Grade 3

The following are highlights of student learning in Grade 3. They are provided to give teachers and parents a quick overview of the mathematical knowledge and skills that students are expected to acquire in each strand in this grade. The expectations on the pages that follow outline the required knowledge and skills in detail and provide information about the ways in which students are expected to demonstrate their learning, how deeply they will explore concepts and at what level of complexity they will perform procedures, and the mathematical processes they will learn and apply throughout the grade.

Number Sense and Numeration: representing and ordering numbers to 1000; representing money amounts to $10; decomposing and composing three-digit numbers; investigating fractions of a set; counting by 1's, 2's, 5's, 10's, 25's, and 100's; adding and subtracting three-digit numbers in a variety of ways; relating one-digit multiplication, and division by one-digit divisors, to real-life situations

Measurement: measuring distance using kilometres; telling time to the nearest 5 minutes; identifying temperature benchmarks; measuring perimeter using standard units; measuring mass in kilograms and capacity in litres; measuring area using grid paper; comparing the length, mass, and capacity of objects using standard units; relating minutes to hours, hours to days, days to weeks, and weeks to years

Geometry and Spatial Sense: using a reference tool to identify right angles and to compare angles with a right angle; classifying two-dimensional shapes by geometric properties (number of sides and angles); classifying three-dimensional figures by geometric properties (number of faces, edges, and vertices); relating different types of quadrilaterals; naming prisms and pyramids; identifying congruent shapes; describing movement on a grid map; recognizing transformations

Patterning and Algebra: creating and extending growing and shrinking patterns; representing geometric patterns with a number sequence, a number line, and a bar graph; determining the missing numbers in equations involving addition and subtraction of one- and two-digit numbers; investigating the properties of zero and one in multiplication

Data Management and Probability: organizing objects into categories using two or more attributes; collecting and organizing categorical and discrete data; reading and displaying data using vertical and horizontal bar graphs; understanding mode; predicting the frequency of an outcome; relating fair games to equally likely events

Grade 3: Mathematical Process Expectations

The mathematical process expectations are to be integrated into student learning associated with all the strands.

Throughout Grade 3, students will:

PROBLEM SOLVING
- apply developing problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding;

REASONING AND PROVING
- apply developing reasoning skills (e.g., pattern recognition, classification) to make and investigate conjectures (e.g., through discussion with others);

REFLECTING
- demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by explaining to others why they think their solution is correct);

SELECTING TOOLS AND COMPUTATIONAL STRATEGIES
- select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;

CONNECTING
- make connections among simple mathematical concepts and procedures, and relate mathematical ideas to situations drawn from everyday contexts;

REPRESENTING
- create basic representations of simple mathematical ideas (e.g., using concrete materials; physical actions, such as hopping or clapping; pictures; numbers; diagrams; invented symbols), make connections among them, and apply them to solve problems;

COMMUNICATING
- communicate mathematical thinking orally, visually, and in writing, using everyday language, a developing mathematical vocabulary, and a variety of representations.

Grade 3: Number Sense and Numeration

Overall Expectations

By the end of Grade 3, students will:

- read, represent, compare, and order whole numbers to 1000, and use concrete materials to represent fractions and money amounts to $10;
- demonstrate an understanding of magnitude by counting forward and backwards by various numbers and from various starting points;
- 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.

Specific Expectations

Quantity Relationships

By the end of Grade 3, students will:

– represent, compare, and order whole numbers to 1000, using a variety of tools (e.g., base ten materials or drawings of them, number lines with increments of 100 or other appropriate amounts);

– read and print in words whole numbers to one hundred, using meaningful contexts (e.g., books, speed limit signs);

– identify and represent the value of a digit in a number according to its position in the number (e.g., use base ten materials to show that the 3 in 324 represents 3 hundreds);

– compose and decompose three-digit numbers into hundreds, tens, and ones in a variety of ways, using concrete materials (e.g., use base ten materials to decompose 327 into 3 hundreds, 2 tens, and 7 ones, or into 2 hundreds, 12 tens, and 7 ones);

– round two-digit numbers to the nearest ten, in problems arising from real-life situations;

– represent and explain, using concrete materials, the relationship among the numbers 1, 10, 100, and 1000, (e.g., use base ten materials to represent the relationship between a decade and a century, or a century and a millennium);

– divide whole objects and sets of objects into equal parts, and identify the parts using fractional names (e.g., one half; three thirds; two fourths or two quarters), without using numbers in standard fractional notation;

– represent and describe the relationships between coins and bills up to $10 (e.g., “There are eight quarters in a toonie and ten dimes in a loonie.”);

– estimate, count, and represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $10;

– solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 1000 (*Sample problem:* Do you know anyone who has lived for close to 1000 days? Explain your reasoning.).

Counting

By the end of Grade 3, students will:

– count forward by 1’s, 2’s, 5’s, 10’s, and 100’s to 1000 from various starting points, and by 25’s to 1000 starting from multiples of 25, using a variety of tools and strategies (e.g., skip count with and without the aid of a calculator; skip count by 10’s using dimes);

– count backwards by 2's, 5's, and 10's from 100 using multiples of 2, 5, and 10 as starting points, and count backwards by 100's from 1000 and any number less than 1000, using a variety of tools (e.g., number lines, calculators, coins) and strategies.

Operational Sense

By the end of Grade 3, students will:

– solve problems involving the addition and subtraction of two-digit numbers, using a variety of mental strategies (e.g., to add 37 + 26, add the tens, add the ones, then combine the tens and ones, like this: 30 + 20 = 50, 7 + 6 = 13, 50 + 13 = 63);

– add and subtract three-digit numbers, using concrete materials, student-generated algorithms, and standard algorithms;

– use estimation when solving problems involving addition and subtraction, to help judge the reasonableness of a solution;

– add and subtract money amounts, using a variety of tools (e.g., currency manipulatives, drawings), to make simulated purchases and change for amounts up to $10 (*Sample problem:* You spent 5 dollars and 75 cents on one item and 10 cents on another item. How much did you spend in total?);

– relate multiplication of one-digit numbers and division by one-digit divisors to real-life situations, using a variety of tools and strategies (e.g., place objects in equal groups, use arrays, write repeated addition or subtraction sentences) (*Sample problem:* Give a real-life example of when you might need to know that 3 groups of 2 is 3 x 2.);

– multiply to 7 x 7 and divide to 49 ÷ 7, using a variety of mental strategies (e.g., doubles, doubles plus another set, skip counting).

Grade 3: Measurement

Overall Expectations

By the end of Grade 3, students will:

- estimate, measure, and record length, perimeter, area, mass, capacity, time, and temperature, using standard units;
- compare, describe, and order objects, using attributes measured in standard units.

Specific Expectations

Attributes, Units, and Measurement Sense

By the end of Grade 3, students will:

– estimate, measure, and record length, height, and distance, using standard units (i.e., centimetre, metre, kilometre) (*Sample problem:* While walking with your class, stop when you think you have travelled one kilometre.);

– draw items using a ruler, given specific lengths in centimetres (*Sample problem:* Draw a pencil that is 5 cm long);

– read time using analogue clocks, to the nearest five minutes, and using digital clocks (e.g., 1:23 means twenty-three minutes after one o'clock), and represent time in 12-hour notation;

– estimate, read (i.e., using a thermometer), and record positive temperatures to the nearest degree Celsius (i.e., using a number line; using appropriate notation) (*Sample problem:* Record the temperature outside each day using a thermometer, and compare your measurements with those reported in the daily news.);

– identify benchmarks for freezing, cold, cool, warm, hot, and boiling temperatures as they relate to water and for cold, cool, warm, and hot temperatures as they relate to air (e.g., water freezes at 0°C; the air temperature on a warm day is about 20°C, but water at 20°C feels cool);

– estimate, measure, and record the perimeter of two-dimensional shapes, through investigation using standard units (*Sample problem:* Estimate, measure, and record the perimeter of your notebook.);

– estimate, measure (i.e., using centimetre grid paper, arrays), and record area (e.g., if a row of 10 connecting cubes is approximately the width of a book, skip counting down the cover of the book with the row of cubes [i.e., counting 10, 20, 30, ...] is one way to determine the area of the book cover);

– choose benchmarks for a kilogram and a litre to help them perform measurement tasks;

– estimate, measure, and record the mass of objects (e.g., can of apple juice, bag of oranges, bag of sand), using the standard unit of the kilogram or parts of a kilogram (e.g., half, quarter);

– estimate, measure, and record the capacity of containers (e.g., juice can, milk bag), using the standard unit of the litre or parts of a litre (e.g., half, quarter).

Measurement Relationships

By the end of Grade 3, students will:

– compare standard units of length (i.e., centimetre, metre, kilometre) (e.g., centimetres are smaller than metres), and select and justify the most appropriate standard unit to measure length;

– compare and order objects on the basis of linear measurements in centimetres and/or metres (e.g., compare a 3 cm object with a 5 cm object; compare a 50 cm object with a 1 m object) in problem-solving contexts;
– compare and order various shapes by area, using congruent shapes (e.g., from a set of pattern blocks or Power Polygons) and grid paper for measuring (*Sample problem:* Does the order of the shapes change when you change the size of the pattern blocks you measure with?);
– describe, through investigation using grid paper, the relationship between the size of a unit of area and the number of units needed to cover a surface (*Sample problem:* What is the difference between the numbers of squares needed to cover the front of a book, using centimetre grid paper and using two-centimetre grid paper?);
– compare and order a collection of objects, using standard units of mass (i.e., kilogram) and/or capacity (i.e., litre);
– solve problems involving the relationships between minutes and hours, hours and days, days and weeks, and weeks and years, using a variety of tools (e.g., clocks, calendars, calculators).

Grade 3: Geometry and Spatial Sense

Overall Expectations

By the end of Grade 3, students will:

- compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties;
- describe relationships between two-dimensional shapes, and between two-dimensional shapes and three-dimensional figures;
- identify and describe the locations and movements of shapes and objects.

Specific Expectations

Geometric Properties

By the end of Grade 3, students will:

– use a reference tool (e.g., paper corner, pattern block, carpenter's square) to identify right angles and to describe angles as greater than, equal to, or less than a right angle (*Sample problem:* Which pattern blocks have angles bigger than a right angle?);

– identify and compare various polygons (i.e., triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons) and sort them by their geometric properties (i.e., number of sides; side lengths; number of interior angles; number of right angles);

– compare various angles, using concrete materials and pictorial representations, and describe angles as *bigger than*, *smaller than*, or *about the same as* other angles (e.g., "Two of the angles on the red pattern block are bigger than all the angles on the green pattern block.");

– compare and sort prisms and pyramids by geometric properties (i.e., number and shape of faces, number of edges, number of vertices), using concrete materials;

– construct rectangular prisms (e.g., using given paper nets; using Polydrons), and describe geometric properties (i.e., number and shape of faces, number of edges, number of vertices) of the prisms.

Geometric Relationships

By the end of Grade 3, students will:

– solve problems requiring the greatest or least number of two-dimensional shapes (e.g., pattern blocks) needed to compose a larger shape in a variety of ways (e.g., to cover an outline puzzle) (*Sample problem:* Compose a hexagon using different numbers of smaller shapes.);

– explain the relationships between different types of quadrilaterals (e.g., a square is a rectangle because a square has four sides and four right angles; a rhombus is a parallelogram because opposite sides of a rhombus are parallel);

– identify and describe the two-dimensional shapes that can be found in a three-dimensional figure (*Sample problem:* Build a structure from blocks, toothpicks, or other concrete materials, and describe it using geometric terms, so that your partner will be able to build your structure without seeing it.);

– describe and name prisms and pyramids by the shape of their base (e.g., rectangular prism, square-based pyramid);

– identify congruent two-dimensional shapes by manipulating and matching concrete materials (e.g., by translating, reflecting, or rotating pattern blocks).

Location and Movement

By the end of Grade 3, students will:

– describe movement from one location to another using a grid map (e.g., to get from the swings to the sandbox, move three squares to the right and two squares down);

– identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations (e.g., a slide to the right is a translation; a turn is a rotation);

– complete and describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry (*Sample problem:* Draw the missing portion of the given butterfly on grid paper.).

Grade 3: Patterning and Algebra

Overall Expectations

By the end of Grade 3, students will:

- describe, extend, and create a variety of numeric patterns and geometric patterns;
- demonstrate an understanding of equality between pairs of expressions, using addition and subtraction of one- and two-digit numbers.

Specific Expectations

Patterns and Relationships

By the end of Grade 3, students will:

– identify, extend, and create a repeating pattern involving two attributes (e.g., size, colour, orientation, number), using a variety of tools (e.g., pattern blocks, attribute blocks, drawings) (*Sample problem:* Create a repeating pattern using three colours and two shapes.);

– identify and describe, through investigation, number patterns involving addition, subtraction, and multiplication, represented on a number line, on a calendar, and on a hundreds chart (e.g., the multiples of 9 appear diagonally in a hundreds chart);

– extend repeating, growing, and shrinking number patterns (*Sample problem:* Write the next three terms in the pattern 4, 8, 12, 16, ….);

– create a number pattern involving addition or subtraction, given a pattern represented on a number line or a pattern rule expressed in words (*Sample problem:* Make a number pattern that starts at 0 and grows by adding 7 each time.);

– represent simple geometric patterns using a number sequence, a number line, or a bar graph (e.g., the given growing pattern of toothpick squares can be represented numerically by the sequence 4, 7, 10, …, which represents the number of toothpicks used to make each figure);

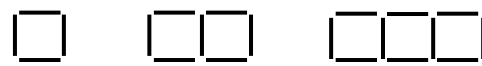

Figure 1 Figure 2 Figure 3

– demonstrate, through investigation, an understanding that a pattern results from repeating an action (e.g., clapping, taking a step forward every second), repeating an operation (e.g., addition, subtraction), using a transformation (e.g., slide, flip, turn), or making some other repeated change to an attribute (e.g., colour, orientation).

Expressions and Equality

By the end of Grade 3, students will:

– determine, through investigation, the inverse relationship between addition and subtraction (e.g., since 4 + 5 = 9, then 9 – 5 = 4; since 16 – 9 = 7, then 7 + 9 = 16);

– determine, the missing number in equations involving addition and subtraction of one- and two-digit numbers, using a variety of tools and strategies (e.g., modelling with concrete materials, using guess and check with and without the aid of a calculator) (*Sample problem:* What is the missing number in the equation 25 – 4 = 15 + □?);

– identify, through investigation, the properties of zero and one in multiplication (i.e., any number multiplied by zero equals zero; any number multiplied by 1 equals the original number) (*Sample problem:* Use tiles to create arrays that represent 3 x 3, 3 x 2, 3 x 1, and 3 x 0. Explain what you think will happen when you multiply any number by 1, and when you multiply any number by 0.);

– identify, through investigation, and use the associative property of addition to facilitate computation with whole numbers (e.g., "I know that 17 + 16 equals 17 + 3 + 13. This is easier to add in my head because I get 20 + 13 = 33.").

Grade 3: Data Management and Probability

Overall Expectations

By the end of Grade 3, students will:

- 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 horizontal axes, as needed;
- read, describe, and interpret primary data presented in charts and graphs, including vertical and horizontal bar graphs;
- predict and investigate the frequency of a specific outcome in a simple probability experiment.

Specific Expectations

Collection and Organization of Data

By the end of Grade 3, students will:

– demonstrate an ability to organize objects into categories, by sorting and classifying objects using two or more attributes simultaneously (*Sample problem:* Sort a collection of buttons by size, colour, and number of holes.);

– collect data by conducting a simple survey about themselves, their environment, issues in their school or community, or content from another subject;

– collect and organize categorical or discrete primary data and display the data in charts, tables, and graphs (including vertical and horizontal bar graphs), with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed, using many-to-one correspondence (e.g., in a pictograph, one car sticker represents 3 cars; on a bar graph, one square represents 2 students) (*Sample problem:* Graph data related to the eye colour of students in the class, using a vertical bar graph. Why does the scale on the vertical axis include values that are not in the set of data?).

Data Relationships

By the end of Grade 3, students will:

– read primary data presented in charts, tables, and graphs (including vertical and horizontal bar graphs), then describe the data using comparative language, and describe the shape of the data (e.g., "Most of the data are at the high end."; "All of the data values are different.");

– interpret and draw conclusions from data presented in charts, tables, and graphs;

– demonstrate an understanding of mode (e.g., "The mode is the value that shows up most often on a graph."), and identify the mode in a set of data.

Probability

By the end of Grade 3, students will:

– predict the frequency of an outcome in a simple probability experiment or game (e.g., "I predict that an even number will come up 5 times and an odd number will come up 5 times when I roll a number cube 10 times."), then perform the experiment, and compare the results with the predictions, using mathematical language;

– demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes.