RENTON SCHOOL DISTRICT NO. 403

DEPARTMENT OF INSTRUCTION

ALGEBRA 1, 2 (S)

Curriculum Guide

Adopted by the Board of Directors June 2002

ACKNOWLEDGMENT

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A PHILOSOPHY OF EDUCATION FOR THE RENTON PUBLIC SCHOOLS

A basic function and duty of a free society is the education of its children, youth and adults.

It is the responsibility of the schools to provide each student with the opportunities necessary to develop the scholarship, skills and attitudes which will enable the student to achieve mental, physical, emotional and social maturity.

Further, each student should, as a result of the school experience, be able to make decisions and to accept responsibility for those decisions.

POLICY: 6001
ADOPTED: February 3, 1977
Renton School District No. 403
Renton, Washington

GENERAL INSTRUCTIONAL GOALS

The Renton Board of Directors recognizes that general goals are necessary to guide the development and implementation of instructional programs and services for grades kindergarten through twelve. Each student shall be provided equal access to instructional programs to meet their anticipated needs.

The Board has as the primary intent of this policy that students will be provided instructional programs and services which will meet their needs and ensure graduation from high school, prepared for citizenship, productive work, and further learning.

The goals for the Renton public schools are consistent with those adopted by the State Board of Education in 1985. They are divided into two general categories of (I) goals to guide the educational process and (II) goals to express expected student achievement.

I. The Renton School District shall foster an educational process that:
   - A. Respect the rights and responsibilities of each student, parent, staff member, and citizen.
   - B. Provides learning experiences matched to differing students' needs, interests, readiness, and learning styles.
   - C. Helps all students achieve at their highest potential and gain satisfaction from their performance.
   - D. Emphasizes that cultural, ethnic, religious, and racial diversity contribute positively to the individual, community, and national enrichment.
   - E. Provides access to the District's learning opportunities.
   - F. Provides a balanced curriculum which accurately represents our past, present, and future society.
   - G. Provides a system to measure and reduce substance abuse in and around the schools.
   - H. Emphasizes the development of good study habits, appropriate conduct and grooming, respect for self and others, self discipline, and initiative.
   - I. Extends learning opportunities beyond the school building, school day, and school year.

J. Informs and involves parents in the process of education throughout all grade levels.
K. Works in partnership with the entire community to achieve these goals.
L. Continually examines its own goals and evaluates programs with regard to the future as well as the present.
M. Provides staff assessment, development, and training to improve the quality of teaching, support, and administrative services and resources.
N. Maintains facilities conducive to learning which are an attractive part of the community.
O. Provides libraries and services that are significant resources to students, staff, and community.

II. Goals expressing expected student achievement. As a result of the educational process in Renton, students should better possess, understand, and apply:

A. Language skills including reading, writing, spelling, and speech.
B. Mathematical skills.
C. Concepts and skills in natural and physical sciences.
D. Concepts and skills in social studies with an appreciation for he heritage of America.
E. Knowledge, skills, and appreciation of arts and humanities.
F. Knowledge and skills necessary to maintain physical and mental health and well-being.
G. Skill in a foreign language.
H. Thinking, study, information gathering, and problem-solving skills to guide further learning.
I. Skills needed for responsible participation in a democratic society and a comprehension of other societies and forms of government.
J. Functional skills necessary for successful participation in the job market.
K. Technological principles and processes.

History of Course Development

In the early 1960's Renton School District initiated the development of course guides for mathematics courses. Among the first courses to have detailed curriculum guides was the Algebra 1,2 (Standard) course. The guide was completed in 1967 and new text materials for the course purchased in 1969.

In 1972 the Algebra 1,2 (S) course was modified by offering it to a selected number of students at the eighth grade level. This allowed students to follow a sequential program which culminated with a calculus course in the senior year.

The curriculum guide and materials were reviewed in 1982 and a new textbook, *Using Algebra* by Laidlaw, was selected. Again in the 1987-1988 school year a committee reviewed the curriculum guide and materials. At that time *Algebra One* by Merrill was selected.

In the 1993-1994 school year a Curriculum Development Committee was established for a review of the curriculum guide and materials for both Algebra 1,2 (S) and Algebra 3,4 (S). The committee developed recommendations with attention to the integration of technology, development of higher level thinking and processing skills, alignment of outcomes with those of other courses and levels, and provisions for learners of varying abilities and styles. The committee also discussed the integration of subject matter and infusion of diversity/multicultural perspectives.

These issues were revisited, and new concerns, including the impact of recent research on learning styles, brain functioning, and cognitive theory, were addressed in the most recent curriculum review, which began in the 1999-2000 school year. The recommendations of the national standards document, *Principles and Standards for School Mathematics*, revised and released by the National Council of Teachers of Mathematics (NCTM) in 2000, were also taken into consideration. In a three year process, the committee examined a wide variety of curricula with several goals in mind: to select or design a curriculum that provided a rich variety of rigorous and worthwhile mathematical tasks for students; to select or design a curriculum that made best use of the teacher's expertise in guiding and facillitating learning; and to select or design a curriculum that would help students attain deeper understandings of algebraic concepts and how those conceptual understandings will be useful in their lifelong learning.

MATHEMATICS PROGRAM GOALS

The Renton Mathematics program must:

1. Provide each student with the opportunities to master, maintain and apply the basic skills and processes of mathematics.

2. Make every effort to ensure that students master the basic skills of arithmetic which will include numbers and place value; addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals; geometric shapes and relationships; measurements; and graphing;

3. Provide for the development of reading skills required for the decoding, and comprehending, of the printed materials;

4. Enable students to understand that mathematics is a meaningful as well as mechanical process;

5. Develop an understanding that mathematics is an indispensable tool needed to function in society, both as a consumer and a member of the work force;

6. Provide curriculum flexibility for both college and vocationally oriented students;

7. Provide for the application of mathematics concepts and skills to situations outside the classroom;

8. Build a student's self-confidence and positive attitude through successful and challenging experiences;

9. Ensure that sufficient programs are available to students in advanced mathematics, e.g., trigonometry, geometry, calculus, etc.;

10. Provide the opportunity to develop logical reasoning and creative thinking; and

11. Increase student awareness of historical developments in mathematics.

Teacher Commentary

Instructional Notes

Students must be able to reflect upon and clarify their thinking about mathematical ideas and relationships if they are to succeed in mathematics; reading, writing, and communicating are thus integral to building good mathematical understandings. The NCTM Standards also suggest more attention should be focused on problem solving, the integration of technology into the classroom, and applications which connect content to everyday situations.

Cooperative learning strategies enhance problem solving, critical thinking, and conceptual learning tasks. Guidelines for implementing these strategies are discussed in the teacher's editions; in particular, group work is an integral part of the CPM program. The use of graphing calculators, computers and additional teaching methods is also encouraged; the Larson *Algebra 1* materials provide regular graphing calculator activities.

Both CPM *Algebra* and the Larson *Algebra 1* provide a variety of assessment materials in a variety of formats from which to select formative and summative assessments. Adequate traditional tests accompany the Larson textbook in multiple choice and completion form. Alternate assessment ideas are also available with both texts. CPM also provides specific formats for group assessments.

In order for the math program to be more effective, teachers will give special consideration to:

1. Using of manipulatives as an effective instructional tool at all grade levels.

2. Treating the stated objectives as *minimal* expectations for students at each grade level.

3. Including non-standard problem solving activities throughout the instructional program.

4. Using precise vocabulary and requiring students to use it when discussing mathematical concepts.

5. Encouraging neatness and legibility.

6. Requiring students to correct their errors.

7. Requiring students to show all work unless otherwise designated.

8. Keeping current records of students' progress.

Introduction to Mathematics

Mathematics for Today and Tomorrow - Mathematics continues to grow at a rapid rate, spreading into new fields and creating new applications, in its open-ended search for patterns. Several factors -- growth of technology, increased applications, impact of computers, and expansion of mathematics itself -- have combined in the past century to extend greatly both the scope and the application of the mathematical sciences. The changes must be reflected in the schools if our students are to be well prepared for tomorrow's world.

What is Mathematics? - Mathematics is a language and science of patterns.

As a language of patterns, mathematics is a means for describing the world in which we live. In its symbols and vocabulary, the language of mathematics is a universal means of communication about relationships and patterns.

As a science of patterns, mathematics is a mode of inquiry that reveals fundamental understandings about order in our world. This mode of inquiry relies on logic and employs observation, simulation, and experimentation as means of challenging and extending our current understanding.

Toward a deeper study of important mathematics - More than at any other time in history, society is placing demands on citizens to interpret and use mathematics to make sense of information and complex situations. Computers and other technologies have increased our capacities for dealing with numbers, for collecting, organizing, representing, and analyzing data. Tables, lists of numbers, graphs of data, and statistics summarizing information occur in every form of the media.

To be well informed as adults and to have access to desirable jobs, students today require an education in mathematics that goes far beyond what was needed by students in the past. All students must develop and sharpen their skills, deepen their understanding of mathematical concepts and processes, and hone their problem solving, reasoning, and communication abilities while using mathematics to make sense of, and to solve, compelling problems. All students need a deep understanding of mathematics; for this to occur, rigorous mathematical content must be reorganized, taught, and assessed in a problem-solving environment. For students to develop this deeper level of understanding, their knowledge must be connected to a variety of ideas and skills across topic areas and grade levels in mathematics, to other subjects taught in school, as well as to situations outside the classroom.

The Essential Academic Learning Requirements in

MATHEMATICS

1. The student understands and applies the concepts and procedures of mathematics.

To meet this standard, the student will:

1.1 understand and apply concepts and procedures from number sense
number and numeration, computation, and estimation

1.2 understand and apply concepts and procedures from measurement
attributes and dimensions, approximation and precision, and systems and tools

1.3 understand and apply concepts and procedures from geometric sense
properties and relationships, and locations and transformations

1.4 understand and apply concepts and procedures from probability and statistics
probability, statistics, and prediction and inference

1.5 understand and apply concepts and procedures from algebraic sense
patterns, representations, and operations

2. The student uses mathematics to define and solve problems.

To meet this standard, the student will:

2.1 investigate situations
by searching for patterns and using a variety of approaches

2.2 formulate questions and define the problem

2.3 construct solutions
by organizing the necessary information and using the appropriate mathematical tools

3. The student uses mathematical reasoning.

To meet this standard, the student will:

3.1 analyze information
from a variety of sources; use models, known facts, patterns and relationships to validate thinking

3.2 predict results
and make conjectures based on analysis of problem situations

3.3 draw conclusions and verify results
support mathematical arguments, justify results, and check for reasonableness of solutions

4. The student communicates knowledge and understanding in both everyday and mathematical language.

To meet this standard, the student will:

4.1 gather information
read, listen, and observe to access and extract mathematical information

4.2 organize and interpret information

4.3 represent and share information
express and explain mathematical ideas using language and notation in ways appropriate for audience and purposes

5. The student understands how mathematical ideas connect within mathematics, to other subject areas, and to real-life situations.

To meet this standard, the student will:

5.1 relate concepts and procedures within mathematics
use conceptual and procedural understandings among content strands, and sue equivalent models and representations

5.2 relate mathematical concepts and procedures to other disciplines
identify and use mathematical patterns, thinking, and modeling in other subject areas

5.3 relate mathematical concepts and procedures to real-life situations
understand the connections between mathematics and problem-solving skills used every day at work and at home

1. The student understands and applies the concepts and procedures of mathematics.

To meet this standard, the student will:

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
1.1 understand and apply concepts and procedures from number sense		
number and numeration		
demonstrate understanding of whole and fractional numbers, and place value in whole numbers using objects, pictures, or symbols	demonstrate understanding of integers, fractions, decimals, percents, place value of decimals, and properties of the rational number system using pictures and symbols	understand and use properties and symbolic representations of rational numbers, powers, and roots
identify, compare, and order whole numbers and simple fractions	compare and order integers, fractions, and decimals	compare and order rational numbers, powers, and roots
demonstrate an understanding of the properties of whole numbers	understand the concepts of prime and composite numbers, factors and multiples, and divisibility rules	understand concepts of and use processes involving prime and composite numbers, factors and multiples, and divisibility
	understand and apply the concepts of ratio and direct proportion	understand and apply the concepts of ratio and both direct and inverse proportion
computation		
show understanding of whole number operations (+, -, ×, ÷) using blocks, sticks, beans, pictures, symbols, etc.	understand operations on non-negative rational numbers	understand operations on rational numbers, powers, and roots
add, subtract, multiply, and divide whole numbers	add, subtract, multiply, and divide non-negative fractions and decimals using rules for order of operation	compute with rational numbers, powers, and roots
use mental arithmetic, pencil and paper, or calculator as appropriate to the task involving whole numbers	use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving non-negative rational numbers	use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving real numbers
estimation		
identify situations involving whole numbers in which estimation is useful	identify situations involving non-negative rational numbers in which estimation is sufficient and computation is not required	identify situations involving rational numbers, powers, and roots in which estimation is sufficient and computation is not required
use estimation to predict computation results and to determine the reasonableness of answers, *for example, estimating a grocery bill*	use estimation to predict computation results and to determine the reasonableness of answers involving non-negative rational numbers, *for example, estimating a tip*	use estimation to predict computation results and to determine the reasonableness of answers involving real numbers, *for example, estimating*

Mathematics - Essential Academic Learning Requirement 1 (Continued)

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
1.2 understand and apply concepts and procedures from measurement		
attributes and dimensions		
understand concepts of perimeter, area, and volume	understand the concepts of and the relationships among perimeter, area, and volume and how changes in one dimension affect perimeter, area, and/or volume	understand how changes in dimension affect perimeter, area, and volume
use directly measurable attributes *such as length, perimeter, area, volume/capacity, angle, weight/mass, time, money, and temperature* to describe and compare objects	measure objects and events directly or using indirect methods *such calculating and applying procedures for determining perimeter, area, and volume*	measure objects and events directly or use indirect methods *such as finding the volume of a cone given its height and diameter*
	understand the concept of rate and how to calculate rates and determine units	calculate rate and other derived and indirect measurements
approximation and precision		
understand that measurement is approximate	understand that precision is related to the unit of measurement used and the calibration of the measurement tool	understand that the precision and accuracy of measurement are affected by the measurement tools and calculating procedures
know when to estimate and use estimation to determine when measurements are reasonable, or to obtain approximations, *for example, estimating the length of the playground by pacing it off*	know when to estimate and use estimation to obtain reasonable approximations, *for example, estimating the length and width of the playground to approximate its area*	know when to estimate and use estimation to obtain reasonable approximations, *for example, estimating how much paint is needed to paint the walls of a classroom*
systems and tools		
understand the benefits of using standard units of measurement for measuring length, area, and volume	understand the appropriate uses of standard units of measurement for both direct and indirect measurement	understand the benefits of standard units of measurement and the advantages of the metric system
understand appropriate units of measure for time, money, length, area, volume/capacity, weight/mass, and temperature	understand the relationship among units within both the U.S. and metric systems	compare, contrast, and use both the U.S. system and metric system
select and use appropriate tools for measuring time, money, length, area, volume, mass, and temperature	select and use tools that will provide an appropriate degree of precision, *for example, using meters vs. kilometers*	select and use tools that will provide an appropriate degree of precision and accuracy for the situation, *for example, using kilometers vs. light years*

Mathematics - Essential Academic Learning Requirement 1 (Continued)

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
1.3 understand and apply concepts and procedures from geometric sense		
properties and relationships		
use attributes of geometric shapes and properties of parallel and perpendicular to identify, name, compare, and sort geometric shapes and figures	use the properties and relationships of plane geometry to describe shapes and figures including angles, degrees in a circle, triangles, isosceles, equilateral, or quadrilateral	use geometric properties and relationships to compare, contrast, describe, and classify 2- and 3-dimensional geometric figures
recognize geometric shapes in the surrounding environment, *for example, identify rectangles within windows*	identify, describe, or draw objects in the surrounding environment in geometric terms, *for example, producing a simple scale drawing of a classroom*	construct geometric models and scale drawings using tools as appropriate, *for example, building a model of a bridge*
understand concepts of symmetry, congruence, and similarity	understand symmetry, congruence, and similarity	understand and use properties of symmetry, congruence, and similarity
draw and build simple shapes and figures using appropriate tools*, such as a straightedge, ruler, protractor, or nets*	perform geometric constructions using a variety of tools and technologies*, such as paper folding, computer software, straightedge, compass*	perform complex geometric constructions using a variety of tools and technologies*, such as paper folding, computer software, straightedge, compass*
locations and transformations		
locate and describe the location of objects on a number line, map, or a coordinate grid in the first quadrant	identify and describe location of objects on coordinate grids in any of the four quadrants	understand and use coordinate grids
understand and draw simple geometric transformations using translations (slides), reflections (flips), or rotations (turns)	understand and apply simple geometric transformations using combinations of translations (slides), or reflections (flips), or rotations (turns)	understand and apply multiple geometric transformations using combinations of translations, reflections, and/or rotations

Mathematics - Essential Academic Learning Requirement 1 (Continued)

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
1.4 understand and apply concepts and procedures from probability and statistics		
probability		
understand the difference between certain and uncertain events	know how to calculate numerical measures of chance for simple events	understand the properties of dependent and independent events
know how to list all possible outcomes of simple experiments	understand procedures for counting outcomes to determine probabilities	understand and use appropriate counting procedures to determine probabilities
understand and use experiments to investigate the probabilities of uncertain events	know how to conduct experiments and simulations and to compare results with mathematical expectations	use both experimental and theoretical methods to determine probabilities
statistics		
collect data in an organized way	collect a random sample of data that represents a described population	collect data using appropriate methods and technology
organize and display data in numerical and graphical forms *such as tables, charts, pictographs, and bar graphs*	organize and display data in appropriate forms, *such as frequency tables, circle graphs, and stem-and-leaf plots*	organize and display data in appropriate forms, *such as tables, graphs, scatter plots, and box and whisker plots*
understand measures of central tendency such as mean, median, and mode in describing data	calculate and appropriately use range and measures of central tendency to describe data	calculate and use the different measures of central tendency, variability, and range as appropriate to describe data
identify how data can be used to support a point of view	identify how statistics can be used to support different points of view	use statistics to support different points of view, *for example, in a debate or a position paper*
prediction and inference		
predict outcomes of simple activities and compare predictions to experimental results	predict outcomes of experiments and simulations and compare the predictions to experimental results	predict outcomes and design and conduct experiments to verify or disprove predictions
understand and make inferences based on experimental results using coins, number cubes, spinners, etc.	understand and make inferences based on analysis of experimental results, statistical data, and simple graphical representations	understand and make inferences based on the analysis of experimental results, statistical data, and graphical representations

Mathematics - Essential Academic Learning Requirement 1 (Continued)

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
1.5 understand and apply concepts and procedures from algebraic sense		
patterns		
recognize, extend, and create patterns of numbers, shapes, or objects *such as beans, toothpicks, pattern blocks, cubes, colored tiles*	recognize, extend, and create patterns and sequences	recognize, extend, and create complex patterns and sequences
write a rule for a pattern based on a single arithmetic operation *between terms, such as a function machine*	represent and describe patterns with tables, graphs, and rules	generalize and express rules describing patterns and sequences
representations		
understand equality and inequality and use =, >, and < in number sentences	represent equalities and inequalities symbolically using =, >, <, ≤, ≥	translate among tabular, symbolic, and graphical representations of relations using =, ≠, >, <, ≥, ≤
Identify and use appropriate symbols and notations in reading and writing open sentences, *for example, 3 × □ = 18*	use variables to write simple expressions, equations, and inequalities, *for example, 3x > 18*	use variables to write expressions, equations, and inequalities
operations		
evaluate simple expressions using blocks, sticks, beans, pictures, etc.	evaluate expressions and formulas	simplify and evaluate expressions and formulas
solve simple equations using blocks, sticks, beans, pictures, etc.	solve single-variable equations	solve equations and inequalities

2. The student uses mathematics to define and solve problems.

To meet this standard, the student will:

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
2.1 investigate situations		
search for patterns in simple situations	search systematically for patterns in simple situations	search systematically for patterns in complex situations
use a variety of strategies and approaches	develop and use a variety of strategies and approaches	use multiple strategies
recognize when information is missing or extraneous	identify missing or extraneous information	identify what information is missing or extraneous and compensate for it
recognize when an approach is unproductive and try a new approach	recognize the need to modify or abandon an unproductive approach	analyze an unproductive approach and attempt to modify it or try a new approach
2.2 formulate questions and define the problem		
identify questions to be answered in familiar situations	identify questions to be answered in new situations	identify questions to be answered in complex situations
define problems in familiar situations	define problems in new situations	define problems in complex situations
identify the knowns and unknowns in familiar situations	identify the knowns and unknowns in new situations	identify the information that is known and unknown in complex situations
2.3 construct solutions		
organize relevant information	organize relevant information from multiple sources	organize and synthesize information from multiple sources
select and use appropriate mathematical tools	select and use appropriate mathematical tools	select and use appropriate mathematical tools
apply viable strategies and appropriate concepts and procedures to construct a solution	apply viable strategies and appropriate concepts and procedures to construct a solution	apply viable strategies and appropriate concepts and procedures to construct a solution

3. The student uses mathematical reasoning.

To meet this standard, the student will:

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
3.1 analyze information		
compare and interpret information in familiar situations	compare, contrast, and interpret information from a variety of sources	compare, contrast, interpret and integrate information from multiple sources
validate thinking using models, known facts, patterns, and relationships	validate thinking and mathematical ideas using models, known facts, patterns, relationships, and counter-examples	validate thinking and mathematical ideas using models, known facts, patterns, relationships, counter-examples, and proportional reasoning
3.2 predict results		
make conjectures based on analysis of familiar problem situations	make conjectures based on analysis of new problem situations	make and explain conjectures based on analysis of problem situations
3.3 draw conclusions and verify results		
test conjectures by finding examples to support or contradict them	test conjectures and explain why they are true or false	test conjectures by formulating a proof or by constructing a counterexample
support arguments and justify results	support arguments and justify results using evidence	support arguments and justify results using inductive and deductive reasoning
check for reasonableness of results	check for reasonableness of results	check for reasonableness of results
reflect on and evaluate procedures and results in familiar situations	reflect on and evaluate procedures and results in new problem situations	reflect on and evaluate procedures and results and make necessary revisions

4. The student communicates knowledge and understanding in both everyday and mathematical language.

To meet this standard, the student will:

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
4.1 gather information		
develop and follow a simple plan for collecting information	develop and follow a plan for collecting information	develop or select and follow an efficient system for collecting information
use reading, listening, and observation to access and extract mathematical information from a variety of sources *such as pictures, diagrams, physical models, classmates, oral narratives, and symbolic representations*	use reading, listening, and observation to access and extract mathematical information from multiple sources *such as pictures, diagrams, physical models, oral narratives, and symbolic representations*	use reading, listening, and observation to access and extract mathematical information from multiple, self-selected sources *such as pictures, diagrams, physical models, oral narratives, and symbolic representations*
use available technology to browse and retrieve mathematical information from a variety of sources	choose appropriate available technology to browse, select, and retrieve relevant mathematical information from a variety of sources	integrate the use of a variety of available technologies to browse, select, and retrieve mathematical information from multiple sources
4.2 organize and interpret information		
organize and clarify mathematical information in at least one way - reflecting, verbalizing, discussing, or writing	organize and clarify mathematical information by reflecting, verbalizing, discussing, or writing	organize, clarify, and refine mathematical information in multiple ways - reflecting, verbalizing, discussing, or writing
4.3 represent and share information		
express ideas using mathematical language and notation *such as physical or pictorial models, tables, charts, graphs, or symbols*	clearly and effectively express or present ideas and situations using both everyday and mathematical language *such as models, tables, charts, graphs, written reflection, or algebraic notation*	express complex ideas and situations using mathematical language and notation in appropriate and efficient forms
explain or represent mathematical ideas and information to familiar people for a given purpose	explain or represent mathematical ideas and information in ways appropriate for audience and purpose	explain or represent complex mathematical ideas and information in ways appropriate for audience and purpose

5. The student understands how mathematical ideas connect within mathematics, to other subject areas, and to real-life situations.

To meet this standard, the student will:

BENCHMARK 1 - GRADE 4	BENCHMARK 2 - GRADE 7	BENCHMARK 3 - GRADE 10
5.1 relate concepts and procedures within mathematics		
relate conceptual and procedural understandings among familiar mathematical content strands	relate and use conceptual and procedural understandings among a variety of mathematical content areas	relate and use conceptual and procedural understandings among multiple mathematical content strands
recognize equivalent mathematical models and representations in familiar situations	relate and use different mathematical models and representations of the same situation	relate and use multiple equivalent mathematical models and representations
5.2 relate mathematical concepts and procedures to other disciplines		
recognize mathematical patterns and ideas in familiar situations in other disciplines	identify mathematical patterns and ideas in other disciplines	extend mathematical patterns and ideas to other disciplines
use mathematical thinking and modeling in familiar situations in other disciplines	use mathematical thinking and modeling in other disciplines	apply mathematical thinking and modeling in other disciplines
describe examples of contributions to the development of mathematics *such as the contributions of women, men, and different cultures*	describe examples of contributions to the development of mathematics *such as the contributions of women, men, and different cultures*	describe examples of contributions to the development of mathematics *such as the contributions of women, men, and different cultures*
5.3 relate mathematical concepts and procedures to real-life situations		
give examples of how mathematics is used in everyday life	recognize the widespread use of mathematics in daily life and the extensive use of mathematics outside the classroom, *for example, in banking or sports statistics*	identify situations in which mathematics can be used to solve problems with local, national, or international implications *such as calculating resources necessary for interstate highway maintenance*
identify how mathematics is used in career settings	investigate the use of mathematics within several occupation/careers of interest	investigate the mathematical knowledge and training requirements for occupational/career areas of interest

FRAMEWORKS

The state of Washington has published Frameworks to be used as guidelines in helping students achieve mastery of the Essential Academic Learning Requirements in Mathematics. Since most students will be taking Algebra in the 9th grade, the state Frameworks for 9th grade are included here to establish a context for the Learning Objectives, Scope, and Sequence of the Algebra curriculum.

NINTH GRADE FRAMEWORKS

Content Overview: By the end of the ninth grade, students can explain the meaning of operations on real numbers and how operations relate to one another. In particular, they understand the roles of the additive and multiplicative inverse properties. They understand the properties of inequalities and the laws for equal addition and multiplication for equations. These students have an intuitive understanding of the density of real numbers and the distinction between rational and irrational numbers, with a special emphasis on pi and simple square roots. They have a grasp of the basic exponent properties including negative integral powers of a positive number. These students can distinguish between direct and inverse variation and describe the nature of each in terms of the types of graphs (linear and curved) related to such relationships. The students can both compute and estimate the values of indicated operations efficiently and accurately.

Students extend their understanding of the representing of lines on coordinate planes through understanding of the role of slope and the determination of parallel and perpendicular lines. They use coordinate grids to investigate and establish properties of geometric transformations, including magnifications. Students use line plots and histograms to examine the nature of data distributions, looking for spread and outliers. They recognize the relationship between variables in two-variable settings and discuss it in terms of trend and relationship. Students can find the equations of trend lines, and discuss their rates of change. They can interpret situations and represent and solve them through systems of equations, discussing the meaning of their solutions.

Process Overview: By the end of the ninth grade, students can formulate, represent, and abstract patterns from numerical and geometric situations, generalize them into algebraic expressions, manipulate these expressions to find equivalent expressions or solve equations, and communicate the results to their peers in writing, speaking, and graphical forms. They should be able to explain their reasoning, using organized lists and expressions developed from differences in T-tables based on successive integer inputs. They should be able to determine if a solution is unique or whether it is one of a list of possible solutions. They should be able to provide probabilistic, statistical, or combinatorial reasoning to back up inductive and elementary deductive reasoning for a statement. They should be able to shift between representations in explaining their solutions to problems and in describing examples of a mathematical concept or principle. They should be able to use spreadsheets, word-processing programs, geometric software, and statistical packages to illustrate and record their work. Students should be able to talk and write about the role mathematics plays in modern society and everyday events.

Content Quick Check

Does the student:

- Compare and contrast the structure (operations, properties, including density) for the real number system and its subsystems (whole, integer, rational, and real)?
- Identify and use appropriately the additive and multiplicative inverses of numbers and variables in solving problems?
- Recognize and apply the properties of equality and inequality for equations and inequalities?
- Solve linear equations and inequalities, justifying steps when required?
- Compare and contrast the nature of an irrational number (notably small square roots for whole numbers and pi) with the nature of a rational number?
- Evaluate, correctly, expressions involving integer exponents, citing properties where necessary?
- Compute accurately and efficiently, using appropriate methods (paper-and-pencil, mental arithmetic, technology) with varied number systems and expressions?
- Estimate when appropriate and with the required level of accuracy?
- Identify the nature and exact value of the slope of a line graphed on a coordinate plane and give its symbolic form?
- Relate the nature of parallel and perpendicular lines in spatial settings with their algebraic representations on a coordinate plane?
- Use line plots, histograms, and other forms of graphics to investigate distributions of data, noting outliers, spread, and symmetry.
- Express the slope (rate of change) for a line graphed in the coordinate plane and identify its intercept(s)?
- Represent lines symbolically or graphically, shifting from given data, graphs, or symbolic forms?
- Evaluate linear and quadratic expressions for given values?
- Relate the solutions of linear and systems of linear equations, to points on their graphs?
- Translate a given situation into a system of equations, represent them, and solve them to resolve the original situation?
- Recognize the relationship between expressions, relations, and equations at an elementary level (data and graphs)?

- **Process Quick Check**

  Note: Problem solving, mathematical reasoning, communication, and connections are necessarily infused throughout the curriculum. Although the processes are quite similar for each grade level, implementation of them will vary based on the developmental level of the students. Specific examples appropriate for Grade 9 can be found on the Suggested Assessment Evidence for the End of Ninth Grade chart.

Does the student:

- Recognize, formulate, solve, perform operations, and communicate effectively in problem-solving situations?
- Abstract patterns from tabular data and generalize them in algebraic expression form?
- Select appropriate forms for communicating problem solution reports depending on audience and level of detail required?
- Employ problem-solving strategies to assist in identifying patterns in problem situations?
- Provide convincing arguments for conjectures based on inductive and informal deductive methods?
- Translate between representations (numerical, graphical, symbolic, and verbal) as appropriate in gathering and recording information, in problem solving, and in communicating results?
- Employ spreadsheets, word-processing, graphing programs, statistical packages, geometry software and other information processing aids in testing conjectures, solving problems, and communicating results?
- Talk and write effectively in describing his/her problem solving and project work in mathematics?
- Recognize the pervasive role mathematics plays in modern society?

· Suggested Assessment Evidence for the End of Ninth Grade (Selected Strands)

	LINKS TO EALRs	ASSESSMENT PROCESSES**				
		1	2	3	4	5
CONCEPTS AND PROCEDURES						
Number Sense						
Applies associative, commutative, identity, inverse, and distributive properties to simplify and complete decimal number operations	1.1	X	X			X
Uses properties of real numbers and order in interpreting rational number situations (ex: finds a rational number between 3/4 and 7/8)	1.1		X			X
Orders sets of rational numbers, integers, or real numbers relative to their values in abstract or concrete settings	1.1	X	X		X	X
Finds the absolute value of integers	1.1		X			X
Expresses whole numbers in prime factored form using exponential notation, such as $48 = 2^4 \bullet 3$	1.1		X		X	X
Converts between common infinite repeating decimal representations and their rational number representations (ex: finds the fraction equivalent to 2.6666…)	1.1		X			X
Describes the nature of an irrational number and provides examples like pi and the square root of 2	1.1	X			X	X
Understands exponent properties including negative integral powers of a positive number.	1.1	X			X	X
Recognizes and interprets numbers in scientific notation in various formats such as standard form, scientific notation, or calculator format (3.5E-6)	1.1	X	X		X	X
Computes in situations involving rational numbers, decimals, integers, and real numbers	1.1		X		X	X
Determines the reasonableness of a calculation involving rational or decimal numbers (ex: is it reasonable that a fast food restaurant sold $150,000 of hamburgers in a day)	1.1		X	X		X
Differentiates between situations where estimates are sufficient and those for which exact values are required	1.1		X	X		
Measurement						
Uses subdivisions of a figure to find or estimate the measure of a complex figure (ex: finds the area or perimeter of a figure with many parts, each of which can be computed or estimated separately)	1.2		X		X	X
Identifies and describes meaning of the slope of a line as a rate of change	1.2		X		X	X
Converts among measures for length, area, volume, mass/weight, or capacity within the U.S. Customary and within the metric system of measurement	1.2		X		X	X
Geometric Sense						
Constructs models of similar figures, showing the relationship between corresponding parts	1.3		X		X	X
Solves for measures of sides of similar figures using proportions	1.3		X			X
Uses proportions to find the sizes of sides of a figure that is magnified or reduced in size	1.3		X		X	X

****Key for Assessment Processes**

1. Illustrated journals
2. Focused observation/anecdotal records
3. Individual interviews
4. Performance assessment
5. Traditional paper-and-pencil tests

	LINKS TO EALRs	ASSESSMENT PROCESSES**				
		1	2	3	4	5
Probability and Statistics						
Gives the probability associated with a simple event	1.4		X		X	X
Identifies equally likely events (ex: rolling an even or odd number on a die)	1.4		X			X
Lists the outcomes for a two-stage event (ex: roll die or spin a spinner) and gives associated probabilities	1.4		X			X
Determines the probability of successive events like flipping a coin twice and getting two heads	1.4		X			X
Develops a conclusion about trends in data from examining a graph, such as explaining the rate of growth in a population	1.4	X	X	X	X	X
Uses scatter plots and box-and-whisker graphs to illustrate and describe the variability in data sets	1.4				X	X
Describes the range and the spread of a set of data	1.4		X			X
Analyzes data sets related to a given situation and writes a short description of the patterns observed, forming and defending the generalizations related to the patterns	1.4	X	X	X	X	X
Draws a trend line describing a set of data	1.4		X		X	X
Algebraic Sense						
Represents numerical patterns, based on constant additions or multiplication, by extending them and giving an explicit expression involving a variable for the general term of the pattern	1.5		X		X	X
Describes and extends geometric patterns based on rotations or reflections of a geometric pattern	1.5				X	X
Evaluates simple expressions and equations via graphs, tables of values, or geometric relationships	1.5	X	X	X	X	
Finds the solution to a linear equation using either symbolic or geometric methods (ex: finding the point where the graph of the equation crosses the x-axis)	1.5		X		X	X
Given the graph of a line, the student finds the equation of the line (ex: given a graph of a line crossing the x-axis at 3 and the y-axis at 5, the student finds its equation)	1.5		X	X		X
Uses rates and proportions to interpolate or extrapolate values on a graph (ex: finds the value associated with a point on a line graph between two given points or slightly beyond two given points)	1.5	X	X	X	X	X
Graphs inequalities in the plane [ex: finds all points (x,y) on a coordinate grid such that $y < 2x - 5$]	1.5		X			X
Estimates the solution to a system of linear equations using graphs or a calculator	1.5		X		X	X

****Key for Assessment Processes**

1. Illustrated journals
2. Focused observation/anecdotal records
3. Individual interviews
4. Performance assessment
5. Traditional paper-and-pencil tests

	LINKS TO EALRs	ASSESSMENT PROCESSES**				
		1	2	3	4	5
PROBLEM SOLVING						
Translates conditions from problems into appropriate representations (ex: writes an equation representing the conditions for use in solving the problem)	2.2					
Identifies the steps that he/she used in solving a problem (ex: found the right formula, substituted in the formula, solved the resulting equation, and interpreted the solution)	2.1, 2.2	**All of the Assessment Processes may be used for gathering evidence**				
Estimates what a reasonable result might be for a problem, selects an appropriate strategy, and uses the estimate to evaluate the resulting solution	2.1, 2.2					
MATHEMATICAL REASONING						
Explains the relevance of data to the problem at hand or whether an argument/statement is consistent with other information in a problem	3.1, 3.2, 3.3					
Develops a convincing argument for the validity of a statement provided as an answer to a question	3.2					
Develops and supports conjectures based on patterns, statements, or evidence related to a given situation	3.2, 3.3					
Lists special cases related to a given problem and develops a conjecture based on the evidence in the cases	3.1, 3.2					
COMMUNICATION						
Develops an organized oral or written procedure or plan for communicating information relating to a problem and its solution to others	4.1, 4.3					
Expresses mathematical ideas verbally or in writing in a clear, logical, and correct fashion in discussing the solution, or progress toward a solution, to a problem	4.2, 4.3					
Represents information in a table, graph, or expression and translates between these forms of representation.	4.3					
Chooses an appropriate form of representation for discussing a problem and its solution (verbal, tabular, graphical, or symbolical)	4.1, 4.2, 4.3	**All of the Assessment Processes may be used for gathering evidence**				
CONNECTIONS						
Describes the relationship between algebraic and geometric representations of a concept (ex: describes why parallel lines have the same slope)	5.1					
Outlines the relationship between mathematical concepts using words or diagrams (ex: describes with words and diagrams why the slopes of perpendicular lines are negative reciprocals of one another)	5.1					
Uses mathematics to develop a model for a situation in another subject matter area and explains the relevance of the model (ex: explains with a graph that the volume occupied by a gas increases as the gas is heated)	5.2					
Describes uses of mathematics in at least one career	5.3					

****Key for Assessment Processes**

1. Illustrated journals
2. Focused observation/anecdotal records
3. Individual interviews
4. Performance assessment
5. Traditional paper-and-pencil tests

LEARNING OBJECTIVES

Introduction: The above Frameworks provide an outline of the learning objectives for the Algebra 1, 2 (S) course. The following provides a more detailed elaboration of the expectations with respect to specific objectives in Algebra. These are grouped according to the "big ideas" (the two to three essential understandings) around which Algebra courses are built:

- the real number system, its subsystems, and operations with real numbers;
- symbolic representation and manipulation of mathematical ideas;
- linear and quadratic equations and inequalities, and the representation of quantitative relationships in words, equations, graphs, and tables.

The Real Number System: Students will develop a basic understanding of topics related to building a more complex understanding of number. Topics should include integer operations, rational numbers, real numbers, irrationals, variables, exponents, roots, order of operations, real number operations, scientific notation, ratio, proportion, percent, and estimation.

Specific Objectives (students will be able to):

- Apply the order of operations to evaluate expressions.
- Solve open sentences.
- State the coordinate of a point on a number line.
- Graph integers on a number line.
- Add and subtract integers and rational numbers (using a variety of methods).
- Compare rational numbers (and write in increasing or decreasing order).
- Write inequalities for graphs on number lines.
- Graph inequalities on number lines.
- Find a number between two rational numbers.
- Multiply and divide integers and rational numbers.
- Solve proportion and percent problems.
- Solve problems involving percent increase and decrease, sales tax, discounts, and practical applications of percent concepts.
- Express numbers in scientific and standard notation, and convert between the two forms.
- Find the prime factorization of an integer, and the GCF of a pair of integers.
- Simplify rational and irrational square roots using a calculator as well as radical notation.
- Know and apply the Pythagorean Theorem.
- Identify irrational numbers.

- Simplify radical expression containing variables, and involving addition and subtraction.
- Solve radical equations.
- Use estimation skills to evaluate the reasonableness of answers.

Symbolic Representation: Students will become fluent in the symbolic language of mathematics. Topics here should also include using variables, writing equations and inequalities (in one and two variables), solving equations and inequalities (using all operations), functions, relations, using the properties (with an emphasis on the Distributive Property), monomials and polynomials, and factoring.

Specific Objectives (students will be able to):

- Translate verbal expressions into mathematical expressions, equations, and formulae.
- Define variables and write equations for verbal problems.
- Write an expression containing identical factors as an expression using exponents.
- Recognize and apply the Algebraic Properties (including Identity, Reflexive, Symmetric, Transitive, Commutative, Associative, Equality, Inverse, and Distributive).
- Recognize and use the commutative and associative properties.
- Recognize and use the distributive property to simplify expressions and solve equations.
- Solve equations using all operations, and involving more than one operation.
- Solve equations for a specific variable.
- Solve and graph inequalities.
- Solve absolute value equations (compound inequalities) and graph their solutions.
- Differentiate between monomials and polynomials, and identify polynomials by degree.
- Recognize and combine like terms.
- Apply exponent rules.
- Multiply monomials, binomials, and polynomials.
- Factor monomials, binomials, and polynomials.
- Identify and factor special binomials and trinomials (perfect square trinomials and difference of squares binomials).
- Apply a variety of methods to factor and solve binomial and polynomial expressions and equations.
- Simplify rational expressions.
- Multiply and divide rational expression.
- Add and subtract rational expressions with like denominators.

Linear and Quadratic Equations and Inequalities: Students will explore linear equations as representations or models of relationships, and will learn to solve systems of linear equations graphically and algebraically. Students should be able to move back and forth among the forms for representing data (graphs, algebraic equations, verbal expressions, and charts or tables). Students will be able to recognize functions and relations, and will be able to solve problems using linear equations, functions, relations, and quadratics.

Specific Objectives (students will be able to):

- Graph ordered pairs on a coordinate plane.
- Identify the domain, range, and inverse of a relation.
- Differentiate between relations and functions.
- Graph linear equations on a coordinate plane.
- Calculate values for functions and linear equations.
- Graph inequalities on a coordinate plane.
- Write an equation to represent a relation, given a chart, graph, or verbal expression.
- Solve problems by using line and bar graphs.
- Find the slope of a line.
- Write a linear equation in standard form, slope-intercept form, or point-slope form, given
    - two points on the line,
    - given a point on the line and its slope,
    - the line's intercepts,
    - a chart, graph, or verbal expression describing the line.
- Graph linear equations.
- Determine the intercepts of a graph, and be able to describe what the intercepts represent in the context of the graph.
- Find the coordinates of the midpoint of a line segment.
- Find the distance between two points using the distance formula.
- Solve systems of equations using a variety of methods (substitution, elimination, and graphing).
- Be able to explain what the solution to a system of equations represents in the context of a practical application (percent, interest rates, distance-rate-time, mixtures, etc.)
- Write quadratic equations in standard form.
- Graph quadratic functions and identify the axis of symmetry and the roots, or zeros, of an equation.
- Solve quadratic equations, using the most appropriate method (graphing, factoring, completing the square, using the quadratic formula).

Mathematical Processes: It is presumed that mathematical processes, including effective strategies for cooperative learning (in addition to individual work), along with problem solving strategies, and effective reasoning and communication, will be explicitly taught throughout the course.

Cooperative Learning. Students should be given opportunities to work in cooperative learning groups and individually throughout the year. Although both texts provide such opportunities, they are integral to the approach in CPM *Algebra 1*. It is recommended that teachers who place a greater emphasis on the Larson materials nonetheless use the cooperative learning strategies and structures outlined in the CPM teachers' materials, including teaching CPM Unit 0, "Getting Started: Working in Teams" to introduce students to appropriate cooperative learning behaviors.

Problem Solving. Teachers should structure the curriculum to include exploration and application of a variety of problem solving strategies, including guessing and checking, drawing a diagram, making a table, making a list, solving a simpler problem, using a formula, using a model, and writing an equation. Both texts provide extensive use of problem solving; the problem solving in the Larson *Algebra 1* is presented more discretely; in CPM *Algebra 1*, the problem solving is integral to structure and presentation of concepts.

Reasoning and Communication. The curriculum should be presented in such a way as to encourage increasing self-reliance on the part of the student in developing reasoning and communication skills. Problem solving situations and application problems which require reasoning skills should be a regular part of independent practice. In addition, students should regularly be given practice in communicating their thinking in written and oral forms to a variety of audiences (the teacher, their peers, and other audiences as appropriate).

Scope and Sequence

Completion of either of the texts, CPM *Algebra 1* or Larson *Algebra 1*, should result in the students' meeting the learning objectives stated above and provided in the state Frameworks. CPM *Algebra 1* covers the requisite topics if completed through Unit 12. If there is time available at the end of the 2nd semester, Unit 13, a return to the study of Quadratics in greater depth, is recommended. Larson *Algebra 1* covers the requisite topics if completed through Chapter 12, but specific sections may be treated as optional, as noted below. Optional sections may be omitted entirely, and returned to at the end of the year as time permits. A suggested Scope and Sequence follows for each text.

The preferred approach would be to use the CPM as a classroom text to involve students actively in cooperative learning and constructing understandings in the classroom context. CPM and Larson (McDougal Littell) supplemental materials can both be used to provide homework practice problems. Teachers may select more or fewer lessons from the Larson *Algebra 1* according to the needs of their individual classes. If teachers choose to supplement CPM more often with Larson, care should be taken that essential vocabulary and experiences are not dropped out of the curriculum, and that the pacing is modified to ensure completion of all required units.

CPM *Algebra 1*

1st Semester:	Units 0 through 6
2nd Semester:	Units 7 through 12
	Unit 13 optional (complete as time permits)

Larson *Algebra 1*

1st Semester:	Chapters 1 through 6. Optional sections: 2.4, 6.6 - 6.7.
2nd Semester:	Chapters 7. Optional section: 7.5.
	Chapter 8. Optional sections: 8.5 – 8.6.
	Chapter 9. Optional sections: 9.4 – 9.7.
	Chapters 11. Optional sections: 11.6 – 11.8.
	Chapter 12. Optional sections: 12.7 – 12.8.

The two texts correlate quite well, and units from CPM can be supplemented with practice work from the corresponding sections in Larson (and vice versa).

INSTRUCTIONAL MATERIALS

Basic Materials:

ALGEBRA 1, 2 (S) Student Texts:

College Preparatory Mathematics 1 (Algebra 1). 2nd Edition, Version 6.1. CPM Educational Program.

Algebra 1. Larson, Ron, *et al*. McDougal Littell. 2001.

College Preparatory Mathematics 1 (Algebra 1). 2nd Edition, Version 6.1. Teacher's Edition. CPM Educational Program.

Algebra 1, Teacher's Edition. Larson, Ron, *et al*. McDougal Littell. 2001.

Teacher's Resource Package. McDougal Littell. 2001.

Supplemental Materials:

Software and online programs. Recommended, not required.

Cognitive Tutor, Carnegie Learning.

ALEKS, Glencoe Publishing

EVALUATION

Evaluation of students in Algebra 1 ,2 (S) toward the attainment of the objectives listed in this guide will be measured in a variety of ways. These include tests from the textbook publisher, teacher made tests, alternative assessments, and standardized achievement tests. Students will be tested individually, as well as in group situations.