BROOKFIELD PUBLIC SCHOOLS

MATHEMATICS CURRICULUM FRAMEWORK

MARCH 2007



BROOKFIELD MATHEMATICS CURRICULUM

Mathematics Philosophy/Beliefs

We believe that a strong foundation in mathematics is necessary to solve everyday problems, to think more critically, and to function in a technological world. Learning to imagine, reason intuit, question and prove are higher-order processes that must be developed through a sound program of mathematics.

It is necessary that the mathematics program be meaningful to students. In order to accomplish this, activities must focus on real-world problems, including the applications and strategies needed to solve them.

The process of mathematics, rather than a one-answer and one-method strategy, is very important and must be regularly reinforced. A conceptual focus and understanding of mathematical processes will enable students to be more effective problem solvers and thinkers.

We believe that instruction in mathematics must be varied. The text is only one of many types of materials. Students need to concretely manipulate objects to build the bridge to an abstract understanding, and they must understand how to use technology to solve more complex problems. Classroom instruction is most effective when students have opportunities to interact with others in cooperative groups, explore concepts on an individual basis, work with a peer, engage in classroom discussions, and become involved in project work.

We believe that electronic technologies – calculators and computers – are essential tools for teaching, learning, and doing mathematics. They furnish visual images of mathematical ideas, they facilitate organizing and analyzing data, and they compute efficiently and accurately. They support investigation in every area of mathematics and support students in focusing on decision-making, reflection, reasoning, and problem solving.

Student progress in mathematics must be carefully monitored on a regular basis using a variety of assessment methods. Assessment is most effective when it is a part of the instructional process and when it is employed at the end of a learning cycle. Traditional paper-pencil tests and performance-based assessments complement each other to provide formative and summative information about a student's progress. Students need to demonstrate their understanding of mathematical concepts and their ability to apply them.

We believe that a mathematics program must address a variety of topics and that students must be taught how those topics interrelate. These topics include algebraic reasoning, numerical and proportional reasoning, geometry and measurement, and working with data. Instruction is ongoing, and topics are regularly repeated for reinforcement.

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Mathematics Program Goals

As a result of education in the Grades K-12 Mathematics program, students will:

- proficiently apply a range of numerical, algebraic, geometric and statistical concepts and skills to formulate, analyze and solve real-world problems; to facilitate inquiry and the exploration of real-world phenomena; and to support continued development and appreciation of mathematics as a discipline;
- communicate numerical, geometric, algebraic and statistical ideas orally and in written form with models, pictures, graphs and mathematical symbols, and written explanations using a variety of calculator displays, spreadsheets, other related computer software, and other relevant technologies;
- use inductive and deductive reasoning to make, defend and evaluate conjectures and arguments, to justify assertions and verity tentative conclusions, and to solve mathematical problems;
- use mathematical skills and concepts to make and justify decisions and predictions, to identify patterns and trends, to pose questions from data and situations, and to formulate and solve problems;
- identify and use connections within mathematics to identify interrelationships and equivalent representations, to construct mathematical models, and to investigate and appreciate mathematical structure;
- select and use appropriate approaches and tools, including various methods of estimations, for solving computational, geometric, algebraic, probability and statistics problems.
- use mathematical skills and concepts with proficiency and confidence, and appreciate the power and utility of mathematics as a discipline and as a tool for solving problems in any real-life situation.

BROOKFIELD MATHEMATICS CURRICULUM Hallmarks of Excellent Practice

Hallmarks of excellent practice are the observable, in-class characteristics and actions that denote a high quality program. The hallmarks are noted in instructional research and represent the best pedagogy to build student independence through the gradual release of responsibility from the teacher to the student:

Focus of Mathematics Instruction:

- Set high expectations for **all** students
- Ensure early and equitable opportunities to learn mathematics
- Foster the systematic and appropriate use of technological tools
- Actively involve all students
- Use a variety of problem-solving activities
 - Applying strategies
 - Open-ended problems
 - Patterns and relationships
 - Real-world situations
- Use a variety of instructional strategies
 - Cooperative learning
 - Individual exploration
 - Peer instruction
 - o Project work
 - o Discussions
 - Adjusting instruction to accommodate students with diverse needs, abilities, and interests
- Focus on concepts and process, as well as the acquisition of basic and advanced skills
- Use a variety of learning tools
 - o Manipulatives
 - o Paper/pencil
 - o Technology
- Ensure periodic instruction and review of skills
- Use a variety of assessment strategies
 - Writing and explaining
 - o Performance-based
 - Traditional paper/pencil
- Integrate and instruct in multiple topics
 - o Number sense
 - o Operations
 - Estimation and approximation
 - Ratios, percents, proportions
 - o Measurements
 - o Geometry
 - Probability and statistics
 - o Patterns
 - Algebra and functions
 - Discrete math analyze and model a variety of real-world situations that involve recurring relationships, sequences, networks, combinations and permutations

1. *Teacher modeling* the expected performance through:

- Explicit instruction identifying effective strategies by working with exemplars, high quality examples, in various texts including those available through the use of technology (textbooks, primary sources, student work, and other literature)
- Think-alouds
- Meta-Cognition
- Demonstrations by teachers of their own work as artists, writers, scientists, musicians, craftspeople, readers, mathematicians, hobbyists, poets, researchers, etc.

-Mentors are used as guides to develop student competencies (the works of artists, writers, scientists, mathematicians, poets, researchers, etc.)

- Rubrics define expectations.

2. *Guided Practice* through:

- Activities that build on one another with increasing levels of complexity and decreasing levels of support
- Multiple structures that meet the individual needs of students (differentiating instruction through a mix of whole class, small group and individual activities)
- Strategies or criteria that are adjusted to accommodate differences in students' learning needs
- Teacher as coach/facilitator, providing feedback during activities
- Active learning exploring/learning by doing and discussions with 'peers
- Conferencing engage students to reflect on their learning processes
- Use of visual tools to track thinking by coding text, the use of post-its, and graphic organizers
- Student use rubrics to guide their work

3. Independent Practice through:

- Activities that prompt students to apply new learning
- Self- assessment tools such as rubrics, checklists, and reflective responses
- Routines that cause students to analyze their own work and reflect on their growth as learners.

4. <u>Application opportunities through:</u>

- Activities or performance expectations that require students to apply skills and strategies, and new concepts in real world, authentic performance tasks. This may include the use of technology.

5. <u>Assessment practice focuses on:</u>

- The continual assessment of student learning to guide instruction:
 - Diagnostic assessment before instruction to guide the instructional learning process
 - Formative assessment during instruction to provide specific and frequent feedback to students and teachers and to make adjustments to refocus attention
 - Summative assessments at the end of instruction to determine the level of attainment of the learning goals.

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Hallmarks Continued Essential Understandings

- 1. Algebraic Reasoning: Patterns and Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.
- 2. Numerical and Proportional Reasoning Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.
- 3. **Geometry and Measurement** Shapes and structures can be analyzed, visualized, and measured and transformed using a variety of strategies, tools and technologies.
- 4. **Working with Data**: Probability and Statistics Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

Mathematics Essential Questions

How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?

How are quantitative relationships represented by numbers?

How do geometric relationships and measurements help us to solve problems and make sense of our world?

How can collecting, organizing, and displaying data help us analyze information and make reasonable and informed decisions?

Mathematics Content Standards

Students should:

- 1.1 Understand and describe patterns and functional relationships.
- 1.2 Represent and analyze quantitative relationships in a variety of ways.
- 1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.
- 2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.
- 2.2 Use numbers and their properti4es to compute flexibly and fluently, and to reasonably estimate measures and quantities.

3.1 Use properties and characteristics of two – and three – dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.

BROOKFIELD MATHEMATICS CURRICULUM

- 3.2 Use spatial reasoning, location and geometric relationships to solve problems.
- 3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measure.
- 4.1 Collect, organize and display data using appropriate statistical and graphical methods.
- 4.2 Analyze data sets to form hypotheses and make predictions.
- 4.3 Understand and apply basic concepts of probability.

Prekindergarten

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?			
Students	Performance	Expected Performances	
should	Standards		
1.1 Understand	a. Sort and classify	(A1) Sort and classify objects by a single	
and describe	objects by an attribute.	attribute (size, shape, color, texture,	
patterns and		orientation and position) and describe the	
functional		reason for the action.	
relationships.		(A2) Describe qualitative changes such as	
		hotter, cooler or taller.	
	b. Describe and extend	(A3) Recognize, copy, extend and create	
	patterns using the	simple auditory and physical patterns using a	
	attributes of various	variety of materials in different contexts.	
	objects.		

Prekindergarten NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

How are quantitative relationships represented by numbers?		
Students	Performance	Expected Performances
should	Standards	
2.1 Understand	a. Use numbers to	(N1) Count and identify the number of objects
that a variety	count, order and	in a set.
of numerical	compare.	(N2) Compare sets and identify those with
representations		more, less and the same amounts.
can be used to		(N3) Describe the position of objects using
describe		the terms first and last.
quantitative	b. Share equal parts of	(N4) Explore a whole and half of an object.
relationships.	a whole object.	
2.2 Use	a. Count, adding one	(N5) Count by rote, 1 to 10
numbers and	or more to the	(N6) Count as one more object is added to a
their	previous amount.	set of objects.
properties to		
compute		
flexibly and		
fluently and to		
reasonably		
estimate		
measures and		
quantities.		

Prekindergarten GEOMETRY AND MEASUREMENT			
Shapes and structures can be analyzed, visualized, measured and transformed using			
a variety of strategies, tools and technologies.			
		tionships and measurements help us to	
	solve problems and make sense of our world?		
Students	Performance		
	Standards	Expected Performances	
should		(C1) I leaving a set simple share such as a second	
3.1 Use properties	a. Identify and sort	(G1) Identify and sort simple shapes such as square,	
and	shapes and solids by	rectangle, triangle and circle, and solids such as cube,	
characteristics of	physical	cylinder, sphere and prism.	
two- and three-	characteristics.	(G2) Use a variety of materials to construct various	
dimensional		shapes and describe their physical attributes.	
shapes and			
geometric			
theorems to			
describe			
relationships,			
communicate			
ideas and solve			
problems.			
3.2 Use spatial	a. Use positional	(G3) Use positional language – e.g., under, over,	
reasoning,	language to describe	inside, next, near, in front – to describe position and	
location and	location, direction and	order.	
geometric	position of objects.	(G4) Complete simple shape and jigsaw puzzles.	
relationships to			
solve problems.			
3.3 Develop and	a. Sequence events	(G5) Describe time periods or a sequence of events	
apply units,	during a limited time	using terms such as morning, afternoon and night or	
systems, formulas	period.	yesterday, today and tomorrow.	
and appropriate	b. Use nonstandard	(G6) Use nonstandard units and body referents to	
tools to estimate	units to estimate	compare and estimate length, area and capacity.	
and measure.	measures of length,	(G7) Sort, estimate and order objects by length or	
	area and capacity.	area using comparative language such as more,	
		longer, shorter, taller or bigger to describe	
		relationships.	

	Prekindergarten		
WORE	WORKING WITH DATA: PROBABILITY AND STATISTICS		
D	ata can be analyzed to ma	ke informed decisions using a	
	· ·	tools and technologies.	
How can collecti	ng, organizing and displa	aying data help us analyze information and	
n	nake reasonable prediction	ons and informed decisions?	
Students	Performance	Expected Performances	
should	Standards		
4.1 Collect,	a. Make comparisons	(D1) Collect, describe, organize, sort and	
organize and	from information	display objects and pictures in real graphs.	
display data	displayed in real		
using	graphs.		
appropriate			
statistical and			
graphical			
methods.			
4.3 Understand	a. Determine when	(D2) Use patterns to describe some events that	
and apply basic	events are likely to	repeat.	
concepts of	happen again.	(D3) Identify events related to personal	
probability.		experiences as likely or unlikely to happen.	

Kindergarten

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

phenomena and solve a variety of problems.		
Students	Performance	Expected Performances
should	Standards	
1.1 Understand	a. Sort and classify	(A1) Sort and classify objects by size, shape,
and describe	objects using attributes.	color, texture, use, position and orientation
patterns and		and describe the reason for the action.
functional	b. Identify a pattern	(A2) Recognize, copy and extend patterns of
relationships.	and describe the rule	sounds, colors, shapes, textures and numbers
	using the physical	in a variety of contexts and describe the rule
	attributes or position of	of the pattern.
	objects in a sequence.	(A3) Make comparisons and describe
		qualitative and quantitative changes of a
		given pattern (more, less, bigger, smaller,
		longer, one more, one less).

Kindergarten

NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

How are quantitative relationships represented by numbers?		
Students	Performance	Expected Performances
should	Standards	-
2.1 Understand	a. Use numbers to	(N1) Use numbers to locate, order, label and
that a variety	count, order, compare,	measure.
of numerical	label, locate and	(N2) Identify the numerals 1-10 and match
representations	measure.	sets of objects to the numerals.
can be used to		(N3) Compare sets using the terms "more,"
describe		"less" or "the same" and order sets from
quantitative		least to greatest.
relationships.		(N4) Identify ordinal position of objects, first
		through fifth, and last.
		(N5) Act out story problems and solve
		practical problems using objects.
	b. Share equal parts of	(N6) Use a variety of models to identify a
	an object.	whole and a half of an object.
		(N7) Compare two parts of a whole and
		describe the parts as closer to a whole, or
		closer to very little.
		(N8) Recognize that two halves can be put
		together to make a whole.
	c. Share a set of objects	(N9) Share a set of objects considered to be a
	that is divided into	whole by forming two smaller sets that have
	groups with equal	equal amounts.
	amounts.	
2.2 Use	a. Count, adding one	(N10) Count to and past 10 to 20, then to 30,
numbers and	more to the previous	and group and count objects by 10.
their	number, and group and	(N11) Estimate the amount of objects in a set
properties to	count by ones and tens.	using 10 as a benchmark, and then count to
compute		determine if the amount is more or less than
flexibly and		10.
fluency and to		(N12) Identify sets and numbers, which are
reasonably		equal and one more.
estimate		(N13) Recognize and name pennies and
measures and		dimes; count and trade pennies for objects.
quantities.		

Kindergarten GEOMETRY AND MEASUREMENT			
Shapes and structures can be analyzed, visualized, measured and transformed using			
a variety of strategies, tools and technologies.			
How			
	How do geometric relationships and measurements help us to solve problems and make sense of our world?		
Students	Performance	Expected Performances	
should	Standards	•	
3.1 Use	a. Identify and sort	(G1) Sort, order, compare and use comparative	
properties and	shapes and solids by	language to describe small sets of objects	
characteristics of	physical	sequenced by size, length, area and volume.	
two- and three-	characteristics.	(G2) Identify, sort and compare two- and three-	
dimensional		dimensional shapes and solids in the	
shapes and		environment, such as triangles, squares,	
geometric		rectangles, circles, cubes, spheres, cylinders and	
theorems to		cones.	
describe		(G3) Use a variety of materials to create	
relationships,		geometric shapes and solids and build copies of	
communicate		simple shapes and designs by direct observation	
ideas and solve		and by visual memory.	
problems.			
3.2 Use spatial	a. Use positional	(G4) Describe the position, location and	
reasoning,	language to describe	direction of objects, or parts of objects, using	
location and	location, direction and	terms such as inside, outside, top, bottom, close,	
geometric	position of objects.	closer, etc.	
relationships to			
solve problems.	TT 1 1 1		
3.3 Develop and	a. Use calendars and	(G5) Locate a date on the calendar (yesterday,	
apply units,	clocks to measure and	today and tomorrow) and sequence events using	
systems, formulas and	record time. b. Use nonstandard	terms like before and after.	
appropriate tools	units to estimate	(G6) Estimate the number of objects in a handful, and then count to verify.	
to estimate and		(G7) Estimate the amount of objects in a set	
measure.	measures of length, area, temperature,	using benchmarks of 10, and count to determine	
measure.	weight and capacity.	if the estimate is more or less.	
	weight and edpacity.	(G8) Explore, describe and discuss strategies to	
		estimate length, area, temperature and weight	
		using nonstandard units to compare.	
		(G9) Explore using everyday objects as	
		nonstandard units to measure length, area and	
		capacity.	
		(G10) Compare the weight of two objects using	
		a balance scale and identify which is heavier.	

Kindergarten			
WORKING WITH DATA: PROBABILITY AND STATISTICS			
D	Data can be analyzed to make informed decisions using a		
TT 11 (1	• •	ools and technologies.	
		ying data help us analyze information and	
	–	ns and informed decisions?	
Students	Performance	Expected Performances	
should	Standards		
4.1 Collect,	a. Visualize information	(D1) Pose questions about personal	
organize and	and make comparisons	information, experiences and environment.	
display data	about information	(D2) Explore ways to record and organize	
using	displayed in real and	data using tallies and tables.	
appropriate	picture graphs.	(D3) Construct real graphs and picture graphs	
statistical and		and describe the data using the terms more,	
graphical		less and same.	
methods.		(D4) Organize information through	
		systematic counting, sorting, making lists and	
		graphic organizers.	
4.2 Analyze data	a. Extend different types	(D5) Identify visual, auditory and physical	
sets to form	of patterns and make	patterns and extend to make predictions.	
hypotheses and	predictions.		
make predictions.			
4.3 Understand	a. Observe the	(D6) Describe the likelihood of events related	
and apply basic	frequency of real-world	to personal experiences.	
concepts of	events and identify the	(D7) Engage in simple probability activities	
probability.	likelihood of future	and discuss the results.	
	events.		

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

	phenomena and solve a variety of problems:		
Students	Performance	Expected Performances	
should	Standards		
1.1 Understand and describe patterns and functional relationships.	a. Examine attributes of objects and describe their relationships.	 (A1) Sort, classify and order objects and numbers based on one and two attributes and describe the rule used. (A2) Recognize, extend, describe and create a variety of patterns, and translate the same pattern from one representation (such as color) to another representation (such as shape). (A3) Describe counting patterns and number patterns. (A4) Develop and test generalizations based on observations of patterns and relationships. 	
1.2 Represent and analyze quantitative relationships in a variety of ways.	a. Represent the result of counting, combining and separating sets of objects using number sentences.	(A5) Model real-life situations that involve addition and subtraction of whole numbers using objects, pictures and open sentences.	
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.	a. Identify quantities as equivalent or non- equivalent.	(A6) Demonstrate balance or equivalence using models.	

Grade 1			
NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify			
	calculations using a variety of strategies, tools and technologies.		
	•	lationships represented by numbers?	
Students	Performance	Expected Performances	
should	Standards		
2.1 Understand	a. Represent and	(N1) Estimate and describe quantity with benchmark	
that a variety of numerical	order two-digit	amounts such as 0, 10 and 100. (N2) Represent two-digit numbers on number lines	
representations	numbers as groups of tens and ones in	and using models.	
can be used to	the base ten place	(N3) Determine and compare values and trade with	
describe	value system.	sets of pennies and dimes.	
quantitative	value system.	(N4) Identify ordinal position of objects, first through	
relationships.		tenth.	
	b. Identify and compare equal parts of a whole.	 (N5) Identify and represent ¹/₂, ¹/₃ and ¹/₄ of a whole and identify portions that are not halves, thirds or fourths. (N6 Compare parts of a whole object and estimate whether they are closer to a very little, one half or one whole. (N7) Make a whole of equal-sized parts of familiar objects. 	
	 c. Partition a set of objects into smaller groups with equal amounts. d. Describe relationships 	 (N8) Identify half of a small set of objects considered to be the whole. (N9) Describe patterns with simple ratios using familiar contexts, such as 1 set has 4 lags, 2 sets have 	
	relationships between quantities using ratios.	familiar contexts, such as 1 cat has 4 legs, 2 cats have 8 legs.	
2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate	a. Count by groups, add one more to the grouping and compare values of groups.	 (N10) Count whole numbers to 100. (N11) Identify, read and write numerals to 100 and beyond. (N12) Group and skip count by 2s, 5s and 10s. (N13) Count on from a given amount, orally and with models, and count back from 10. (N14) Identify 1 more and 1 less and explore 10 more and 10 less than a number. 	
measures and quantities	b. Add by counting and combining and subtract by separating, comparing or counting on.	 (N15) Write number sentences and use objects and pictures to model and solve addition and subtraction story problems. (N16) Develop, describe and use a variety of strategies to add and subtract one-digit numbers. (N17) Explore finding the sum of two two-digit numbers using models and counting strategies. (N18) Identify reasonable answers to problems that reflect real-world experiences. 	

Grade 1		
GEOMETRY AND MEASUREMENT		
Shapes and structures can be analyzed, visualized, measured and transformed using		
a variety of strategies, tools and technologies.		
How do geometric relationships and measurements help us to		
		make sense of our world?
Students	Performance	Expected Performances
Should	Standards	
3.1 Use	a. Classify shapes and	(G1) Sort, build, name and draw two- and three-
properties and	solids by common	dimensional objects.
characteristics of	characteristics.	(G2) Use a variety of materials to create two- and
two- and three-		three-dimensional designs and copy them from
dimensional		visual memory.
shapes and		(G3) Create and explore shapes and designs with
geometric theorems to		a line of symmetry.
describe		
relationships,		
communicate		
ideas and solve		
problems.		
3.2 Use spatial	a. Describe, name and	(G4) Indicate relative position, direction and
reasoning,	interpret direction and	location with terms such as inside, outside, top,
location and	position of objects.	bottom, left and right.
geometric	F	
relationships to		
solve problems.		
3.3 Develop and	a. Plan and sequence	(G5) Estimate and compare the length of time
apply units,	events.	needed to complete tasks using terms such as
systems,		longer or shorter.
formulas and		(G6) Use the calendar to identify dates, days,
appropriate		weeks and months and to plan and sequence
tools to estimate		events.
and measure.		(G7) Tell time to the hour with analog and digital
		clocks.
	b. Estimate length,	(G8) Use physical referents to make estimates
	area, volume, weight	and to determine and describe the reasonableness
	and temperature using	of answers to measurement problems.
	nonstandard units.	(G9) Use estimation, physical referents and
	.	nonstandard units to sort and compare objects.
	c. Use standard units	(G10) Explore using the standard units of inch
	of measure to	and centimeter to estimate and measure length.
	communicate	
	measurement in a	
	universal manner.	

Grade 1			
WORKING WITH DATA: PROBABILITY AND STATISTICS			
l	Data can be analyzed to make informed decisions using		
		tools and technologies.	
		ying data help us analyze information and	
		ns and informed decisions?	
Students	Performance	Expected Performances	
should	Standards		
4.1 Collect,	a. Collect, organize,	(D1) Pose questions and collect, organize,	
organize and	record and describe	record and describe data using tallies, tables,	
display data	data.	real graphs, picture graphs, glyphs (coded	
using		pictures) and bar graphs.	
appropriate			
statistical and			
graphical			
methods.			
4.2 Analyze data	a. Organize data in	(D2) Use various methods to organize	
sets to form	tables and graphs and	information including lists, systematic	
hypotheses and	make comparisons of	counting, sorting, graphic organizers and	
make predictions.	the data.	tables.	
		(D3) Use comparative language to describe	
		the data in tables and graphs.	
4.3 Understand	a. Determine the	(D4) Observe, record, graph and describe the	
and apply basic	likelihood of certain	results of simple probability activities and	
concepts of	events through simple	games.	
probability.	experiments and	(D5) Describe and explain the likelihood of	
	observations of games.	various events in the students' world.	

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Students	Performance	Expected Performances
should	Standards	F
1.1 Understand and describe patterns and functional relationships.	a. Describe and extend patterns.	 (A1) Describe and classify data and objects based on more than one attribute. (A2) Use patterns and the rules that describe them to identify a missing object, objects with common or different attributes, and the complement of a set of objects. (A3) Explore a variety of ways to describe and write rules for patterns.
	b. Analyze change in terms of quantity and quality using patterns.	 (A4) Explore and describe number patterns including odd and even numbers, counting by 2s, 5s, 10s, 100s and counting on by 10. (A5) Make comparisons of data and analyze observable changes using qualitative and quantitative descriptions.
1.2 Represent and analyze quantitative relationships in a variety of ways.	a. Represent real-life situations using number sentences.	(A6) Model situations involving addition and subtraction of whole numbers using objects, pictures, symbols and open sentences.
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.	a. Represent quantities that have the same value with an equal sign.	(A7) Demonstrate understanding of the = sign as an equality symbol.

	Grade 2		
NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be			
expressed numerically in multiple ways in order to make connections and simplify			
calculations using a variety of strategies, tools and technologies.			
	-	lationships represented by numbers?	
Students	Performance	Expected Performances	
should	Standards		
2.1 Understand	a. Represent three-	(N1) Use place value models and pictures to	
that a variety of	digit numbers as	represent two- and three-digit numbers and write	
numerical	groups of hundreds,	numbers in expanded and regrouped forms.	
representations	tens and ones in the	(N2) Locate, label and order two- and three-digit	
can be used to	base ten place value	numbers using place value models, pictures and	
describe	system.	number lines.	
quantitative		(N3) Use place value models, pictures and number	
relationships.		lines to identify 10 more and 10 less and 100 more	
		and 100 less than a number.	
		(N4) Count with and trade pennies, dimes and dollars	
		and determine and compare values.	
	b. Represent	(N5) Model and describe equal parts of a whole as	
	fractions by sharing	unit fractions $\frac{1}{2}$ through $\frac{1}{10}$.	
	portions of equal	(N6) Use models and familiar objects to estimate,	
	size as parts of a	compare and order unit fractions $(\frac{1}{2}, \frac{1}{3}, \frac{1}{4})$ of a whole.	
	whole or parts of a	(N7) Estimate and use counting and grouping of	
	set.	objects to find equal parts of a small set of counting	
		objects, such as $\frac{1}{2}$, $\frac{1}{3}$ or $\frac{1}{4}$ of 12 cookies.	
		(N8) Explore equivalent fractions using models.	
	c. Recognize that	(N9) Identify and build models of fractional parts of a	
	the denominator of	whole (such as $\frac{3}{4}$), other than unit fractions.	
	a fraction tells how	(N10) Explore and describe addition with like	
	many equal parts an	denominators and write matching fraction sentences	
	object or a set has	using models.	
	been divided into,		
	and that the		
	numerator indicates		
	how many of the		
	parts are being		
	considered.		
	d. Describe	(N11) Describe simple ratios in patterns using models	
	relationships	and pictures (e.g., in a pattern of green, green, red	
	between quantities	blocks, there are always two green blocks for each	
	using ratios.	red block).	

2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.	a. Develop fact families of basic facts using the inverse relationship of addition and subtraction.	(N12) Recall basic addition and subtraction facts. (N13) Identify reasonable answers and solve addition and subtraction problems involving real-world experiences.
	b. Explore the relationship of multiplication and division through a variety of methods.	 (N14) Explore multiplication by extending number patterns, skip counting, combining repeated addends, building models of groups the same size and using arrays and pictures. (N15) Explore the connection between multiplication and division using models and pictures of groups and arrays.
	c. Identify and use equivalent representations of numbers to estimate and compute.	 (N16) Compare and round numbers to the nearest 10 using place value models and number lines. (N17) Explore and describe strategies for representing, estimating, adding and subtracting two two-digit numbers with and without regrouping. (N18) Recognize when an estimate is appropriate and use estimation strategies that result in identifying a reasonable answer to a problem.

Grade 2			
Shapes and stu	GEOMETRY AND MEASUREMENT Shapes and structures can be analyzed, visualized, measured and transformed using		
Shapes and sh	a variety of strategies, tools and technologies.		
How	How do geometric relationships and measurements help us to		
		make sense of our world?	
Students	Performance	Expected Performances	
Should	Standards		
3.1 Use	a. Identify shapes as	(G1) Explore translations (slides), reflections	
properties and	the same when there	(flips) and rotations (turns) of simple polygons	
characteristics of	are changes in	using manipulative materials.	
two- and three-	position.	(G2) Build and identify shapes that have one or	
dimensional		more lines of reflective symmetry or that can be	
shapes and		divided into two congruent parts.	
geometric		(G3) Explore filling a two-dimensional region	
theorems to		with different shapes.	
describe			
relationships,			
communicate ideas and solve			
problems. 3.2 Use spatial	a. Recognize and use	(G4) Explore combining and subdividing	
reasoning,	geometric	polygons and solids with manipulative materials	
location and	relationships to solve	and reconstruct them from visual memory.	
geometric	problems.	(G5) Build, describe, draw and identify	
relationships to	problems.	polygons, solids and other two- and three-	
solve problems.		dimensional objects found in the environment.	
P - Southand			
3.3 Develop and	a. Estimate and	(G6) Use the calendar to write and solve	
apply units,	measure the length of	problems involving time.	
systems,	time to complete	(G7) Tell time to the half-hour, and explore time	
formulas and	activities and tasks.	to the quarter-hour (analog and digital).	
appropriate	b. Measure through	(G8) Develop and use nonstandard referents and	
tools to estimate	direct comparison	standard benchmarks to estimate and measure	
and measure.	and through	length, area, weight, capacity and volume.	
	repetition of units.	(G9) Identify reasonable estimates and describe	
		the strategies used to determine the estimates.	
		(G10) Explore using measurement tools such as	
		thermometers, basic rulers and balance scales to	
		measure temperature, length and weight.	

Grade 2 WORKING WITH DATA: PROBABILITY AND STATISTICS		
Data can be analyzed to make informed decisions using		
	a variety of strategies, too	0
How can collect	• •	g data help us analyze information and
	nake reasonable predictions	
Students	Performance Standards	Expected Performances
should		_
4.1 Collect,	a. Construct graphs from	(D1) Pose questions and systematically
organize and	data, then make	collect, sort, organize, record and analyze
display data	comparisons and draw	data using tables, charts and picture and
using	conclusions.	bar graphs.
appropriate		(D2) Use comparative terms to describe
statistical and		data.
graphical		
methods.		
4.2 Analyze data	a. Determine patterns and	(D3) Investigate combinations using
sets to form	make predictions from data	models.
hypotheses and	displayed in tables and	
make	graphs.	
predictions.		
4.3 Understand	a. Analyze data gathered	(D4) Discuss the likelihood of various
and apply basic	from experiments and	events, state possibilities, make
concepts of	identify the likelihood of	predictions and test them in practical
probability.	future events.	situations.
		(D5) Conduct probability experiments and record the results in tables and graphs.

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Students	Performance	Expected Performances
should	Standards	L'Apecteu i cristimunecis
1.1 Understand	a. Create and describe	(A1) Use a variety of materials to construct,
and describe	patterns using different	reproduce, describe and extend numerical
patterns and	objects and symbols.	and spatial patterns.
functional		(A2) Explore and describe patterns and
relationships.		sequences using tables, graphs and charts.
		(A3) Sort and classify the same set of objects
		in more than one way and explain the reason
		for each sort.
1.2 Represent	a. Identify	(A4) Model situations that reflect
and analyze	mathematical	mathematical relationships involving
quantitative	relationships as	addition, subtraction, multiplication and
relationships in	equations.	division as open number sentences and
a variety of		match number sentences to story problems.
ways.		
1.3 Use	a. Represent quantities	(A5) Demonstrate understanding of the =
operations,	that have the same	sign as an equality symbol and explore
properties and	value with an equal	inequalities and the \neq symbol.
algebraic	sign.	(A6) Demonstrate equivalence using the
symbols to		commutative and associative properties of
determine		whole numbers.
equivalence		
and solve		
problems.		

Grade 3 NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.		
How	are quantitative relation	nships represented by numbers?
Students	Performance	Expected Performances
should	Standards	
2.1 Understand	a. Represent numbers	(N1) Use models and expanded and
that a variety	in expanded and	regrouped forms to represent two- and three-
of numerical	regrouped forms in the	digit numbers.
representations	base ten place value	(N2) Locate, label, compare and order whole
can be used to	system.	numbers to 1000, including multiples of 10
describe	-	and 100, using place value models, number
quantitative		patterns and the number line.
relationships.		(N3) Name and state the value of pennies,
		nickels, dimes, quarters and half-dollars and
		show different ways to make a given amount.
		(N4) Determine and compare the values of
		sets of coins and write the values using
		decimal notation.
	b. Recognize that a	(N5) Use models and pictures to represent
	fraction with the same	fractions and label the parts with words and
	numerator and	fraction symbols.
	denominator represents	(N6) Identify a whole as a fraction with the
	the whole object or an	same numerator and denominator.
	entire set.	(N7) Use counting and grouping of objects to
		find equal parts of a set of objects and use
		models and number patterns to identify
		amounts such as $\frac{2}{3}$ of 12 is 8.
	c. Use fractions to	(N8) Estimate fractional values and measure
	measure and to	to the nearest half unit with the aid of
	represent points on a	number lines and rulers.
	ruler or number line.	
2.2 Use	a. Use strategies that	(N9) Identify 10 and 100 more and less than
numbers and	involve place value	a number.
their properties	patterns and algebraic	(N10) Compare and round numbers to the
to compute	properties to estimate,	nearest 10 and 100.
flexibly and	add and subtract.	(N11) Use commutative and associative
fluently, and to		properties to solve problems.
reasonably		
estimate		
measures and		
quantities.		

b. Approximate solutions to problems involving computation through the use of efficient methods.	 (N12) Estimate, add and subtract with two- and three- digit numbers using a variety of strategies. (N13) Use estimation strategies to determine and justify the reasonableness of a computational answer. (N14) Recognize when an estimate is appropriate and determine whether an estimation strategy will result in an over-or
c. Solve multiplication and division problems using rectangular arrays, number patterns, skip counting and repeated addends.	 underestimate. (N15) State the multiplication and division facts with factors of 1, 2, 3, 4, 5 and 10. (N16 Explore division problems with and without remainders. (N17) Write and solve multiplication and division story problems and match to number sentences (equations). (N18) Use models and pictures of sets and arrays to represent multiplication and division of two- and three-digit numbers by one-digit numbers.
d. Compare fractions, identify equivalent fractions and add and subtract fractions with like and unlike denominators using models and pictures.	 (N19) Construct and use models to identify equivalent fractions and to compare and order fractions with like and unlike denominators of 2, 3, 4, 5, 6 and 8. (N20) Identify patterns with equivalent ratios such as 3 out of 6 crayons are red or 4 out of 8 crayons are red are the same as 1 out of 2 crayons is red. (N21) Construct and use models to add and subtract fractions with like and unlike denominators and write fraction sentences to match the models. (N22) Write and solve story problems that involve fractions.

Grade 3		
GEOMETRY AND MEASUREMENT Shapes and structures can be analyzed, visualized, measured and transformed using		
a variety of strategies, tools and technologies.		
How		s and measurements help us to
	solve problems and ma	
Students	Performance	Expected Performances
Should	Standards	r
3.1 Use properties	a. Classify and compare	(G1) Sort polygons and solids through using
and	polygons and solids	characteristics such as the relationship of
characteristics of	using various attributes.	sides (parallel, perpendicular), kinds of
two- and three-	_	angles (acute, right and obtuse), symmetry
dimensional		and congruence.
shapes and		(G2) Describe similarities and differences of
geometric		two- and three-dimensional shapes in the
theorems to		environment using physical features such as
describe		number of sides, number of angles, lengths
relationships,		of sides and straight and curved parts.
communicate		(G3) Investigate ways to tile or tessellate a
ideas and solve		region or shape using various polygons.
problems.		
3.2 Use spatial	a. Represent location on	(G4) Draw and interpret simple maps using
reasoning, location and	simple maps.	coordinate systems and shapes or pictures.
geometric relationships to		
solve problems.		
3.3 Develop and	a. Plan events and make	(G5) Tell time to the minute, using analog
apply units,	schedules.	and digital clocks, and identify AM and PM.
systems, formulas	senedares.	(G6) Use calendars and clocks to plan and
and appropriate		sequence events.
tools to estimate	b. Determine and use	(G7) Develop and explain strategies for
and measure.	different tools and units	using nonstandard and standard referents to
	appropriate for specific	estimate measurements of length, area,
	measurement tasks.	weight, temperature, volume and capacity.
		(G8) Explore strategies for estimating and
		measuring the perimeters, areas and volumes
		of irregular shapes and solids.
		(G9) Describe and use estimation strategies
		that can identify a reasonable answer to a
		measurement problem when an estimate is
		appropriate.

Grade 3		
WORKING WITH DATA: PROBABILITY AND STATISTICS		
]	•	ake informed decisions using
		, tools and technologies.
		aying data help us analyze information and
		ons and informed decisions?
Students	Performance	Expected Performances
should	Standards	
4.1 Collect,	a. Design surveys for	(D1) Pose questions and use a variety of
organize and	the collection of data	ways to collect, organize and analyze data
display data	and justify conclusions	from samples and surveys.
using	drawn from the data.	(D2) Display, read, interpret and draw
appropriate		conclusions from data that is represented in
statistical and		a variety of ways including tables, charts,
graphical		lists, diagrams, line plots and bar graphs.
methods.		
4.2 Analyze	a. Analyze data to	(D3) Describe trends in data using range and
data sets to	identify a typical	mode.
form	element or event.	
hypotheses and		
make		
predictions.		
4.3 Understand	a. Use samples and	(D4) Make predictions and test them by
and apply	simulations to	conducting probability experiments and
basic concepts	determine probability	recording results.
of probability.	and to make and test	(D5) Explore the fairness of games
	predictions.	involving a variety of spinners and dice.

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Studente	Performance	Eurostad Daufanmanaag
Students		Expected Performances
Should	Standards	
1.1 Understand	a. Classify patterns as	(A1) Recognize a variety of patterns and
and describe	repeating or growing.	trends including repeating and growing
patterns and		patterns.
functional		(A2) Explore extending and comparing
relationships.		arithmetic and geometric sequences.
		(A3) Develop and test generalizations of patterns and relationships.
1.2 Represent	a. Demonstrate the	(A4) Use equations to describe the rules for
and analyze	equivalence of both	number patterns and to model word
•	-	1
quantitative	sides of an equation.	problems.
relationships in		(A5) Demonstrate equivalence with the
a variety of		commutative, associative and distributive
ways.		properties of whole numbers.
1.3 Use	a. Represent possible	(A6) Use variables to represent quantities in
operations,	values using symbols.	expressions and number sentences.
properties and		_
algebraic		
symbols to		
determine		
equivalence		
and solve		
problems.		

Grade 4 NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.			
	How are quantitative relationships represented by numbers?		
Students	Performance	Expected Performances	
should	Standards	r	
2.1 Understand	a. Extend whole	(N1) Build place value models, draw	
that a variety of	number place value	diagrams and show equivalent representations	
numerical	patterns, models and	for two-, three- and four-digit numbers in	
representations	notations to include	expanded and regrouped forms.	
can be used to	decimals, which are	(N2) Build models and describe tenths and	
describe	fractions that have	hundredths using equivalent ratio, fraction and	
quantitative	denominators that are	decimal notation.	
relationships.	multiples of ten.		
	 b. Use models and pictures to reveal patterns about equivalent fractions and ratios. c. Use fractions to represent a ratio or a division problem. d. Make comparisons and describe quantitative 	 (N3) Estimate locations and label fractions on number lines and rulers. (N4) Build and label a variety of models to represent, compare and order fractional parts of a whole and mixed numbers and to identify ratios and equivalent fractions. (N5) Use counting, number patterns and grouping to identify parts of a set. (N6) Express a division problem as a fraction and describe the relationship between the divisor and the remainder written as a fraction. (N7) Use models, pictures and number patterns to solve simple problems involving ratios and proportions. 	
	relationships using ratios.		
2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.	a. Use place value concepts and commutative and associative properties to estimate and compute.	 (N8) Use place value models, diagrams, number patterns and number lines to identify, order, round, and compare two-, three-, and four-digit whole numbers up to 10,000. (N9) Solve practical problems and extend patterns involving 10 and 100 more and less than a number. (N10) Use place value concepts, number patterns, the number line and the commutative and associative properties to develop estimation and computation strategies. (N11) Apply and explain a variety of estimation strategies in problem-solving situations to add and subtract money amounts less than \$10.00 and two- and three-digit numbers with and without regrouping. 	

b. Use number patterns, basic facts, rectangular arrays, place value models and the distributive property to multiply and divide.	 (N12) Determine and discuss the reasonableness of an answer and explain why a particular estimation strategy will result in an over- or underestimate. (N13) Write and solve multistep word problems, including problems with extraneous information. (N14) Develop fluency with multiplication and division fact families for all factors 1 through 10. (N15) Relate multiplication and division to models with groups and rectangular arrays and begin to identify prime and composite numbers. (N16) Explore the property of zero in multiplication and its implication in division. (N17) Identify the appropriate operation and write a word problem to match a given addition, subtraction, multiplication or division number sentence and write the matching number sentence to solve a word problem. (N18) Use arrays and explore using the
	(N18) Use arrays and explore using the distributive property $10 \ge (5 + 4) = (10 \ge 5) + (10 \ge 4)$ to estimate, multiply and divide two-and three-digit numbers by one-digit factors.
c. Add and subtract	(N19) Solve problems involving the addition
fractions and mixed numbers with like	and subtraction of fractions with like denominators.
and unlike	(N20) Use models and pictures to estimate a
denominators using	reasonable answer when adding or subtracting
models, pictures and	decimals, fractions and mixed numbers.
number sentences.	(N21) Write and solve word problems
	involving decimals, fractions and mixed
	numbers, identify reasonable answers, and
	match equations to the problems.

Grade 4					
	GEOMETRY AND MEASUREMENT				
Shapes and stru	-	alized, measured and transformed using			
	a variety of strategies, to	<u> </u>			
How	How do geometric relationships and measurements help us to				
	solve problems and mak				
Students Should	Performance Standards	Expected Performances			
3.1 Use properties	a. Describe geometric	(G1) Build, draw, describe and classify two-			
and characteristics	properties of polygons	and three-dimensional figures.			
of two- and three-	and solids.	(G2) Analyze two-dimensional shapes and			
dimensional shapes		determine lines of symmetry and congruence.			
and geometric		(G3) Identify translations, reflections and			
theorems to describe		rotations in geometric designs.			
relationships,					
communicate ideas					
and solve problems.					
3.2 Use spatial	a. Find possible pathways	(G4) Create and read maps and use			
reasoning, location	between two points using	coordinate systems to specify locations.			
and geometric	maps that are based on				
relationships to	the rectangular				
solve problems.	coordinate system.				
3.3 Develop and	a. Recognize that patterns	(G5) Explore converting inches to feet and			
apply units, systems,	exist between	feet to yards.			
formulas and	measurements of length,	(G6) Solve practical problems that involve			
appropriate tools to	perimeter and area of	estimation and measurement of length,			
estimate and	squares and rectangles.	perimeter, area, volume, capacity, weight and			
measure.		temperature. (G7) Explore relationships between the			
		lengths of sides of rectangles and their areas			
		and perimeters and generalize the patterns as			
		simple formulas.			
	b. Make precise	(G8) Identify and use the appropriate			
	measurements and use	customary and metric units and tools for			
	benchmarks to estimate	measuring length, perimeter, area, weight,			
	measures.	time, temperature, volume and capacity.			
		(G9) Explore converting from one unit to			
		another when measuring time and			
		solve problems that involve elapsed time			
		using clocks and calendars.			
		$(\mathbf{G10})$ Use estimation to predict reasonable			
		answers to measurement problems.			
		(G11) Estimate, draw and measure length to			
		the nearest inch, half-inch and centimeter.			

Grade 4					
WORKING WITH DATA: PROBABILITY AND STATISTICS					
Data can be analyzed to make informed decisions using					
How can collect	a variety of strategies, tools and technologies.				
How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?					
Students Performance Expected Performances					
should	Standards				
4.1 Collect,	a. Organize and analyze	(D1) Explore a variety of ways to collect,			
organize and	categorical and	organize, record, analyze and interpret data			
display data	numerical data.	and identify patterns and trends.			
using		(D2) Construct and interpret broken line			
appropriate		graphs, line plots, bar graphs, picture			
statistical and		graphs, glyphs and simple circle graphs.			
graphical		(D3) Make predictions and defend			
methods.		conclusions based on data.			
4.2 Analyze	a. Describe what is	(D4) Use the range, mode, median and			
data sets to	"average" about the	mean to describe features of a data set.			
form	characteristics in a data				
hypotheses	set.				
and make					
predictions.					
4.3 Under-	a. Determine fair	(D5) Identify possible outcomes of events			
stand and	situations and good	using combinations (where order does not			
apply basic	choices based upon the	matter) and explore situations resulting in			
concepts of	likelihood of an	permutations (where order does matter).			
probability.	occurrence.	(D6) Conduct probability experiments and express the probability based on possible outcomes.			

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Students	Performance	Expected Performances
		Expected Terrormances
should 1.1 Understand and describe patterns and functional relationships.	Standards a. Identify trends and make predictions based upon patterns and data displayed in different formats.	 (A1) Extend and compare arithmetic and geometric sequences. (A2) Represent geometric and numeric patterns using words, tables, graphs and equations. (A3) Analyze patterns and data to make
		generalizations and predictions.
1.2 Represent and analyze quantitative relationships in a variety of ways.	a. Recognize that a change in one variable may relate to a change in another variable.	(A4) Describe how a change in one variable relates to a change in a second variable in context.
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.	a. Describe the general relationship between two sets of data using an equation or inequality.	 (A5) Represent mathematical relationships using variables in expressions, equations and inequalities. (A6) Model and solve one-step equations using materials that model equivalence.

NUMEDICAL		Grade 5		
NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and				
		riety of strategies, tools and technologies.		
		tionships represented by numbers?		
Students	Performance	Expected Performances		
should	Standards	Expected renormances		
2.1 Understand	a. Extend whole	(N1) Identify, round, order and compare whole		
that a variety of	number place value	numbers to 1,000,000 using place value models,		
numerical	patterns, models	diagrams and number lines.		
representations	and notations to	(N2) Express numbers in expanded and		
can be used to	include decimals,	regrouped forms and use the numbers to support		
describe	which are fractions	computational strategies.		
quantitative	that have	(N3) Solve problems involving finding 10, 100		
relationships.	denominators that	and 1000 more and less than a number.		
renutionships.	10.	(N4) Estimate products and missing factors using		
	10.	multiples of 10, 100 and 1000.		
		(N5) Use models to extend whole number place		
		value concepts and patterns to decimals.		
		(N6) Explore numbers less than zero and extend		
		the number line to introduce the concept of		
		integers within practical applications.		
	b. Classify numbers	(N7) Use rectangular arrays to identify factor		
	by their factors.	pairs and to classify numbers as prime,		
	5	composite and perfect squares.		
		(N8) Explore divisibility rules and patterns with		
		remainders.		
	c. Express numbers	(N9) Represent a rational number in its		
	as equivalent	equivalent fraction, decimal, ratio and percent		
	fractions, decimals	forms with models, number patterns and		
	or percents.	common factors.		
	_	(N10) Construct and use models and pictures to		
		add and subtract fractions, decimals and mixed		
		numbers with like and unlike denominators.		
		(N11) Use equivalence and substitution with		
		common denominators when adding and		
		subtracting.		
		(N12) Construct and use models and pictorial		
		representations to multiply common fractions		
		and mixed numbers.		
	d. Represent ratios	(N13) Build models to identify and compare		
	and proportions and	ratios and describe quantitative relationships		
	solve problems	using fraction and decimal equivalents.		
	using models and	(N14) Write division problems in fraction form		
	pictures.	and round the fraction form to estimate an		
		answer to a division problem.		
		(N15) Use ratios and proportions to solve		
		practical problems such as interpreting maps and		

		scale drawings or identifying probability.
2.2 Use	a. Estimate and	(N16) Choose and use benchmarks to
numbers and	compute using	approximate locations on number lines and
their properties	models and	coordinate grids.
to compute	pictures.	(N17) Estimate and use counting, grouping of
flexibly and		objects, number patterns, equivalent ratios and
fluently, and to		division to find fractional parts of a set of
reasonably		objects.
estimate		(N18) Develop strategies, using place value
measures and		relationships, inverse operations and
quantities.		commutative, associative and distributive
		properties, to simplify computations with two-,
		three-, and four-digit numbers and money
		amounts.
		(N19) Use estimation to predict results and to
		recognize when an answer is or is not reasonable.
		(N20) Explain when an estimation strategy will
		result in an over- or underestimate.
		(N21) Create and solve multistep problems and
		explore order of operations in the context of
		practical situations.

Grade 5				
GEOMETRY AND MEASUREMENT				
Shapes and structures can be analyzed, visualized, measured and transformed using				
TT	a variety of strategies, tools and technologies.			
How do geometric relationships and measurements help us to				
Studenta	solve problems and make sense of our world? Students Performance Standards Expected Performances			
Students Should	Performance Standards	Expected Performances		
3.1 Use	a Usa gaometria	(C1) Use geometric relationshing such as		
properties and	a. Use geometric	(G1) Use geometric relationships such as		
characteristics	relationships to describe	parallel, perpendicular and congruent to describe the attributes of sets and subsets of		
of two- and	polygons and solids.	shapes and solids.		
three-		-		
dimensional		(G2) Make and test conjectures about		
shapes and	b. Recognize that	geometric relationships. (G3) Explore the relationship between area		
geometric		and perimeter when the dimensions of a		
theorems to	changes in the perimeter of a polygon may affect	polygon change.		
describe	its area, and changes in	(G4) Develop formulas to find the perimeter		
relationships,	area may affect the	and area of squares, rectangles and triangles.		
communicate	perimeter.	and area of squares, rectangles and trangles.		
ideas and solve	perimeter.			
problems.				
3.2 Use spatial	a. Identify, describe and	(G5) Represent the surface of three-		
reasoning,	build nets for solid	dimensional objects through the use of two-		
location and	figures and objects.	dimensional nets.		
geometric		(G6) Investigate and develop strategies to		
relationships to		determine the volume of rectangular solids.		
solve problems.	b. Determine geometric	(G7) Plot points on the rectangular		
F	relationships through	coordinate system and estimate and		
	spatial visualization.	determine the distance between points.		
3.3 Develop and	a. Solve problems in the	(G8) Solve length problems involving		
apply units,	measure of time and in	conversion of measure within the customary		
systems,	the conversion of units of	and metric systems.		
formulas and	length in the customary	(G9) Solve problems involving the		
appropriate	and metric systems using	conversion of measure of time and elapsed		
tools to estimate	specific ratios.	time (days, hours, minutes and seconds).		
and measure.	-	(G10) Estimate and choose appropriate units		
		and tools to measure and solve a variety of		
		problems involving length, perimeter, area,		
		volume, capacity, mass, time, angle and		
		temperature.		

	Grade 5			
WORKING WITH DATA: PROBABILITY AND STATISTICS				
I	Data can be analyzed to make informed decisions using			
		, tools and technologies.		
		aying data help us analyze information and		
		ons and informed decisions?		
Students	Performance	Expected Performances		
should	Standards			
4.1 Collect,	a. Differentiate	(D1) Construct and interpret broken line		
organize and	between numerical and	graphs, line plots, bar graphs, picture		
display data	categorical data and	graphs, simple circle graphs, and stem and		
using	their appropriate	leaf plots and evaluate how well each kind		
appropriate	representations.	of display represents the features of the data.		
statistical and				
graphical				
methods.	— 1 1100			
4.2 Analyze	a. Examine different	(D2) Design and conduct surveys and		
data sets to	data collection methods	samplings to collect data that represent a		
form	and their effects.	general population.		
hypotheses and		(D3) Explore how a change in an outlier can		
make		change the measures of central tendency.		
predictions.	D -1-4- (b - 1'1-1'11			
4.3 Understand	a. Relate the likelihood	(D4) Identify possible outcomes and express		
and apply basic	of an event to a	the likelihood of events as a fraction.		
concepts of	numerical value.	(D5) Design and conduct probability		
probability.		experiments and games of chance.		
		(D6) Make and test predictions of probability and fairness		
		probability and fairness.		

Grade 6

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?

Students	Performance	Expected Performances
should	Standards	
1.1 Understand	a. Identify relationships	(A1) Describe, analyze and extend
and describe	and make	numeric, geometric and statistical patterns
patterns and	generalizations through	and use them to identify trends and justify
functional	the use of patterns.	predictions.
relationships.		
1.2 Represent	a. Represent and	(A2) Determine the nature of changes in
and analyze	analyze mathematical	linear relationships using graphs, tables and
quantitative	relationships with the	equations.
relationships in	help of tables, graphs,	(A3) Represent numerical and contextual
a variety of	equations and	situations with algebraic expressions,
ways.	inequalities.	equations and inequalities.
1.3 Use	a. Solve real-world	(A4) Use variables as placeholders, to
operations,	problems using	denote a pattern, to write a formula and to
properties and	algebraic methods.	represent a function or relation.
algebraic		(A5) Evaluate algebraic expressions and
symbols to		formulas using substitution.
determine		
equivalence and	b. Demonstrate how to	(A6) Model and solve one-step linear
solve problems.	maintain equivalence in	equations by maintaining equivalence.
	equations.	

Grade 6

NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

How are quantitative relationships represented by numbers?				
Students should	Performance	Expected Performances		
	Standards	-		
2.1 Understand that a	a. Relate whole	(N1) Locate, order and compare		
variety of numerical	numbers, fractions,	whole numbers, fractions,		
representations can be	decimals and integers to	decimals and integers on number		
used to describe	number lines, scales, the	lines, scales and the coordinate		
quantitative	coordinate plane and	grid.		
relationships.	problem-solving	(N2) Explain orally and in writing		
F	situations.	when a situation requires an exact		
		answer or when an estimate is		
		sufficient.		
	b. Express place value	(N3) Recognize place value		
	patterns using exponents	patterns when multiplying and		
	to write powers of ten.	dividing decimals by powers of 10.		
		(N4) Compare large numbers		
		using expanded forms and powers		
		of ten.		
		(N5) Develop, describe and use a		
		variety of ways to estimate and		
		calculate with large numbers and		
		connect the strategies to powers of		
		ten.		
	c. Interpret and connect	(N6) Use models and common		
	fraction notation to	factors to identify equivalent		
	division.	fractions and their decimal		
		representations.		
		(N7) Determine the decimal		
		equivalents of fractions.		
		(N8) Recognize that multiplication		
		by a unit fraction is equivalent to		
		dividing by the fraction's		
		denominator.		
	d. Compare quantities	(N9) Estimate and find percents		
	and solve problems	using benchmarks and number		
	using ratios, rates and	patterns.		
	percents.	(N10) Convert between rates using		
	percento.	ratios and proportions.		
		(N11) Solve problems involving		
		ratios, proportions and percents.		
		ratios, proportions and percents.		

2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.	a. Solve problems using a variety of computational strategies, including the use of calculators.	 (N12) Estimate and predict reasonable answers and recognize and explain when an estimate will be more or less than an exact answer. (N13) Use a variety of computational strategies (mental computation, paper-and-pencil and calculator) to add, subtract, multiply and divide multidigit numbers in the context of multistep word and practical problems. (N14) Apply the order of operations and algebraic properties (associative, commutative, distributive, inverse operations and additive and multiplicative identities) to estimate and solve multistep problems. (N15) Use factors of composite numbers, powers of ten and divisibility rules to find products and missing factors. (N16) Add, subtract and multiply fractions and decimals using a
		0
	b. Describe when products or quotients with fractions and decimals can yield a larger or smaller result than either factor.	 (N18 Determine the fractional part of a set using procedures connected to models. (N19) Represent division with decimals, fractions and mixed numbers as related to models and context.

Grade 6			
GEOMETRY AND MEASUREMENT Shapes and structures can be analyzed, visualized, measured and transformed using			
Shapes and s	a variety of strategies, tools and technologies.		
Hov	How do geometric relationships and measurements help us to		
	solve problems and mak	-	
Students	Performance Standards	Expected Performances	
Should			
3.1 Use	a. Classify polygons	(G1) Use the relationships of sides and	
properties and	according to their	angles to classify sets and subsets of	
characteristics	properties.	polygons.	
of two- and		(G2) Make and test conjectures about side	
three-		and angle relationships and congruence.	
dimensional	b. Examine the	(G3) Use the rectangle as a basic shape to	
shapes and	relationships between the	model and develop formulas for the area of	
geometric	measures of area of two-	triangles, parallelograms, trapezoids and	
theorems to	dimensional objects and	circles.	
describe	volume of three-	(G4) Recognize the relationships among	
relationships, communicate	dimensional objects.	radius, diameter, circumference and area of	
ideas and solve		circles.	
		(G5) Develop and use strategies to	
problems.		determine the volume of rectangular solids and cylinders.	
3.2 Use spatial	a. Construct similar	(G6) Explore similarity of polygons as a	
reasoning,	polygons on coordinate	result of dilations (a reduction or	
location and	grids.	enlargement) and their effects on their	
geometric	0	measurements.	
relationships to			
solve problems.			
3.3 Develop and	a. Solve problems	(G7) Estimate and determine length, area,	
apply units,	involving measurement	volume, mass and angle measures.	
systems,	through the use of a	(G8) Select and use appropriate units,	
formulas and	variety of tools, techniques	strategies and tools to measure and solve	
appropriate	and strategies.	problems involving length, perimeter, area,	
tools to estimate		volume, capacity, weight, mass, temperature	
and measure.		and angles.	
	b. Use specific ratios to	(G9) Use different ratios to convert between	
	convert between measure	units of length, area and volume in the	
	of length, area, volume,	customary and metric systems.	
	mass and capacity in the	(G10) Recognize and use powers of ten as	
	customary and metric	conversion ratios in the metric system.	
	systems.		

Grade 6				
WORKING WITH DATA: PROBABILITY AND STATISTICS Data can be analyzed to make informed decisions using				
a variety of strategies, tools and technologies.				
How can collect		ying data help us analyze information and		
		ns and informed decisions?		
Students	Content Standards	Expected Performances		
should		_		
4.1 Collect,	a. Display and compare	(D1) Compare sets of data graphically		
organize and	sets of data using various	using histograms, double bar graphs, back-		
display data	systematic or graphical	to-back stem and leaf plots and scatter		
using	representations.	plots.		
appropriate		(D2) Construct circle graphs and recognize		
statistical and		that they represent data proportionally.		
graphical		(D3) Use systematic listing and counting		
methods.		strategies to solve problems.		
4.2 Analyze	a. Describe the shape of	(D4) Describe the shape of data sets using		
data sets to	data sets using the	measures of spread (range and outliers) and		
form	measures of spread and	central tendency (mode, median and		
hypotheses	central tendency.	mean).		
and make		(D5) Recognize that changes in a data set		
predictions.		can affect the mode, median, mean and		
4.3 Under-	a. Understand that	range.		
4.5 Under- stand and	probabilities are more	(D6) Explore the relationship between the number of trials in an experiment and the		
apply basic	reliable to use as	predicted outcomes.		
concepts of	predictors when there is a	(D7) Design and conduct probability		
probability.	large number of trials.	experiments and make predictions about		
probability.		outcomes that are equally likely or not		
		equally likely.		
	b. Express probability	(D8) Express probabilities as fractions,		
	using various numerical	ratios, decimals and percents.		
	representations.	· • •		

Grade 7			
ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS			
Patterns and functional relationships can be represented and analyzed using			
		tools and technologies.	
How de	-	elp us describe data and physical	
	phenomena and solve	a variety of problems?	
Students	Performance	Expected Performances	
should	Standards	-	
1.1 Understand	a. Analyze physical	(A1) Generalize mathematical situations	
and describe	phenomena and patterns	and patterns with algebraic expressions,	
patterns and	to identify relationships	equations and inequalities.	
functional	and make	(A2) Identify the independent and	
relationships.	generalizations.	dependent variables in a given situation.	
		(A3) Recognize and explain when a graph	
		should be continuous or a discrete set of	
		points.	
1.2 Represent	a. Describe the effects of	(A4) Use graphs, tables, equations and	
and analyze	characteristics of	verbal descriptions to represent and analyze	
quantitative	mathematical	changes in linear and nonlinear	
relationships in	relationships on the way	relationships.	
a variety of	the relationships are	(A5) Recognize that a linear relationship	
ways.	represented.	has a constant rate of change.	
1.3 Use	a. Solve problems using	(A6) Solve problems using concrete, verbal,	
operations,	a variety of algebraic	symbolic, graphical and tabular	
properties and	methods.	representations.	
algebraic			
symbols to	b. Maintain equivalence	(A7) Model and solve one-step and two-step	
determine	in equations to	linear equations using a variety of methods.	
equivalence	determine solutions.	inical equations using a variety of methods.	
and solve	determine solutions.		
problems.			

Grade 7 NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify			
calculations using a variety of strategies, tools and technologies.			
	How are quantitative relationships represented by numbers?		
Students	Performance	Expected Performances	
Should	Standards		
2.1 Understand that	a. Represent real-	(N1) Rewrite a rational number in its	
a variety of	world situations	equivalent fraction, decimal, ratio and percent	
numerical	and solutions to	forms with number patterns and common	
representations can	problems using the	factors.	
be used to describe	appropriate	(N2) Identify and classify fractions as	
quantitative	symbolic form	terminating or repeating decimals.	
relationships.	(fractions, decimals	(N3) Estimate and perform computations with	
	or percents).	fractions, decimals, mixed numbers, improper	
		fractions, ratios, proportions and percents.	
		(N4) Multiply and divide mixed numbers and	
		decimals using the distributive property.	
		(N5) Use and describe appropriate methods to	
		divide by a fraction or a decimal.	
		(N6) Solve practical problems involving rates,	
		scale factors, mixtures and percents with	
		proportions.	
		(N7) Estimate to predict outcomes and	
		determine reasonableness of results, and	
		describe whether an estimate is an over- or	
		underestimate.	
	b. Understand the	(N8) Use powers of ten and positive exponents	
	use of scientific	to express and compare magnitude of very	
	notation as related	large numbers and connect to scientific	
	to powers of ten as	notation.	
	an efficient method	(N9) Develop, describe and use a variety of	
	for writing and	methods to estimate and calculate with very	
	comparing very	large numbers.	
	large numbers.		
	c. Use percents to	(N10) Estimate and find percents, including	
	make comparisons	percents greater than 100 percent and less than	
	between groups of	1 percent using number patterns and the	
	unequal size.	distributive property.	
		(N11) Find what percent one amount is of	
		another amount using a variety of strategies.	
2.2 Use numbers and	a. Extend the	(N12) Solve problems with positive and negative	
their properties to	operations of	numbers using models and number lines.	
compute flexibly and	addition,	(N13) Use the order of operations to compute and	
fluently, and to	subtraction,	solve a variety of multistep problems, including	
reasonably estimate	multiplication and	those with parentheses and exponents.	
measures and	division to negative	(N14) Explore absolute value while solving	
quantities.	numbers.	problems involving distance.	

Grade 7			
GEOMETRY AND MEASUREMENT			
Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.			
How		and measurements help us to	
110%	solve problems and mak	-	
Students	Performance Standards	Expected Performances	
Should		•	
3.1 Use	a. Describe and classify	(G1) Identify which classes of polygons	
properties and	polygons according to	have line and/or rotational symmetry.	
characteristics of	their transformational	(G2) Use rectangular grids to represent	
two- and three-	properties.	polygons and perform transformations	
dimensional		(translations, rotations, reflections and	
shapes and		dilations) on these polygons.	
geometric theorems to		(G3) Describe the effect of transformations	
describe		on polygons with line and/or rotational symmetry.	
relationships,		symmetry.	
communicate			
ideas and solve			
problems.			
3.2 Use spatial	a. Understand how three-	(G4) Draw and interpret nets, cross-sections	
reasoning,	dimensional objects can	and front, side and top views of various	
location and	be represented in two	solids.	
geometric	dimensions using base	(G5) Develop and use strategies to	
relationships to	plans (footprints),	determine the surface area of three-	
solve problems.	orthogonal views, nets and	dimensional objects.	
	isometric drawings.		
3.3 Develop and	a. Solve geometric and	(G6) Use estimation and measurement	
apply units,	measurement problems	strategies to solve problems involving the	
systems,	through the use of a	areas of irregular polygons and volumes of	
formulas and	variety of tools,	irregular solids.	
appropriate	techniques and strategies.	č	
tools to estimate			
and measure.			

Grade 7 WORKING WITH DATA: PROBABILITY AND STATISTICS				
Data can be analyzed to make informed decisions using				
	•	tools and technologies.		
How can collect		ying data help us analyze information and		
		ns and informed decisions?		
Students	Content Standards	Expected Performances		
should				
4.1 Collect,	a. Select the appropriate	(D1) Formulate questions, design surveys		
organize and	visual representation of	and samplings, organize and analyze		
display data	data based on the kind of	gathered data and defend the analysis.		
using	data collected and the	(D2) Organize and display data using		
appropriate	purpose for its use.	appropriate graphical representations and		
statistical and		make and defend predictions based on		
graphical		patterns and trends.		
methods.				
4.2 Analyze	a. Understand that	(D3). Find, use and interpret measures of		
data sets to	measures of central	central tendency and spread, including		
form	tendency and spread can	mode, median, mean, range and outliers.		
hypotheses	be used to describe data	(D4) Compare two sets of data based on		
and make	sets and justify	their distributions and measures of central		
predictions.	conclusions.	tendency.		
4.3 Under-	a. Compare and	(D5) Identify the two ways of obtaining		
stand and	determine experimental	probabilities: by gathering data from		
apply basic	and theoretical	experiments (experimental probability); and		
concepts of	probabilities.	by analyzing the possible and likely		
probability.		outcomes (theoretical probability).		
		(D6) Conduct experiments and compare		
		experimental to theoretical probabilities.		
		(D7) Solve problems involving the		
		probability of simple and compound events		
		in familiar contexts.		

Grade 8		
ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS		
Patterns and functional relationships can be represented and analyzed using		
TT. 1		tools and technologies.
How do	—	help us describe data and physical
C4 L		a variety of problems?
Students should	Performance Standards	Expected Performances
1.1 Understand		(A1) Write requiring and explicit functions
	a. Analyze physical	(A1) Write recursive and explicit functions
and describe	phenomena, functions	to generalize patterns.
patterns and functional	and patterns to identify	(A2) Identify relationships that are linear
relationships.	relationships and make	and nonlinear and compare and contrast
relationships.	generalizations.	their properties using tables, graphs,
		equations and verbal descriptions. (A3) Recognize and solve problems of direct
		(AS) Recognize and solve problems of direct variation.
1 2 Doprocont	a. Describe the effects	(A4) Determine the constant rate of change
1.2 Represent	of characteristics of	
and analyze		in a linear relationship and recognize this as the slope of a line.
quantitative relationships in	linear relationships on	1
a variety of	the way the relationships are	(A5) Compare and contrast the graphs of lines with the same slope versus those with
ways.	represented verbally	different slopes.
(in all y b)	and in tables, graphs	(A6) Interpret slope and y-intercepts from
	and equations.	contextual situations, graphs and linear
	und equations.	equations.
		(A7) Given two linear relationships in
		context, recognize that they may have a
		common solution.
1.3 Use	a. Solve problems using	(A8) Solve multistep equations using
operations,	various algebraic	algebraic properties.
properties and	methods and properties.	(A9) Use tables, graphs and equations to
algebraic		represent mathematical relationships and
symbols to		solve real-world problems.
determine		
equivalence		
and solve		
problems.		

Grade 8 NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.		
		nships represented by numbers?
Students	Performance	Expected Performances
should	Standards	
2.1 Understand	a. Compare and order	(N1) Compare, locate, label and order rational
that a variety	integers, powers and	numbers on number lines, scales, coordinate
of numerical	roots using number	grids and measurement tools.
representations	lines and grids.	(N2) Identify another rational number between
can be used to	6	any two rational numbers.
describe		(N3) Solve a variety of problems involving
quantitative		integers, powers, roots and scientific notation.
relationships.	b. Extend the	(N4) Use powers of ten and negative
renutionships.	understanding of	exponents to write decimal fractions.
· · · · · · · · · · · · · · · · · · ·	scientific notation to	(N5) Use powers of ten and positive and
	very small numbers.	negative exponents to express and compare
	very sman numbers.	magnitude of very large and very small
		numbers and connect to scientific notation.
		(N6) Find the results of multiplication and
		division with powers of ten using patterns in
		operating with exponents.
		(N7) Develop, describe and use a variety of
		methods to operate with very large and very
		small numbers.
2.2 Use	a. Solve problems	(N8) Estimate and solve problems involving
numbers and	involving fractions,	percent of increase and decrease.
their	decimals, ratios and	
properties to	percents.	
compute	b. Make	(N9) Use the rules for exponents to multiply
flexibly and	generalizations about	and divide with powers of ten, including
fluently, and to	operations with very	negative exponents.
reasonably	large and very small	(N10) Develop, describe and use a variety of
estimate	numbers.	methods to estimate and calculate mentally
measures and		with very large and very small numbers.
quantities.	c. Connect the	(N11) Solve problems that involve repetitive
-	exponential growth	patterns and iterations, such as compound
	and decay models to	interest, using tables, spreadsheets and
	repeated multiplication	calculators.
	by the same factor.	
	by the same factor.	

Grade 8 GEOMETRY AND MEASUREMENT			
Shapes and structures can be analyzed, visualized, measured and transformed using			
TT	a variety of strategies, tools and technologies.		
How	solve problems and ma	s and measurements help us to	
Students	Performance Standards	Expected Performances	
Should	i entormance Stanuarus	Expected 1 erformances	
3.1 Use	a. Explore the	(G1) Explore the effect of scale factors on	
properties and	relationships among sides,	the length, area and volume ratios of similar	
characteristics	angles, perimeters, areas,	polygons, circles and solids.	
of two- and	surface areas and volumes	(G2) Make and test conjectures about the	
three-	of congruent and similar	relationships among angles, sides, perimeters	
dimensional	polygons and solids.	and areas of congruent and similar polygons,	
shapes and		including the Pythagorean Theorem.	
geometric			
theorems to			
describe			
relationships,			
communicate			
ideas and solve			
problems.			
3.2 Use spatial	a. Model geometric	(G3) Use coordinate geometry to explore and	
reasoning,	relationships in a variety	test geometric relationships of parallel and	
location and	of ways.	perpendicular lines and polygons and their	
geometric		transformations.	
relationships to			
solve problems.	a Use a veriety of	(CA) Develop many property strategies to	
3.3 Develop and apply units,	a. Use a variety of concrete methods,	(G4) Develop measurement strategies to find the surface area and volume of	
systems,	including displacement, to	pyramids, cones, spheres and irregular solids.	
formulas and	find volumes of solids.	(G5) Use estimation and measurement	
appropriate	This formites of bolids.	strategies to solve problems involving the	
tools to estimate		volumes of solids.	
and measure.			
und medgure.	b. Solve problems involving measurement	(G6) Use the Pythagorean Theorem to solve indirect measurement problems.	
	through the use of	(G7) Describe the accuracy of estimates and	
	appropriate tools,	measures and the precision of measurement	
	techniques and strategies.	tools. (G8) Solve dimensional analysis problems.	

Grade 8 WORKING WITH DATA: PROBABILITY AND STATISTICS		
Data can be analyzed to make informed decisions using		
	•	tools and technologies.
How can collect	i	ying data help us analyze information and
r		ns and informed decisions?
Students	Content Standards	Expected Performances
should		
4.1 Collect,	a. Construct appropriate	(D1) Collect, organize, display, compare
organize and	representations of data	and analyze large data sets.
display data	based on the size and	(D2) Construct a variety of data displays,
using	kind of data set and the	including box-and-whisker plots, and
appropriate	purpose for its use.	identify where measures of central
statistical and		tendency and dispersion are found in
graphical		graphical displays.
methods.		
4.2 Analyze	a. Make and evaluate	(D3) Make predictions from scatter plots
data sets to	statistical claims and	using or estimating a line-of-best-fit.
form	justify conclusions with	(D4) Make inferences and evaluate
hypotheses	evidence.	reasonable hypotheses based on
and make		experimental data.
predictions.		(D5) Analyze and interpret data using
		descriptive statistics, including range,
		mode, median, quartiles, outliers and mean.
		(D6) Determine the accuracy of statistical claims.
		(D7) Describe the role of random sampling, random number generation and the effects
		of sample size in statistical claims.
4.3 Under-	a. Determine possible	(D8) Distinguish between combinations
stand and	outcomes using a variety	and permutations as ways to predict
apply basic	of counting techniques.	possible outcomes in certain situations.
concepts of	or counting cominques.	(D9) Use combinations and permutations,
probability.		trees and networks (counting strategies) in
F - Souther J.		a variety of contexts, and identify when
		order is irrelevant in determining a
		solution.
		501411011.

9-12 Core		
ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS		
Patterns and functional relationships can be represented and analyzed using		
	a variety of strategies, to	
How do]		lp us describe data and physical
	phenomena and solve a	· · ·
Students	Performance	Expected Performances
should	Standards	
1.1 Understand	a. Describe relationships	(A1) Identify, describe, create and
and describe	and make	generalize numeric, geometric and
patterns and	generalizations about	statistical patterns with tables, graphs,
functional	patterns and functions.	words and symbolic rules.
relationships.		(A2) Make and justify predictions based
		on patterns.
		(A3) Identify the characteristics of
		functions and relations, including domain
		and range.
		(A4) Describe and compare properties
		and classes of linear, quadratic and
100	D	exponential functions.
1.2 Represent	a. Represent and	(A5) Represent functions and relations on
and analyze	analyze linear and non-	the coordinate plane.
quantitative	linear functions and	(A6) Identify an appropriate symbolic
relationships in	relations symbolically	representation for a function or relation
a variety of	and with tables and	displayed graphically or verbally.
ways.	graphs.	(A7) Recognize and explain the meaning
		of the slope and x- and y-intercepts as
		they relate to a context, graph, table or
		equation.
		(A8) Evaluate and interpret the graphs of
		linear, exponential and polynomial
		functions.
1.3 Use	a. Manipulate equations,	(A8) Model and solve problems with
operations,	inequalities and	linear, quadratic and absolute value
properties and	functions to solve	equations and linear inequalities.
algebraic	problems.	(A9) Determine equivalent
symbols to		representations of an algebraic equation
determine		or inequality to simplify and solve
equivalence and		problems.
solve problems.		(A10) Solve systems of two linear
		equations using algebraic or graphical
		methods.

Grade 9-12 Core			
NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships			
	can be expressed numerically in multiple ways in order to make connections and		
		ety of strategies, tools and technologies.	
		onships represented by numbers?	
Students	Performance	Expected Performances	
should	Standards		
2.1 Understand	a. Extend the	(N1) Compare, locate, label and order real	
that a variety	understanding of	numbers on number lines, scales, coordinate	
of numerical	number to include	grids and measurement tools.	
representations	integers, rational	(N2) Select and use an appropriate form of	
can be used to	numbers and real	number (integer, fraction, decimal, ratio,	
describe	numbers.	percent, exponential, scientific notation,	
quantitative		irrational) to solve practical problems	
relationships.		involving order, magnitude, measures, labels,	
		locations and scales.	
	b. Interpret and	(N3) Use technological tools such as	
	represent large sets of	spreadsheets, probes, computer algebra	
	numbers with the aid	systems and graphing utilities to organize and	
	of technologies	analyze large amounts of numerical	
		information.	
2.2 Use	a. Develop strategies	(N4) Select and use appropriate methods for	
numbers and	for computation and	computing to solve problems in a variety of	
their	estimation using	contexts.	
properties to	properties of number	(N5) Solve problems involving scientific	
compute	systems to solve	notation and absolute value.	
flexibly and	problems.	(N6) Develop and use a variety of strategies to	
fluently, and to		estimate values of formulas, functions and	
reasonably		roots; to recognize the limitations of	
estimate		estimation; and to judge the implications of the	
measures and		results.	
quantities.	b. Solve proportional	(N7) Use dimensional analysis to determine	
	reasoning problems.	equivalent rates.	
		(N8) Solve problems using direct and inverse	
		variation.	

Grade 9-12 CORE		
GEOMETRY AND MEASUREMENT		
Shapes and structures can be analyzed, visualized, measured and transformed using		
a variety of strategies, tools and technologies.		
How do	o geometric relationships a	nd measurements help us to
	solve problems and make	sense of our world?
Students Should	Performance Standards	Expected Performances
3.1 Use properties	a. Investigate	(G1) Use models and constructions to
and characteristics	relationships among	make, test and summarize conjectures
of two- and three-	plane and solid geometric	involving properties of geometric figures.
dimensional shapes	figures using geometric	(G2) Use geometric properties to solve
and geometric	models, constructions	problems in two and three dimensions.
theorems to describe	and tools.	(G3) Determine and compare properties of
relationships,		classes of polygons.
communicate ideas	b. Develop and evaluate	(G4) Recognize the validity of an
and solve problems.	mathematical arguments	argument.
	using reasoning and proof.	(G5) Create logical arguments to solve problems and determine geometric
	proof.	relationships.
3.2 Use spatial	a. Verify geometric	(G6) Interpret geometric relationships using
reasoning, location	relationships using	algebraic equations and inequalities, and
and geometric	algebra, coordinate	vice versa.
relationships to	geometry and	(G7) Describe how a change in
solve problems.	transformations.	measurement of one or more parts of a
•		polygon or solid may affect its perimeter,
		area, surface area and volume and make
		generalizations for similar figures.
		(G8) Apply transformations to plane figures
		to determine congruence, similarity,
		symmetry and tessellations.
3.3 Develop and	a. Solve a variety of	(G9) Select appropriate units, scales, degree
apply units, systems,	problems involving one-,	of precision, and strategies to determine
formulas and	two- and three-	length, angle measure, perimeter,
appropriate tools to	dimensional	circumference and area of plane geometric
estimate and	measurements using geometric relationships	figures. (G10) Use indirect methods including the
measure.	and trigonometric ratios.	Pythagorean Theorem, trigonometric ratios
	and trigonometric ratios.	and proportions in similar figures to solve a
		variety of measurement problems.
		(G11) Judge the reasonableness of answers
		to direct and indirect measurement
		problems.
		(G12) Use two-dimensional representations
		and formal and informal methods to solve
		surface-area and volume problems.

Grade 9-12 Core		
WORKING WITH DATA: PROBABILITY AND STATISTICS		
Data can be analyzed to make informed decisions using		
	a variety of strategies	, tools and technologies.
		aying data help us analyze information and
		ons and informed decisions?
Students	Content Standards	Expected Performances
should		
4.1 Collect,	a. Create the	(D1) Collect real data and create meaningful
organize and	appropriate visual or	graphical representations of the data.
display data	graphical	(D2) Develop, use and explain applications
using	representation of real	and limitations of linear and nonlinear
appropriate	data.	models and regression in a variety of
statistical and		contexts.
graphical		
methods.		
4.2 Analyze	a. Analyze real-world	(D3) Estimate an unknown value between
data sets to	problems using	data points on a graph (interpolation) and
form	statistical techniques.	make predictions by extending the graph
hypotheses and		(extrapolation).
make		(D4) Use data from samples to make
predictions.		inferences about a population and determine
		whether claims are reasonable or false.
		(D5) Determine and use measures of spread
		and central tendency to describe and
	TT 1 / 1 1	compare sets of data.
4.3 Understand	a. Understand and	(D6) Determine outcomes and solve
and apply basic	apply the principles of	problems involving the probabilities of
concepts of	probability in a variety	events.
probability.	of situations.	(D7) Explore the concepts of conditional
		probability in real-world contexts.
		(D8) Apply theoretical and experimental
		probabilities appropriately to solve problems
		and predict experimental results.

	9-12 Extended		
ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS Patterns and functional relationships can be represented and analyzed using			
a variety of strategies, tools and technologies.			
How do patterns and functions help us describe data and physical			
	phenomena and solve a variety of problems?		
Students should	Performance	Expected Performances	
	Standards	-	
1.1 Understand and describe patterns and functional relationships.	a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions.	 (AE 1) Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric. (AE 2) Analyze essential relations in a problem to determine possible functions that could model the situation. (AE 3) Explore conic sections and their applications graphically and symbolically. (AE 4) Solve problems involving financial applications including compound interest, amortization of loans, and investments. (AE 5) Solve problems involving direct and inverse variation. (AE 6) Understand and use optimization strategies including linear programming 	
1.2 Represent and analyze quantitative relationships in a variety of ways.	a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations.	 strategies, including linear programming. (AE 7) Apply the concepts of limits to sequences and asymptotic behavior of functions. (AE 8) Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes and line of symmetry for that function. (AE 9) Recognize the effect of changes in parameters on the graphs of functions or relations. 	
		 (AE 10) Recognize that the slope of the tangent line to a curve represents the rate of change. (AE 11) Represent functions and relations with polar coordinates and in the complex plane. 	
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.	a. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices.	 (AE 12) Determine equivalent representations of an algebraic equation or inequality to simplify and solve problems. (AE 13) Combine, compose and invert functions. (AE 14) Use logarithms, vectors and matrices to solve problems. 	

Grade 9-12 Extended NUMERICAL AND PROPORTIONAL REASONING: Quantitative relationships		
can be expressed numerically in multiple ways in order to make connections and		
* *		ety of strategies, tools and technologies.
		onships represented by numbers?
Students	Performance	Expected Performances
should	Standards	
2.1 Understand	a. Extend the	(NE 1) Compare and contrast the properties of
that a variety	understanding of	numbers and number systems, including
of numerical	number to include the	rational, real and complex numbers.
representations	set of complex	(NE 2) Select and use an appropriate form of
can be used to	numbers.	number (integer, fraction, decimal, ratio,
describe		percent, exponential, scientific notation,
quantitative		irrational, complex) to solve practical
relationships.		problems involving order, magnitude,
		measures, labels, locations and scales.
		(NE 3) Justify mathematical procedures and
		determine how they apply to invented
		operations using field properties (closure,
		associative, commutative, distributive, identity
		and inverse).
		(NE 4) Judge the effects of computations with
		powers and roots on the magnitude of results.
2.2 Use	a. Investigate	(NE 5) Recognize vectors and matrices as
numbers and	mathematical	systems that have some, but not all, of the
their	properties and	properties of real numbers.
properties to	operations related to	(NE 6) Perform operations with complex
compute	objects that are not	numbers, matrices, determinants and
flexibly and	numbers.	logarithms.
fluently, and to		
reasonably		
estimate		
measures and		
quantities.		

Grade 9-12 EXTENDED			
GEOMETRY AND MEASUREMENT			
Shapes and structures can be analyzed, visualized, measured and transformed using			
Howe	a variety of strategies, tools and technologies. How do geometric relationships and measurements help us to		
	solve problems and mak		
Students Should	Performance Standards	Expected Performances	
3.1 Use properties	a. Use methods of	(GE 1) Recognize the relationships between	
and	deductive and inductive	a conditional statement and its converse,	
characteristics of	reasoning to make, test	inverse and contrapositive.	
two- and three-	and validate geometric	(GE 2) Test the validity of logical	
dimensional	conjectures.	arguments.	
shapes and		(GE 3) Use deductive arguments, including	
geometric		direct and indirect proofs, to develop an	
theorems to		understanding of an axiomatic approach to	
describe		geometry.	
relationships,	b. Explore non-	(GE 4) Recognize that the familiar	
communicate	Euclidean geometries.	geometry of Euclid is based on a particular	
ideas and solve	C	set of axioms and that a different set of	
problems.		axioms would lead to a different geometry.	
3.2 Use spatial	a. Use a variety of	(GE 5) Visualize three-dimensional objects	
reasoning,	coordinate systems and	from different perspectives and analyze	
location and	transformations to solve	cross-sections, surface area and volume.	
geometric	geometric problems in	(GE 6) Use Cartesian, navigational, polar	
relationships to	two- and three-	and spherical systems to represent, analyze	
solve problems.	dimensions using	and solve geometric and measurement	
	appropriate tools and	problems.	
	technologies	(GE 7) Represent translations, reflections,	
		rotations and dilations of plane figures	
		using sketches, coordinates, vectors,	
		function notation and matrices to examine	
		the effects of transformations and their	
		composites and to solve related geometric	
22D 1 1	A • ·	problems.	
3.3 Develop and	a. Approximate	(GE 8) Use successive approximation,	
apply units,	measurements that	upper and lower bounds, and limits to solve	
systems, formulas	cannot be directly determined with some	measurement problems. $(\mathbf{CF} 0)$ Use properties of similarity and	
and appropriate tools to estimate	degree of precision using	(GE 9) Use properties of similarity and techniques of trigonometry to make indirect	
and measure.	appropriate tools,	measurements of lengths and angles to	
unu measure.	techniques and	solve a variety of problems.	
	strategies.	sorre a variety of problems.	
	surveyies.		

Grade 9-12 Extended		
WORKING WITH DATA: PROBABILITY AND STATISTICS		
Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.		
How can collect		aying data help us analyze information and
		ons and informed decisions?
Students	Content Standards	Expected Performances
should		
4.1 Collect,	a. Model real data	(DE 1) Investigate and solve relevant
organize and	graphically using	problems by designing statistical
display data	appropriate tools,	experiments and collecting, organizing,
using appropriate	technology and strategies.	displaying and analyzing data in tabular, graphical and symbolic forms.
statistical and	sualegies.	(DE 2) Apply and defend regression models
graphical		for bivariate data and use them to formulate
methods.		predictions.
		(DE 3) Recognize the limitations of
		mathematical models based on sample data
		as representations of real-world situations.
4.2 Analyze	a. Describe and analyze	(DE 4) Determine statistical measures to
data sets to	sets of data using	describe univariate data.
form	statistical models.	(DE 5) Describe characteristics of sampling
hypotheses and		methods and analyze the effects of random
make		versus biased sampling.
predictions. 4.3 Understand	a. Solve problems using	(DE 6) Understand and use permutations,
and apply	the methods of discrete	combinations, recursion and mathematical
basic concepts	mathematics.	induction to solve problems.
of probability.	mathematics.	(DE 7) Solve problems using finite graphs.
··· ··································	b. Make statistical	(DE 8) Explore the characteristics and
	inferences through the	applications of the normal distribution and
	use of probability.	standardized scores.
		(DE 9) Construct and interpret confidence
		intervals.
		(DE 10) Explore a variety of statistical tests
		such as chi-squares and t-tests and
		understand the meaning of hypothesis
		testing.
		(DE 11) Use relative frequency and
		expected values to represent and solve
		problems involving uncertainty.