ELEMENTARY PROGRAM

Math Alignment Project

Kindergarten – Grade 8

Revised May 2010

Based on: The Ontario Curriculum Grades 1-8: Mathematics Revised, 2005
Kindergarten Program Documents, Revised 2006

Writing Team

Ann Boyd - Instructional Coach
Annette Blake - Teacher Consultant
Heather Furtney - Instructional Coach
Michelle Black - Teacher Consultant
Nancy Norton - Elementary Program Coordinator
William Valoppi - Principal Leader

With Thanks to:

Cam MacDonald - Math Coach
Chris Lambert- Program Secretary
Sarah Drewanz – Program Secretary
Sally Landon - System Research Leader
Adrienne Patterson – Teacher Consultant
Stacey Nicholls - Teacher
Sue Young - Teacher Consultant
Hamilton Wentworth DSB
Bellview PS (Pilot School)
Central PS (Pilot School)
Graham Bell-Victoria P (Pilot School)
Grandview PS (Pilot School)
King George PS (Pilot School)
Major Ballachey PS (Pilot School)
Prince Charles PS (Pilot School)
Princess Elizabeth PS (Pilot School)
Woodman – Echo PS (Pilot School)

Purpose

The Math Alignment Project (MAP) curriculum framework document has two main components:

1) Curriculum Framework Document / Scope and Sequence
2) Home Support Communication Calendars

The Mathematics Alignment Project (MAP) curriculum framework document is intended to guide classroom teachers in the planning, implementation and reporting of their mathematics program. The MAP curriculum framework document is based on the Mathematics Ontario Curriculum Grades 1-8, 2005 and the Kindergarten Program, 2006.

The MAP curriculum framework aligns the Overall Expectations to be addressed by term and allows for a consistent approach to the instruction of mathematics in Grand Erie. The document highlights Tools and Manipulatives that will support each strand, as well as provides suggestions for learning opportunities and connections to available resources. This MAP curriculum framework document is designed to have all curriculum expectations addressed by early June to align with reporting dates, however, the intent is that mathematics instruction in June will address the greatest needs of the students as indicated by student achievement throughout the year. In order to best support combined grades the same Overall Expectations are addressed in the same term across several grade levels (where possible).

Differentiated Instruction is the foundation for teaching. **Teachers must use their professional judgment to determine the starting point for instruction based on student need,** since important factors such as developmental needs of their students, background knowledge, split-grade considerations, school based initiatives, and resources could not be considered in the development of the MAP curriculum framework document.

The Home Support Communication Calendars provide suggestions of activities and conversations students can engage in at home that will support the delivery of the Mathematics Curriculum by term. These calendars are available in a WordPerfect document to allow teachers to enhance or modify the content of the Calendars as they see fit.

The Ministry of Education has produced or supported the production of a variety of resource documents that teachers may find helpful as they plan programs based on the expectations outlined in this curriculum document. Please refer to Page 16 for a list of available resources.

Considerations for Program

Teaching Approaches

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 objective of the learning and the needs of the students.

In order to learn mathematics and to apply their knowledge effectively, students must develop a solid understanding of mathematical concepts. Research and successful classroom practice have shown that an investigative approach, with an emphasis on learning through problem solving and reasoning, best enables students to develop the conceptual foundation they need.

When planning mathematics programs, teachers will provide activities and assignments that encourage students to search for patterns and relationships and engage in logical inquiry.

Teachers need to use rich problems and present situations that provide a variety of opportunities for students to develop mathematical understanding through problem solving.

Please Note: The Overall Expectations have been identified by the first letter of the Strand, for example, the first overall expectation in Number Sense and Numeration is **NV1** (**N**umber sense and numeration o**V**erall expectation **1**), the second overall expectation in Measurement in MV2, etc)

Planning in Mathematics

All learning, especially new learning, should be embedded in well-chosen contexts for learning – that is, contexts that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. Such rich contexts for learning open the door for students to see the connections and key principles of mathematics, such as pattern or relationship. This understanding of key principles will enable and encourage students to use mathematical reasoning throughout their lives.

Although the Overall Expectations are divided into terms, it continues to be best practice to reinforce and consolidate key concepts through the day/term/year.

Effective instructional approaches and learning activities draw on students' prior knowledge, capture their interest, and encourage meaningful practice both inside and outside the classroom. Students' interest will be engaged when they are able to see the connections between the mathematical concepts they are learning and their application in the world around them and in real-life situations.

Students will investigate mathematical concepts using a variety of tools and strategies, both manual and technological. Manipulatives are necessary tools for supporting the effective learning of mathematics by all students. These concrete learning tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. Moreover, using a variety of manipulatives helps deepen and extend students' understanding of mathematical concepts. For example, students who have used only base ten materials to represent two-digit numbers may not have as strong a conceptual understanding of place value as students who have also bundled craft sticks into tens and hundreds and used an abacus.

Manipulatives are also a valuable aid to teachers. By analysing students' concrete representations of mathematical concepts and listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide supports to help enhance their thinking.

Fostering students' communication skills is an important part of the teacher's role in the mathematics classroom. Through skillfully led classroom discussions, students build understanding and consolidate their learning. Discussions provide students with the opportunity to ask questions, make conjectures, share and clarify ideas, suggest and compare strategies, and explain their reasoning. As they discuss ideas with their peers, students learn to discriminate between effective and ineffective strategies for problem solving.

Students' understanding is revealed through both oral communication and writing, but it is not necessary for all mathematics learning to involve a written communication component. **Students need opportunities to focus on their oral communication without the additional responsibility of writing.**

Whether students are talking or writing about their mathematical learning, teachers can prompt them to explain their thinking and the mathematical reasoning behind a solution or the use of a particular strategy by asking the question "How do you know?" Since mathematical reasoning must be the primary focus of students' communication, it is important for teachers to select instructional strategies that elicit mathematical reasoning from their students.

Promoting Positive Attitudes Towards Mathematics

Students' attitudes have a significant effect on how they approach problem solving and how well they succeed in mathematics. Teachers can help students develop the confidence they need by demonstrating a positive disposition towards mathematics. **Students need to understand that, for some mathematics problems, there may be several ways to arrive at the correct answer.**

Teachers can help students understand that problem solving of almost any kind often requires a considerable expenditure of time and energy and a good deal of perseverance. Once students have this understanding, teachers can encourage them to develop the willingness to persist, to investigate, to reason and explore alternative solutions, and to take the risks necessary to become successful problem solvers. **Students need to believe that they are capable of finding solutions.**

Cross-Curricular and Integrated Learning

Mathematics must be taught in an integrated fashion. Although the Mathematics Curriculum is divided into strands, it is imperative that we help students make the connections between the concepts across the different strands.

Research shows that the development of skills and knowledge in mathematics is often enhanced by learning in other strands of mathematics and other subject areas. Teachers should ensure that all students have ample opportunities to explore a subject from multiple perspectives by emphasizing cross-curricular learning and integrated learning, as follows:

a) Integrating expectations between math strands (e.g., providing opportunities for students to approach problems that address multiple strands in mathematics)

b) In cross-curricular learning, students are provided with opportunities to learn and use related content and/or skills in two or more subjects. Students can use the concepts and skills of mathematics in their science or social studies lessons. Similarly, students can use what they have learned in science to illustrate or develop mathematical understanding. For example, in Grade 6, concepts associated with the fulcrum of a lever can be used to develop a better understanding of the impact that changing a set of data can have on the mean.

c) In integrated learning, students are provided with opportunities to work towards meeting expectations from two or more subjects within a single unit, lesson, or activity. By linking expectations from different subject areas, teachers can provide students with multiple opportunities to reinforce and demonstrate their knowledge and skills in a range of settings.

For example, students in Grade 2 could be given the opportunity to relate the study of location and movement in the Geometry and Spatial Sense strand of mathematics to the study of movement in the Structures and Mechanisms strand in science and technology and mapping in Social Studies. Similarly, the same students could link their study of the characteristics of symmetrical shapes in Visual Arts to the creation of symmetrical shapes in their work in Geometry and Spatial Sense.

Reporting

The Math Alignment curriculum framework has been aligned to the reporting dates outlined in the Growing Success – 1 -12 Assessment, Evaluation and Report Policy Document.

The curriculum framework 'Scope and Sequence' for Grades 1-8 has been divided into three sections:

1a) Fall Progress Report (September – November)
1b) Term 1 (September – end of January)
2) Term 2 (February – June)

It is expected that teachers will comment on student progress with respect to expectations outlined in the Fall (September – November) section during the Fall Progress Report, but that all expectations addressed during Term 1 (September – end of January) will formally be reported on the Term 1 Report Card. All expectations addressed during Term 2 will be formally reported on the Term 2 Report Card.

******Please note, if reporting timelines require teachers to finalize Term 1 Report Cards before all expectations to be addressed in Term 1 have been evaluated, then the remaining expectations must be reported on during Term 2. This may result in some of the expectations outlined in the Term 1 Scope and Sequence being reported on during Term 2.

Teachers are expected to follow the guidelines outlined in the Growing Success – 1 -12 Assessment, Evaluation and Report Policy and the GEDSB Report Card Directions.

The Mathematical Processes	
The mathematical processes are a set of seven interconnected expectations that describe the processes through which students acquire and apply mathematical knowledge and skills.	
Problem Solving	Problem solving forms the basis of effective mathematics programs and should be the mainstay of mathematical instruction. ▪ Students learn to solve problems and learn *through* problem solving. ▪ Students are given numerous opportunities to connect mathematical ideas and to develop conceptual understanding. *See Problem-Solving Model
Reasoning and Proving	The reasoning process supports a deeper understanding of mathematics by enabling students to make sense of the mathematics they are learning. ▪ Students will learn by exploring phenomena, developing ideas, making mathematical conjectures, and justifying results. ▪ Students will reason from the evidence they find in their explorations and investigations or from what they already know to be true. ▪ Students will recognize the characteristics of an acceptable argument in the mathematics classroom.
Reflecting	Reflecting on their own thinking and the thinking of others helps students make important connections and internalize a deeper understanding of the mathematical concepts involved. ▪ Students will learn by regularly and consciously reflecting on and monitoring their own thought processes. ▪ Students will reflect on alternative ways to perform a task and on the reasonableness of an answer.
Selecting Tools and Computational Strategies	Students need to develop the ability to select the appropriate electronic tools, manipulatives, and computational strategies to perform particular mathematical tasks, to investigate mathematical ideas, and to solve problems.
Connecting	Students need to have experiences that allow them to make connections between concepts and skills from one strand of mathematics to another to understand how the procedures, concepts and skills are related. ▪ Students will begin to see that mathematics is more than a series of isolated skills and concepts. ▪ Students will understand they can use their learning in one area of mathematics to understand another. ▪ Students will make connections between the mathematics they learn at school and its applications in their everyday lives.
Representing	Students represent mathematical ideas and relationships and model situations using concrete materials, pictures, diagrams, graphs, tables, numbers, words, and symbols. Learning the various forms of representation helps students to understand mathematical concepts and relationships; communicate their thinking, arguments, and understandings; recognize connections among related mathematical concepts; and use mathematics to model and interpret realistic problem situations. ▪ Students will recognize the connections between representations, and use the different representations appropriately and as needed to solve problems.
Communicating	Communication is the process of expressing mathematical ideas and understanding orally, visually, and in writing, using numbers, symbols, pictures, graphs, diagrams, and words. ▪ Students will provide effective explanations (e.g., apply correct mathematical notation in the development and presentation of mathematical ideas and solutions).

A Problem-Solving Model

The most commonly used problem-solving model is George Polya's four-step model: understand the problem; make a plan; carry out the plan; and look back to check the results. (These four steps are now reflected in the Thinking category of the achievement chart first published in Polya's How to Solve It, 1945). Below is a modified GEDSB version, which separates Step 1 into two distinct steps.

Given: Understand the Information Given in the Problem
- reread and restate the problem

Required: Understand the Requirements of the Problem
- identify the information given and the information that needs to be determined to help solve the problem

Application: Make a Plan
- relate the problem to similar problems solved in the past
- consider possible strategies
- select a strategy or a combination of strategies
- revise or apply different strategies as necessary

Solution: Carry Out the Plan
- execute the chosen strategy
- do the necessary calculations
- monitor success
- revise or apply different strategies as necessary

Statement/Reflection Look Back at the Solution
- check the reasonableness of the answer
- review the method used: Did it make sense? Is there a better way to approach the problem?
- consider extensions or variations

Please note: The five-step model is generally not taught directly before Grade 3, because young students tend to become too focused on the model and pay less attention to the mathematical concepts involved and to making sense of the problem – however, Kindergarten- Grade 2 teachers are encouraged to introduce this model orally and through modeled experiences as appropriate.

Number Sense & Numeration

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Quantity Relationships	demonstrate an understanding of number, using concrete materials to explore and investigate counting, quantity, and number relationships	Read, represent, compare, and order whole numbers to 50, and use concrete materials to investigate fractions and money amounts	Read, represent, compare and order whole number to 100 and use concrete materials to represent fractions and money amounts to 100 cents	Read, represent, compare, and order whole numbers to 1000 and use concrete materials to represent fractions and money amounts to $10	Read, represent, compare and order whole number to 10,000, decimal numbers to tenths, and simple fractions, and represent money amounts to $100	Read, represent, compare and order whole numbers to 100,000, decimal numbers to hundredths, proper and improper fractions, and mixed numbers	Read, represent, compare, and order whole numbers to 1,000, 000, decimal numbers to thousandths, proper and improper fractions and mixed numbers	Represent, compare and order numbers, including integers	Represent, compare, and order equivalent representations of numbers including those involving positive exponents
Operational Sense	Demonstrate an understanding of number, using concrete materials to explore and investigate counting, quantity, and number relationships	Solve problems involving the addition and subtraction of single digit whole numbers, using a variety of strategies	Solve problems involving the addition and subtraction of one and two digit whole numbers using a variety of strategies, and investigate multiplication and division	Solve problems involving the addition and subtraction of single and multi-digit whole numbers using a variety of strategies, and demonstrate an understanding of multiplication and division	Solve problems involving the addition, subtraction, multiplication, and division of single and multi digit whole numbers, and involving the addition and subtraction of decimal numbers to tenths and money amounts, using a variety of strategies	Solve problems involving the multiplication and division of multi digit whole numbers, and involving the addition and subtraction of decimal numbers to hundredths using a variety of strategies	Solve problems involving the multiplication and division of whole numbers, and the addition and subtraction of decimal numbers to thousandths using a variety of strategies	Demonstrate an understanding of addition and subtraction of fractions and integers, and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers	Solve problems involving whole numbers, decimal numbers, fractions and integers using a variety of computational strategies
Counting	Demonstrate an understanding of number, using concrete materials to explore and investigate counting	Demonstrate an understanding of magnitude by counting forward to 100 and backwards from 20	Demonstrate an understanding of magnitude by counting forward to 200 and backwards from 50 using multiples of various numbers as starting points	Demonstrate an understanding of magnitude by counting forward and backwards by various numbers and from various starting points	Demonstrate an understanding of magnitude by counting forward and backwards by 0, 1 and by fractional amounts	Demonstrate an understanding of magnitude by counting forward and backwards by 0.01			
Proportional Relationships					Demonstrate an understanding of proportional reasoning by investigating whole number unit rates	Demonstrate an understanding of proportional reasoning by investigating whole number rates	Demonstrate an understanding of relationships involving percent, ratio, and unit rate	Demonstrate an understanding of proportional relationships using percent, ratio, and rate	Solve problems by using proportional reasoning in a variety of meaningful contexts

Geometry and Spatial Sense

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Properties of Two-Dimensional Shapes and Three-Dimensional Figures	Describe, sort, classify, and compare two-dimensional shapes and three-dimensional figures	Identify common two-dimensional shapes and three-dimensional figures and sort and classify them by their attributes	Identify two-dimensional shapes and three-dimensional figures and sort and classify them by their geometric properties	Compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties	Identify quadrilaterals and three-dimensional figures and classify them by their geometric properties, and compare various angles to benchmarks	Identify and classify two-dimensional shapes by side and angle properties, and compare and sort three-dimensional figures	Classify and construct polygons and angles	Construct related lines, and classify triangles, quadrilaterals and prisms	Demonstrate an understanding of the geometric properties of quadrilaterals and circles and the application of geometric properties in the real world
Geometric Relationships	Describe, sort, classify, and compare two-dimensional shapes and three-dimensional figures	Compose and decompose common two-dimensional figures	Compose and decompose two-dimensional shapes and three-dimensional figures	Describe relationships between two-dimensional shapes, and three-dimensional figures	Construct three-dimensional figures using two-dimensional shapes	Identify and construct nets of prisms and pyramids	Sketch three-dimensional figures, and construct three-dimensional figures from drawings	Develop an understanding of similarity, and distinguish similarity and congruence	Develop geometric relationships involving lines, triangles, and polyhedra, and solve problems involving lines and triangles
Location and Movement	Describe the location and movement of objects through investigation	Describe the relative location of objects using positional language	Describe and represent the relative locations of objects, and represent objects on a map	Identify and describe the locations and movements of shapes and objects	Identify and describe the location of an object, using a grid map, and reflect two-dimensional shapes	Identify and describe the location of an object, using the cardinal directions, and translate two-dimensional shapes	Describe the location in the first quadrant of a coordinate system and rotate two-dimensional shapes	Describe location in the four quadrants of a coordinate system, dilatate two-dimensional shapes, and apply transformations to create and analyse designs	Represent transformations using the Cartesian coordinate plane, and make connections between transformations and the real world

Measurement

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Attributes, Units & Measurement Sense	Measure and compare length, mass, capacity, area, temperature of objects/ materials and the passage of time using non-standard units, through free exploration, focused exploration, and guided activity	Estimate, measure and describe length, area, mass, capacity, time and temperature using non-standard units of the same size	Estimate, measure and record length, perimeter, area, mass, capacity, time and temperature using non-standard units and standard units	Estimate, measure and record length, perimeter, area, mass, capacity, time and temperature using standard units	Estimate, measure and record length, perimeter, area, mass, capacity, volume and elapsed time using a variety of strategies	Estimate, measure and record perimeter, area, temperature change, and elapsed time, using a variety of strategies	Estimate, measure and record quantities, using the metric measurement system	Report on research into real-life applications of area measurements	Research, describe, and report on applications of volume and capacity measurement
Measurement Relationships	Measure and compare length, mass, capacity, area, temperature of objects / materials, and the passage of time, using non-standard units, through free exploration, focused exploration, and guided activity	Compare, describe and order objects using attributes measured in non-standard units of same size	Compare, describe and order objects using attributes measured in non-standard units and standard units	Compare, describe and order objects using attributes measured in standard units	Determine the relationships among units and measurable attributes, including the area and perimeter of rectangles	Determine the relationships among units and measurable attributes, including the area of a rectangle and the volume of a rectangular prism	Determine the relationships among units and measurable attributes, including the area of a parallelogram, the area of a triangle, and the volume of a triangular prism	Determine the relationships among units and measurable attributes, including the area of a trapezoid and the volume of a right prism	Determine the relationships among units and measurable attributes, including the area of a circle and volume of a cylinder

Patterning and Algebra

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Patterns and Relationships	Explore, recognize, describe, and create patterns, using a variety of materials in different contexts	Identify, describe, extend and create repeating patterns	Identify, describe, extend and create repeating patterns, growing patterns and shrinking patterns	Describe, extend, and create a variety of numeric patterns and geometric patterns	Describe, extend and create a variety of numeric and geometric patterns, make predictions related to the patterns, and investigate repeating patterns involving reflections	Determine through investigation using a table of values, relationships in growing and shrinking patterns, and investigate repeating patterns involving translations	Describe and represent relationships in growing and shrinking patterns (where the terms are whole numbers) and investigate repeating patterns involving rotations	Represent linear growing patterns (where the terms are whole numbers) using concrete materials, graphs and algebraic expressions	Represent linear growing patterns (where the terms are whole numbers) using graphs, algebraic expressions and equations
Expressions and Equality		Demonstrate an understanding of the concept of equality, using concrete materials and addition and subtraction to 10	Demonstrate an understanding of the concept of equality between pairs of expressions using concrete materials, symbols and addition and subtraction to 18	Demonstrate an understanding of equality between pairs of expressions, using addition and subtraction of one and two digit numbers	Demonstrate an understanding of equality between pairs of expressions, using addition, subtraction and multiplication	Demonstrate through investigation, an understanding of the use of variables in equations.	Use variables in simple algebraic expressions and equations to describe relationships	Model real-life linear relationships graphically and algebraically, and solve simple algebraic equations using a variety of strategies, including inspection and guess and check	Model linear relationships graphically and algebraically, and solve and verify algebraic equations, using a variety of strategies, including inspection, guess and check and using a "balance" model

Data Management and Probability

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Collect and Organize Data	Sort, classify, and display a variety of concrete objects, collect data, begin to read and describe displays of data, and begin to explore the concept of probability in everyday contexts	Collect and organize categorical primary data and display the data using concrete graphs and pictographs, with regard to the order of labels on the horizontal axis	Collect and organize categorical or discrete primary data and display the data, using tally charts, concrete graphs, pictographs, line plots, simple bar graphs and other graphic organizers, with labels ordered appropriately along horizontal axes, as needed	Collect and organize categorical or discrete primary data and display the data, using charts and graphs, including vertical and horizontal bar graphs, with labels ordered appropriately along the horizontal axes as needed	Collect and organize discrete primary data and display the data using charts and graphs, including stem-and-leaf plots and double bar graphs	Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including broken-line graphs	Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs including continuous line graphs	Collect and organize discrete or continuous primary data and secondary data and display the data using charts and graphs, including relative frequency tables and circle graphs	Collect and organize categorical, discrete or continuous primary data and secondary data and display the data using charts and graphs, including frequency tables with intervals, histograms and scatter plots
Understanding Date	Sort, classify, and display a variety of concrete objects, collect data, begin to read and describe displays of data	Read and describe primary data presented in concrete graphs and pictographs	Read and describe primary data presented in tally charts, concrete graphs, pictographs, line plots, simple bar graphs and other graphic organizers	Read, describe, and interpret primary data presented in charts and graphs, including vertical and horizontal bar graphs	Read, describe and interpret primary data and secondary data presented in charts and graphs, including stem-and-leaf plots and double bar graphs	Read, describe, and interpret primary data and secondary data presented in charts and graphs including broken-line graphs	Read, describe, and interpret data, and explain relationships between sets of data	Make and evaluate convincing arguments, based on the analysis of data	Apply a variety of data management tools and strategies to make convincing arguments about data
Probability	Begin to explore the concept of probability in everyday contexts	Describe the likelihood that everyday events will happen	Describe probability in everyday situations and simple games	Predict and investigate the frequency of a specific outcome in a simple probability experiment	Predict the results of a simple probability experiment, then conduct the experiment and compare the prediction to the results	Represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models	Determine the theoretical probability of an outcome in a probability experiment and use it to predict the frequency of the outcome	Compare experimental probabilities with the theoretical probability of an outcome involving two independent events	Use probability models to make predictions about real-life events.

Ministry Support Material in Numeracy

A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 3:
Number Sense and Numeration, 2003
Geometry and Spatial Sense, 2005
Patterning and Algebra, 2007
Data Management and Probability, 2007
Measurement, 2007

A Guide to Effective Instruction in Mathematics, Grades 4 to 6
Number Sense and Numeration, 2008
- Volume 1 The Big Ideas
- Volume 2 Addition and Subtraction
- Volume 3 Multiplication
- Volume 4 Division
- Volume 5 Fractions
- Volume 6 Decimal Numbers

Geometry and Spatial Sense, 2008
Patterning and Algebra, 2008
Data Management and Probability, 2008
Measurement, 2008

A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 6
- Volume 1 Foundations of Mathematics Instruction
- Volume 2 Problem Solving and Communication
- Volume 3 Classroom Resources and Management
- Volume 4 Assessment and Home Connections
- Volume 5 Teaching Basic Facts and Multidigit Computations

TIPS4RM- Grades 7-8

GEDSB Support Material - *Professional Reading*

Elementary & Middle School Mathematics By: John A. Vandewalle
About Teaching Mathematics By: Marilyn Burns
50 Problem Solving Lessons By: Marilyn Burns
Writing In Math Class By: Marilyn Burns
Using Math Talk to Help Students Learn By: Suzanne H. Chapin
Mathematics Every Elementary Teacher Should Know K-8 By: Derek Haylock and Douglas McDougall

Math Alignment Project

Scope & Sequence

Grade 7

Based on: The Ontario Curriculum Grades 1-8: Mathematics Revised, 2005
Kindergarten Program Documents, Revised 2006

GEDSB is committed to the use of TIPS4RM.
Please refer to theTIPS4RM Resource for planning and implementing mathematics instruction.

Math Alignment Project
Grade 7 Overview

	September to November (Fall Progress Report)	November to end of January	February to Early June
	Term 1 Report (end of January)		Term 2 Report (June)
Number Sense and Numeration	**Quantity Relationships** ▪ Whole numbers and decimals numbers ▪ Perfect squares and perfect roots **Operational Sense** ▪ Addition and subtraction o Whole numbers o Decimal numbers o Order of operation ▪ Multiplication and division o Whole numbers o Decimals numbers (to thousandths by one-digit whole numbers) o Order of operations	**Quantity Relationships** ▪ Integers **Operational Sense** ▪ Additional and subtraction o Integers	**Quantity Relationships** ▪fractions ▪appropriate quantity representation **Operational Sense** ▪ addition and subtraction o fractions with like and unlike denominators ▪ multiplication and repeated addition o fractions **Proportional Relationships** ▪ Percent, ration and unit rate Whole numbers, fractions, decimals
Measurement	**Please note that expectations (or portions of expectations) in *italics* are addressed during another term**	**Attributes, Units, and Measurement Sense** ▪ area (real life situations) **Measurement Relationships** ▪ metric conversions o mm and cm, g and kg, ml and L o area ▪ area o composite 2-D shapes o formula of a trapezoid	**Measurement Relationships** ▪ sketch polygonal prisms ▪ volume oformula of a right prism ▪ surface area o right prism

Math Alignment Project
Grade 7 Overview

	September to November	November to end of January	February to Early June
	Term 1 Report (end of January)		Term 2 Report (June)
Geometry and Spatial Sense		**Geometric Properties** ▪ construct related lines ▪ triangles and quadrilaterals o sort and classify: symmetry, angles, sides ▪ construct bisectors(angle and perpendicular **Geometric Relationships** ▪ unique triangles (minimum side/angle information) ▪ relationships (area, perimeter, side lengths, angles) ▪ similarity and congruence	**Location and Movement** ▪ Cartesian coordinate plane ▪ Dilations transformations **Geometric Properties** ▪ Prisms o Angles between faces o Right prisms
Patterning and Algebra	**Patterns and Relationships** ▪ Linear growing patterns o Whole numbers o Concrete materials, graphs, algebraic expressions	**Variables, Expressions and Equations** ▪ Linear relationships (graphically and algebraically) ▪ Algebraic equations	
Data Management and Probability	**Collection and Organization of Data** ▪ Categorical, discrete and continuous data ▪ Charts and graphs (relative frequency tables, circle graphs) **Data Relationships** ▪ Trends and relationships ▪ Convincing arguments		**Probability** ▪ Experimental verses theoretical probability (two independent events)

Math Alignment Project

STRAND: Number Sense and Numeration — Fall Progress Report (September – November)

Overall Expectation & Big Idea	Specific Expectations
NV1: **Quantity Relationships** represent, compare, and order numbers, *including integers*	▪ represent, compare, and order decimals to hundredths *and fractions*, using a variety of tools ▪ generate multiples and factors, using a variety of tools and strategies ▪ represent perfect squares and square roots, using a variety of tools ▪ explain the relationship between exponential notation and the measurement of area and volume
NV2: **Operational Sense** *demonstrate an understanding of addition and subtraction of fractions and* integers, and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers	▪ use a variety of mental strategies to solve problems involving the addition and subtraction of *fractions and* decimals ▪ solve problems involving the multiplication and division of decimal numbers to thousandths by one-digit whole numbers, using a variety of tools and strategies ▪ solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools and strategies ▪ use estimation when solving problems involving operations with whole numbers, decimals, and percents, to help judge the reasonableness of a solution ▪ evaluate expressions that involve whole numbers and decimals, including expressions that contain brackets, using order of operations

Please note that expectations (or portions of expectations) in *italics* are addressed during another term

Tools and Manipulatives

base ten materials
calculators
concrete materials
connecting cubes
geoboard
grid paper
hundreds chart
number lines

Provide Students with Opportunities to:

-represent, compare, and order decimals to hundredths number lines, Cuisenaire rods, base ten materials, calculators
- identify multiples on a hundreds chart
-use geoboards, connecting cubes, grid paper to represent perfect squares and square roots
- Explain why area is expressed in square units [units^2] and volume is expressed in cubic units [units^3]

Suggested Resources:

Targeted Implementation & Planning Support for Revised Math **(TIPS4RM)**

- Unit 2

Math Makes Sense

Components of:

- Unit 1
- Unit 2
- Unit 4

Math Alignment Project

STRAND: Patterning and Algebra — Fall Progress Report (September – November)

Overall Expectation & Big Idea	Specific Expectations	**Tools and Manipulatives**
PV1: **Patterns and Relationships** represent linear growing patterns (where the terms are whole numbers) using concrete materials, graphs, and algebraic expressions	▪ represent linear growing patterns, using a variety of tools and strategies ▪ make predictions about linear growing patterns, through investigation with concrete materials ▪ develop and represent the general term of a linear growing pattern, using algebraic expressions involving one operation ▪ compare pattern rules that generate a pattern by adding or subtracting a constant, or multiplying or dividing by a constant, to get the next term with pattern rules that use the term number to describe the general term	calculators concrete materials connecting cubes spreadsheets **Provide Students with opportunities to:** -make a table of values using the term number and the term; plot the coordinates on a graph; write a pattern rule using words -write the general term pattern algebraically (e.g., the general term for the sequence 4, 5, 6, 7, ... can be written algebraically as n + 3, for 1, 3, 5, 7, 9, ... the pattern rule is "double the term number and subtract 1", which can be written algebraically as 2 x n – 1) **Suggested Resources:** **TIPS4RM** ▪ Unit 2 **Math Makes Sense** Components of: ▪ Unit 10

Math Alignment Project

STRAND: **Data Management** and Probability — Fall Progress Report (September – November)

Overall Expectation & Big Idea	Specific Expectations
DV1: **Collection and Organization of Data** collect and organize categorical, discrete, or continuous primary data and secondary data and display the data using charts and graphs, including relative frequency tables and circle graphs	▪ collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject and record observations or measurements ▪ collect and organize categorical, discrete, or continuous primary data and secondary data and display the data in charts, tables, and graphs (including relative frequency tables and circle graphs) that have appropriate titles, labels and scales that suit the range and distribution of the data, using a variety of tools ▪ select an appropriate type of graph to represent a set of data, graph the data using technology, and justify the choice of graph ▪ distinguish between a census and a sample from a population ▪ identify bias in data collection methods
DV2: **Data Relationships** make and evaluate convincing arguments, based on the analysis of data	▪ read, interpret, and draw conclusions from primary data and from secondary data presented in charts, tables, and graphs ▪ identify, through investigation, graphs that present data in misleading ways ▪ determine, through investigation, the effect on a measure of central tendency of adding or removing a value or values ▪ identify and describe trends, based on the distribution of the data presented in tables and graphs, using informal language ▪ make inferences and convincing arguments that are based on the analysis of charts, tables, and graphs

Tools and Manipulatives

dynamic statistical software
graph paper
spreadsheets

Provide Students with opportunities to:

-identify bias in data collection methods (How reliable are your results if you only sample "X" to determine "Y"?)
-read, interpret, and draw conclusions from data presented in frequency tables and circle graphs
- understand that graphs can represent data in a misleading way (e.g., line graphs that exaggerate change by starting the vertical axis at a point greater than zero)
-understand mean, median and mode, and the impact an outlier may have on each

Suggested Resources:

TIPS4RM

- Unit 1
- Unit 3

Math Makes Sense

Components of:

- Unit 5

Math Alignment Project

STRAND: Number Sense and Numeration — Term 1 (November – end of January)

Overall Expectation & Big Idea	Specific Expectations	**Tools and Manipulatives**
NV1: **Quantity Relationships** represent, compare, and order numbers, including integers	▪ identify and compare integers found in real-life contexts ▪ represent and order integers, using a variety of tools	number lines two-coloured counters virtual manipulatives **Provide Students With and opportunities to:** -identify and compare integers found in real-life contexts (e.g., temperature, money amounts/debt, etc) -solve problems involving the addition and subtraction of integers (e.g., temperature change) **Suggested Resources:** **TIPS4RM** ▪ Unit 2 **Math Makes Sense** Components of: ▪ Unit 9
NV2: **Operational Sense** demonstrate an understanding of addition and subtraction *of fractions* and integers, *and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers*	▪ add and subtract integers, using a variety of tools	

ELEMENTARY PROGRAM

Math Alignment Project

STRAND: Measurement

Term 1 (November – end of January)

Overall Expectation & Big Idea	Specific Expectations
MV1: **Attributes, Units, and Measurement Sense** report on research into real-life applications of area measurements	▪ research and report on real-life applications of area measurements
MV2: **Measurement Relationships** determine the relationships among units and measurable attributes, including the area of a trapezoid *and the volume of a right prism*	▪ solve problems that require conversion between metric units of measure ▪ solve problems that require conversion between metric units of area ▪ determine, through investigation using a variety of tools and strategies, the relationship for calculating the area of a trapezoid, and generalize to develop the formula ▪ solve problems involving the estimation and calculation of the area of a trapezoid ▪ estimate and calculate the area of composite two-dimensional shapes by decomposing into shapes with known area relationships

Tools and Manipulatives

2-D shapes
concrete materials
dynamic geometric software
grid paper
pattern blocks

Provide Students With and opportunities to:

-solve problems requiring conversions (millimeters/centimetres, grams/kilograms, milliliters/litre, square centimetres/square metres))

- Determine the relationship between the area of a parallelogram and the area of a trapezoid

Suggested Resources:

TIPS4RM

- Unit 4

Math Makes Sense

Components of:

- Unit 6

Math Alignment Project

STRAND: Geometry and Spatial Sense — Term 1 (November – end of January)

Overall Expectation & Big Idea	Specific Expectations
GV1: **Geometric Properties** construct related lines, and classify triangles, quadrilaterals, *and prisms*	▪ construct related lines using angle properties and a variety of tools and strategies ▪ sort and classify triangles and quadrilaterals by geometric properties related to symmetry, angles, and sides, through investigation using a variety of tools and strategies ▪ construct angle bisectors and perpendicular bisectors, using a variety of tools and strategies, and represent equal angles and equal lengths using mathematical notation
GV2: **Geometric Relationships** develop an understanding of similarity, and distinguish similarity and congruence	▪ identify, through investigation, the minimum side and angle information needed to describe a unique triangle ▪ determine, through investigation using a variety of tools relationships among area, perimeter, corresponding side lengths, and corresponding angles of congruent shapes ▪ demonstrate an understanding that enlarging or reducing two-dimensional shapes creates similar shapes ▪ distinguish between and compare similar shapes and congruent shapes, using a variety of tools and strategies

Tools and Manipulatives

compass and straight edge
concrete materials
dynamic geometry / Tiling software
geoboard
grid paper
Mira
pattern blocks
Polydrons
protractor

Provide Students with opportunities to:

-use a compass and straight edge, protractor, or dynamic geometry software to construct , parallel; perpendicular; intersecting lines
-use a Mira, dynamic geometry software, and compass to construct angle /perpendicular bisectors

Suggested Resources:

TIPS4RM

- Unit 1
- Unit 6
- Unit 8

Math Makes Sense

Components of:

- Unit 7

Math Alignment Project

STRAND: Patterning and Algebra — Term 1 (November – end of January)

Overall Expectation & Big Idea	Specific Expectations	**Tools and Manipulatives**
PV1: **Variables, Expressions and Equations** model real-life linear relationships graphically and algebraically, and solve simple algebraic equations using a variety of strategies, including inspection and guess and check	▪ model real-life relationships involving constant rates where the initial condition starts at 0 through investigation using tables of values and graphs ▪ model real-life relationships involving constant rates (using algebraic equations with variables to represent the changing quantities in the relationship ▪ translate phrases describing simple mathematical relationships into algebraic expressions using concrete materials ▪ evaluate algebraic expressions by substituting natural numbers for the variables ▪ make connections between evaluating algebraic expressions and determining the term in a pattern using the general term ▪ solve linear equations of the form ax = c or c = ax and ax + b = c or variations such as b + ax = c and c = bx + a by modelling with concrete materials, by inspection, or by guess and check, with and without the aid of a calculator	algebra tiles calculator concrete materials counters pattern blocks **Provide Students with opportunities to:** -Create a table of values and graph the relationship between linear relationships (e.g., distance, time) -understand and solve algebraic equations with a constant (e.g., speed, heart rate, billing rate) and a variable **Suggested Resources:** **TIPS4RM** ▪ Unit 5 **Math Makes Sense** Components of: ▪ Unit 10

Math Alignment Project

STRAND: Number Sense and Numeration — Term 2 (February to June)

Overall Expectation & Big Idea	Specific Expectations
NV1: **Quantity Relationships** represent, compare, and order numbers, *including integers*	▪ represent, compare, and order *decimals to hundredths and* fractions, using a variety of tools ▪ select and justify the most appropriate representation of a quantity for a given context
NV3: **Operational Sense** demonstrate an understanding of addition and subtraction of fractions *and integers, and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers*	▪ divide whole numbers by simple fractions and by decimal numbers to hundredths, using concrete materials ▪ use a variety of mental strategies to solve problems involving the addition and subtraction of fractions and decimals ▪ add and subtract fractions with simple like and unlike denominators, using a variety of tools and algorithms ▪ demonstrate, using concrete materials, the relationship between the repeated addition of fractions and the multiplication of that fraction by a whole number
NV3: **Proportional Relationships** demonstrate an understanding of proportional relationships using percent, ratio, and rate	▪ determine, through investigation, the relationships among fractions, decimals, percents, and ratios ▪ solve problems that involve determining whole number percents, using a variety of tools ▪ demonstrate an understanding of rate as a comparison, or ratio, of two measurements with different units ▪ solve problems involving the calculation of unit rates

Tools and Manipulatives

base ten materials
calculator
concrete materials
Cuisenaire Rods
fraction circles
number lines

Provide Students with opportunities to:

-determine the most appropriate representation of a quantity (fraction, decimal, percent) for a given context
-solve problems involving the addition and subtraction of fractions with like and unlike denominators

Suggested Resources:

TIPS4RM
- Unit 7
- Unit 9

Math Makes Sense
Components of:
- Unit 2
- Unit 4
- Unit 8

Math Alignment Project

STRAND: Measurement

Term 2 (February to June)

Overall Expectation & Big Idea	Specific Expectations	**Tools and Manipulatives**
MV2: **Measurement Relationships** determine the relationships among units and measurable attributes, *including the area of a trapezoid and* the volume of a right prism	▪ sketch different polygonal prisms that share the same volume ▪ determine, through investigation using a variety of tools and strategies, the relationship for calculating the area of a trapezoid, and generalize to develop the formula ▪ determine, through investigation using a variety of tools and strategies the relationship between the height, the area of the base, and the volume of right prisms with simple polygonal bases and generalize to develop the formula ▪ determine, through investigation using a variety of tools the surface area of right prisms ▪ solve problems that involve the surface area and volume of right prisms and that require conversion between metric measures of capacity and volume	concrete materials dynamic geometry software nets Polydrons **Provide Students with opportunities to:** -sketch polygonal prisms using dynamic geometry software - Decompose right prisms with simple polygonal bases into triangular prisms and rectangular prisms. For each prism, record the area of the base, the height, and the volume on a chart. Identify relationships. -explore the relationship between volume and surface area of right prisms **Suggested Resources:** **TIPS4RM** ▪ Unit 4 ▪ Unit 10 **Math Makes Sense** Components of: ▪ Unit 3

Math Alignment Project

STRAND: Geometry and Spatial Sense

Term 2 (February to June)

Overall Expectation & Big Idea	Specific Expectations
GV1: **Geometric Properties** construct related lines, and classify triangles, quadrilaterals, and prisms	▪ investigate, using concrete materials, the angles between the faces of a prism, and identify right prisms
GV3: **Location and Movement** describe location in the four quadrants of a coordinate system, dilatate two-dimensional shapes, and apply transformations to create and analyze designs	▪ plot points using all four quadrants of the Cartesian coordinate plane ▪ identify, perform, and describe dilatations, through investigation using a variety of tools ▪ create and analyze designs involving translations, reflections, dilatations, and/or simple rotations of two-dimensional shapes, using a variety of tools and strategies ▪ determine, through investigation using a variety of tools polygons or combinations of polygons that tile a plane, and describe the transformation(s) involved

Tools and Manipulatives

2-D shapes
3-D shapes (prisms)
concrete materials
Polydrons

Provide Students with opportunities to:

-investigate the angles between the faces of a prism
-Identify the perpendicular faces in a set of right prisms
-show that dilatations create similar shapes and that translations, rotations, and reflections generate congruent shapes
-plot points on a Cartesian coordinate plane

Suggested Resources:

TIPS4RM

- Unit 10

Math Makes Sense

Components of:

- Unit 3

Math Alignment Project

STRAND: Data Management and **Probability** Term 2 (February to June)

Overall Expectation & Big Idea	Specific Expectations	**Tools and Manipulatives**
DV3: **Probability** compare experimental probabilities with the theoretical probability of an outcome involving two independent events	▪ research and report on real-world applications of probabilities expressed in fraction, decimal, and percent form ▪ make predictions about a population when given a probability ▪ represent in a variety of ways all the possible outcomes of a probability experiment involving two independent events, and determine the theoretical probability of a specific outcome involving two independent events ▪ perform a simple probability experiment involving two independent events, and compare the experimental probability with the theoretical probability of a specific outcome	coins counters number cubes spinners **Provide Students with opportunities to:** -explore experimental and theoretical probability involving two independent events (e.g, rolling a cube and flipping a coin) **Suggested Resources:** **TIPS4RM** ▪ Unit 7 **Math Makes Sense** Components of: ▪ Unit 11