For example, students need to experience mathematical consequences and nuances that can be applied to different texts. This application expands students' understanding of the influence and relevance of mathematics.

Health Education – Grade seven mathematics has many direct connections to the students' learnings in health education. When students "Reflect on and analyze food choices by applying the nutrient content labels on packaged foods", students are required to use their understanding of percent. The students can also reflect upon percent with respect to the amount of time in a day that they are physically active, and measures of central tendency can be determined for individual students or for the class as a whole. From there, students can be engaged in developing and implementing health action plans in response to those measures of central tendencies and/or percents.

"When my teacher shows me how to use the math we are learning in other classes, then it makes math class seem more worthwhile."
Saskatchewan Student

***Physical Education* –** To connect the students' physical activity to the students' study of the Cartesian plane, activities in physical education can include student reflection on quadrants of activity and movement transformations (translations, reflections, and rotations) required to move from one location to another. When studying percents, students can be asked to find examples that come from or enhance their study of the effects of exercise and inactivity, nutrition and nutritional habits, and developing and carrying out an action plan in which students could solve problems involving percents between 1% and 100%. As well, the students can apply their learnings of central tendency and probabilities to analyze and make decisions regarding data collected for planning an activity and the feedback data collected at the end of the planned activity. Students can also be engaged in solving problems involving percents and decimals in the context of personal fitness.

***Career Guidance* –** While students are investigating their different work and life roles, students can represent the percent of time spent in each role on a daily or weekly basis on a circle graph. Similarly, the students could carry out data analysis, such as the determination of measures of central tendency or the number of people within a particular economic sector, by using researched information regarding percents.

***Science* –** In exploring biodiversity and the interconnectedness of the natural environment, there are numerous opportunities for students to solve mathematical problems related to percents and to create circle graphs to represent situational values and statistics. The students' study of heat also has direct connections to the students' understanding and development of integers by solving problems involving temperature change and the determination of measures of central tendencies within and between different heat problems. In addition, students can also be engaged in circle graph representations of the composition of the Earth's crust as well as solving problems involving percents related to the composition of the Earth's crust.

***Social Studies* –** Grade seven social studies' in-depth investigation of the Pacific Rim countries can provide a variety of contexts in which students can solve problems and create mathematical representations. Measures of central tendency can be used to analyze populations within these countries and circle graphs can be used to represent and analyze different aspects of life in the Pacific Rim.

Critical Characteristics of Mathematics Education

The content of K-12 Mathematics can be organized in a variety of ways. In this document, the outcomes and indicators are grouped according to four strands: **Number, Patterns and Relations, Shape and Space, and Statistics and Probability.** Although this organization implies a relation between the outcomes identified in each of the strands, it should be noted the mathematical concepts are interrelated between strands as well as within strands.

When mathematics is taught without a rich integration of these processes, it becomes a stagnant set of facts and procedures devoid of meaning rather than the dynamic and rich discipline that it is.

The mathematics curriculum also recognizes seven processes inherent in the teaching, learning, and doing of mathematics. These processes focus on: communicating, making connections, mental mathematics and estimating, problem solving, reasoning, and visualizing along with using technology to integrate these processes into the mathematics classroom to help students learn mathematics with deeper understanding.

The outcomes in K-12 mathematics should be addressed through the appropriate mathematical processes lenses. Teachers should consider carefully in their planning those processes indicated as being important to the various outcomes.

Communication [C]

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

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

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

Communication can help students make connections among concrete, pictorial, symbolic, verbal, written, and mental representations of mathematical ideas.

Connections [CN]

Contextualization and making connections to the experiences of learners are powerful processes in developing mathematical understanding. When mathematical ideas are connected to each other

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

or to real world phenomena, students can begin to view mathematics as useful, relevant, and integrated.

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

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

Mental mathematics and estimation are fundamental components of number sense.

Mental Mathematics and Estimation [ME]

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

Estimation strategies are used to determine approximate values for qualities.

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

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

Estimation is a strategy for determining approximate values of quantities, usually by referring to benchmarks or using referents, or for determining the reasonableness of calculated values. Students need to know how, when, and what strategy to use when estimating.

Estimation is used to make mathematical judgements and develop useful, efficient strategies for dealing with situations in daily life.

Problem Solving [PS]

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

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

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

Problem solving requires and builds depth of conceptual understanding and student engagement.

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

Reasoning [R]

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

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

Mathematical experiences in and out of the classroom provide opportunities for inductive and deductive reasoning. Inductive reasoning occurs when students explore and record results, analyze observations, make generalizations from patterns, and test these generalizations. Deductive reasoning occurs when students reach new conclusions based upon what is already known or assumed to be true.

Visualization [V]

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

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

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

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

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

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.

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

Calculators and computers can be used to:

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

Technology contributes to a learning environment in which the growing curiosity of students can lead to rich mathematical discoveries at all grade levels. It is important for students to understand and appreciate the appropriate use of technology in a mathematics classroom.

Teaching for Deep Understanding

For deep understanding, it is vital that mathematics be taught through the students uncovering and co-constructing their knowledge, with very few ideas being covered or relayed directly by the teacher. As an example, the Cartesian plane is something which the teacher must cover. It is the sign we use to show that we want to combine or add two quantities. The process of adding, and the development of addition and subtraction facts should not be "covered", but rather "discovered" through the students' investigation of patterns, relationships, abstractions, and generalizations. Teachers need to "unpack" outcomes to identify those things that students need to know (behold) and those that they need to be able to apply, explain, and transfer to new situations.

It is important that a mathematics learning environment include effective interplay of reflection, exploration of patterns and relationships, sharing of ideas and problems, consideration of different perspectives, decision making, generalizing, verifying and proving, and modeling and representing. Mathematics is truly learned when students are engaged in strategic "play" with mathematical concepts and differing perspectives. When students learn mathematics by being told what to do, how to do it, and when to do it, they cannot make the strong learning connections necessary for learning to be meaningful, easily accessible, and transferable.

The mathematics learning environment must necessarily be one which is respectful of individuals and groups. It needs to foster discussion and self-reflection, the asking of questions, the seeking of multiple answers, and the co-construction of understanding.

In grade 7, students are learning about the addition and subtraction of fractions. Learning for deep understanding requires the students to explore patterns and relationships, often in concrete and visual representations and to hypothesize, test their own personal rules and strategies for adding and subtracting fractions, and then to generalize these learnings into abstract symbolic processes that reflect their individual and class understandings.

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

Grade 7 Mathematics Outcomes and Indicators

Number Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators* ***may*** *be used to determine whether students have met the corresponding outcome.)*
Number Sense *Logical Thinking* *Mathematical Attitude*	N7.1 Demonstrate an understanding of division through the development and application of divisibility strategies for 2, 3, 4, 5, 6, 8, 9, and 10, and through an analysis of division involving zero. [C, CN, ME, R]	a. Investigate division by 2, 3, 4, 5, 6, 8, 9, or 10 and generalize strategies for determining divisibility by those numbers. b. Apply strategies for determining divisibility to sort a set of numbers in Venn or Carroll diagrams. c. Determine or validate the factors of a number by applying strategies for divisibility. d. Explain the result of dividing a quantity of zero by a non-zero quantity. e. Explain (by generalizing patterns, analogies, and mathematical reasoning) why division of non-zero quantities by zero is not defined.
Number Sense *Logical Thinking* *Mathematical Attitude*	N7.2 Expand and demonstrate understanding of the addition, subtraction, multiplication, and division of decimals to greater numbers of decimal places, and the order of operations. [C, CN, ME, PS, R, T]	a. Provide a justification for the placement of a decimal in a sum or difference of decimals up to thousandths (e.g., for 4.5 + 0.73 + 256.458, think 4 + 256 so the sum is greater than 260; thus, the decimal will be placed so that the sum is in the hundreds). b. Provide a justification for the placement of a decimal in a product (e.g., for \$12.33 × 2.4, think \$12 × 2, so the product is greater than \$24; thus, the decimal in the final product would be placed so that the answer is in the tens). c. Provide a justification for the placement of a decimal in a quotient (e.g., for 51.50 m ÷ 2.1, think 50 m ÷ 2 so the quotient is approximately 25 m; thus, the final answer will be in the tens). (Note: If the divisor has more than one digit, students should be allowed to use technology to determine the final answer.) d. Solve a problem involving the addition, or subtraction, of two or more decimal numbers.

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

Number Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	N7.2 continued	e. Solve a problem involving the multiplication or division of decimal numbers with 2-digit multipliers or 1-digit divisors (whole numbers or decimals) without the use of technology. f. Solve a problem involving the multiplication or division of decimal numbers with more than a 2-digit multiplier or 1-digit divisor (whole number or decimal), with the use of technology. g. Check the reasonableness of solutions using estimation. h. Solve a problem that involves operations on decimals (limited to thousandths) taking into consideration the order of operations. i. Explain by using examples why it is important to follow a specific order of operations when calculating with decimals and/or whole numbers.
Number Sense *Logical Thinking* *Mathematical Attitude*	N7.3 Demonstrate an understanding of the relationships between positive decimals, positive fractions (including mixed numbers, proper fractions and improper fractions), and whole numbers. [C, CN, ME, R, T]	a. Predict the decimal representation of a fraction based upon patterns and justify the reasoning (e.g., knowing the decimal equivalent of 1/8 and 2/8, predict and verify the decimal representation of 7/8). b. Match a set of fractions to their decimal representations. c. Sort a set of fractions into repeating or terminating decimals. d. Explain and demonstrate how any terminating decimal can also be written as a repeating decimal. e. Express a fraction as a terminating or repeating decimal. f. Express a repeating decimal as a fraction. g. Express a terminating decimal as a fraction. h. Explain the re and division.

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

Number Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	N7.3 continued	i. Provide an example where the decimal representation of a fraction is an approximation of its exact value. j. Order a set of numbers containing decimals, fractions, and/or whole numbers in ascending or descending orders and justify the order determined. k. Identify, with justification, a number that would be between two given numbers (decimal, fraction, and/or whole numbers) in an ordered sequence or shown on a number line. l. Identify incorrectly placed numbers within an ordered sequence or shown on a number line. m. Order the numbers in a set of numbers by using benchmarks on a number line such as 0, ½ , and 1.
Number Sense *Logical Thinking* *Mathematical Attitude*	N7.4 Expand and demonstrate an understanding of percent to include fractional percents between 1% and 100%. [C, PS, R]	a. Create a representation (concrete, pictorial, physical or oral) of a fractional percent between 1% and 100%. b. Express a percent as a decimal or fraction. c. Solve a problem that involves finding a percent. d. Solve a problem that involves finding percents of a value. e. Determine the answer to a percent problem where the answer requires rounding and explain why an approximate answer is needed, e.g., total cost including taxes. f. Explain the meaning of a percent given in a particular context. g. Make and justify decisions, or suggest courses of action based upon known percents for the situation.

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

Number Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
Number Sense *Logical Thinking* *Mathematical Attitude* *Spatial Sense*	N7.5 Develop and demonstrate an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially, and symbolically (limited to positive sums and differences). [C, CN, ME, PS, R, V]	a. Estimate the sum or difference of positive fractions and/or mixed numbers and explain the reasoning. b. Model addition and subtraction of positive fractions and/or mixed numbers using concrete or visual representations, and record the process used symbolically. c. Determine the sum or difference of two positive fractions or mixed numbers with like denominators and explain the strategy used. d. Explain how common denominators for fractions and/or mixed numbers and factors are related. e. Explain how a common denominator can help when adding fractions and/or mixed numbers. f. Determine the sum or difference of two positive fractions or mixed numbers with unlike denominators and explain the strategy used. g. Simplify a positive fraction or mixed number by identifying and dividing off the common factor between the numerator and denominator. h. Generalize and explain personal strategies for determining the sum or difference of positive fractions and/or mixed numbers. i. Solve a problem involving the addition or subtraction of positive fractions or mixed numbers. j. Explain how the sum or difference of positive fractions and/or mixed numbers can be represented symbolically in different ways.

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

Number Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators* ***may*** *be used to determine whether students have met the corresponding outcome.)*
Number Sense *Logical Thinking* *Mathematical Attitude* *Spatial Sense*	N7.6 Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially, and symbolically. [C, CN, PS, R, V]	a. Represent opposite integers concretely, pictorially, and symbolically and explain why they are called opposite integers. b. Explain, using concrete materials such as integer tiles and diagrams, that the sum of opposite integers is zero (e.g., a move in one direction followed by an equivalent move in the opposite direction results in no net change in position). c. Illustrate, using a number line, the results of adding or subtracting negative and positive integers. d. Add two integers using concrete materials or pictorial representations and record the process symbolically. e. Subtract two integers using concrete materials or pictorial representations and record the process symbolically. f. Investigate patterns in adding and subtracting integers to generalize personal strategies for adding and subtracting integers. g. Solve problems involving the addition and subtraction of integers.

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

Patterns and Relations Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
Logical Thinking *Number Sense* *Spatial Sense* *Mathematical Attitude*	P7.1 Demonstrate an understanding of the relationships between oral and written patterns, graphs and linear relations. [C, CN, R]	a. Represent a relationship found within an oral or written pattern using a linear relation. b. Analyse whether an oral or written pattern is linear in nature. c. Provide a context for a linear relation. d. Identify a pattern from the environment that is linear in nature and write a linear relation to describe the pattern. e. Identify assumptions made when writing a linear relation for a pattern. f. Create a table of values for a linear relation by evaluating the relation for different variable values. g. Create a table of values using a linear relation and graph the table of values (limited to discrete points). h. Sketch the graph from a table of values created for a linear relation and describe the patterns found in the graph. i. Describe the relationship shown on a graph using everyday language in spoken or written form. j. Analyze a graph in order to draw a conclusion or solve a problem. k. Match a set of linear relations to a set of graphs and explain the strategies used. l. Match a set of graphs to a set of linear relations and justify the selections made. m. Describe a situation which could result in a graph similar to one that is shown.

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

Patterns and Relations Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
Logical Thinking *Number Sense* *Spatial Sense* *Mathematical Attitude*	P7.2 Demonstrate an understanding of equations and expressions by: • distinguishing between equations and expressions • evaluating expressions • verifying solutions to equations. [C, CN, ME]	a. Explain what a variable is and how it is used in an expression. b. Provide an example of an expression and an equation, and explain how they are similar and different. c. Explain how to evaluate an expression and how that result is different from a solution to an equation. d. Verify a possible solution to a linear equation using substitution and explain the result.
Logical Thinking *Mathematical Attitude* *Number Sense* *Spatial Sense*	P7.3 Demonstrate an understanding of one- and two-step linear equations of the form $\frac{ax}{b}+c=d$ (where *a, b, c, and d are whole numbers, $c \leq d$* and $b \neq 0$) by modeling the solution of the equations concretely, pictorially, physically, and symbolically and explaining the solution in terms of the preservation of equality. [C, CN, PS, R, V]	a. Model the preservation of equality for each of the four operations using concrete materials or using pictorial representations, explain the process orally and record it symbolically. b. Generalize strategies for carrying out operations that involve the use of the preservation of equality. c. Solve an equation by applying the preservation of equality. d. Identify and provide an example of a constant term, a numerical coefficient, and a variable in an expression and an equation. e. Represent a problem with a linear equation and solve the equation using concrete models, (e.g., counters, integer tiles) and record the process symbolically. f. Draw a representation of the steps used to solve a linear equation. g. Verify the solution to a linear equation using concrete materials or diagrams.

Patterns and Relations Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	P7.3 continued	h. Explain what the solution for a linear equation means. i. Represent a problem situation using a linear equation. j. Solve a problem using a linear equation.
Logical Thinking *Mathematical Attitude* *Number Sense* *Spatial Sense*	P7.4 Demonstrate an understanding of linear equations of the form $x+a=b$ (where *a* and *b* are integers) by modeling problems as a linear equation and solving the problems concretely, pictorially, and symbolically. [C, CN, PS, R, V]	a. Represent a problem with a linear equation of the form $x+a=b$ where *a* and *b* are integers and solve the equation using concrete models (e.g., counters, integer tiles) and record the process symbolically. b. Verify a solution to a problem involving a linear equation of the form $x+a=b$ where *a* and *b* are integers.

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

Shape and Space Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
Logical Thinking *Mathematical Attitude* *Spatial Sense* *Number Sense*	SS7.1 Demonstrate an understanding of circles including circumference and central angles. [C, CN, R, V]	a. Identify the characteristics of a circle. b. Define and illustrate the relationship between the diameter and radius of a circle. c. Answer the question "how many radii does a circle have and why?" d. Answer the question "how many diameters does a circle have and why?" e. Explain (with illustrations) why a specified point and radius length (or diameter length) describes exactly one circle. f. Illustrate and explain the relationship between a radius and a diameter of a circle. g. Generalize, from investigations, the relationship between the circumference and the diameter of a circle. h. Define pi (π) and explain how it is related to circles. i. Sort a set of angles as central angles of a circle or not. j. Demonstrate that the sum of the central angles of a circle is 360°. k. Draw a circle with a specific radius or diameter with and without a compass. l. Solve problems involving circles.
Logical Thinking *Mathematical Attitude* *Spatial Sense* *Number Sense*	SS7.2 Develop and apply formulas for determining the area of: • triangles • parallelograms • circles. [CN, PS, R, V]	a. Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle. b. Generalize, using examples, a formula for determining the area of triangles. c. Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.

Shape and Space Strand

Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	SS7.2 continued	d. Generalize, using examples, a formula for determining the area of parallelograms. e. Illustrate and explain how to estimate the area of a circle without the use of a formula. f. Illustrate and explain how the area of a circle can be approximated by the circumference of the circle times its radius. g. Generalize a formula for finding the area of a circle. h. Solve problems involving the area of triangles, parallelograms, or circles.
Spatial Sense *Logical Thinking* *Mathematical Attitude* *Number Sense*	SS7.3 Demonstrate an understanding of 2-D relationships involving lines and angles. [CN, R, V, T]	a. Identify and describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors, and angle bisectors in the environment. b. Identify, with justification, line segments on a diagram that are parallel or perpendicular. c. Investigate and explain how paper, pencil, compass, and rulers can be used to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors. d. Investigate how paper folding can be used to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors. e. Use technology to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors. f. Draw a line segment perpendicular to another line segment and explain why they are perpendicular. g. Draw a line segment parallel to another line segment and explain why they are parallel. h. Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

Shape and Space Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	SS7.3 continued	i. Draw the perpendicular bisector of a line segment using more than one method and verify the construction. j. Use geometric constructions to create a design or picture, and identify the constructions present in the design.
Spatial Sense *Logical Thinking* *Mathematical Attitude* *Number Sense*	SS7.4 Demonstrate an understanding of the Cartesian plane and ordered pairs with integral coordinates. [C, CN, V]	a. Label the axes of a four quadrant Cartesian plane and identify the origin. b. Explain how orientation (the direction in a situation) can influence the labelling of the axes on a Cartesian plane. c. Identify the location of a point in any quadrant of a Cartesian plane using an ordered pair with integral coordinates. d. Plot the point corresponding to an ordered pair with integral coordinates on a Cartesian plane with a scale of 1, 2, 5, or 10 on its axes. e. Draw shapes and designs, using integral ordered pairs, in a Cartesian plane. f. Create shapes and designs, and identify the points used to produce the shapes and designs in any quadrant of a Cartesian plane.
Logical Thinking *Mathematical Attitude* *Spatial Sense* *Number Sense*	SS7.5 Expand and demonstrate an understanding of transformations (translations, rotations, and reflections) of 2-D shapes in all four quadrants of the Cartesian plane. [CN, PS, T, V]	*(It is intended that the original shape and its image have vertices with integral coordinates.)* a. Identify the coordinates of the vertices of a 2-D shape shown on a Cartesian plane. b. Describe the horizontal and vertical movement required to move from one point to another point on a Cartesian plane.

Shape and Space Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators* ***may*** *be used to determine whether students have met the corresponding outcome.)*
	SS7.5 continued	c. Describe the positional change of the vertices of a 2-D shape to the corresponding vertices of its image as a result of a transformation or successive transformations on a Cartesian plane. d. Determine the distance between points along horizontal and vertical lines in a Cartesian plane. e. Perform a transformation or consecutive transformations on a 2-D shape and identify coordinates of the vertices of the image. f. Describe the positional change of the vertices of a 2-D shape to the corresponding vertices of its image as a result of a transformation or a combination of successive transformations. g. Describe the image resulting from the transformation of a 2-D shape on a Cartesian plane by identifying the coordinates of the vertices of the image.

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

Statistics and Probability Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators* ***may*** *be used to determine whether students have met the corresponding outcome.)*
Number Sense *Spatial Sense* *Logical Thinking* *Mathematical Attitude*	SP7.1 Demonstrate an understanding of the measures of central tendency and range for sets of data. [C, CN, PS, R, T]	a. Concretely represent mean, median, and mode and explain the similarities and differences among them. b. Determine mean, median, and mode for a set of data, and explain why these values may be the same or different. c. Determine the range of a set of data. d. Provide a context in which the mean, median, or mode is the most appropriate measure of central tendency to use when reporting findings and explain the choice. e. Solve a problem involving the measures of central tendency. f. Analyze a set of data to identify any outliers. g. Explain the effect of outliers on the measures of central tendency for a data set. h. Identify outliers in a set of data and justify whether or not they should be included in the reporting of the measures of central tendency. i. Provide examples of situations in which outliers would and would not be used in reporting the measures of central tendency. j. Explain why qualitative data, such as colour or favourite activity, cannot be analyzed for all three measures of central tendency.

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

Statistics and Probability Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
Spatial Sense *Number Sense* *Logical Thinking* *Mathematical Attitude*	SP7.2 Demonstrate an understanding of circle graphs. [C, CN, PS, R, T, V]	a. Identify common attributes of circle graphs, such as: ➢ title, label, or legend ➢ the sum of the central angles is 360° ➢ the data is reported as a percent of the total and the sum of the percents is equal to 100%. b. Create and label a circle graph, with and without technology, to display a set of data. c. Find, describe, and compare circle graphs in a variety of print and electronic media such as newspapers, magazines, and the Internet. d. Translate percents displayed in a circle graph into quantities to solve a problem. e. Interpret a circle graph to answer questions. f. Identify the characteristics of a set of data that make it possible to create a circle graph.
Number Sense *Logical Thinking* *Mathematical Attitude*	SP7.3 Demonstrate an understanding of theoretical and experimental probabilities for two independent events where the combined sample space has 36 or fewer elements. [C, ME, PS R, T]	a. Explain what a probability tells about the situation to which it refers. b. Provide an example of two independent events, such as: ➢ spinning a four section spinner and an eight-sided die ➢ tossing a coin and rolling a twelve-sided die ➢ tossing two coins ➢ rolling two dice and explain why they are independent.

Statistics and Probability Strand		
Goals	**Outcomes** *Students will:*	**Indicators** *(The following indicators **may** be used to determine whether students have met the corresponding outcome.)*
	SP7.3 continued	c. Identify the sample space (all possible outcomes) for each of two independent events using a tree diagram, table, or another graphic organizer. d. Determine the theoretical probability of an outcome involving two independent events. e. Conduct a probability experiment for an outcome involving two independent events, with and without technology, to compare the experimental probability to the theoretical probability. f. Solve a probability problem involving two independent events. g. Explain how theoretical and experimental probabilities are related and why they cannot be assumed to be equal. h. Represent a probability stated as a percent as a fraction or a decimal. i. Represent a probability stated as a fraction or decimal as a percent.

Appendix A: Terminology

Benchmarks: Numeric quantities used to compare and order other numeric quantities. For example, multiples of powers of 10 might be used as benchmarks for whole numbers, or 0, 1, and ½ might be used as benchmarks for fractions between 0 and 1.

Carroll Diagram: A table used for organizing and highlighting relationships between characteristics of elements in a data set. Each characteristic is broken into yes/no descriptors or into independent categories. The Carroll diagram shows all possible ways to match the different categories between the characteristics. For example, the following Carroll diagram represents information about a classroom in terms of girls and boys with shoes or sandals:

	Factor of 4	Factor of 6
36	Yes	Yes
42	No	Yes

These diagrams can be used to analyze a situation according to one characteristic, one category, or a combination of both.

Front-end Estimation: A process of finding approximate values for computations by considering rounded or sometimes truncated values (e.g., 34 + 72 is approximately equal to 30 + 70 = 100 by front-end estimation).

Graphic Organizer: Any pictorial representation used to show relationships between data, information, and/or understandings. Some examples are Venn diagrams, tree diagrams, concept webs, and Carroll diagrams.

Independent Events: Two or more occurrences of an event that do not influence each other.

Number Line: Because grade seven students have had very little experience with scale or ratio and proportion, number lines should reflect relative positioning rather than scaled points. In some resources, the use of a number line that indicates the relationship between numbers but not the ratio of quantity is called an *Empty Number Line*.

Outlier: A piece of data that lies outside of the normal dispersion of the data in the set.

Personal Strategies: Personal strategies are strategies that the students have constructed and understand. Outcomes and indicators that specify the use of personal strategies convey the message that there is not a single procedure or algorithm that is correct. Students should be encouraged to explore, share, and make decisions about what strategies to use in different contexts. Development of personal strategies is an indicator of the attainment of a deeper understanding.

Preservation of Equality: A mathematical concept that allows for manipulation and alternate representations by ensuring that the new expression and/or equation meaning is maintained. In expressions, preservation of equality involves the application of an operation and its inverse to the expression (e.g., adding 3 and subtracting 3, or multiplying by 2 and dividing by 2 preserves equality). In equations, equality can be preserved by applying an operation and its inverse to one side of the equation (each of which is an expression) or by applying the same operation to both sides of the equation.

Record the Process Symbolically: It is important that as students explore and represent mathematical concepts concretely, physically, and pictorially that, at each stage, students be required to reflect upon what it would look like symbolically. For example, if the student shows adding ten blocks to both sides of a balance, students should also be writing the corresponding equation (after a few experiences with just working with the blocks) in symbolic form (e.g., students might write $x - 10 \mathbf{+ 10} = 3 \mathbf{+ 10}$). By writing their process symbolically, the students are engaged in making sense of the processes of abstraction which are foundational to mathematical theory and its development.

Representation: Mathematical ideas can be represented and manipulated in a variety of formats including: concrete manipulatives, pictorial designs, physical movements, oral or written description, and symbolic notation. Students need to have experiences in working with many different types of representations, and in transferring and translating knowledge between the different forms of representations.

Appendix B: Three Grades at a Glance

The chart below shows the outcomes for mathematics in grades 6, 7, and 8 in each of the four strands with the outcomes being lined up to show the flow of content development.

<table>
<tr><th colspan="3">Number Strand</th></tr>
<tr><th>Grade 6 (Draft)</th><th>Grade 7</th><th>Grade 8 (Draft)</th></tr>
<tr><th colspan="3">Whole and Decimal Numbers</th></tr>
<tr><td>Demonstrate an understanding of place value for numbers:
• greater than one million
• less than one thousandth.
[C, CN, R, T]

Solve problems involving large numbers, using technology.
[ME, PS, T]

Demonstrate an understanding of factors and multiples by:
• determining multiples and factors of numbers less than 100
• identifying prime and composite numbers
• solving problems involving multiples.
[PS, R, V]</td><td>N7.1 Demonstrate an understanding of division through the development and application of divisibility strategies for 2, 3, 4, 5, 6, 8, 9, and 10, and through an analysis of division involving zero.
[C, CN, ME, R]

N7.2 Expand and demonstrate understanding of the addition, subtraction, multiplication, and division of decimals to greater numbers of decimal places, and the order of operations.
[C, CN, ME, PS, R, T]</td><td></td></tr>
<tr><th colspan="3">Square Roots</th></tr>
<tr><td></td><td></td><td>Demonstrate an understanding of perfect squares and square roots, concretely, pictorially, and symbolically (limited to whole numbers).
[C, CN, R, V]

Determine the approximate square root of numbers that are not perfect squares (limited to whole numbers).
[C, CN, ME, R, T]</td></tr>
</table>

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

Number Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Relating Whole Numbers, Fractions, and Decimals		
	N7.3 Demonstrate an understanding of the relationships between positive decimals, positive fractions (including mixed numbers, proper fractions, and improper fractions), and whole numbers. [C, CN, R, T]	
Percent		
Demonstrate an understanding of percent (limited to whole numbers), concretely, pictorially, and symbolically. [C, CN, PS, R, V]	N7.4 Expand and demonstrate an understanding of percent to include fractional percents between 1% and 100%. [C, PS, R]	Demonstrate an understanding of percents greater than or equal to 0%. [CN, PS, R, V]
Integers and Operations on Integers		
Demonstrate an understanding of integers, concretely, pictorially and symbolically. [C, CN, R, V]	N7.6 Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially, and symbolically. [C, CN, PS, R, V]	Demonstrate an understanding of multiplication and division of integers, concretely, pictorially, and symbolically. [C, CN, PS, R,]
Fractions		
Relate improper fractions to mixed numbers. [CN, ME, R, V]	N7.5 Develop and demonstrate an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially and symbolically (limited to positive sums and differences). [C, CN, ME, PS, R, V]	Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically. [C, CN, ME, PS]

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

Number Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Ratio, Rate and Proportional Reasoning		
Demonstrate an understanding of ratio, concretely, pictorially, and symbolically. [C, CN, PS, R, V]		Demonstrate an understanding of ratio and rate. [C, CN, V] Solve problems that involve rates, ratios, and proportional reasoning. [C, CN, PS, R]

Patterns and Relations Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Relationships in Tables and Graphs		
Demonstrate an understanding of the relationship within tables of values to solve problems. [C, CN, PS, R] Represent and describe patterns and relationships using graphs and tables. [C, CN, ME, PS, R, V]	P7.1 Demonstrate an understanding of the relationships between oral and written patterns, graphs and linear relations.	
Linear Relations		
		Graph and analyze two variable linear relations. [C, ME, PS, R, T,V]
Expressions and Equations		
	P7.2 Demonstrate an understanding of equations and expressions by: • distinguishing between equations and expressions • evaluating expressions • verifying solutions to equations.	

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

Patterns and Relations Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Equality		
Demonstrate and explain the meaning of preservation of equality concretely, pictorially, and symbolically. [C, CN, PS, R, V]		
Linear Equations		
Represent generalizations arising from number relationships using equations with letter variables. [C, CN, PS, R, V]	P7.3 Demonstrate an understanding of one- and two-step linear equations of the form $\frac{ax}{b}+c=d$ (where *a, b, c, and d are whole numbers,* $c \leq d$ and $b \neq 0$) by modeling the solution of the equations concretely, pictorially, physically, and symbolically and explaining the solution in terms of the preservation of equality. P7.4 Demonstrate an understanding of linear equations of the form $x+a=b$ (where *a* and *b* are integers) by modeling problems as a linear equation and solving the problems concretely, pictorially, and symbolically.	Model and solve problems using linear equations of the form: • $ax=b$ • $\frac{x}{a}=b, a \neq 0$ • $ax+b=c$ • $\frac{x}{a}+b=c, a \neq 0$ • $a(x+b)=c$ concretely, pictorially and symbolically, where a, b, and c are integers. [C, CN, PS, V]

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

Shape and Space Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Angles		
Demonstrate an understanding of angles by: • identifying examples of angles in the environment • classifying angles according to their measure • estimating the measure of angles using 45°, 90°, and 180° as reference angles • determining angle measures in degrees • drawing and labelling angles when the measure is specified. [C, CN, ME, V] Demonstrate that the sum of interior angles is: • 180° in a triangle • 360° in a quadrilateral. [C, R]		
Circles		
	SS7.1 Demonstrate an understanding of circles including circumference and central angles. [C, CN, R, V]	

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

Shape and Space Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Perimeter, Area, Surface Area and Volume Formulas		
Develop and apply a formula for determining the: • perimeter of polygons • area of rectangles • volume of right rectangular prisms. [C, CN, PS, R, V]	SS7.2 Develop and apply formulas for determining the area of: • triangles • parallelograms • circles. [CN, PS, R, V]	Determine the surface area of: • right rectangular prisms • right triangular prisms • right cylinders to solve problems. [C, CN, PS, R, V] Develop and apply formulas for determining the volume of right prisms and right cylinders. [C, CN, PS, R, V]
Pythagorean Theorem		
		Develop and apply the Pythagorean theorem to solve problems. [CN, PS, R, V, T]
3-D Objects		
		Draw and construct nets for 3-D objects. [C, CN, PS, V] Draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms. [C, CN, R, T, V]

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

Shape and Space Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
2-D Shapes		
Construct and compare triangles, including: • scalene • isosceles • equilateral • right • obtuse • acute in different orientations. [C, PS, R, V] Describe and compare the sides and angles of regular and irregular polygons. [C, PS, R, V]	SS7.3 Demonstrate an understanding of 2-D relationships involving lines and angles. [CN, R, V, T]	
Cartesian Plane		
Identify and plot points in the first quadrant of a Cartesian plane using whole number ordered pairs. [C, CN, V]	SS7.4 Demonstrate an understanding of the Cartesian plane and ordered pairs with integral coordinates. [C, CN, V]	

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

Shape and Space Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Transformations and Tessellations		
Perform a combination of translation(s), rotation(s), and/or reflection(s) on a single 2-D shape, with and without technology, and draw and describe the image. [C, CN, PS, T, V] Perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations. [C, CN, T, V] Perform and describe single transformations of a 2-D shape in the first quadrant of a Cartesian plane (limited to whole number vertices). [C, CN, PS, T, V]	SS7.5 Expand and demonstrate an understanding of transformations (translations, rotations, and reflections) of 2-D shapes in all four quadrants of the Cartesian plane. [CN, PS, T, V]	Demonstrate an understanding of tessellations by: • explaining the properties of shapes that make tessellating possible • creating tessellations • identifying tessellations in the environment. [C, CN, PS, T, V]

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

Statistics and Probability Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Central Tendency		
	SP7.1 Demonstrate an understanding of the measure of central tendency and range for sets of data. [C, CN, PS, R, T]	
Graphing Data		
Create, label, and interpret line graphs to draw conclusions. [C, CN, PS, R, V] Graph collected data and analyze the graph to solve problems. [C, CN, PS]	SP7.2 Demonstrate an understanding of circle graphs. [C, CN, PS, R, T, V]	Critique ways in which data are presented. [C, R, T, V]
Data Collection		
Select, justify, and use appropriate methods of collecting data, including: • questionnaires • experiments • databases • electronic media. [C, PS, T]		

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

Statistics and Probability Strand		
Grade 6 *(Draft)*	**Grade 7**	**Grade 8 *(Draft)***
Probability		
Demonstrate an understanding of probability by: • identifying all possible outcomes of a probability experiment • differentiating between experimental and theoretical probability • determining the theoretical probability of outcomes in a probability experiment • determining the experimental probability of outcomes in a probability experiment • comparing experimental results with the theoretical probability for an experiment. [C, ME, PS, T]		
Probability of Independent Events		
	SP7.3 Demonstrate an understanding of theoretical and experimental probabilities for two independent events where the combined sample space has 36 or fewer elements. [C, ME, PS R, T]	Solve problems involving the probability of independent events. [C, CN, PS, T]

References

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Sullivan, P. (2002). *Good questions for math teaching: Why ask them and what to ask, K-6*. Sausalito, CA: Math Solutions Publications.

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