THE CATHOLIC BOARD OF EDUCATION CONTENT AND PROCESS STANDARDS AND BENCHMARKS IN MATHEMATICS (CCPSBM)

CURRICULUM GUIDE FOR PARENTS K – 6

2008

GENERAL REMARKS AND ACKNOWLEDGEMENTS

The development of a mathematics curriculum for the Catholic Board of Education began in 2001 with the creation of a draft document under the direction of Claudette Rolle, Curriculum Supervisor. The final document, Catholic Board of Education Content and Process Standards and Benchmarks in Mathematics (CCPSBM) 2007, built on the frame work that was laid out by Mrs. Rolle and members of her team namely: Randol Dorsett, Jacintha Goffe, Joan Rolle, Renee Mortimer, Stephen Taylor, Marie Rodgers, Denise Cooper, Bernadette Johnson, Madge Clare and Margaret Murray. Curriculum development is truly a team effort and we recognize the hard work and dedication that went into the creation of the draft document.

This document, the Catholic Board of Education Content and Process Standards and Benchmarks in Mathematics (CCPSBM) Curriculum Guide for Parents, 2008 is adapted from the Catholic Board of Education Content and Process Standards and Benchmarks in Mathematics (CCPSBM) 2007 which, like the draft, owes its existence to the hard work and dedication of another group of talented and committed educators who are cognizant of the fact that team work and collaboration contribute to the advancement of education. We are also indebted to the Ministry of Education Science and Technology, the National Council of Teachers of Mathematics and the California State Board of Education for allowing us to incorporate their standards and benchmarks into our document.

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Mathematics education is everybody's business. Parents, as stakeholders along with teachers and the community, can make significant contributions.
In an effective mathematics program:
- Parents are encouraged to be involved in the education of their children and are assisted in supporting their children's learning in mathematics. Parents' comments are encouraged, valued, and used for program planning.

- Materials are organized so that parents and siblings can provide extended learning experiences for the students.

It is our hope that this document will be of use to parents as we work in partnership to ensure that mathematics education is relevant to the growth of each child as we rapidly progress in the Twenty-first Century with its new and exciting challenges.

Respectfully,

Joan Rolle
Curriculum Officer

MISSION STATEMENT OF THE CATHOLIC BOARD OF EDUCATION

Catholic Education/Formation/Learning is more than information and facts. It involves a wide view, a way of seeing. It also involves a way of living, valuing, judging and most of all it involves the good news of the reign of God.

PHILOSOPHY OF THE CATHOLIC BOARD OF EDUCATION

All schools under the jurisdiction of the Catholic Board of Education (The Board) are grounded upon the fundamental principles of Christianity and the teachings of the Roman Catholic Church. All instruction within the Catholic Schools, therefore, must be rooted in the spiritual and moral precepts of the Church while meeting the highest academic standards. All teachers are expected to live and work in harmony with the religious aims and purposes of the Archdiocese of Nassau.

The Board believes that all persons are created in the image and likeness of God and that through the vehicle of its educational system that image will be respected and given the opportunity to reach its fullest potential in each person.   All teachers must therefore be concerned with academic and intellectual development with an equal concern for the spiritual, mental, physical and social growth and development of those persons entrusted to their care. This concern is fundamental … with God-given sanctity and rights.

Religious education is an integral part of the daily school curriculum. Students leaving Catholic schools should have, according to their psychological and academic understanding, a good knowledge of the Scriptures, both literal and interpretative, Sacraments, respect for the dignity of their own bodies, respect for the dignity of other persons and respect for the environment. In short they are to have a sound understanding of their faith and their basic responsibilities as good citizens. All students must participate in religious instruction and Church liturgies including the celebration of the Mass.

Persons serving in Catholic Schools presuppose and participate in maintaining an environment in which Gospel principles and the teaching of Christian values, judgments and actions consistent with these prevail. They identify themselves as people willing to believe and profess those Christian values and principles demonstrated in such an environment.

CATHOLIC BOARD OF EDUCATION
COMMITMENT TO THE STUDENT

As Catholic school educators we believe that students, like ourselves, are pilgrim people, making their journey through this life with a constant focus on the next. As Christian Catholic educators, we have a special responsibility to encourage each student to achieve his/her maximum potential. We work to stimulate the spirit of inquiry, the acquisition of knowledge and understanding, and the thoughtful formulation of worthy goals. In fulfilling our obligation to the student, we are called to:

1. Help students see the relevance of a Christian value system in their daily lives.

2. Help students learn to relate human culture and knowledge to the news of salvation.

3. Show Christian concern about the joys and problems of each student

4. Speak with charity and justice about students even when called upon to discuss sensitive matters.

5. Work with students in preparing liturgies, para-liturgies, and other religious programs.

6. Respect confidential information concerning students and their homes.

7. Plan appropriate service projects for students that will develop their sense of responsibility to the community.

8. Enable students to grow in a sense of self-worth and accountability by selecting activities which promote the positive self-concept as becomes a maturing Christian.

9. Develop the students' knowledge and understanding of the subject (s) for which we are responsible, without suppression or distortion.

A REFLECTION STATEMENT ON THE CATHOLIC SCHOOL LEARNING COMMUNITY PROMULGATED BY THE DEPARTMENT OF ELEMENTARY SCHOOLS OF THE NATIONAL CATHOLIC EDUCATIONAL ASSOCIATION

The NCEA Department of Elementary Schools affirms that the formation of the whole child is a foundational Catholic pedagogical concept echoed throughout all Catholic Church documents on Catholic Education. Commitment to this worthy endeavour mandates that the planned curriculum, as well as its delivery and assessment, be designed to meet the learning needs of every student. It also requires that instruction occur in the context of a Christian learning community where every member is valued. Finally, meaningful instruction in the Catholic school assumes a grounding in the sacred, the blending of religion and spirituality in which the shared faith and values of the entire learning community permeate every aspect of teaching and learning.

The Curriculum Department of the Catholic Board of Education recognizes that an effective curriculum in a Catholic school must include the following elements:

1. **A defined philosophy of Catholic education:** This philosophy is essential to meaningful curriculum development. Educators must understand the distinctive elements of a Catholic school; the integration of the Gospel message throughout curriculum; ongoing spiritual and religious formation of students, faculty and staff; academic excellence; holistic approach to student learning; inclusive practices; service to the school and community; and ethical use of technology. The distinctiveness of the Catholic approach lies in the integration of faith values into each aspect of the curriculum, which extends to all the experience that students have while at school.

2. **A supportive classroom climate that fosters success:** A nurturing classroom climate is essential to learning; A learning environment that allows children to experience successes and errors without recrimination is a place that values learners. While students are not mere spectators in developing this ambience, teachers bear the chief responsibility for creating this affirming learning community.

3. **Stipulate learning outcomes:** Student learning outcomes promote the development of higher order thinking skills. When these outcomes are designed to stimulate the expression of the students' multiple intelligences, children and youth are more likely to succeed in learning the required materials and retaining the information skills.

4. **Integration of faith and values into all curricular areas:** The religious dimensions of life is intertwined with the secular. In Catholic schools, educators consistently rely on teachable moments that foster a deeper understanding of the sacred and human.

5. **Teaching as Jesus did:** Teachers commit themselves equally to the development of their interior and professional lives. They follow the methodology of Jesus, who began with the learners' context, helping learners discover truth for themselves, took advantage of teachable moments, and provided learners with opportunities to practice what they learned.

6. **Assessment of intended outcomes:** Educators are attuned to the cognitive development of students. They combine quantitative and qualitative measurement tools to obtain a comprehensive and holistic profile of each student.

7. **Improvement of instructional design:** Educators and administrators systematically reflect upon various aspects of the curriculum to determine strengths and weaknesses. From these regular reviews adjustments are made in the school learning programs.

Foreword

T he National Council of Teachers of Mathematics (NCTM) in their executive summary of the Principles and Standards for School Mathematics (PSSM) state that

> We live in a time of extraordinary and accelerating change. New knowledge, tools, and ways of doing and communicating mathematics continue to emerge and evolve. The need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase. (p.1)

The Ministry of Education Science and Technology in its Curriculum/Resource Guidelines for Mathematics (1999) contends that

> Mathematics is regarded as a way of reasoning and thinking which enhances the education of man whatever his place in society. It is a basic tool in the development of science, technology, industry and commerce. All students need to be equipped with this tool which is essential to productivity and thought.

. The State of California in its document, Mathematics Framework for California Public Schools, Kindergarten through Grade Twelve (SCMF) maintains that "To compete successfully in the worldwide economy and to participate fully as informed citizens, today's students must have a high degree of comprehension of mathematics." (p.xiii).

Cognizant of the sentiments expressed in the aforementioned documents, current research findings in the field of curriculum, assessment and instruction and in keeping with the goals and objectives outlined in the Catholic Board of Education's (CBE) document, The Catholic Graduate at Graduation, the Curriculum Department of the CBE has undertaken to produce a compendium of content and process standards in mathematics for K-6 which will serve as a framework to direct the establishment of rigorous instructional goals and objectives, relevant formative and summative assessment tools, effective instructional strategies and professional development programs to properly equip our students to meet the demands of a twentieth century that is driven by science, technology, industry and commerce.

In addition, the CBE makes the following commitment (adopted from the NCTM):

Goals for the CCPSBM

1. All students will have access to high quality, engaging mathematics instruction with ambitious expectations for all.
2. Accommodations will be provided for students who need them and challenges for those who stand to benefit from them.

3. Knowledgeable teachers will have adequate resources to support their work and will be afforded the opportunity to continually grow as professionals.
4. The curriculum will offer students opportunities to learn important mathematical concepts and procedures with understanding.
5. Technology will be an essential component of the instructional environment.
6. Students will confidently engage in complex mathematical tasks chosen carefully by teachers.
7. Students will draw on knowledge from a wide variety of mathematical topics, sometimes approaching the same problem from different mathematical perspectives or representing the mathematics in different ways until they find methods that enable them to make progress.
8. Teachers will help students make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures.
9. Students will develop into flexible and resourceful problem solvers.
10. Alone or in groups and with access to technology, students will work productively and reflectively, with the skilled guidance of their teachers.
11. Orally and in writing, students will communicate their ideas and results effectively.
12. Students will value mathematics and engage actively in learning it.

Goals for Teachers:

1. Increase knowledge of mathematics content through professional development focusing on standards-based mathematics.
2. Provide an instructional program that preserves the balance of computational and procedural skills, conceptual understanding and problem solving.
3. Assess student progress frequently toward the achievement of the mathematics standards and adjust instruction accordingly.
4. Provide the learning in each instructional year that lays the necessary groundwork for success in subsequent grades or mathematics courses.
5. Create and maintain a classroom environment that fosters a genuine understanding and confidence in all students that through hard work and sustained effort, they can achieve or exceed the mathematics standards.
6. Offer alternative instructional suggestions and strategies that address the specific needs of students.
7. Identify the most successful and efficient approaches within a particular classroom so that learning is maximized.

Goals for Students

1. Develop fluency in basic computational and procedural skills, an understanding of mathematical concepts, and the ability to use mathematical reasoning to solve mathematical problems, including recognizing and solving routine problems

readily and finding ways to reach a solution or goal when no routine path is apparent.

2. Communicating precisely about quantities, logical relationships, and unknown values through the use of signs, symbols, model, graphs, and mathematical terms.

3. Develop logical thinking in order to analyze evidence and build arguments to support or refute hypotheses.

4. Make connections among mathematical ideas and between mathematics and other disciplines.

5. Apply mathematics to everyday life and develop an interest in pursuing advanced studies in mathematics and in a wide array of mathematically related career choices.

6. Develop an appreciation for the beauty and power of mathematics.

STANDARDS AND BENCHMARKS DEFINED

For the purpose of this document, mathematics standards will be defined as "descriptions of what mathematics instruction should enable students to know (content), do or use (process)," (NCTM) and the degree or quality of proficiency which students are expected to display in relation to the content and process standards (performance) . Content standards in mathematics describe the knowledge of concepts that students should possess. Process standards in mathematics describe ways of acquiring and applying content knowledge. Performance standards in mathematics describe the level of proficiency (judged by assessment tools) that is expected in mathematical content and process knowledge. When standards are more clearly or finely defined or broken down into desired knowledge or process, benchmarks are created. Standards may be viewed as general objectives or goals desirable for mastery at all grade levels and benchmarks as more specific objectives unique to a specific grade level. A standard is a strand which flows through all grade levels. Benchmarks are usually grade level specific.

Standards are also referred to as strands which divide mathematical content into smaller sets of manageable and understandable categories. There is no set formula for the establishment of strands and there may be some overlapping of strands. The nature of the content found in the strand changes as they spiral through the various grade levels and all strands are not given equal weight. The use of strands is not a prescription but only a guideline (SCMF)

The following information provided by the NCTM and SCMF explains content and process standards (also referred to as understandings and application).

Content Standards

Concept of Numbers deals with understanding numbers, developing meanings of operations, and computing fluently. School mathematics depends on numbers which are used to count, measure and estimate. The mathematics for this standard centers on the development of number concepts; on computation with numbers (addition, subtraction, multiplication, division, finding powers and roots); on numeration (systems for writing numbers, including base ten, fractions, negative numbers, rational numbers, percents, scientific notation) and on notations. Young children focus on whole numbers with which they count, compare quantities, and develop an understanding of the structure of the base-ten number system. In higher grades, fractions and integers become more prominent. This standard at this level includes the study of prime and composite numbers, of irrational numbers and their approximation by rationals of real numbers and of complex numbers. An understanding of numbers allows computational procedures to be learned and recalled with ease. Students should be able to perform computations in different ways. They should use mental methods and estimations in addition to doing paper-and-pencil calculations. Having computational fluency allows students to make good decisions about the use of calculators. Regardless of the method used to compute, students should be able to explain their method, understand that many methods exist, and see the usefulness of methods that are efficient, accurate, and general.

Functions and Algebra. This strand involves two closely related subjects. Functions are rules that assign to each element in an initial set an element in the second set. For example, as early as kindergarten, children take collections of colored balls and sort them according to color, thereby assigning to each ball its color in the process. Later, students work with simple numeric functions, such as unit conversions that assign quantities of measurement; for example, 12 inches to each foot. Therefore, functions are introduced informally at the elementary level and grow in prominence and importance with the student's increasing grasp of algebra in the higher grades.

Algebraic symbols and procedures for working with them are a towering mathematical accomplishment in the history of mathematics and are critical in mathematical work and like functions are introduced informally. Algebra is best learned as a set of concepts and techniques tied to the representation of quantitative relations and as a style of mathematical thinking for formalizing patterns, functions, and generalizations. Although many adults think that algebra is an area of mathematics more suited to middle school or high school students, even young children can be encouraged to use algebraic reasoning as they study numbers and operations and as they investigate patterns and relations among sets of numbers. Algebra appears initially in its proper form in the third grade as "generalized arithmetic." In later grades algebra is the vital tool needed for solving equations and inequalities and using them as mathematical models of real situations. Students solve the problems that arise by translating from natural language – by which they communicate daily- to the abstract language of algebra and conversely, from the formal language of algebra to natural language to demonstrate clear understanding of the

concepts involved. In the Algebra Standard, the connections of algebra to number and everyday situations are extended in the later grade bands to include geometric ideas.

Geometry. Geometry is the study of space and figures in space. In school any study of space, whether practical or theoretical belongs in the geometry standard or strand. In the early grades it includes the recognition of basic shapes, such as triangles, circles, squares, spheres and cubes. Geometry has long been regarded as the place in high school where students learn to prove geometric theorems. The Geometry Standard takes a broader view of the power of geometry by calling on students to analyze characteristics of geometric shapes and make mathematical arguments about the geometric relationship, as well as to use visualization, spatial reasoning, and geometric modeling to solve problems. Geometry is a natural area of mathematics for the development of students' reasoning and justification skills.

Measurement. The study of measurement is crucial in the school mathematics curriculum because of its practicality and pervasiveness in so many aspects of life. In the early grades this strand includes the use of measuring tools, such as rulers. In the later grades the content extends to the study of area and volume and the measurement of angles. The Measurement Standard includes understanding the attributes, units, systems, and processes of measurement as well as applying the techniques, tools, and formulas to determine measurements. Measurement can serve as a way to integrate the different strands of mathematics because it offers opportunities to learn about and apply other areas of mathematics such as number, geometry, functions, and statistical ideas.

Data Analysis, Statistics and Probability. Reasoning statistically is essential to being an informed citizen and consumer. The Data Analysis and Probability Standard calls for students to formulate questions and collect, organize, and display relevant data to answer these questions. Additionally, it emphasizes learning appropriate statistical methods to analyze data, making inferences and predictions based on data, and understanding and using the basic concepts of probability. This strand includes the definitions and calculations of various averages and the analysis of data by classification and by graphical displays, taking into account randomness and bias in sampling. In the lower grades effort is largely limited to collecting data and displaying it in graphs, in addition to calculating simple averages and performing probability experiments.

Process Standards

It should be kept in mind that process standards are to be embedded in all of the content standards.
Problem Solving. Solving problems is not only a goal of learning mathematics but also a major means of doing so. It is an integral part of mathematics, not an isolated piece of the mathematics program. Students require frequent opportunities to formulate, grapple with, and solve complex problems that involve a significant amount of effort. They are to be encouraged to reflect on their thinking during the problem-solving process so that they can apply and adapt the strategies they develop to other problems and in other contexts.

By solving mathematical problems, students acquire ways of thinking, habits of persistence and curiosity, and confidence in unfamiliar situations that serve them well outside the mathematics classroom.

Reasoning and Proof. Mathematical reasoning and proof offer powerful ways of developing and expressing insights about a wide range of phenomena. People who reason and think analytically tend to note patterns, structure, or regularities in both real-world and mathematical situations. They ask if those patterns are accidental or if they occur for a reason. They make and investigate mathematical conjectures. They develop and evaluate mathematical arguments and proofs, which are formal ways of expressing particular kinds of reasoning and justification. By exploring phenomena, justifying results, and using mathematical conjectures in all content areas and—with different expectations of sophistication— at all grade levels, students should see and expect that mathematics makes sense.

Communication. Mathematical communication is a way of sharing ideas and clarifying understanding. Through communication, ideas become objects of reflection, refinement, discussion, and amendment. When students are challenged to communicate the results of their thinking to others orally or in writing, they learn to be clear, convincing, and precise in their use of mathematical language. Explanations should include mathematical arguments and rationales, not just procedural descriptions or summaries. Listening to others' explanations gives students opportunities to develop their own understandings. Conversations in which mathematical ideas are explored from multiple perspectives help the participants sharpen their thinking and make connections.

Connections. Mathematics is not a collection of separate strands or standards, even though it is often partitioned and presented in this manner. Rather, mathematics is an integrated field of study. When students connect mathematical ideas, their understanding is deeper and more lasting, and they come to view mathematics as a coherent whole. They see mathematical connections in the rich interplay among mathematical topics, in contexts that relate mathematics to other subjects, and in their own interests and experience. Through instruction that emphasizes the interrelatedness of mathematical ideas, students learn not only mathematics but also about the utility of mathematics.

Representations. Mathematical ideas can be represented in a variety of ways: pictures, concrete materials, tables, graphs, number and letter symbols, spreadsheet displays, and so on. The ways in which mathematical ideas are represented is fundamental to how people understand and use those ideas. Many of the representations we now take for granted are the result of a process of cultural refinement that took place over many years. When students gain access to mathematical representations and the ideas they express and when they can create representations to capture mathematical concepts or relationships, they acquire a set of tools that significantly expand their capacity to model and interpret physical, social, and mathematical phenomenon.

These standards are strands which will span all grade levels from K-6. Each standard will receive different emphasis, focus and depth of coverage at each grade level.

Content standards in mathematics describe the knowledge of concepts that students should possess. Process standards in mathematics describe ways of acquiring and applying content knowledge. Performance standards in mathematics describe the level of proficiency (judged by assessment tools) that is expected in mathematical content and process knowledge. When standards are more clearly or finely defined or broken down into desired knowledge or process, benchmarks are created. Standards may be viewed as general objectives or goals desirable for mastery at all grade levels and benchmarks as more specific objectives unique to a specific grade level. A standard is a strand which flows through all grade levels. Benchmarks are usually grade level specific.

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MATHEMATICS STANDARDS OF THE CATHOLIC BOARD OF EDUCATION

STANDARD 1: Understands and applies properties of the concept of numbers

STANDARD 2: Understands and applies properties of the concepts of measurement.

STANDARD 3: Understands and applies properties of the concepts of geometry

STANDARD 4: Understands and applies concepts of statistics, data analysis and probability

STANDARD 5: Understands and applies properties of functions and algebra

STANDARD 6: Uses appropriate mathematical procedures and critical thinking skills (reasoning and proof, communication, connections, and representation) while performing the processes of computation and solving problems.

Example of a mathematics standard and two accompanying benchmarks:

Standard (S3): Understands and applies properties of the concept of geometry
Benchmarks:
- B1: Uses positional vocabulary to describe basic spatial relationships
- B2: Recognizes, names, describes, sorts two and three dimensional objects and shapes

DESCRIPTION OF LABELING

For the purposes of tracking and identification, standards and benchmarks have been clearly labeled by grade level, standard and benchmark.

A label of KMS3B1 should be interpreted as follows:

K	**=**	**Kindergarten**
M	**=**	**Mathematics**
S3	**=**	**Standard Three**
B1	**=**	**Benchmark One**

CONTENT AND PROCESS STANDARDS K – 6

It should be noted that the list of benchmarks at each grade level outlined below is only a guideline for instruction. The amount of benchmarks covered during the course of the year by the teacher will depend on a number of factors some of which include:

1. Entry level performance of each child ascertained after pre-testing
2. Rate at which concepts are mastered by the class as a whole and by students individually
3. Information relative to performance garnered from ongoing formative assessment

All standards will be covered but not all benchmarks within a particular standard will be covered. Based on the factors mentioned above and others, teachers will decide which benchmarks are the most crucial to cover in the time allotted for instruction. This information will be periodically communicated to parents and the Catholic Education Centre.

KINDERGARTEN   MATHEMATICS CONTENT AND PROCESS STANDARDS
(Aligned with standards of the NCTM and the MOEST and the assessment tools SESAT 2 and the CEC Kindergarten End of Term District Examination)
By the end of kindergarten, students understand small numbers, quantities, and simple shapes in their everyday environment. They count, compare, describe and sort objects and develop a sense of properties and patterns. They reason, provide proof, communicate, make connections and produce representations of their mastery of content.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	**Benchmark**
KMS1B1	Compare two or more sets of objects (up to 10 objects in each group) and identify which set is equal to, more than, or less than the other.
KMS1B2	Count orally to 50
KMS1B3	Identifies and recognizes numerals 1-20
KMS1B4	Count, recognize (one to one relationship), name and order a number of objects up to 20.
KMS1B5	Know and explain that the larger numbers describe sets with more objects in them than the smaller numbers have
KMS1B6	Use concrete objects to determine the answers to addition and subtraction problems (for 2 numbers that are each less than 10)
KMS1B7	Use strategies to recognize when an estimate is reasonable using numbers in the ones and tens places
KMS1B8	Identify ordinal positions up to 5
KMS1B9	Match pictorial models to fraction names and notation (1/2 and ¼)
KMS1B10	Solve problems involving fraction concepts

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
KMS2B1	Sort and classify concrete objects according to one or more attributes (size, colour, texture, shape, weight)
KMS2B2	Measure and compare using nonstandard units (string ,scoops, cups) the length, weight, temperature and capacity of objects (note which object is shorter, longer, taller, lighter, heavier, hotter or colder or holds more)
KMS2B3	Uses simple measurement terms correctly (e.g. tall/short, big/small, empty/full, heavy/light, tomorrow/yesterday
KMS2B4	Demonstrate an understanding of concepts of time (e.g. morning, afternoon , evening, today, yesterday, tomorrow, week, year) and tools that measure time (e.g. be able to say a clock tells time and a calendar names days, months etc.)
KMS2B5	Name the days of the week and months of the year and solve simple problems involving calendar concepts
KMS2B6	Identify the time (to the nearest hour) of everyday events (e.g. lunch time is 12 o'clock; bedtime is 8 o'clock at night)
KMS2B7	Identify the values of some coins (Bahamian and American for the SESAT) 1, 5, 10 and 25 cents

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
KMS3B1	Use positional vocabulary to describe basic spatial relationships (e.g. on top/the the middle on the bottom, above/below, over/under/up/down/inside/outside, before/after)
KMS3B2	Recognize, names, describes, sorts and compares (roundness, position, shape, size, number of corners) two and three dimensional objects and shapes (circle, triangle, square, rectangle, cone, cans, blocks, balls)

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
KMS4B1	Pose information questions; collect data; and read and interpret simple tables and graphs.
KMS4B2	Compare information on objects using two categories (e.g. rough/smooth)
KMS4B3	Use simple grids correctly (e.g. in games such as bingo, tick-tack-toe)
KMS4B4	Use language of probability (e.g. chance, might, lucky) through games to identify possible outcomes

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
KMS5B1	Recognize, creates and extends simple patterns using a variety of materials or actions (e.g. red blocks alternating with blue blocks; popsicle sticks, counters, clap-clap-stomp)
KMS5B2	Identify, sort and classify objects by attribute and identify objects that do not belong to a particular group (e.g. all these balls are green, those are red.)
KMS5B3	Sort and classify objects by color and shape
KMS5B4	Add or subtract groups of objects to make them equal (balancing 2 quantities)
KMS5B5	Follow simple directions (e.g. move one step backward, 2 steps forwards)
KMS5B6	Identify missing elements in a visual and numerical pattern

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
KMS6B1	Determine the approach, materials and strategies to be used when setting up a problem
KMS6B2	Use tools and strategies, such as manipulatives or sketches to model problems
KMS6B3	Explain the reasoning used with concrete objects and or pictorial representations in solving problems

GRADE ONE:MATHEMATICS CONTENT AND PROCESS STANDARDS

By the end of grade one, students understand and use the concept of ones and tens in the place value number system. Students add and subtract small numbers with ease. They measure with simple units and locate objects in space. They describe data and analyze and solve simple problems.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G1MS1B1	Count, read and write numbers 1 – 100
G1MS1B2	Match place value models to number names and notation (tens and ones)
G1MS1B3	Locate whole numbers on a number line
G1MS1B4	Count forward or backward from an initial number
G1MS1B5	Understand that numbers are symbols used to represent quantities or attributes of real-world objects one to one
G1MS1B6	Understand symbolic, concrete, and pictorial representations of numbers (e.g. written numerals, objects in sets, number lines)
G1MS1B7	Understand the concept of a unit and its subdivision into equal parts (e.g. one object such as a candy bar and its division to share among 4 persons)
G1MS1B8	Understand whole numbers by exploring number relationships using concrete materials (e.g. demonstrates with blocks that 7 is one les than 8 or two more than 5)
G1MS1B9	Understand the concept of order by sequencing events (e.g. the steps in washing a dog)
G1MS1B10	Identify ordinal positions up to 10
G1MS1B11	Compare and order whole numbers using concrete materials and drawings to develop number meanings (e.g. to show place value, arrange 32 counters in groups of 3 tens and 2 ones)
G1MS1B12	Compare and order whole numbers to 100 by using the terms more/less/same
G1MS1B13	Represent equivalent forms of the same number through the use of physical models, diagrams and number expressions to 20 (e.g. 8 may be represented as 4+4; 5+3; 2+2+2+2; 10-2)
G1MS1B14	Count and group objects in ones and tens (e.g. three groups of 10 and 4 equals 34 or 30+4
G1MS1B15	Represent fractions using concrete materials (e.g. identifies ½; ¼; 1/3 of a whole
G1MS1B16	Understand and explain basic operations (addition and subtraction) of whole numbers (up to double digits without regrouping) by modeling and discussing a variety of problem situations (e.g. shows that addition involves joining.)
G1MS1B17	Identify, compare and contrast and know the value of coins and

#	
	show different combinations of coins that equal the same value using Bahamian and American coins.
G1MS1B18	Skip counting by 2's, 5's, 10's to 100.

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
G1MS2B1	Compare the length, weight, and capacity of two or more objects by using direct comparison or a nonstandard unit.
G1MS2B2	Tell time to the nearest hour and relate time to events(e.g. before/after, shorter/longer
G1MS2B3	Recite days and months in order
G1MS2B4	Counting on to solve problems involving elapsed time to the hour.
G1MS2B5	Compare the areas of shapes using non-standard units (e.g. which object will occupy more space on a flat surface)
G1MS2B6	Estimate or measure length using non-standard units
G1MS2B7	Estimate or measure temperature using non-standard units
G1MS2B8	Use a balance scale

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G1MS3B1	Identify, describe and compare triangles, rectangles, squares, and circles
G1MS3B2	Classify and sort familiar plane and solid objects by common attributes, such as color, position, shape, size, roundness
G1MS3B3	Identify appropriate tools of measurement
G1MS3B4	Understands that patterns can be made putting different shapes together or taking them apart
G1MS3B5	Give and follow directions about location.
G1MS3B6	Arrange and describe objects in space by proximity, position and direction (e.g. near, far, below, above, up, down, behind, in front of, next to, left or right of).

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G1MS4B1	Sort objects and data by common attributes (colour, size, shape, texture) and describe the categories.
G1MS4B2	Describe, extend and explain ways to get to a next element in simple repeating patterns (e.g. rhythmic, numeric, color and shape)
G1MS4B3	Read and interprets graphs and tables (bar, picture)
G1MS4B4	Compare data by using pictures and bar graphs
G1MS4B6	Demonstrate the ability to predict in familiar day-to-day situations
G1MS4B7	Make predictions from a graph

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G1MS5B1	Recognize regularities in a variety of contexts (e.g. frequency of occurrence of events, designs, shapes, sets of numbers)
G1MS5B2	Write and solve number sentences from problem situations that express relationships involving addition and subtraction
G1MS5B3	Understand the meaning of the symbols +, -, =
G1MS5B4	Create problem situations that might lead to given number sentences involving addition and subtraction
G1MS5B5	Extend a picture, sound, object or numerical pattern
G1MS5B6	Translate problem situations into algebraic equations and expressions
G1MS5B7	Use Venn diagrams for classification

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G1MS6B1	Know the addition facts (sums to 10) and the corresponding subtraction facts and commit them to memory
G1MS6B2	Solve problems involving place value concepts
G1MS6B3	Use the inverse relationship between addition and subtraction to solve problems up to 10.
G1MS6B4	Identify one more than, one less than, 10 more than and 10 less or 100 more than or less than a given number.
G1MS6B5	Count by 2s, 5s and 10s to 100 relating the process to recitation of the times tables
G1MS6B6	Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference). Solve simple problems involving counting, joining,

#	Benchmark
	and taking one group away from another (e.g. how many buttons are on the table). Describe and explain the strategies used making precise calculations and checking the validity of the results from the context of the problem
G1MS6B7	Estimate quantities in everyday life (e.g. guesses then counts how many beans are in the jar)
G1MS6B8	Solve problems using spatial reasoning
G1MS6B9	Solve addition and subtraction problems with one- and two-digit numbers (without regrouping)
G1MS6B10	Find the sum of three one-digit numbers
G1MS6B11	Use discussions with teachers and other students to understand problems
G1MS6B12	Solve problems by applying strategies including the use of tools such as manipulatives or sketches to model problems and justifying solutions to problems
G1MS6B13	Solve problems involving fraction concepts
G1MS6B14	Identify and use key words in problem solving

GRADE TWO: MATHEMATICS CONTENT AND PROCESS STANDARDS

By the end of grade two, students understand place value and number relationships in addition and subtraction, and they use simple concepts of multiplication. They measure quantities with appropriate units. They classify shapes and see relationships among them by paying attention to their geometric attributes. They collect and analyze data and verify the answers.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G2MS1B1	Count, read and write whole numbers to 999 using concrete materials, drawings, numerals and words, and expanded form and identify the place value for each digit
G2MS1B2	Understand basic whole number relationships (e.g. 4 is less than 10, 30 is 3 tens), uses the terms greater than, less than and equal to
G2MS1B3	Identify a number that is 10 and 100 times more than a given number
G2MS1B4	Locate whole numbers on a number line
G2MS1B5	Know odd and even numbers
G2MS1B6	Understand that fractional parts of a whole are equally sized pieces
G2MS1B7	Order and compare whole numbers to 999 by using the symbols <, =, >
G2MS1B8	Understand and use the inverse relationship between addition and subtraction to solve problems and check solutions
G2MS1B9	Find the sum or difference of two whole numbers up to three digits long up to 2 regroupings
G2MS1B10	Use mental arithmetic to find the sum or difference of two two-digit numbers up to 99
G2MS1B11	Count forward and backward from an initial number
G2MS1B12	Identify and use properties of addition and multiplication
G2MS1B13	Skip count to 48 by 4's
G2MS1B14	Use repeated addition, arrays and counting by multiples to do multiplication (2, 3, 4, 5 and 10)
G2MS1B15	Use repeated subtraction, equal sharing and forming equal groups with remainders to do division
G2MS1B16	Know the multiplication tables of 2s, 5s, and 10s to times 12 and commit to memory
G2MS1B17	Recognize, name and compare unit fractions from 1/12 to ½
G2MS1B18	Recognize fractions of a whole and parts of a group
G2MS1B19	Know that when all fractional parts are included such as four-fourths, the result is equal to the whole and to one
G2MS1B20	Solve problems using combination of coins and bills
G2MS1B21	Know and use the decimal notation and the dollar and the dollar and cent symbols for money

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
G2MS2B1	Understand the basic measures of length, width, height, weight, and temperature (use a thermometer)
G2MS2B2	Demonstrate an understanding of and ability to apply measurement terms (e.g. centimeter, meter, gram, kilogram, second, minute, hour, coins to $1 value, and bills, make change for $1.00)
G2MS2B3	Identify relationships between and among measurement concepts (e.g. shorter time, longer length, colder temperatures)
G2MS2B4	Solves problems related to day-today environment using concrete experiences of measurement and estimation
G2MS2B5	Measure the length of objects by repeating a nonstandard or standard unit
G2MS2B6	Use different units to measure the same object and predict whether the measure will be greater or smaller when a different unit is used
G2MS2B7	Tell time to the nearest half hour and know relationships of time (e.g. minutes in an hour, days in a month, weeks in a year)
G2MS2B8	Determine the duration of intervals of time in hours (e.g. 11:00 a.m. to 4:00 p.m.)
G2MS2B9	Recognize when an estimate is reasonable in measurements

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G2MS3B1	Sort and classify solid shapes e.g. identifies a sphere, cone, cube and cylinder
G2MS3B2	Understand properties of common plane shapes (e.g. number of sides, faces, corners and edges)
G2MS3B3	Understand the difference between plane and solid shapes (e.g. explains differences using words, pictures or with objects)
G2MS3B4	Describe and classify three-dimensional figure and two-dimensional shapes using concrete materials and drawings
G2MS3B5	Identify symmetry

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G2MS4B1	Collect, sort and classify objects and data using concrete materials (e.g. constructs and interprets concrete, picture and bar graphs)
G2MS4B2	Record numerical data in systematic ways, keeping track of what has been counted
G2MS4B3	Represent the same data set in more than one way (e.g. bar graphs and charts with tallies)
G2MS4B4	Ask and answer simple questions related to data representations
G2MS4B5	Recognize, describe and extend patterns and determine a next term in linear patterns
G2MS4B6	Solve problems involving simple number patterns
G2MS4B7	Understand that some events are more likely to happen than others

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G2MS5B1	Identify, continue and create pictorial patterns; action patterns; number patterns which repeat or grow
G2MS5B2	Explore patterns and pattern rules in real world
G2MS5B3	Use the commutative and associative rules to simplify mental calculations and to check results
G2MS5B4	Relate problem situations to number sentences involving addition and subtraction
G2MS5B5	Solve addition and subtraction problems by using data from simple charts, picture graphs and number sentences.
G2MS5B6	Identify missing elements in a numerical pattern
G2MS5B7	Use Venn diagrams for classification
G2MS5B8	Translate problem situations into algebraic equations and expressions

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G2MS6B1	Solve problems involving the four operations (multiplication as repeated addition and division as repeated subtraction) using facts, mental or paper and pencil algorithms, determining the approach, materials, and strategies to use, using tools such as manipulatives or sketches to model problems and explaining the strategies used to arrive at the answers
G2MS6B2	Defend the reasoning used and justify the procedures selected in problem solving making precise calculations and checking the validity of the results in the context of the problem

#	**Benchmark**
G2MS6B3	Explore multiplication as repeated addition through story problems (Note that this is meant as an introduction only. The student does not learn multiplication and division facts at this time)
G2MS6B4	Explore division as repeated subtraction through story problems (Note that this is meant as an introduction only. The student does not learn multiplication and division facts at this time)
G2MS6B5	Solve problems using fraction concepts

GRADE THREE: MATHEMATICS CONTENT AND PROCESS STANDARDS

By the end of grade three, students deepen their understanding of place value and their understanding of and skill with addition, subtraction, multiplication and division of whole numbers. Students estimate, measure, and describe objects in space. They use patterns to help solve problems. They represent number relationships and conduct simple probability experiments.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G3MS1B1	Understand the basic difference between odd and even numbers
G3MS1B2	Recall basic addition and subtraction facts with automaticity
G3MS1B3	Count, read and write whole numbers to 10,000
G3MS1B4	Compare and order whole numbers to 10,000 using concrete materials, number lines, drawings and ordinals
G3MS1B5	Identify the place value for each digit in numbers to 10,000
G3MS1B6	Round numbers to 10,000 to the nearest ten, hundred, and thousand using rounding to estimate computations and to check the reasonableness of computational results
G3MS1B7	Use expanded notation to represent numbers
G3MS1B8	Perform basic mental computations on whole numbers using the four operations
G3MS1B9	Know the language of basic operations – factors, products multiplication
G3MS1B10	Find the sum or difference of two whole numbers between 0 and 10,000 and understand the inverse relationship between addition and subtraction (regrouping 3 times)
G3MS1B11	Memorize to automaticity the multiplication table for numbers between 1 and 10 up to times 12
G3MS1B12	Use the inverse relationship of multiplication and division to compute and check results
G3MS1B13	Solve simple problems involving multiplication of multidigit numbers by one-digit numbers (456 x 3 =)
G3MS1B14	Solve division problems in which a multidigit number is evenly divided by a one-digit number ($135 \div 5 =$)
G3MS1B15	Understand the special properties of 0 and 1 in multiplication and division
G3MS1B16	Determine the unit cost when given the total cost and number of units.
G3MS1B17	Solve problems that require two or more operations
G3MS1B18	Understand the relationships among fractions, decimals, mixed numbers and whole numbers (equivalent forms of basic percents, fractions and decimals (e.g. ½ is equivalent to 50% is equivalent to .5) and when one form might be more useful than

#	Benchmark
	another
G3MS1B19	Compare fractions represented by drawings or concrete materials to show equivalency and to add and subtract simple fractions in context
G3MS1B20	Add and subtract simple fractions with like denominators
G3MS1B21	Solve problems involving addition, subtraction, multiplication and division of money amounts in decimal notation and multiply and divide money amounts in decimal notation by using whole-number multipliers and divisors.
G3MS1B22	Know and understand that fractions and decimals are two different representations of the same concept (e.g. ½ is 50 cents)
G3MS1B23	Solve real-world problems and equations involving number operations using various computational methods including paper and pencil, mental mathematics, calculators and estimation (e.g., addition and subtraction of whole numbers involving the sum or difference of 2 whole numbers up to and including 9,999 or less with or without regrouping; computations with dollars and cents) and explains the strategies used
G3MS1B24	Use a calculator as tool in problem solving beyond the required pencil-and-paper skills

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
G3MS2B1	Understand the basic measures of perimeter, area, volume, capacity, mass, angle, and circumference
G3MS2B2	Choose the appropriate tools (rulers for length, measuring cups for capacity, protractors for angles) and units (metric and imperial) and estimate and measure the length, liquid volume and weight/mass of given objects
G3MS2B3	Know approximate size of basic standard units (e.g. centimeter, feet, grams) and the relationship between them (e.g. between inches and feet)
G3MS2B4	Understand relationships between measures (e.g. between length, perimeter and area)
G3MS2B5	Understand that measurement is not exact
G3MS2B6	Use specific strategies to estimate quantities and measurements
G3MS2B7	Select and use appropriate units of measurement, according to type and size of unit
G3MS2B8	Demonstrate an understanding of and ability to apply measurement terms (e.g. use a metric ruler to measure to the

#	Benchmark
	nearest centimeter, tells time accurately, reads and records temperatures o a thermometer and interprets the readings, understands the concepts of week, month, year
G3MS2B9	Solve problems related to day-to-day environment using measurement and estimation
G3MS2B10	Estimate or determine the area and volume of solid figures by covering them with squares or by counting the number of cubes that will fill them
G3MS2B11	Estimate, measure and record the perimeter and the area of two dimensional shapes and compare the perimeters and areas
G3MS2B12	Estimate, measure and record the capacity of containers and the mass of familiar objects and compare the measures
G3MS2B13	Carry out simple unit conversions within a system of measurement (e.g. centimeters and meters, hours and minutes)

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G3MS3B1	Identify, describe and classify polygons (including pentagons, hexagons, octagons, trapezoid, parallelogram, cube, sphere)
G3MS3B2	Understand the basic properties of figures (e.g. two dimensionality, symmetry, number of faces, type of angle)
G3MS3B3	Predict and verify the effects of combining, subdividing and changing basic shapes
G3MS3B4	Understand that shapes can be congruent or similar
G3MS3B5	Use motion geometry (e.g. turns, flips, slides) to understand geometric relationships
G3MS3B6	Understand characteristics of lines (e.g., parallel, perpendicular, intersecting) and angles (e.g., right, acute)
G3MS3B7	Understand how scale in maps and drawings shows relative size and distance
G3MS3B8	Identify and classify common shapes (plane and solid) and explains their properties in simple terms (sphere, cylinder, cone, cuboid, cube, pyramid)
G3MS3B9	Identify and draw points, lines and line segments using rulers and straight edges
G3MS3B10	Understand that geometric shapes are useful for representing and describing real world situations
G3MS3B11	Investigate the attributes of three-dimensional figures and two-dimensional shapes using concrete materials and drawings

#	Benchmark
G3MS3B12	Describe location and movements on a grid
G3MS3B13	Use language effectively to describe geometric concepts, reasoning, and investigations
G3MS3B14	Identify attributes of triangles (e.g. two equal sides for the isosceles triangle, three equal sides for the equilateral triangle, right angle for the right triangle.)
G3MS3B15	Identify attributes of quadrilaterals (e.g. parallel sides for the parallelogram, right angles for the rectangle, equal sides and right angles for the square.)
G3MS3B16	Identify right angles in geometric figures or in appropriate objects and determine whether other angles are greater or less than a right angle
G3MS3B17	Identify common solid objects that are components needed to make a more complex solid object.

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G3MS4B1	Understand that data represent specific pieces of information about real-world objects or activities
G3MS4B2	Understand that spreading data out on a number line helps to see what the extremes are, where the data points pile up, and where the gaps are
G3MS4B3	Understand that a summary of data should include where the middle is and how much spread there is around it
G3MS4B4	Organize and display data in simple bar graphs, pie charts, and line graphs
G3MS4B5	Read and interpret simple bar graphs, pie charts, and line graphs
G3MS4B6	Understand that data come in many different forms and that collecting, organizing, and displaying data can be done in many ways
G3MS4B7	Understand the basic concept of a sample (e.g., a large sample leads to more reliable information; a small part of something may have unique characteristics but not be an accurate representation of the whole)
G3MS4B8	Sort, classify and cross-classifies objects and data (e.g., collects, organises and analyses data using a simple bar graph)
G3MS4B9	Interpret displays of data, present the information, and

#	Benchmark
	discusses it using mathematical language
G3MS4B10	Identify whether common events are certain, likely, unlikely or improbable.
G3MS4B11	Record the possible outcomes for a simple event (e.g. tossing a coin and systematically keep track of the outcomes when the event is repeated many times
G3MS4B12	Summarize and display the results of probability experiments in a clear and organized way (e.g. bar graph or a line plot)
G3MS4B13	Use the results of probability experiments to predict future events (e.g. use a line plot to predict the temperature forecast for the next day.)
G3MS4B14	Understand that the word "chance" refers to the likelihood of an event
G3MS4B15	Recognize events that are sure to happen, events that are sure not to happen, and events that may or may not happen (e.g., in terms of "certain," "uncertain," "likely," "unlikely")
G3MS4B16	Understand that when predictions are based on what is known about the past, one must assume that conditions stay the same from the past event to the predicted future event
G3MS4B17	Understand that statistical predictions are better for describing what proportion of a group will experience something (e.g., what proportion of automobiles will be involved in accidents) rather than which individuals within the group will experience something, and how often events will occur (e.g., how many sunny days will occur over a year) rather than exactly when they will occur
G3MS4B18	Use basic sample spaces (i.e., the set of all possible outcomes) to describe events
G3MS4B19	Relate meaningful experiences about probability
G3MS4B20	Understand that some events can be predicted fairly well but others cannot because we do not always know everything that may affect an event

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G3MS5B1	Recognize a wide variety of patterns (e.g., basic linear patterns such as [2, 4, 6, 8 . . .] ; simple repeating and growing patterns) and the rules that explain them
G3MS5B2	Understand that the same pattern can be represented in different ways (e.g., geometrically or numerically; the pattern of numbers [7, 14, 21, 28 . . .] is equivalent to the mathematical relationship $7 \times n$)
G3MS5B3	Know that a variable is a letter or symbol that stands for one or more numbers
G3MS5B4	Understand the basic concept of an equality relationship (i.e., an equation is a number sentence that shows two quantities that are equal)
G3MS5B5	Solve simple open sentences involving operations on whole numbers (e.g., $+ 17 = 23$)
G3MS5B6	Know basic characteristics and features of the rectangular coordinate system (e.g., the horizontal axis is the X axis and the vertical axis is the Y axis)
G3MS5B7	Recognize that patterning results from repetition
G3MS5B8	Identify, extend and create linear and non-linear geometric patterns, number and measurement patterns, and patterns in his/her environment
G3MS5B9	Create charts to display patterns
G3MS5B10	Identify relationships between and among patterns
G3MS5B11	Represent relationships of quantities in the form of mathematical expressions, equations or inequalities
G3MS5B12	Solve problems involving numeric equations or inequalities.
G3MS5B13	Select appropriate operational and relational symbols to make an expression true (e.g. if 4 _ 3 = 12 what operational symbol goes in the blank?)
G3MS5B14	Express simple unit conversion in symbolic form (e.g. _ inches = feet x 12).
G3MS5B15	Recognize and use the commutative and associative properties of multiplication (e.g. if 5 x7 =35, then what is 7 x 5? And if 5 x 7 x 3 = 105 then what is 7 x 3 x 5?)
G3MS5B16	Solve simple problems involving a functional relationship between two quantities (e.g. find the total cost of multiple items given the cost per unit.)

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G3MS6B1	Use a variety of strategies to understand problem situations (e.g., discussing with peers, stating problems in own words, modeling problem with diagrams or physical objects, identifying a pattern, identifying relationships, distinguishing relevant information, sequencing and prioritizing information)
G3MS6B2	Represent problems situations in a variety of forms (e.g., translates from a diagram to a number or symbolic expression)
G3MS6B3	Understand that some ways of representing a problem are more helpful than others
G3MS6B4	Use trial and error and the process of elimination to solve problems
G3MS6B5	Determine when and how to break a problem into simpler parts.
G3MS6B6	Understand the basic language of logic in mathematical situations (e.g., "and," "or," "not")
G3MS6B7	Use explanations of the methods and reasoning behind the problem solution to determine reasonableness of and to verify results with respect to the original problem
G3MS6B8	Understand basic valid and invalid arguments (e.g., counter examples, irrelevant approaches)
G3MS6B9	Solve non-routine problems by applying strategies
G3MS6B10	Make organized lists or tables of information necessary for solving a problem
G3MS6B11	Use estimation to verify the reasonableness of calculated results
G3MS6B12	Apply strategies and results from simpler problems to more complex problems
G3MS6B13	Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams ad models to explain mathematical reasoning
G3MS6B14	Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
G3MS6B15	Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
G3MS6B16	Make precise calculations and check the validity of the results from the context of the problem
G3MS6B17	Note the method deriving the solution and demonstrate a

#	Benchmark
	conceptual understanding of the derivation by solving similar problems.
G3MS6B18	Develop generalizations of the results obtained and apply them in other circumstances.

GRADE FOUR: MATHEMATICS CONTENT AND PROCESS STANDARDS

By the end of grade four, students understand large numbers and addition, subtraction, multiplication and division of whole numbers. They describe and compare simple fractions and decimals. They understand the properties of, and the relationships between, plane geometric figures. They collect, represent, and analyze data to answer questions.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G4MS1B1	Read and write whole numbers in the millions
G4MS1B2	Order and compare whole numbers and decimals to two decimal places using concrete materials where applicable
G4MS1B3	Round whole numbers through the millions to the nearest ten, hundred, thousand, ten thousand, or hundred thousand.
G4MS1B4	Decide when a rounded solution is called for and explain why such a solution may be appropriate
G4MS1B5	Explain different interpretations of fractions for example, parts of a whole, parts of a set; explain equivalence of fractions
G4MS1B6	Write tenths and hundredths in decimal and fraction notations and know the fraction and decimal equivalents for halves and fourths
G4MS1B7	Write the fraction represented by a drawing of parts of a figure; represent a given fraction by using drawings; and relate a fraction to a simple decimal on a number line
G4MS1B8	Identify on a number line the relative position of positive fractions, positive mixed numbers and decimals to two decimal places
G4MS1B9	Estimate and compute the sum or difference of whole numbers and positive decimals to two places
G4MS1B10	Demonstrate an understanding of and the ability to use standard algorithms for the addition and subtraction of multidigit numbers
G4MS1B11	Demonstrate an understanding of and the ability to use standard algorithms for multiplying a multidigit number (3 digits) by a two-digit number and for dividing a multidigit number (up to 4 digits) by a one-digit number with remainders; use relationships between them to simplify computations and to check results.
G4MS1B12	Solve problems involving multiplication of multidigit numbers by two-digit numbers
G4MS1B13	Solve problems involving division of multidigit numbers by one-digit numbers
G4MS1B14	Understand that many whole numbers break down in different ways (e.g. 12=4x3=2x6=2x2x3
G4MS1B15	Know that numbers such as 2,3,5,7 and 11 do not have any

#	Benchmark
	factors except themselves and the number one and that such numbers are called prime numbers
G4MS1B16	Understand the relationships among fractions, decimals, mixed numbers, and whole numbers
G4MS1B17	Understand equivalent forms of basic percents, fractions, and decimals (e.g., ½ is equivalent to 50% is equivalent to .5) and when one form of a number might be more useful than another
G4MS1B18	Understand the basic difference between odd and even numbers
G4MS1B19	Understand the relative magnitude of whole numbers, fractions, decimals, and mixed numbers
G4MS1B20	Identify, write and illustrate mixed numbers
G4MS1B21	Compare and order mixed numbers and proper and improper fractions with like denominators using concrete materials and drawings
G4MS1B22	Understand and explain basic operations (addition and subtraction) of decimals by modeling and discussing a variety of problem situations

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
G4MS2B1	Select and use appropriate units of measurement, according to type and size of unit
G4MS2B2	Demonstrate an understanding of and ability to apply appropriate metric prefixes in measurement and estimation activities (***e.g., estimates and measures length in kilometres, metres, centimetres, and millimetres selecting the appropriate unit when necessary)
G4MS2B3	Solve problems related to his/her day-to-day environment using measurement and estimation (***e.g., estimates and measures time needed to perform a task, solves real world problems involving the addition, subtraction, multiplication and division of money)
G4MS2B4	Select and use appropriate tools for given measurement situations (e.g., rulers for length, measuring cups for capacity, protractors for angle)
G4MS2B5	Know approximate size of basic standard units (e.g., centimetres, feet, grams) and relationships between them (e.g.,

#	Benchmark
	between inches and feet)
G4MS2B6	Measure the area of rectangular shapes by using appropriate units, such as square centimeter, square meter, square kilometer square inch, square yard or square mile
G4MS2B7	Recognize that rectangles that have the same area can have different perimeters
G4MS2B8	Understand that rectangles that have the same perimeter can have different areas
G4MS2B9	Understand and use formulas to solve problems involving perimeters and areas of rectangles and squares. Use those formulas to find the areas of more complex figures by dividing the figures into basic shapes
G4MS2B10	Identify and locate points on a grid using ordered pairs.

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G4MS3B1	Identify the radius and diameter of a circle
G4MS3B2	Identify figures that have bilateral symmetry
G4MS3B3	Know basic geometric language for describing and naming shapes (e.g., trapezoid, parallelogram, cube, sphere)
G4MS3B4	Understand basic properties of figures (e.g., two- or three-dimensionality, symmetry, number of faces, type of angle)
G4MS3B5	Predict and verify the effects of combining, subdividing, and changing basic shapes
G4MS3B6	Understand that shapes can be congruent or similar
G4MS3B7	Use motion geometry (e.g., turns, flips, slides) to understand geometric relationships
G4MS3B8	Understand characteristics of lines (e.g., parallel, perpendicular, intersecting) and angles (e.g., right, acute)
G4MS3B9	Understand how scale in maps and drawings shows relative size and distance
G4MS3B10	Investigate the attributes of three-dimensional figures and two-dimensional shapes using concrete materials and drawings (e.g., *draws and builds three-dimensional objects and models)
G4MS3B11	Know the definitions of a right angle, an acute angle, straight angle and an obtuse angle. Understand that 90º, 180º, 270º and 360º are associated, respectively, with ¼, ½, ¾ and full turns
G4MS3B12	Know the definitions of different triangles (e.g. equilateral, isosceles, scalene) and identify their attributes
G4MS3B13	Know the definition of different quadrilaterals (e.g. rhombus, square, rectangle, parallelogram, trapezoid)

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G4MS4B1	Understand that data represent specific pieces of information about real-world objects or activities
G4MS4B2	Understand that spreading data out on a number line helps to see what the extremes are, where the data points pile up, and where the gaps are
G4MS4B3	Understand that a summary of data should include where the middle is and how much spread there is around it
G4MS4B4	Organize and display data in simple bar graphs, pie charts, and line graphs
G4MS4B5	Read and interpret simple bar graphs, pie charts, and line graphs
G4MS4B6	Understand that data come in many different forms and that collecting, organizing, and displaying data can be done in many ways
G4MS4B7	Understand the basic concept of a sample (e.g., a large sample leads to more reliable information; a small part of something may have unique characteristics but not be an accurate representation of the whole)
G4MS4B8	Collect and organize data and identify their use (e.g., ***collect, record, organize and analyze data from bar and line graphs)
G4MS4B9	Predict the results of data collected
G4MS4B10	Interpret displays of data and presents the information using mathematical terms (***e.g., identifies the median and mode of an ordering, calculates the average—arithmetical mean—of a set of data, estimates the average/mean of a set of data using mental arithmetic)
G4MS4B11	Formulate survey questions; systematically collect and represent data on a number line; and coordinate graphs, tables, and charts.
G4MS4B12	Interpret one- and two-variable data graphs to answer questions about a situation
G4MS4B13	Understand that the word "chance" refers to the likelihood of an event
G4MS4B14	Recognize events that are sure to happen, events that are sure not to happen, and events that may or may not happen (e.g., in terms of "certain," "uncertain," "likely," "unlikely")
G4MS4B15	Understand that when predictions are based on what is known about the past, one must assume that conditions stay the same

#	Benchmark
	from the past event to the predicted future event
G4MS4B16	Understand that statistical predictions are better for describing what proportion of a group will experience something (e.g., what proportion of automobiles will be involved in accidents) rather than which individuals within the group will experience something, and how often events will occur (e.g., how many sunny days will occur over a year) rather than exactly when they will occur
G4MS4B17	Use basic sample spaces (i.e., the set of all possible outcomes) to describe events
G4MS4B18	Demonstrate an understanding of probability and uses language appropriate to situations involving probability experiments (e.g., ***performs simple experiments and records probability)
G4MS4B19	Solve simple problems involving the concept of probability
G4MS4B20	Represent all possible outcomes for a simple probability situation in an organized way (e.g. tables, grids, tree diagrams)
G4MS4B21	Express outcomes of experimentally probability situations verbally and numerically

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G4MS5B1	Use letters, boxes or other symbols to stand for any number in simple expressions or equations (e.g. demonstrate an understanding and the use of the concept of a variable).
G4MS5B2	Interpret and evaluate mathematical expressions that now use parentheses (order of operations).
G4MS5B3	Use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations
G4MS5B4	Use and interpret formulas (e.g. area=length x width or A=lw) to answer questions about quantities and their relationships
G4MS5B5	Understand that an equation such as $y = 3x + 5$ is a prescription for determining a second number when a first number is given
G4MS5B6	Know and understand that equals added to equals are equal
G4MS5B7	Know and understand that equals multiplied by equals are equal
G4MS5B8	Recognize a wide variety of patterns (e.g., basic linear patterns such as [2, 4, 6, 8 . . .] ; simple repeating and growing patterns) and the rules that explain them
G4MS5B9	Understand that the same pattern can be represented in

#	Benchmark
	different ways (e.g., geometrically or numerically; the pattern of numbers [7, 14, 21, 28 . . .] is equivalent to the mathematical relationship 7 × n)
G4MS5B10	Know that a variable is a letter or symbol that stands for one or more numbers
G4MS5B11	Understand the basic concept of an equality relationship (i.e., an equation is a number sentence that shows two quantities that are equal)
G4MS5B12	Know basic characteristics and features of the rectangular coordinate system (e.g., the horizontal axis is the X axis and the vertical axis is the Y axis)
G4MS5B13	Identify relationships between and among patterns
G4MS5B14	Demonstrate an understanding of mathematical relationships in patterns using concrete materials, drawings, and symbol
G4MS5B15	Apply patterning strategies to problem-solving situations (***e.g., solves non-routine problems where finding a pattern is an appropriate strategy)

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G4MS6B1	Add, subtract, multiply, and divide whole numbers and decimals
G4MS6B2	Add and subtract simple fractions
G4MS6B3	Use specific strategies (e.g., front-end estimation, rounding) to estimate computations and to check the reasonableness of computational results
G4MS6B4	Perform basic mental computations (e.g., addition and subtraction of whole numbers)
G4MS6B5	Determine the effects of addition, subtraction, multiplication, and division on size and order of numbers
G4MS6B6	Understand the properties of and the relationships among addition, subtraction, multiplication, and division (e.g., reversing the order of two addends does not change the sum; division is the inverse of multiplication)
G4MS6B7	Solve real-world problems involving number operations (e.g., computations with dollars and cents)
G4MS6B8	Know the language of basic operations (e.g., "factors," "products," "multiplication")
G4MS6B9	Select and performs computation techniques appropriate to specific problems involving whole numbers and decimals, and

#	Benchmark
	determines whether the results are reasonable (***e.g., rounds whole numbers to the nearest thousand, ten thousand, and hundred thousand, rounds decimals to the nearest whole, tenth and hundredth)
G4MS6B10	Solve problems involving whole numbers and decimals, and describes and explains the variety of strategies used
G4MS6B11	Justify in oral or written expression the method chosen for calculations beyond the proficiency expectations for pencil-and-paper operations: estimation, mental computation, concrete materials, algorithms (rules for calculations), or calculators
G4MS6B12	Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns
G4MS6B13	Determine when and how to break a problem into simpler parts.
G4MS6B14	Use estimation to verify the reasonableness of calculated results
G4MS6B15	Apply strategies and results from simpler problems to more complex problems
G4MS6B16	Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to explain mathematical reasoning.
G4MS6B17	Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work
G4MS6B18	Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy
G4MS6B19	Make precise calculations and check the validity of the results from the context of the problem
G4MS6B20	Evaluate the reasonableness of the solution in the context of the original situation
G4MS6B21	Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems
G4MS6B22	Develop generalizations of the results obtained and apply them in other circumstances

GRADE FIVE: **MATHEMATICS CONTENT AND PROCESS STANDARDS**
(Aligned with standards of the NCTM and the MOEST and the assessment tools SAT 10
Primary 2 and the CEC Grade Four End of Term District Examination)

By the end of grade five, students increase their facility with the four basic arithmetic operations applied to fractions and decimals and learn to add and subtract positive and negative numbers. They know and use common measuring units to determine length and area and know and use formulas to determine the volume of simple geometric figures. Students know the concept of angle measurement and use a protractor and compass to solve problems. They use grids, tables, graphs and charts to record and analyze data.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G5MS1B1	Estimate, round and manipulate very large (e.g. millions) and very small (e.g. thousandths) numbers.
G5MS1B2	Understand and compute positive integer powers of integers; compute examples as repeated multiplication
G5MS1B3	Understands the relationships among fractions, decimals, mixed numbers, and whole numbers
G5MS1B4	Understand equivalent forms of basic percents, fractions, and decimals (e.g., ½ is equivalent to 50% is equivalent to .5) and when one form of a number might be more useful than another; compute a given percent of a whole number
G5MS1B5	Understand the basic difference between odd and even numbers and relationships between whole and Roman numerals
G5MS1B6	Identify and represent on a number line decimals, fractions, mixed numbers and positive integers
G5MS1B7	Determine the prime factors of all numbers through 50 and write the numbers as the product of their prime factors by using exponents to show multiples of a factor
G5MS1B8	Use models (e.g., number lines, two-dimensional and three-dimensional regions) to identify, order, and compare numbers
G5MS1B9	Identify and use the different kinds of numbers—even/odd, whole numbers, fractions, decimals, perfect squares
G5MS1B10	Use the terms sum, difference, product, quotient, factor, divisor, dividend and remainder appropriately
G5MS1B11	Demonstrate proficiency with long division with multidigit divisors up to 2 digits
G5MS1B12	Compare, order, and represent whole numbers, decimals, and fractions using concrete materials and drawings
G5MS1B13	Understand, explain and perform basic operations (addition, subtraction, multiplication and division :whole number divisor) of decimals by modeling and discussing a variety of problem situations

#	Benchmark
G5MS1B14	Compare and order, and represent the relationship between, fractions, improper fractions, and mixed numbers using concrete materials and drawings
G5MS1B15	Determine the LCM and GCF of whole numbers and use them to solve problems with fractions
G5MS1B16	Solve simple problems including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less) and express answers in the simplest form
G5MS1B17	Understand the concept of multiplication and division of fractions
G5MS1B18	Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	Benchmark
G5MS2B1	Understand the basic measures perimeter, area, volume, capacity, mass, angle, and circumference
G5MS2B2	Know approximate size of basic standard units (e.g., centimeters, feet, grams) and relationships between them (e.g., between inches and feet)
G5MS2B3	Understand relationships between measures (e.g., between length, perimeter, and area)
G5MS2B4	Use specific strategies to estimate quantities and measurements (e.g., estimating the whole by estimating the parts)
G5MS2B5	Select and uses appropriate units of measurement, according to type and size of unit
G5MS2B6	Demonstrates an understanding of and ability to apply appropriate metric prefixes in measurement and estimation activities (***e.g., measure and estimate length using standard unit—kilometre, metre, decimetre, centimetre, millimetre, estimates and measures volume with appropriate units, estimates, compares and measures time needed to complete a task)
G5MS2B7	Identify relationships between and among measurement concepts—linear, temporal, monetary (***e.g., establishes the relationships among second, minutes, hour, day, week, month, year, decade and century)
G5MS2B8	Derive and use the formula for the area of a triangle and of a parallelogram by comparing each with the formula for the area of a rectangle (e.g. two of the same triangles make a

#	Benchmark
	parallelogram with twice the area; a parallelogram is compared with a rectangle of the same area by pasting and cutting a right triangle on the parallelogram.
G5MS2B9	Construct a cube and rectangular box from two-dimensional patterns and use these patterns to compute the surface area for these objects.
G5MS2B10	Understand the concept of volume and use the appropriate unites in common measuring systems (i.e. cubic centimeters cm³) to compute the volume of rectangular solids.

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G5MS3B1	Identify, describe, compare, and classify geometric figures
G5MS3B2	Draw and build three-dimensional objects and models
G5MS3B3	Solve problems using geometric models
G5MS3B4	Understand key concepts in transformational geometry using concrete materials and drawings
G5MS3B5	Identify congruent and similar figures using transformations
G5MS3B6	Use mathematical language effectively to describe geometric concepts, reasoning, and investigations, and coordinate systems
G5MS3B7	Measure, identify, and draw angles, perpendicular and parallel lines, rectangles, and triangles by using appropriate tools (e.g. straightedge, ruler, compass, protractor, drawing software).
G5MS3B8	Know that the sum of the angles of any triangle is 180º and the sum of the angles of any quadrilateral is 360º and use this information to solve problems
G5MS3B9	Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids.

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G5MS4B1	Understand that spreading data out on a number line helps to see what the extremes are, where the data points pile up, and where the gaps are
G5MS4B2	Use computer applications to record the results of data collected
G5MS4B3	Predict the validity of the results of data collected
G5MS4B4	Interpret displays of data and presents the information using mathematical terms (***e.g., finds mean, median, mode and range of a set of data)
G5MS4B5	Evaluate and use data from graphic organizers (***e.g., explains statistical and graphical information)
G5MS4B6	Understand that spreading data out on a number line helps to see what the extremes are, where the data points pile up and where the gaps are
G5MS4B7	Understand that a summary of data should include where the middle is and how much spread there is around it
G5MS4B8	Organize and display single-variable data in appropriate graphs and representations (e.g. histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.
G5MS4B9	Use fractions and percentages to compare data sets of different sizes
G5MS4B10	Identify ordered pairs of data from a graph and interpret the meaning of the data in terms of the situation depicted by the graph
G5MS4B11	Know how to write ordered pairs correctly; for example (x,y)
G5MS4B12	Relate meaningful experiences about probability
G5MS4B13	Understand that some events can be predicted fairly well but others cannot because we do not always know everything that may affect an event

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G5MS5B1	Identify, extend and create patterns in a variety of contexts
G5MS5B2	Analyze and discuss patterning rules
G5MS5B3	Create tables to display patterns
G5MS5B4	Apply patterning strategies to problem-solving situations (***e.g., solve single variable equations using concrete objects, pictures or numbers)
G5MS5B5	Understand the basic concept of an equality relationship (i.e., an equation is a number sentence that shows two quantities that are equal)
G5MS5B6	Know basic characteristics and features of the rectangular coordinate system (e.g., the horizontal axis is the X axis and the vertical axis is the Y axis)
G5MS5B7	Use information taken from a graph or equation to answer questions about a problem situation
G5MS5B8	Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitutions
G5MS5B9	Know and use the distributive property in equations and expressions with variables
G5MS5B10	Identify and graph ordered pairs in the four quadrants of the coordinate plane
G5MS5B11	Solve problems involving linear functions with integer values; write the equation; and graph the resulting ordered pairs of integers on a grid

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G5MS6B1	Use a variety of strategies to understand problem situations (e.g., discussing with peers, stating problems in own words, modeling problem with diagrams or physical objects, identifying a pattern)
G5MS6B2	Represent problems situations in a variety of forms (e.g., translates from a diagram to a number or symbolic expression)
G5MS6B3	Understand that some ways of representing a problem are more helpful than others
G5MS6B4	Use trial and error and the process of elimination to solve problems
G5MS6B5	Know the difference between pertinent and irrelevant information when solving problems; analyze problems by identifying relationships; sequence and prioritize information and observe patterns
G5MS6B6	Understand the basic language of logic in mathematical situations (e.g., "and," "or," "not")
G5MS6B7	Use explanations of the methods and reasoning behind the problem solution to determine reasonableness of and to verify results with respect to the original problem
G5MS6B8	Understand basic valid and invalid arguments (e.g., counter examples, irrelevant approaches)
G5MS6B9	Understand that some ways of representing a problem are more helpful than others
G5MS6B10	Justify in oral and written expression the method chosen for calculations: estimation, mental computation, concrete materials, algorithms, or calculators
G5MS6B11	Understand the properties of and the relationships among addition, subtraction, multiplication, and division (e.g., reversing the order of two addends does not change the sum; division is the inverse of multiplication)
G5MS6B12	Use specific strategies (e.g., front-end estimation, rounding) to estimate computations and to check the reasonableness of computational results
G5MS6B13	Determine when and how to break a problem into simpler parts
G5MS6B14	Use estimation to verify the reasonableness of calculated results
G5MS6B15	Apply strategies and results from simpler problems to more complex problems
G5MS6B16	Use a variety of methods such as words, numbers, symbols,

#	Benchmark
	charts, graphs, tables, diagrams and models to explain mathematical reasoning
G5MS6B17	Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work
G5MS6B18	Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy
G5MS6B19	Make precise calculations and check the validity of the results from the context of the problem
G5MS6B20	Evaluate the reasonableness of the solution in the context of the original situation
G5MS6B21	Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems
G5MS6B22	Develop generalizations of the results obtained and apply them in other circumstances

By the end of grade six, students have mastered the four arithmetic operations with whole numbers, positive fractions, positive decimals, and positive and negative integers; they accurately compute and solve problems. They apply their knowledge to statistics and probability. Students understand the concepts of mean, median and mode of data sets and how to calculate the range. They analyze data and sampling processed for possible bias and misleading conclusions; they use addition and multiplication of fractions routinely to calculate the probabilities for compound events. Students conceptually understand and work with ratios and proportions; they compute percentages. Students know about π and the formulas involving geometric shapes and in ratios to represent an unknown part of an expression. They solve one-step linear equations.

STANDARD ONE: Understands and Applies Properties of the Concept of Numbers

#	Benchmark
G6MS1B1	Understand the relationships among equivalent number representations (e.g., whole numbers, positive and negative integers, fractions, ratios, decimals, percents, exponentials) and the advantages and disadvantages of each type of representation
G6MS1B2	Understand the characteristics and properties (e.g., order relations, relative magnitude, base- ten place value) of the set of rational numbers and its subsets (e.g., whole numbers, fractions, decimals, integers)
G6MS1B3	Understand the role of positive and negative integers in the number system
G6MS1B4	Understand basic number theory concepts (e.g., prime and composite numbers, factors, multiples, odd and even numbers, square numbers, roots, divisibility)
G6MS1B5	Understand the structure of numeration systems that are based on numbers other than 10 (e.g., base 60 for telling time and measuring angles, Roman numerals for dates and clock faces)
G6MS1B6	Recall basic multiplication and division facts (3 seconds or less per fact)
G6MS1B7	Represent and explore relationships between, decimals, mixed numbers, and fractions using concrete materials and drawings
G6MS1B8	Compare, order and represent decimals, percents, rates, and ratios using concrete materials and drawings
G6MS1B9	Compare and order, and represent the relationship between, fractions with unlike denominators using concrete materials and

	drawings e.g. number line
G6MS1B10	Understand the significance of numbers in the greater world and evaluates the use of numbers in the media
G6MS1B11	Compare and order fractions, decimals and mixed numbers and place them on a number line
G6MS1B12	Interpret and use ratios in different contexts to show the relative sizes of two quantities, using appropriate notations (a/b, a to b, a:b)
G6MS1B13	Use proportions to solve problems (e.g. determine the value of n if 4/7 = n/21, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse
G6MS1B14	Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips
G6MS1B15	Solve problems involving addition, subtraction, multiplication and division of positive fractions and explain why a particular operation was used for a given situation
G6MS1B16	Determine the least common multiple and the greatest common factor of whole numbers; use them to solve problems with fractions

STANDARD TWO: Understands and applies properties of the concepts of measurement

#	**Benchmark**
G6MS2B1	Understand the basic concept of rate as a measure (e.g., miles per gallon)
G6MS2B2	Solve problems involving perimeter (circumference) and area of various shapes (e.g., parallelograms, triangles, circles)
G6MS2B3	Understand the relationships among linear dimensions, area, and volume and the corresponding uses of units, square units, and cubic units of measure
G6MS2B4	Solve problems involving units of measurement and converts answers to a larger or smaller unit within the same system (i.e., standard or metric)
G6MS2B5	Understand the concepts of precision and significant digits as they relate to measurement (e.g., how units indicate precision)
G6MS2B6	Select and use appropriate units and tools, depending on degree of accuracy required, to find measurements for real-world problems
G6MS2B7	Understand formulas for finding measures (e.g., area, volume, surface area)
G6MS2B8	Select and use appropriate estimation techniques (e.g., overestimate, underestimate, range of estimates) to solve real-

#	Benchmark
	world problems
G6MS2B9	Understand procedures for basic indirect measurements (e.g., using grids to estimate area of irregular figures)
G6MS2B10	Understand the concept of a constant such as π; know the formulas for the circumference and area of a circle
G6MS2B11	Know the common estimates of π (3.14; 22/7) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements
G6MS2B12	Know and use the formulas for the volume of rectangular solids and cylinders (area of base x. height); compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid

STANDARD THREE: Understands and applies properties of the concepts of geometry

#	Benchmark
G6MS3B1	Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms
G6MS3B2	Use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle
G6MS3B3	Draw quadrilaterals and triangles from given information about them (e.g. quadrilateral having equal sides but no right angles, a right isosceles triangle)
G6MS3B4	Understand the defining properties of three-dimensional figures (e.g., a cube has edges with equal lengths, faces with equal areas and congruent shapes, right angle corners)
G6MS3B5	Understand the defining properties of triangles (e.g., the sum of the measures of two sides of a triangle must be greater than the measure of the third side)
G6MS3B6	Understand geometric transformations of figures (e.g., rotations, translations, dilations)
G6MS3B7	Understand the relationships between two- and three-dimensional representations of a figure (e.g., scale drawings)
G6MS3B8	Understand the mathematical concepts of similarity (e.g., scale, proportion, growth rates) and congruency
G6MS3B9	Understand the concept of tessellation (i.e., a repetitive pattern of polygons that fit together with no gaps or holes)
G6MS3B10	Classify types of triangles, quadrilaterals and angles by properties
G6MS3B11	Identify, describe, compare, and classify geometric figures

#	Benchmark
G6MS3B12	draw and construct three-dimensional geometric figures from nets
G6MS3B13	Predict and verify the effects of combining, subdividing, and changing basic shapes
G6MS3B14	Use mathematical language effectively to describe geometric concepts, reasoning, and investigations, and coordinate systems

STANDARD FOUR: Understands and applies properties of the concepts of statistics, data analysis and probability

#	Benchmark
G6MS4B1	Understand basic characteristics of measures of central tendency and how to compute them(i.e., mean, mode, median)
G6MS4B2	Know why a specific measure of central tendency (mean, median) provides the most useful information in a given context
G6MS4B3	Understands basic characteristics of frequency and distribution (e.g., range, varying rates of change, gaps, clusters)
G6MS4B4	Read and interpret data in charts, tables, plots (e.g., stem-and-leaf, box-and-whiskers, scatter), and graphs (e.g., bar, circle, line)
G6MS4B5	Use data and statistical measures for a variety of purposes (e.g., formulating hypotheses, making predictions, testing conjectures)
G6MS4B6	Organize and displays data using tables, graphs (e.g., line, circle, bar)
G6MS4B7	Understand faulty arguments, common errors, and misleading presentations of data
G6MS4B8	Understand that the same set of data can be represented using a variety of tables, graphs, and symbols and that different modes of representation often convey different messages (e.g., variation in scale can alter a visual message)
G6MS4B9	Understand the basic concept of outliers and how they affect the range, mean, median and mode
G6MS4B10	Understand basic concepts about how samples are chosen (e.g., random samples, bias in sampling procedures, limited samples, sampling error)
G6MS4B11	Systematically collect, organise and analyse data using several types of graphs and measures of central tendencies (mean, media, mode and range)
G6MS4B12	Use computer applications to examine data in a variety of ways

#	Benchmark
G6MS4B13	Construct graphic organizers using computer applications
G6MS4B14	Evaluate data and make conclusions from the analysis of data (***e.g., collects, organizes, graphs and analyses a set of data as the answer to a question or problem)
G6MS4B15	Understand that data come in many different forms and that collecting, organizing and displaying data can be done in many ways
G6MS4B16	Understand the basic concept of a sample (e.g., a large sample leads to more reliable information; a small part of something may have unique characteristics but not be an accurate representation of the whole)
G6MS4B17	Compare different samples of a population with the data from the entire population and identify a situation in which it makes sense to use a sample
G6MS4B18	Identify different ways of selecting a sample and which method makes a sample more representative for a population
G6MS4B19	Analyze data displays and explain why the way in which the question was asked might have influenced the results obtained and why the way in which the results were displayed might have influenced the conclusions reached
G6MS4B20	Identify data that represents sampling errors and explain why the sample (and the display) might be biased
G6MS4B21	Identify claims based on statistical data and in simple cases, evaluate the validity of the claims
G6MS4B22	Represent all possible outcomes for compound events in an organized way and express the theoretical probability of each outcome
G6MS4B23	Use data to estimate the probability of future events
G6MS4B24	Represent probabilities as ratios, proportions, decimals between 0 and 1 and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if P is the probability of an event, 1-P is the probability of an event not occurring
G6MS4B25	Determine probability using mathematical/theoretical models (e.g., table or tree diagram, area model, list, counting procedures, sample space)
G6MS4B26	Determine probability using simulations or experiments
G6MS4B27	Understand how predictions are based on data and probabilities (e.g., the difference between predictions based on theoretical probability and experimental probability)

#	Benchmark
G6MS4B28	Understand that the measure of certainty in a given situation depends on a number of factors (e.g., amount of data collected, what is known about the situation, how current data are)
G6MS4B29	Understand the relationship between the numerical expression of a probability (e.g., fraction, percentage, odds) and the events that produce these numbers
G6MS4B30	Use knowledge of probability to pose and solve problems (***e.g., makes reasonable predictions about the outcome of an event using simple probability rules)
G6MS4B31	examines the concepts of possibility and probability
G6MS4B32	Understand that statistical predictions are better for describing what proportion of a group will experience something (e.g., what proportion of automobiles will be involved in accidents) rather than which individuals within the group will experience something, and how often events will occur (e.g., how many sunny days will occur over a year) rather than exactly when they will occur

STANDARD FIVE: Understands and applies properties of functions and algebra

#	Benchmark
G6MS5B1	Know that an expression is a mathematical statement using numbers and symbols to represent relationships and real-world situations (e.g., equations and inequalities with or without variables)
G6MS5B2	Understand that a variable can be used in many ways (e.g., as a placeholder for a specific unknown, such as $x + 8 = 13$; as a representative of a range of values, such as $4t + 7$)
G6MS5B3	Understand various representations (e.g., tables, graphs, verbal descriptions, algebraic expressions, Venn diagram) of patterns and functions and the relationships among these representations
G6MS5B4	Understand the basic concept of a function (i.e., functions describe how changes in one quantity or variable result in changes in another)
G6MS5B5	Solve linear equations using concrete, informal, and formal methods (e.g., using properties, graphing ordered pairs)
G6MS5B6	Display pattern relationships graphically and numerically
G6MS5B7	Apply patterning strategies to problem-solving situations (***e.g., solves story problems using algebraic equations,

#	Benchmark
	solves non-routine problems where finding a pattern is an appropriate strategy)
G6MS5B8	Solve simple open sentences involving operations on whole numbers (e.g., __ + 17 = 23)
G6MS5B9	Write and solve one-step linear equations with one variable
G6MS5B10	Write and evaluate an algebraic expression for a given situation, using up to three variables
G6MS5B11	Apply algebraic order of operations and the commutative, associative and distributive properties to evaluate expressions; and justify each step in the process
G6MS5B12	Solve problems manually by using the correct order of operations or by using a calculator
G6MS5B13	Demonstrate an understanding that rate is a measure of one quantity per unit value of another quantity.
G6MS5B14	Solve problems involving rates, average speed, distance and time
G6MS5B15	Use variables in expressions describing geometric quantities (e.g. P=2w+2l)
G6MS5B16	Express in symbolic form simple relationships arising from geometry

STANDARD SIX: Uses appropriate mathematical procedures and critical thinking skills while performing the processes of computation and solving problems

#	Benchmark
G6MS6B1	Understand exponentiation of rational numbers and root-extraction (e.g., squares and square roots, cube)
G6MS6B2	Select and uses appropriate computational methods (e.g., mental, paper and pencil, calculator, computer) for a given situation
G6MS6B3	Understand the correct order of operations for performing arithmetic computations
G6MS6B4	Use proportional reasoning to solve mathematical and real-world problems (e.g., involving equivalent fractions, equal ratios, constant rate of change, proportions, percents)
G6MS6B5	Understand the properties of operations with rational numbers (e.g., distributive property, commutative and associative properties of addition and multiplication, inverse properties, identity properties)
G6MS6B6	Know when an estimate is more appropriate than an exact answer for a variety of problem situations

#	**Benchmark**
G6MS6B7	Understand how different algorithms work for arithmetic computations and operations
G6MS6B8	Select and perform computation techniques appropriate to specific problems involving unlike denominators in fractions and the multiplication and division of decimals and percents, and determines whether the results are reasonable
G6MS6B9	justifies and verifies the method chosen for calculations with whole numbers, fractions, decimals, and percents
G6MS6B11	Use and verify estimation strategies (e.g., rounding) to determine the reasonableness of solutions to problems and justifies the choice of strategy
G6MS6B12	Apply mental mathematics strategies to addition, subtraction, multiplication and division (e.g., adding, subtracting, multiplying, dividing with multiples of 100, making 10's in addition)
G6MS6B13	Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information and observing patterns
G6MS6B14	Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed
G6MS6B15	Determine when and how to break a problem into simpler parts
G6MS6B16	Use estimation to verify the reasonableness of calculated results
G6MS6B17	Apply strategies and results from simpler problems to more complex problems
G6MS6B18	Estimate unknown quantities graphically and solve them by using logical reasoning and arithmetic and algebraic techniques
G6MS6B19	Use a variety of methods such as words numbers symbols charts graphs, tab les, diagrams and models to explain mathematical reasoning
G6MS6B20	Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work
G6MS6B21	Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy
G6MS6B22	Make precise calculations and check the validity of the results from the context of the problem
G6MS6B23	Evaluate the reasonableness of the solution in the context of the

#	Benchmark
	original situation
G6MS6B24	Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems
G6MS6B25	Develop generalizations of the results obtained and the strategies used and apply them in new problem situations